Chapter 4. Environmental Consequences

4.1 INTRODUCTION

This chapter, which is organized by topic area, identifies and discloses environmental impacts resulting from selection of the alternatives presented in **Chapter 2**. Each topic area includes a method of analysis section that identifies indicators and assumptions (see **Appendix 10**). Management actions proposed in **Chapter 2** are planning-level decisions that do not result in direct on-the-ground changes. However, the analysis in this chapter focuses on impacts that would likely result in on-the-ground changes as the decisions in this plan are implemented.

This analysis identifies impacts that may benefit, enhance, or improve a resource because of management actions, as well as those that have the potential to impair a resource. If an activity or action is not addressed in a given section, either no impacts are expected or the impact is expected to be negligible. The projected impacts on land use activities and the associated environmental impacts of land uses are characterized and evaluated for each of the alternatives. Some management actions may affect only certain resources. Baseline is the current condition or situation, as described in **Chapter 3**. At times, impacts are described using ranges of potential impacts or in qualitative terms.

4.2 GREATER SAGE-GROUSE

4.2.1 Nature and Types of Effects

Habitat Designation and Management

Management issues addressed during the land use planning process include adjustments to designated HMAs, habitat objectives, disturbance caps, and mitigation strategies, all of which may vary by alternative. Changes to these issues are reflected in actions related to management of other resources, such as minerals. For example, adjusting HMA boundaries could lead to fewer or greater acres managed as PHMA, and subsequently, fewer or greater areas subject to restrictions on mineral resource management. Permitted activities within HMA boundaries may also vary by alternative. Therefore, impacts from GRSG management are incorporated into the impacts discussion for management of other resources (see subsections below).

Habitat management and designations impact GRSG by influencing the level of activities and associated disturbances can occur in GRSG habitat. Impacts to GRSG resulting from GRSG habitat disturbances can vary depending on proximity to important GRSG seasonal habitats, type and quality of the habitat disturbed (e.g., good quality nesting habitat), type of disturbance (e.g., road, oil and gas wells, mining operation, wind turbines, and pipeline), associated indirect impacts (e.g., one-time human presence and noise disturbance or on-going maintenance and human presence), how the disturbance is distributed on the landscape (e.g., spread out or consolidated), other existing threats, and disturbance density. In general, any impacts that decrease nesting success and chick and adult female survival can impact population growth and viability (Taylor et al. 2012). Analyses of disturbance thresholds found GRSG began negatively responding to disturbances at approximately 4.5% disturbance and did not use habitats when surface disturbance exceeded 8% (Kirol 2012). Other research reported almost all occupied leks (99%) in the western portion of the range had less than 3% disturbance from urbanization within 3.1 miles of the lek (versus extirpated leks, Knick et al. 2013). Similarly, rangewide lek trend analyses suggest that aggregated human influences on the landscape are associated with negative GRSG lek count trends (Johnson et al. 2011) and population persistence (Aldridge et al. 2008; Wisdom et al. 2011; Kirol et al. 2020). Varied methodology precludes direct comparisons of

these studies. Similarly, the BLM would use different criteria for calculating disturbance caps for some alternatives, as described in the Alternatives subsections below.

Habitat fragmentation can result in lower tolerance to disturbance (Doherty et al. 2016), increased movement distances, reductions in lek persistence, lek attendance, population recruitment, yearling and adult annual survival, female nest site selection, nest initiation, and complete loss of leks and winter habitat (Schroeder and Robb 2003; Aldridge and Boyce 2007; Walker et al. 2007a; Doherty et al. 2008). Large-scale disturbances, such as agricultural conversions, within surrounding landscapes affect GRSG habitat selection and population persistence (Aldridge et al. 2008; Knick and Hanser 2011; Wisdom et al. 2011). Habitat loss and fragmentation also decrease the connectivity between seasonal habitats, potentially resulting in population isolation or loss (Knick and Hanser 2011; Doherty et al. 2008) and decreased genetic connectivity (Row et al. 2018; Oyler-McCance et al. 2022).

Because GRSG habitat use varies by season (see **Chapter 3**), the impacts of disturbance may vary due to different life stages being affected and may result in changes to vital rates. Research has found negative responses of GRSG to ex-urban development on brood-rearing habitats (Westover et al. 2016), well pads and roads on nesting habitat (Zabihi et al. 2017), and human disturbance on all habitats once sagebrush landscape cover is reduced to a level where GRSG occupancy is negatively affected (Doherty et al. 2016). These effects are intensified in highly fragmented habitats with low sagebrush landscape cover. Considering the spatial area of disturbances in relation to seasonal habitats and different GRSG life history stages is important (Reinhardt et al. 2017; Doherty et al. 2016).

Disturbances due to land use activities vary by geographical areas. For example, open plains, prairies, and plateaus may be suitable for wind and solar energy development, whereas mountainous regions may be more suitable for recreation. Because rangewide lek persistence is related to environmental factors, including topography and landscape configuration (Wann et al. 2023), impacts from disturbance likely varies by geographical area. Activities in higher quality habitat may have a greater impact on GRSG. Additionally, activities contributing to habitat fragmentation may interfere with gene flow and population persistence, particularly since GRSG may already avoid dispersal areas of rough terrain or steepness (Row et al. 2018).

Under some alternatives a disturbance and energy facility density cap is included to limit aggregated disturbance and impacts within GRSG management areas. Setting caps influence allowable level of disturbance within a GRSG HMA, which varies by alternative. A lower level of allowable disturbance would have fewer impacts to GRSG, including both habitat and individuals. Adaptive management is included in some alternatives if habitat or populations continue to decline to the point that thresholds are met. In that event, more restrictive measures could be applied. The goal of adaptive management is to detect effects on GRSG habitats and populations and act in an appropriate time frame to effectively offset impacts.

Baseline data show a total of 330,285 acres of disturbance on PHMA/IHMA in fine scale HAF units rangewide (excluding WY, for which fine scale HAFs have not yet been mapped), and the amount of disturbance in PHMA/IHMA within fine scale HAF units does not currently exceed 3% (BLM data 2023). However, the targeted annual warning system (TAWS), which identifies local populations exhibiting asynchronous decline relative to regional population patterns (Coates et al. 2021), estimated 2.9% average annual declines in GRSG populations across their geographical range over a 29-year time period (Coates et al. 2023). Similarly, a rangewide analysis conducted by the BLM showed that sagebrush availability declined by approximately 3% between 2012 and 2018, and 16 habitat triggers were tripped between 2015 and 2020 (Herren et al. 2021). Forty-two GRSG population triggers were tripped in the same time period (Herren et al. 2021). Most of the habitat triggers were the result of wildfires and the associated loss of sagebrush habitats. For population

triggers, management changes were identified as needed to address the causal factor in almost half of the areas evaluated. These data indicate that similar trends may continue even with a 3% (or higher) disturbance cap. However, these trends were calculated rangewide, whereas disturbance caps would be calculated at smaller scales (see the Alternatives sections). Additionally, not all the alternatives incorporate wildfire into the disturbance calculations, and since wildfire is a primary driver of sagebrush habitat loss, there may be differences in the total amount of disturbance needed to stay within the cap by alternative (see Alternatives sections).

Minerals Management

Mineral extraction of all types in GRSG habitat may result in habitat loss from construction of infrastructure, surface or underground mines, and other associated facilities. GRSG population reestablishment in reclaimed areas may take upwards of 30 years (Braun 1998). The use of reclaimed areas is likely influenced by whether the sagebrush systems are mesic or arid, with GRSG more likely to use reclaimed mesic sagebrush systems which recover more quickly (Walker 2022). Where compromised by invasive grasses, reclamation may be only minimally effective, without additional intervention.

Necessary infrastructure, including location, construction, and use of ancillary facilities, staging areas, roads, railroad tracks, buildings and power lines cause additional direct and indirect impacts on GRSG (Fedy at al. 2015; Kirol et al. 2015a, b; Edmunds et al. 2017; Spence et al. 2017; Green et al. 2017). These may also result in noise and light pollution, fugitive dust, human disturbance, increases in predator perch sites, and weed proliferation, any of which leads to habitat degradation (Hanser et al. 2018).

Fluid Mineral Resource Management

Industrial activity associated with oil and gas development disrupts the habitat and life cycle of GRSG, resulting in negative impacts to populations and habitats (Naugle et al. 2011; Taylor et al. 2012; Smith and Dwyer 2016; Green et al. 2017). GRSG populations typically decline following oil and gas development (Holloran 2005; Walker et al. 2007a; Doherty et al. 2008), and impacts have been observed when leks occur within 2.5 miles of a producing well, when greater than eight active wells are within 3.1 miles of leks, or when more than 200 active wells are within 11 miles of leks (Johnson et al. 2011). Other studies reported increasing density of oil and gas wells correlated with decreasing lek attendance with effects observed at 3.98 miles from leks. Abundance was also negatively affected for a distance of between 3 and 4 miles (Holloran 2005). Before implementation of Wyoming's Core Area Strategy, lek attendance was negatively correlated with density of oil and gas wells (Green et al. 2017; Hanser et al. 2018). In some instances, impacts have been directly attributed to features associated with energy development (e.g., roads, power lines, noise, and associated infrastructure; Walker et al. 2007a; Doherty et al. 2008; Lyon and Anderson 2003; Holloran 2005; Kaiser 2006; Aldridge and Boyce 2007). A one mile buffer from energy development in Wyoming and Montana resulted in a lek persistence of approximately 30%, whereas lek persistence in areas without oil and gas development averaged 85% (Walker et al. 2007a). Three miles was recommended as a minimum buffer to protect GRSG from energy development impacts in the Bi-State area (Coates et al. 2013). Other impacts have been documented within varying distances from energy infrastructure and at different well densities (Manier et al. 2014).

A one- to four-year time lag between oil and gas development and lek decline can occur, possibly because this activity negatively affects recruitment rather than causing avoidance or decreased survival (Green et al. 2017). Lags are potentially explained by avoidance and reduced survival and fecundity in GRSG generations produced following the onset of development (combined with adult philopatry, Holloran et al. 2010).

Direct, indirect, and residual impacts from energy development accrue both locally and cumulatively at the landscape scale. GRSG populations typically decline following oil and gas development (Holloran 2005; Walker et al. 2007a; Doherty et al. 2008). Indirect effects are habitat degradation or utilization displacement and are estimated to occur out to 11.8 miles from leks (Naugle et al. 2011). Population impacts have been observed when leks occur within 2.5 miles of a producing well, when greater than eight active wells are within 3.1 miles of leks, or when more than 200 active wells are within 11 miles of leks (Johnson et al. 2011). Other impacts have been documented within varying distances from energy infrastructure and at different well densities (Manier et al. 2014).Noise from industrial activity may disrupt GRSG communication potentially interfering with acoustical signals that attract females to leks (Gibson and Bradbury 1986; Gratson 1993; Blickley et al. 2012). Noise associated with oil and gas development may have played a factor in habitat selection and a decrease in lek attendance by GRSG in western Wyoming (Holloran 2005). Recent studies in oil and gas areas suggest that GRSG avoid leks exposed to human noise (Blickley et al. 2012; Blickley and Patricelli 2012) and may cause declines in GRSG (Ambrose et al. 2021). Chronic noise pollution can also cause GRSG to avoid otherwise suitable habitat (Patricelli et al. 2013) and can cause elevated stress levels in the birds that remain in noisy areas (Blickley et al. 2012).

Interaction and intensity of effects of habitat loss from energy development could cumulatively or individually lead to habitat fragmentation in the long term (Connelly et al. 2004; Holloran 2005). This could negatively impact lek persistence and attendance, winter habitat use, recruitment, yearling annual survival rate, and female nest site choice (Holloran 2005; Aldridge and Boyce 2007; Walker et al. 2007a; Doherty et al. 2008, 2016).

To address impacts identified, stipulations would be associated with new fluid mineral leasing (e.g., oil, gas, and geothermal) in GRSG HMAs including NSO, CSU/disturbance caps, and TL stipulations on new leases. These stipulations are intended to reduce or avoid direct disturbance, protect HMAs from surface-disturbing activities, and conserve habitat and population connectivity contributing to genetic diversity. NSO stipulations on new leases would limit impacts to HMAs from surface-disturbance, ensure connectivity between leks, and minimize habitat fragmentation. However, NSO stipulations can push infrastructure to surrounding private and state lands which may still result in GRSG habitat fragmentation. Waivers, exceptions, and modifications (WEMs) could be applied to stipulations and could void or modify the stipulation depending on the alternative.

Other Mineral Resource Management (Salable, Nonenergy Leasable, Locatable, and Coal)

Impacts from management of other mineral resources would be similar to those described for fluid mineral resources, and include disturbance, habitat loss/degradation. Infrastructure for mining is like that required for oil and gas but is more localized in extent, but mines may have a large footprint. Direct habitat loss can occur from removing vegetation and soil to access mineral resources and storage of overburden (soil removed from mining activities or the formation of mine shafts) in undisturbed habitat. Construction of ancillary facilities (e.g., air vents, fans, and shafts), staging areas, roads, railroad tracks, and structures such as buildings and power lines can result in direct habitat loss. Indirect impacts, such as noise, light, human activity, dewatering of springs and surface water, loss or reduction of groundwater that may be connected or important to surface waters, and subsidence, can impact GRSG. The interaction and intensity of effects from habitat loss could cumulatively or individually lead to habitat fragmentation in the long term (Connelly et al. 2004; Holloran 2005). Surface mining has a greater direct habitat impact than underground mining but disturbance from aboveground infrastructure for also results in direct loss of habitat if it occurs in GRSG habitat.

A few scientific studies examine the effects of coal mining on GRSG. In North Park, Colorado, overall GRSG population numbers were not reduced, but there was a reduction in the number of males attending leks within 0.8 mile of 3 coal mines, and existing leks failed to recruit yearling males (Braun 1986; Remington and Braun 1991). New leks formed farther from mining disturbance (Remington and Braun 1991). Some leks that were abandoned adjacent to mine areas reestablished when mining activities ceased, suggesting disturbance rather than habitat loss was the limiting factor (Remington and Braun 1991). Hen survival did not decline in a population of GRSG near large surface coal mines in northeast Wyoming, and nest success appeared not to be affected by adjacent mining activity (Brown and Clayton 2004). Blasting, a practice used to remove overburden or the target mineral, produces noise and ground shock. The full effect of ground shock on wildlife is unknown but noise from mining operations during lekking activity could result in lek or nest abandonment (Moore and Mills 1977).

As described for fluid mineral leasing, stipulations would be associated with other mineral leasing in GRSG HMAs and would vary by alternative. The BLM could ask the Secretary of the Interior to propose and make a withdrawal of the land from location and entry under the Mining Law of 1872 pursuant to Section 204(a) of FLMPA. Proposing and making a withdrawal is not a land use planning process and a recommendation does not in itself restrict activities or have any direct impacts. Should the Secretary propose a withdrawal, that proposal would require environmental and other analyses under NEPA and other applicable authorities before the land could be withdrawn. For purposes of this planning initiative, the alternatives analysis includes a description of the likely environmental effects should the Secretary propose and make a withdrawal in the future (e.g., reduced potential for behavioral disturbance and habitat loss/alterations).

Lands and Realty Management

GRSG respond negatively to increased human infrastructure in sagebrush habitats, including roads, power lines, and communication towers (Manier et al. 2013). Although transmission and power line construction does not generally result in substantial direct habitat loss, it would permanently disturb individual GRSG and habitat along the ROW due to the associated human activity, equipment, and noise, and would contribute to habitat fragmentation. In addition, transmission lines can provide perches and nest sites for ravens and raptors, resulting in indirect negative impacts on GRSG survival and reproduction (Gillan et al. 2013; Gibson et al. 2018; Lockyer et al. 2103; Coates et al. 2014, 2016, 2020; Howe et al. 2014; Hanser et al. 2018; O'Neil et al. 2018). Avian predator control methods, such as deterrents, may help reduce avian predation impacts on GRSG, but efficacy is variable (Prather and Messmer 2010; Lammers and Collopy 2007; Slater and Smith 2010).

Areas managed as ROW exclusion would prohibit development of all or certain types/ subsets of ROWs (e.g., utility scale wind and solar testing and development). In areas managed as ROW avoidance the BLM would consider allowing ROW on a case-by-case basis. This flexibility may be advantageous where federal and private landownership areas are mixed and exclusion areas may result in more widespread development, potentially in higher quality habitat, on private lands if BLM-administered lands could not be used.

Collisions with power lines, vehicles, and property fencing and increased predation by raptors using these features may increase GRSG deaths at leks (Connelly et al. 2000a; Lammers and Collopy 2007). Since GRSG deaths associated with power lines and roads occur year-round (Aldridge and Boyce 2007) roads and power lines may also indirectly affect lek persistence by altering productivity of local populations or survival at other times of the year. Artificial ponds created by development (Zou et al. 2006) can support breeding mosquitoes known to carry West Nile virus (Walker et al. 2007b) and elevate the risk of GRSG deaths in late summer

(Walker and Naugle 2011). GRSG may also avoid otherwise suitable habitat as development increases (Lyon and Anderson 2003; Holloran 2005; Kaiser 2006; Doherty et al. 2008).

Avoidance of developed areas should be considered a reduction in the distribution of GRSG (Walker et al. 2007a) as avoidance can result in population declines when density dependence, competition, or displacement of birds into poorer-quality adjacent habitat lowers survival or reproduction (Aldridge and Boyce 2007; Holloran et al. 2010). The specific response is tied to the type of ROW, its location, and associated human activity and infrastructure. GRSG exhibit extremely high site fidelity, which strongly suggests that unfamiliarity with new habitats may also reduce survival (Baxter et al. 2008; Holloran and Anderson 2005), as evidenced in other grouse species (Yoder et al. 2004).

Renewable Energy Management

Potential impacts of renewable energy on GRSG have not been as widely studied as other energy developments. However, impacts on GRSG can be anticipated from studies of oil and gas development and associated infrastructure on the species (Becker et al. 2009). Because GRSG have evolved in habitats with little vertical structure or other man-made features, tall vertical structures such as wind turbines may displace GRSG from their usual habitat (Johnson and Stephens 2011). Wind energy studies have found nest and brood survival are negatively affected with proximity to wind turbines, likely a result of increased predation (LeBeau 2012; LeBeau et al. 2014, 2017a, 2017b). Additional concerns with wind energy development include noise produced by rotating blades, GRSG avoidance of structures, mortality by flying into rotors, and the presence of new roads and power lines (Connelly et al. 2004; Manier et al. 2013). Disturbance from the footprint of infrastructure is negatively associated with GRSG viability (Kirol et al. 2020; Coates et al. 2021). Development of solar facilities would have similar infrastructure effects (vertical structures, roads, fencing, other associated infrastructure, and related changes in vegetation), but would occur at a discrete location with intense development (i.e., a solar field). Negative impacts to GRSG from solar facilities are anticipated to extend to ancillary infrastructure, such as transmission lines and substations as seen with other types of energy development. While there is less potential for mortality or injury due to collisions at solar versus wind facilities, there may be an increased risk of GRSG mortality due to collisions with fencing associated with solar facilities. Research on geothermal development in Nevada reported adverse effects on GRSG populations by decreasing nest survival, adult survival, and increased density of common ravens (Coates et al. 2021).

Longer-term residual impacts may be cumulative and their contribution to GRSG population declines depend on the magnitude, frequency, and duration of human disturbance. GRSG may abandon leks if repeatedly disturbed by raptors perching on power lines or other tall vertical structures near leks (Ellis 1984), by vehicular traffic on roads (Lyon and Anderson 2003), or by noise and human activity associated with energy development (Braun et al. 2002; Holloran 2005; Kaiser 2006).

Travel and Transportation Management

The effect of roads can be direct through changes in habitat and GRSG populations and indirect through avoidance behavior (Lyon and Anderson 2003; USFWS 2010a). Roads alter and fragment habitat by impeding use of seasonal habitats, facilitating habitat degradation by creating a corridor along which invasive plants can spread, allowing for increased human noise disturbance, resulting in GRSG avoidance (i.e., functional habitat loss), direct mortality, and increasing mammalian and avian predator abundance (Formann and Alexander 1998).

GRSG persistence is inversely correlated with road density. Compared with currently occupied GRSG range, areas where GRSG no longer occur are 60% closer to highways and had 25% higher road densities (Manier et al. 2013, citing Wisdom et al. 2011). Within GRSG range, 95% of the mapped sagebrush habitats are within 1.6 miles of a mapped road and density of secondary roads exceeds 3.1 miles per 247 acres in some areas (Knick et al. 2011). Incremental effects of accumulating length state and federal highways and interstates near leks included decreasing lek counts when there were more than 3.1 miles of federal or state highway within 3.1 miles of leks and when more than 12.4 miles of highway occurs within 11.2-miles of leks (Johnson et al. 2011).

Livestock Grazing Management

Research shows livestock grazing in GRSG habitat may either improve or decrease habitat quality, depending on the type of habitat, spatial and temporal scale, and how the grazing is administered (Beck and Mitchell 2000; Boyd et al. 2014). Because of numerous variables that influence the landscape (e.g., vegetation present, soil, elevation, aspect, and precipitation) combined with historic and current levels (e.g., numbers and use) and methods of livestock grazing (e.g., kind of livestock, rest-rotation, and seasonal use) and associated infrastructure on grazing lands (e.g., fences, water impoundments and tanks, corrals), impacts on GRSG habitat from livestock grazing vary tremendously in space and time (Manier et al. 2013). Because of this variability across the planning area the nature and level of impacts discussed in this analysis are described in broad terms. Effects from livestock grazing on riparian habitats are outlined in **Section 4.3.1**, *Nature and Type of Effects.*

Impacts from livestock herbivory (consumption of vegetation) are diffused over broad spatial or temporal scales and are different than discrete disturbances (Knick et al. 2011; BLM IM 2012-044, BLM National Greater Sage-Grouse Land Use Planning Strategy). Livestock herbivory can influence yearly vegetation conditions, and/or result in altered vegetation dominance over time. Prolonged selective grazing pressure on vegetation communities can affect the condition of individual plants, abundance of species, interspecific competition, and ultimately, community composition (Manier and Hobbs 2006). While specific effects and conditions from grazing are localized in most cases, the continuous and collective presence of these effects across the West may affect the regional condition of GRSG habitats (Manier et al. 2013).

Timing of grazing relative to plant growth stages (e.g., growth initiation, rapid growth, seed development, seed ripe, and dormancy) can influence the effects on vegetation (Briske and Hendrickson 1998; Briske et al. 2003; Veblen et al. 2011). Repeated grazing during periods of fastest growth of the dominant grasses and forbs in intermountain sagebrush steppe over multiple consecutive years tends to favor sagebrush growth (Pyke 2011) through reduced competitive ability of grasses (Manier et al. 2013). Spring grazing in winter habitat may improve GRSG winter habitat because grass reductions can increase sagebrush densities (Angell 1997; Beck and Mitchell 2000), suggesting an opportunity to graze GRSG winter habitats in spring when non-overlapping brood-rearing habitats would be avoided, and vice versa (Manier et al. 2013). Because GRSG initiate nesting prior to new herbaceous growth, grazing levels from the previous year and the residual grass can provide initial cover for nesting GRSG (Hausleitner et al. 2005; Holloran et al. 2005). Nesting GRSG consistently select areas with more sagebrush canopy cover and taller grasses compared with available habitats (Hagen et al. 2007), increasing the probability of a successful hatch (Manier et al. 2013). If nesting and early brood-rearing habitats are grazed in a manner that consistently results in a lack of sufficient residual grass cover the following spring, predation of GRSG nests could increase and the rate of nest success could decrease (USFWS 2010).

The availability of forbs is an essential component of a pre-laying hen's diet (Barnett and Crawford 1994; Connelly et al. 2000; Gregg et al. 2008). In Nevada, greater forb diversity and higher plant species richness were small-scale habitat factors associated with brood success (Casazza et al. 2011). A reduction in forbs due to livestock grazing would reduce the value of nesting and early and later brood-rearing habitat for GRSG and may cause them to use less optimal habitat, potentially affecting nesting GRSG (Barnett and Crawford 1994) and chick survival (Huwer et al. 2008). Forb diversity and concentration dramatically increase invertebrate densities, which are crucial for chick survival and growth (Johnson and Boyce 1990). Insect diversity and density are positively correlated with herbaceous density and diversity (Jamison et al. 2002). However, recent research has found that grazing intensity was not ultimately detrimental to insect abundance and permitted some insect taxa to thrive (Richardson et al. 2023).

The effects from grazing also vary by kind of livestock, numbers of livestock, duration, and area (intensity), and grazing management systems (e.g., rest-rotation and deferred rotation). Grazing intensity (e.g., stocking rate, duration, and frequency) has consistently been identified as having impacts on ecosystem and rangeland health (Briske et al. 2008; Veblen et al. 2011), including the vegetative structure required by GRSG. Livestock, especially cattle, prefer to concentrate near water sources and the location of water affects livestock distribution patterns. This pattern can result in disproportional use of riparian habitats and wet meadows, which can result in loss of riparian vegetation and cover, as well as compaction of soils and lowering of water tables, which alters water quality, invertebrate populations, and plant species composition. This can result in degradation of crucial habitats for GRSG.

Man-made water sources provided in support of livestock grazing may attract GRSG and expose them to insects that may serves as vectors for diseases such as West Nile virus (Naugle et al. 2004). Additionally, the presence of livestock is positively associated with increased raven occurrence (Coates et al. 2016), which can lead to increased GRSG predation. Livestock management practices provide ravens with resource subsidies, such as water sources, which are naturally scarce in the arid west. Structural range improvements, such as fences represent potential movement barriers or predator perches and are a potential cause of direct mortality to GRSG due to collision (Stevens et al. 2012; Manier et al. 2013).

Livestock grazing can be a management tool to aid in the management or maintenance of vegetation communities within GRSG habitat (see site-scale habitat suitability indicators, **Appendix 8**, Greater Sage-Grouse Habitat Monitoring and Reporting). Well managed livestock grazing may change plant community composition, increase productivity of selected species, increase forage quality, and alter structure to increase habitat diversity (Vavra 2005), and can positively effect GRSG habitat suitability (Manier et al. 2013). Many studies demonstrate weeds can be controlled through grazing at a specific time, intensity, and duration to reduce abundance of these species. Under controlled situations, where livestock is used as a targeted vegetation treatment tool, livestock can reduce fine fuel loads (e.g., cheatgrass) (Diamond et al. 2009). Cheatgrass completes its reproductive cycle, using limited soil moisture and nutrients, well before most native perennial grasses and is usually dry by mid-summer, which coincides with increased wildfire danger (Pellant 1996). Intense "flash" grazing during the winter or early-late spring, while it is still green, may control cheatgrass. However, recent research also suggests bunchgrass community structure and the presence of biological soil crusts increases resistance to cheatgrass invasions and that grazing management that decreases those components decreases the vegetation communities' resistance to invasion (Reisner et al. 2013). Sheep and goats (if permitted) can be used to control noxious weeds such as leafy spurge, spotted knapweed, and yellow star thistle. Effectiveness of livestock as a management tool for the control of undesirable vegetation is highly dependent on the scale, livestock behavior, and ability to avoid grazing native vegetation.

Although the potential for population level effects is uncertain, GRSG may be directly impacted by livestock trampling of GRSG eggs or causing nest desertion from repeated disturbance (Beck and Mitchell 2000). Trampling by livestock under short-duration or season-long grazing may also kill sagebrush, particularly seedlings growing in the spaces between shrubs (Beck and Mitchell 2000), though effects are typically localized.

Under all alternatives, described in **Section 2.9.7**, livestock grazing would be managed to meet or make progress towards land health standards and improper grazing would be limited and addressed through implementation-level corrective actions. In this RMPA, varying acres of GRSG HMAs would be available or unavailable for livestock grazing. The actual number of AUMs authorized on a permit may be adjusted through permit renewals, permit modification, allotment management plan development, or other appropriate implementation activity. In areas unavailable for grazing, there would be no GRSG habitat alterations as a result of grazing, as described above. However, removal of grazing would result in reduced landscape scale removal of fine fuels, which could indirectly impact GRSG habitat by increasing the potential for wildfire. The BLM could still implement targeted grazing treatments, but the scale would be less than if more areas are available for grazing. In areas of mixed land ownership, making public lands unavailable for grazing that are adjacent to private grazing lands would result in more fencing. This could impact GRSG due to increased perches for avian predators (Coates et al. 2015; O'Neil et al 2018) and increased risk of collision. Additionally, sale of private lands could lead to an increased potential for urbanization in some areas, which may impact GRSG due to habitat loss, fragmentation and disturbance.

Wild Horse and Burro Management

Wild horses may alter habitat conditions for GRSG, including reduced vegetation abundance and cover, increased shrub canopy fragmentation, lowered species richness, increased compaction in surface soil horizons, and increased dominance of unpalatable forbs (Manier et al. 2013; Chambers et al. 2017; Coates et al. 2021). In addition, horse populations over appropriate management levels can degrade riparian areas, decrease water quantity and quality, and increase soil erosion. Cumulatively, this can reduce habitat quality for wildlife, including GRSG. Effects of wild horses on habitats may also be more pronounced during periods of drought or vegetation stress (NTT 2011). Methods used for wild horse and burro gathers may also disturb GRSG.

Fences used to manage horse distribution represent a potential source of direct mortality to GRSG (Manier et al. 2013). Year-round water availability in horse herd management areas and wild horse territories is required by the Wild and Free-Roaming Horses and Burros Act of 1971. This can result in year-long use of riparian areas by wild horses and other modifications (e.g., fences, troughs). Negative effects are possible depending on how each facility is constructed. Range improvements would increase potential perch sites for avian predators (fences) and potential drowning hazards (troughs).

Predator Management

GRSG are prey for various predators including coyotes, badgers, bobcats, red fox, hawks, and corvids (Mainer et al. 2013). Predation can be a threat to GRSG, especially in areas of low population density where there is limited habitat or poor habitat quality (USFWS 2010). Under some circumstances, predation rates can increase, such as when human subsidies attract increased numbers of predators. Raven populations have dramatically increased, with 293% more ravens within GRSG range compared to outside their range between 1966 and 2018 (Harju et al. 2021). This has led to concerns about increased predation rates which can be exacerbated by supplemental food resources, increased infrastructure supporting nesting and perching opportunities, increased paved roads and highways which are sources of road-kill, and livestock carcasses

and afterbirths. Elevated raven abundance associated with human resource subsidies have been documented to cause elevated predation rates on GRSG (Coates et al. 2020). Predator control in areas of compromised habitats with high populations of synanthropic predators (predators that live near, and benefit from, an association with humans) may be help ensure GRSG persistence until habitat conditions improve (Coates et al. 2015; O'Neil et al 2018). Predators, especially coyotes are often controlled to prevent livestock loss, may reduce predation on GRSG.

ACEC Designation

Special management areas such as ACECs can be used as a management tool to provide protection to GRSG and habitats through restrictions on uses and surface-disturbing activities. However, the conservation value of an ACEC designation for GRSG depends on area's purpose, and in some cases, surface-disturbing activities may be allowed. The High Lakes ACEC and Red Knoll ACEC, in OR include GRSG and GRSG plant communities as relevant and important values although they were not specifically designated for GRSG conservation. Management to protect these values in these ACECs and others that overlap GRSG habitat may provide incidental protection to GRSG and their habitats by restricting land disturbances (e.g., ROWs).

4.2.2 Alternative 1

Habitat Designation and Management

Rangewide Environmental Consequences

Under Alternative 1, GRSG habitat is separated into SFAs, PHMA, GHMA, and other HMAs for certain states (see **Table 2-3**). Restrictions to land use and surface-disturbing activities would occur within each HMA and SFA, depending on the classification (see **Chapter 3**). Corresponding management actions, including lek buffers, required design features, fluid mineral leasing prioritization, and habitat objectives, would provide a hierarchy of potential conditions to minimize effects in HMAs. Mineral withdrawal was recommended for lands within SFAs to emphasize protection of GRSG, and if the withdrawal would occur management for SFAs would provide the highest level of protection to GRSG. However, the lack of WEMs in SFAs, even for actions that would benefit GRSG, could limit habitat improvements. In general, restrictions to land use and surface-disturbing activities in HMAs and SFAs would reduce the likelihood for habitat loss, fragmentation, and direct disturbance to GRSG. Effects from specific restrictions associated with each resource use are described in the sections below. In most cases management actions for state-specific HMA (IHMA, OHMA, etc.) would be consistent with those for PHMA; where differences occur, they are analyzed under *State-Specific Environmental Consequences*. Alternative 1 includes lek buffers for all HMAs. These buffers are consistent with the lek buffer distances identified in the USGS Report, *Conservation Buffer Distance Estimates for Greater Sage-Grouse - A Review* (a 1-mile buffer would be used as the minimum threshold in Colorado). Modifications to the buffer distances could be made if they meet the criteria outlined in the report. Lek buffers would reduce disruption to GRSG, minimize habitat loss, and reduce habitat degradation, and should contribute to maintaining nesting habitat effectiveness and brood survival.

Alternative 1 incorporates an adaptive management strategy composed of soft and hard triggers that are based on population and habitat changes. The BLM would rely on data from several sources to track and identify population changes to assess the population trigger in the adaptive management approach. Triggers would be determined by population area, making the strategy more locally responsive than if triggers were determined on a sub-regional or statewide basis. Responses to soft triggers may require adjustment of future project level/plan implementation activities, as consistent with the individual site-specific NEPA analyses. Soft trigger responses can come in the form of terms, conditions, RDFs, or site-specific mitigation measures. Hard triggers represent a threshold indicating that immediate action is necessary to stop a severe deviation from GRSG conservation objectives set forth in the Proposed Plans. If new scientific information becomes

available demonstrating that the hard-wired response would be insufficient to stop a severe deviation from sage-grouse conservation objectives set forth in the ARMPA, the BLM will implement interim management direction to ensure conservation options are not foreclosed. The BLM will also undertake any appropriate plan amendments or revision if necessary. The use of adaptive management would benefit GRSG by allowing flexible resource management decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. If management changes are successful, they would reduce impacts to GRSG by limiting disturbances and improving habitat conditions. The BLM would require and ensure mitigation that achieves a net conservation gain in all HMA types and in all states (except WY GHMA). Properly implemented, mitigation should offset any loss of GRSG habitat resulting from land use activities.

Under Alternative 1, all states would include language to maintain and enhance sagebrush habitats with the intent of conserving GRSG populations. Habitat objectives would be considered when authorizing activities in GRSG habitat. The exact language varies by state, but in general, inclusion of specific habitat objectives could result in increased certainty and greater levels of consistency when considering implementation-level actions. Following these objectives could prevent activities such as improper grazing practices and result in increased habitat quality. Improved habitat conditions would increase nest success, chick survival, and GRSG persistence over the long term.

State-Specific Environmental Consequences

There could be impacts to GRSG in WY GHMA associated with land use activities as described under *Nature and Types of Effects*. No mitigation would be required in WY GHMA.

In CO, ID, NV/CA, OR, and UT, a 3% disturbance cap would apply to land use activities (except wildfire and agriculture) at both biologically significant unit (BSU)-scale and at proposed project analysis area within PHMA. In ID, the same cap would apply but it could be exceeded in utility corridors if it benefits GRSG. Calculating disturbance at the project-level means may prevent some development that could occur if disturbance is only calculated at a coarser scale. In addition to calculating disturbance at the project-level, disturbance would also be calculated for each BSU. The definition of a BSU would vary by state, but in general, a BSU is defined as a spatial area that contains relevant and important GSRG habitats and is used for comparative calculations to support evaluation of changes to habitat. Including caps at both project and BSU scales would reduce disturbance on both the local and landscape scales, therefore, provide protection for both the larger population and individual leks and their surrounding habitat.

Excluding wildfire and agriculture from the disturbance calculation for those states listed above may result in a higher level of disturbance overall. Since wildfire was the primary source of habitat loss in previous years (Herren et al. 2021), this may contribute to continued declining habitat trends. However, wildfire and agriculture are factored into the soft and hard habitat triggers and included as part of the HAF boundary and 70% sagebrush cover habitat objective; if these disturbances lead to the trip of a trigger, adaptive management would be applied to reverse the trends. In PHMA and IHMA, the Anthropogenic Disturbance Screening Criteria would apply stringent criteria to any proposed projects. No disturbance cap would apply in GHMA or GRSG brood-rearing habitat and migration corridors.

Managing RHMA in MT would add protections to GRSG in those areas. Management actions in RHMA would emphasize restoration for the purpose of restoring habitat to provide the ability for establishing or enhancing GRSG populations to sustainable, dense levels. Management in RHMA that leads to restrictions to land use and surface-disturbing activities would reduce the likelihood for habitat loss, fragmentation, and direct disturbance to GRSG. The restoration focus in RHMA would further improve GRSG habitat. The higher

disturbance cap in MT, WY, and the Dakotas could lead to greater levels of anthropogenic disturbance within a project area, and therefore greater potential for habitat loss and alterations as well as direct disturbance to GRSG, depending on the degree to which wildfire and agriculture contribute to disturbance in a given area. Because disturbance will only be calculated at the project level, cumulative disturbance over a larger area could potentially occur at levels that influence GRSG populations within a BSU. However, in areas with reduced habitat due to wildfire and/or agriculture, additional anthropogenic development would be limited, reducing the combination of threats and habitat degradation.

Although all states would include an adaptive management strategy, the metrics, thresholds, timeframes, and spatial scales for evaluating and responding to triggers would vary state by state. As a result, there would be no consistency in how triggers are calculated across the range and responses may not be implemented across an area that encompasses an entire population group and/or seasonal habitats needed throughout the year. If management changes do not apply to all populations and habitats being affected, some individuals and/or habitat areas may improve while others remain impacted.

In UT, the GHMA identified in Alternative 1 is generally comprised of poor-quality habitat on the periphery of larger PHMA. The extent to which some of these GHMA areas may provide connectivity, be used as corridors, or provide certain seasonal habitat during portions of a bird's life cycle is largely unknown due to limited telemetry. Most of these GHMA areas are predominantly private, Tribal, and TLA lands, and because of the limited regulatory discretion (other than split estate where BLM administers the mineral estate) that the BLM has on resources in these areas impacts on GRSG from development are likely to continue at current rates. Only 6 of the 13 leks in GHMA are in areas affected by BLM management, with the other 7 in areas predominantly managed by USFS, tribal, or private entities. Development could still occur in UT GHMA potentially resulting alteration, direct loss, and fragmentation of seasonal GRSG habitats. Fragmentation could further limit the amount of usable habitat available for the small and declining population of GRSG that occupy GHMA.

Minerals Management

Rangewide Environmental Consequences

Leasing of fluid minerals would be allowed in PHMA and ID IHMAs, subject to NSO stipulations and/or seasonal restrictions. This would increase HMA acres subject to effects from mineral resource development as described in *Nature and Types of Effects* compared to alternatives in which PHMA would be closed to leasing. In SFAs, there would be no exceptions, waivers, or modifications allowed. In PHMA outside of SFAs, no waivers or modifications would be allowed; however, exceptions could be considered on a very limited basis, and only in circumstances where granting an exception would have either have no impacts or would reduce impacts on GRSG.

NSO stipulations on new leases would protect PHMA from surface-disturbing activities on BLM lands. In large contiguous areas primarily managed by the BLM, GRSG exposure to disruption would be limited to the human activity that accompanies construction, development, or production activities. Access to fluid mineral deposits would require horizontal drilling from outside the boundaries of the NSO area. However, in areas of mixed ownership, impacts could still occur due to directional/horizontal drilling as described in *Nature and Types of Effects*. NSO on BLM lands may encourage co-location of leases, which could help prevent fragmentation and preserve connectivity between leks by concentrating effects outside of PHMA.

PHMA in all states would be closed to salable mineral development (except where authorized in MT and open subject to restrictions in WY), but open for new free use permits (except ID). PHMA in all states and

ID IHMAs would be closed to non-energy mineral development, but they could consider expansion of existing leases. Most states would include minimization measures for salable mineral and non-energy mineral development in GHMA, but they were not recommended for withdrawal. These are described in the 2015 EISs for CA, CO, ID, MT/DK, NV, OR, UT, and WY (BLM 2015a-2015h). SFAs in all states were recommended for withdrawal from location and entry under the United States mining laws. Following publication of the RODs, the BLM applied for a withdrawal of the SFAs, pursuant to section 204 of FLPMA. The Secretary accepted the BLM's application and the BLM initiated the withdrawal process for those lands. These restrictions would reduce the HMA acres affected and potential impacts to GRSG and habitat within PHMA and GHMA, such as disturbance and habitat alterations. Indirect effects on wildlife include noise, dust, and light impacts resulting from mining and transportation. Additional impacts on GRSG associated with mineral development would be as described under *Nature and Types of Effects*.

State-Specific Environmental Consequences

In WY, applying an NSO within 0.6 miles of occupied GRSG leks in PHMA would protect fewer areas than in other states. Buffer distances from 0.5 to two miles from oil and gas infrastructure have been shown to be inadequate to prevent declines of birds from leks (Walker et al. 2007a). Studies have shown that greater distances, anywhere from two to four miles, are required for viable GRSG populations to persist (Connelly et al. 2000b, Holloran and Anderson 2005, Walker et al. 2007a).

In WY and MT PHMA, fluid mineral development in areas that are already leased (and thus are exempt from NSO stipulations) would also be subject to density and disturbance limits, which would limit the extent of development and associated impacts. GHMA would be subject to NSO stipulations for fluid mineral development within 2 (CO), 1 (OR) or 0.25 (WY) miles of leks. GHMA in UT would also be subject to NSO stipulations but the distance varies by BLM office. PHMA and GHMA in CO and GHMA in OR would be closed to fluid mineral development within 1 mile of leks; this would provide increased protections to GRSG and contribute to lek persistence because no development (surface or subsurface) could occur. Fluid mineral development would be subject to Controlled Surface Use (seasonal restrictions and/or buffers) stipulations in ID, NV/CA OR, and WY GHMA. MT-DK would include a 0.6-mi NSO in GHMA and seasonal limitations (breeding, nesting, early brood-rearing & winter habitat) and CSU (density and disturbance) for the rest of the GHMA. Applying these restrictions to fluid mineral development would reduce potential impacts to GRSG associated with fluid mineral development as described under *Nature and Types of Effects*.

Development of fluid mineral resources in GHMA would still result in the localized direct loss and fragmentation of seasonal habitats and displacement of GRSG from current use areas outside of the applicable lek buffers. The general effects of fragmentation, habitat loss, and displacement are discussed in *Nature and Types of Effects*. Application of lek buffers as required conservation measures or COAs would protect lekking, most nesting, and some brooding habitat; however, nesting and brooding habitat located outside of the buffer would be afforded no specific protections other than the restrictions associated with management of PHMA and GHMA. Impacts of development outside buffer areas could be offset by mitigation because operators would be required to mitigate impacts until there is a net conservation gain. However, mitigation may be conducted off-site if it would provide greater benefit to GRSG as a whole in the planning area, thus potentially resulting in unmitigated impacts on local populations in GHMA.

In CO, ID, ND, NV/CA, OR, UT, WY, and parts of MT/DK (Billings, HiLine, Miles City, ND, SD), priority would be given to leasing and development of fluid mineral resources, including geothermal, outside of PHMA and GHMA, or within the least impactful areas within PHMA and GHMA if avoidance is not possible. Leasing outside of HMAs would reduce potential for impacts associated with horizontal drilling (in PHMA which

would be NSO) and with fluid mineral leasing, exploration, and development in GHMA. However, the prioritization objective could potentially result in temporarily deferring a parcel in PHMA from leasing to a later sale. There would be no similar objective in the Lewistown or Butte Field Offices, and therefore, potential for impacts would be greater.

For both salable mineral and non-energy mineral development, WY PHMA would be subject to seasonal restrictions, while WY and MT PHMA would be subject to density and disturbance limits. These additional restrictions would reduce potential impacts to GRSG associated with salable mineral development as described under *Nature and Types of Effects*, but to a lesser extent than if they were completely closed to development. In Idaho, IHMA would be open to non-energy mineral development in Known Phosphate Lease Areas, and similar impacts (e.g., displacement and habitat impacts from loss, disturbance, and erosion could occur from open pit mining.) could occur in areas open to development.

PHMA in CO, MT/DK, UT, and WY would be considered "essential habitat" for coal unsuitability evaluation. This would likely lead to PHMA in these states being considered unsuitable for coal development and would limit the potential for impacts associated with coal development described in *Nature and Types of Effects*. ID, NV/CA, and OR would not address coal development due to absence of the mineral.

The oil and gas lease stipulations summarized in **Appendix 2** would be applied in MT/DK; these stipulations would reduce the potential for impacts associated with fluid mineral leasing as described in in *Nature and Types of Effects*.

In CO PHMA and within 4 miles of an active lek, siting criteria would be applied to guide development of the lease or unit that would result in the fewest impacts possible to GRSG. Criteria include consideration of location of proposed lease activities in relation to critical GRSG habitat areas, and evaluation of the potential threats from proposed lease activities, and an evaluation of the proposed lease activities, including design features, in relation to the site-specific terrain and habitat features. To authorize an activity based on these criteria, the environmental record of review must show no significant direct disturbance, displacement, or mortality of GRSG.

Lands and Realty Management

Rangewide Environmental Consequences

Under Alternative 1, PHMA in all states, ID IHMAs, and some MT RHMAs would be identified as ROW avoidance areas to allow for management flexibility (except for minor ROWs in WY, as described under state analysis). PHMA would be exclusion areas for wind and solar (utility scale solar only in ID, NV/CA and OR) development (with exceptions in WY, OR, and ID IHMA, see state-specific analysis). Classifying PHMA as exclusion or avoidance areas would decrease the potential for impacts associated with ROW development, such as disturbance and increased potential for predation, as described *in Nature and Types of Effects*. GHMA in all states would be open to minor ROWs with mitigation measures (WY does not require mitigation, see state-specific analysis). Impacts associated with ROW development, such as disturbance and increased potential for predation, could occur in these areas if developed, but mitigation measures would help to offset the impacts.

New ROWs in PHMA would not be allowed except in accordance with the Anthropogenic Disturbance Screening Criteria outlined in Alternative 1. The BLM would collocate new ROWs with existing infrastructure when possible. Alternative 1 would apply at implementation a protective buffer from disturbance around leks in PHMA, IHMA and GHMA, depending on the type of disturbance and based on the latest science. BLM would retain management flexibility to route ROWs to minimize overall impacts on

GRSG habitat. Existing ROW corridors are preferred for collocation of new ROWs but could not be widened more than 50% greater than the original footprint. These measures would protect GRSG and their habitats from fragmentation, disturbance and predation, and other impacts, as described in *Nature and Types of Effects*.

State-Specific Environmental Consequences

In IHMA new ROWs could be considered if in accordance with the IHMA Anthropogenic Disturbance Development Criteria. PHMA in WY would be open to minor ROWs with buffers and mitigation. Effects from ROWs could occur as described under *Nature and Types of Effects*; buffers and mitigation would help offset the impacts, but to a lesser extent than ROW exclusion/avoidance. GHMA in WY would be open to minor ROWs and no mitigation measures would be required. There would be a greater potential for impacts associated with ROWs in these areas.

CO, NV/CA, and OR GHMA would be identified as avoidance areas for major ROWs, which would reduce impacts as described under *Nature and Types of Effects.* ID and UT GHMA would be open to major ROWs with minimization measures, while WY GHMA would be open to major ROWs. In ID and UT, minimization measures would help reduce the impacts, but to a lesser extent than ROW exclusion/avoidance.

Classifying GHMA in CO, NV/CA, and OR as avoidance areas for major ROWs would decrease the potential for impacts associated with ROW development as described *in Nature and Types of Effects*. Opening UT and ID GHMA to major ROWs with minimization measures, would increase the potential for impacts, such as disturbance and increased potential for predation, but mitigation measures would help to offset the impacts. Opening GHMA in WY to major ROWs would also increase the potential for impacts, and there would be no mitigation measures to offset the impacts.

Renewable Energy Management

Rangewide Environmental Consequences

Under Alternative 1, PHMA in all states would be exclusion areas for wind and solar (utility scale solar only in ID, NV/CA and OR) development (with exceptions in WY, OR, and ID IHMAs; see state-specific analysis). Within the exclusion areas, this would eliminate direct impacts from potential renewable energy development on GRSG in PHMA. As a result, GRSG would experience reduced potential for disturbance, habitat alterations, and habitat fragmentation as described *in Nature and Types of Effects*.

State-Specific Environmental Consequences

In WY, PHMA would be avoidance areas for wind development or open if it can be sufficiently demonstrated that development would not result in population declines. ID IHMAs would be avoidance areas for utility-scale solar and wind development. PHMA in OR would be avoidance areas for wind and solar development in Lake, Harney, and Malheur Counties. Classifying PHMA as avoidance areas would decrease the potential for impacts as described in *Nature and Types of Effects*, but to a lesser extent than exclusion areas.

Classifying GHMA in CO, MT/DK, NV/CA, and OR as avoidance areas for wind development, GHMA in CO, MT/DK and OR as avoidance areas for solar development, and GHMA in NV/CA and UT as exclusion areas for solar development, would decrease the potential for impacts associated with wind and/or solar development. Because GHMA in ID, UT and WY would be open to wind development and GHMA in ID and WY are open to solar development, there would be a greater potential for impacts as described in *Nature and Types of Effects*.

Depending upon the potential for renewable energy development and the size and location of permitted development in GRSG habitat, there could be impacts ranging from discountable in less important habitats to decreasing the population growth rate if placed in important habitats. COAs could be applied to reduce impacts on GRSG, but they would not be consistently applied across the decision area. Therefore, renewable energy development in GRSG habitat would be expected to result in habitat loss, degradation, fragmentation, and direct disturbance to the birds. Based on previous research (e.g., LeBeau 2012), nests and broods near wind facilities would have a lower rate of success and such declines in these vital rates, especially impacts on nest success, would decrease the population growth rate in these populations and may lead to loss of the population over time (Taylor et al. 2012).

Livestock Grazing Management

Rangewide Environmental Consequences

Under Alternative 1, PHMA and GHMA in all states, and ID IHMA, and would be available for domestic livestock grazing. Impacts to GRSG and habitat from grazing, such as habitat alterations, could occur in PHMA, GHMA, and ID IHMAs as described in *Nature and Types of Effects*.

Priority for review and processing of grazing permits/leases would be in SFAs, followed by PHMA outside of SFAs. Precedence would be given to existing permits/leases in these areas not meeting land health standards, with focus on those containing riparian areas, including wet meadows. Prioritization would help the BLM identify issues that may be associated with improper grazing and implement corrective actions in the areas that have the greatest habitat value. Management changes, if required, would be tailored to meet land health standards and GRSG habitat objectives. The BLM would also require thresholds and responses to address and respond to future conditions in new fully processed permits. The review process described above would reduce impacts to GRSG from grazing if review leads to adjustments to existing permits/leases that improve land health standards.

State-Specific Environmental Consequences

In MT/DK, the BLM would use applicable RDFs to mitigate potential impacts from West Nile virus when developing or modifying water developments. This would reduce potential for impacts to GRSG from disease spread associated with livestock subsidies as described in *Nature and Types of Effects*.

Under Alternative 1 all or portions of 13 key RNAs in Oregon would be unavailable for livestock grazing (see **Appendix 17** for further analysis). In key RNAs, 21,959 acres would be unavailable to livestock grazing (**Table 3-25**, Oregon Key RNA Acreages). Two key RNAs (Foster Flat and Guano Creek-Sink Lakes) would remain unavailable to livestock grazing. **Tables 4-2** and **4-3** provide corrections and updates to the vegetation communities with the various key RNAs and are based on new, site-specific information gathered or generated by the Lakeview, Vale, and Burns districts in Oregon. Under Alternative 1, fencing would be present in and adjacent to key RNAs in Oregon. However, the ability to distribute livestock would generally be maintained, and impacts would be limited from these actions (BLM 2015, p. 4-203). Making portions of RNAs that contain plant communities important to GRSG unavailable to grazing could provide the BLM with areas for baseline vegetation monitoring without the influence of BLM-permitted activities. Whether removal of grazing would reduce the risk of invasive plant spread into the key RNAs is uncertain.

Wild Horse and Burro Management

Rangewide Environmental Consequences

Under Alternative 1, wild horse populations would continue to be managed for AMLs and in balance with other resource uses (e.g., rangeland health, livestock, and wildlife). Wild horse gathers would be prioritized

based on escalating or potential emergencies, public safety, nuisance animals, court orders, population growth suppression, and resource impacts associated with monitoring data, which is generally based on wild horse population inventories, wild horse condition, availability of sufficient water and forage resources, rangeland health, use levels of upland habitats, and riparian resource conditions. Evaluation of land health assessments in wild horse HMAs could identify vegetation conditions that could prompt gathers, reducing wild horse numbers and the associated impacts on GRSG habitats.

Predation Management

Rangewide Environmental Consequences

Under Alternative 1, following more specific vegetation objectives and reducing opportunities for predators (e.g., by minimizing human resource subsidies) may, in some cases, improve the quality of habitat and decrease opportunities for predation as described under *Nature and Types of Effects*. Improved habitat conditions and decreases in predation would increase nest success, chick survival, and GRSG persistence over the long term.

State-Specific Environmental Consequences

In NV/CA, UT, and WY, habitat objectives to minimize human resource subsidies, and coordinate with other partners on predator management would likely reduce exposure of predatory birds to GRSG nests and chicks, thereby ensuring GRSG persistence until habitat conditions improve (Coates et al. 2015; O'Neil et al 2018). Similarly, habitat management in CO, NV/CA, and UT to provide GRSG concealment from predators may help reduce predation and increase GRSG persistence.

ACEC Designation

Alternative 1 would not result in any impacts from ACEC designation since it does not include management for ACECs.

4.2.3 Alternative 2

Habitat Designation and Management

Rangewide Environmental Consequences

Impacts from designating GRSG habitat as SFAs, PHMA, IHMAs, and GHMA and associated management would be similar to those described for Alternative 1 (**Table 2-3**). However, the overall acreage would be slightly less with less than 1% fewer acres of PHMA and approximately 1.5% fewer acres of GHMA. Further, some SFAs would be removed in states as described under state impacts. Impacts from language to maintain and enhance sagebrush habitats would be the same as described for Alternative 1.

State-Specific Environmental Consequences

Removing SFAs in CA, ID, NV, UT, and WY would reduce protections to GRSG and habitat. However, previous management area classifications (e.g., PHMA) would remain, but protections may be lower under some of those other classifications. Reducing restrictions to land use and surface-disturbing activities could increase the likelihood for habitat loss, fragmentation, and direct disturbance to GRSG. Habitats in these area would likely be reduced in quality due to impacts associated with mineral development described in *Nature and Types of Effects*. If protections are lacking from adjacent lands and the lands are developed, this could lead to habitat fragmentation due to large, contiguous areas of habitat losing habitat suitability. Protections to GRSG and habitat from restrictions to land use and surface-disturbing activities would continue in SFAs in MT and OR, and impacts would be as described under Alternative 1. Management of RHMA would be the same as described for Alternative 1.

Under Alternative 2, the GHMA designation in UT would be removed with all its corresponding management actions from the 2015 plan amendments. The removal of GHMA and their associated management actions would likely incentivize development in areas formally identified as GHMA and could therefore lead to GRSG habitat loss and alterations.

Requirements for mitigation that achieves a net conservation gain in all HMA types would apply in MT/DK, NV/CA, and OR, and impacts would be the same as described for Alternative 1. CO and ID would enforce mitigation resulting in no net loss in HMAs. This would help offset impacts associated with land use activities, as described under *Nature and Types of Effects*, but to a lesser extent than Alternative 1, in which a net conservation gain would be required. In UT and WY, the net conservation gain requirement would be removed. Although the BLM would not require compensatory mitigation in HMAs, it would enforce state mitigation policies and programs. In CO, ID, NV/CA, OR, UT, and WY HMAs, compensatory mitigation would be voluntary unless required by laws or by the State. As a result, the potential for impacts from land use activities, as described under *Nature and Types of Effects*, would be greater relative to Alternative 1.

Impacts from applying a 3% (CO, ID, NV/CA, OR, UT, and the Dakotas) or 5% (MT, WY, and the Dakotas) disturbance cap in PHMA would be similar to those described for Alternative 1. In UT and ID the cap could be exceeded if it would benefit GRSG. The cap would be applied at the BSU and project scale, except in ID which would only apply it at the BSU scale. Consequently, some additional development could occur in ID, which may increase potential for habitat loss and alterations, particularly for individual leks and their surrounding habitat.

The ability to exceed the disturbance and density caps could result in loss and degradation of site-specific GRSG and impacts on local GRSG populations. Exceedances to the caps would only be allowed if site-level analysis indicates the project, in combination with all voluntary and required design features, will improve the condition of GRSG habitat. The risk in allowing this exceedance is the possible loss of a specific type of habitat that mitigation may not address because it does not require compensation for the exact same habitat value. Consequently, it is possible that while the required habitat improvement will occur, it may not address the loss of a specific habitat type. This may result in a long-term impact on GRSG in the project area.

Impacts from including an adaptive management strategy would be similar to those described for Alternative 1. However, some states would include the addition of "un-triggers", meaning that the management change implemented to reverse a trigger could be revoked and the original management would be reimplemented once the issue is resolved. Reverting back to the original management that resulted in the trigger being tripped could lead to additional population declines and/or habitat degradation that could cause the trigger to be tripped again.

In Idaho, the BLM would apply the lek buffer distances for certain land uses from the 2019 Idaho GRSG ARMPA , or Alternative 2, and as described in **Appendix 19**. In general, the buffer distances would vary by HMA type, with buffer distances in PHMA being the largest followed by IHMA, then GHMA. Buffer exception criteria would be included for IHMA/GHMA as described in the appendix. Under Alternative 2, buffer distances in PHMA and IHMA are based upon the 'lower end of the interpreted range' and mostly the 'literature minimum', respectively, as summarized in the USGS Report, *Conservation Buffer Distance Estimates for Greater Sage-Grouse – A Review* (Manier et al. 2014). Buffers would reduce disruption to GRSG, minimize habitat loss, and reduce habitat degradation, which should result in maintaining nesting habitat effectiveness and brood survival. Protections would be greatest in PHMA, followed by IHMA, then GHMA. This approach would encourage development outside of the best habitat and into lesser quality or non-habitat.

In UT, the GHMA designations would be removed with all its corresponding management actions from the 2015 plan amendments. Alternative 2 prioritizes the importance of management prescriptions on PHMA to protect the seasonal habitats that support over 95% of GRSG populations in Utah. Impacts would likely accelerate the effect on resources in the former GHMA since those acres will be removed from management consideration. GRSG management would revert to the management in place prior to the 2015 ARMPA; therefore, some protections such as lek buffers, seasonal restrictions may still be applied depending on the GRSG resource present.

Minerals Management

Rangewide Environmental Consequences

Impacts from fluid mineral management in PHMA and GHMA would be the same as described for Alternative 1, except in CO PHMA and CO GHMA (see state-specific analysis).

Impacts from salable mineral management in PHMA and GHMA would be the same as described for Alternative 1, except in ID IHMAs and NV/CA PHMA (see state-specific analysis).

Impacts from non-energy mineral management in PHMA and GHMA would be the same as described for Alternative 1, except in NV/CA PHMA (see state-specific analysis).

Impacts from coal management in PHMA and GHMA would be the same as described for Alternative 1, except in UT PHMA (see state-specific analysis).

Removing the recommendation for locatable mineral withdrawal in SFAs in all states (except in MT/DK, which did not have a 2019 amendment) has no impact. The Secretary proposes and makes withdrawals through a separate process pursuant to section 204 of FLPMA not through BLM land use planning.

State-Specific Environmental Consequences

Removing the closure of CO PHMA to fluid mineral development would increase potential for disturbance and habitat alterations/degradation since mineral development activities could occur in previously closed areas and potentially result in impacts described under *Nature and Types of Effects*. Changing GHMA from closed to fluid mineral development to NSO would likely have minimal impacts since the stipulation would avoid potential for disturbance and habitat alterations/degradation from surface-disturbing activities.

Impacts from prioritizing fluid mineral leasing outside of HMAs in CO, ID, OR, and MT/DK offices would result in the same impacts in these states as described under Alternative 1. Removing the objective in UT and NV/CA would increase the potential for impacts because land in PHMA and GHMA could be leased. Removal of the mineral leasing prioritization objective would not increase threats, since the NSO stipulation would still be in effect. In WY, fluid mineral leasing would be allowed in PHMA, which would increase the potential for impacts. However, if the BLM has a backlog of Expressions of Interest for leasing, the BLM would prioritize work first in non-habitat followed by lower habitat management areas (e.g., GHMA). For fluid mineral development on existing leases that could adversely affect GRSG populations or habitat, the BLM would work with the lessees, operators, or other project proponents to avoid, reduce, and mitigate adverse impacts consistent with lessees' rights.

Adding exception criteria to salable and non-energy mineral closures for NV/CA PHMA and allowing consideration of new free use permits for salable minerals in ID IHMA and NV/CA PHMA would increase the potential for associated impacts as described in *Nature and Types of Effects.*

Identifying essential habitat in UT PHMA as part of future coal unsuitability criteria would likely lead to these areas being considered unsuitable for coal development and would limit the potential for associated impacts as described in *Nature and Types of Effects*.

In CO PHMA and within 4 miles of an active lek, impacts from applying siting criteria for fluid mineral development would be the same as those described for Alternative 1.

Lands and Realty Management

Rangewide Environmental Consequences

Impacts from ROW management would be the same as described for Alternative 1 (with additional exception criteria in NV/CA, see state-specific analysis).

State-Specific Environmental Consequences

There would be additional exception criteria for ROW development in NV PHMA and for wind development in NV/CA GHMA. This could increase the potential for impacts associated with ROW and renewable energy development.

Renewable Energy Management

Rangewide Environmental Consequences

Impacts from renewable energy management would be the same as described for Alternative 1 (with additional exception criteria in NV/CA, see state-specific analysis).

State-Specific Environmental Consequences

There would be additional exception criteria for ROW and wind/solar development in NV/CA PHMA and for wind development in NV/CA GHMA. This could increase the potential for impacts associated with ROW and renewable energy development.

Livestock Grazing Management

State-Specific Environmental Consequences

Impacts from domestic livestock grazing management would be the same as described for Alternative 1, with the following exceptions. The removal of review prioritization and processing of grazing permits in UT, WY, and NV/CA, may have minimal impacts as the BLM still has the authority to prioritize staff time and budget to identify areas that aren't meeting land health standards and implement corrective actions in areas with the greatest GRSG habitat value.

In Oregon, all or portions of 13 key RNAs would be available to livestock grazing, consistent with all applicable regulations and policies. The 13 key RNAs available for livestock grazing would be Black Canyon, Dry Creek Bench, East Fork Trout Creek, Fish Creek Rim, Foley Lake, Lake Ridge, Mahogany Ridge, North Ridge Bully Creek, Rahilly-Gravelly, South Bull Canyon, South Ridge Bully Creek, Spring Mountain, and Toppin Creek Butte (BLM 2019a, p. 1-6). The key RNAs would be required to meet land health standards and other applicable BLM regulations and policies and would remain subject to management, including regulation of grazing, to maintain and promote the characteristics of the RNAs (BLM 2018, p. 4-6). Grazing impacts would vary within and among the key 13 RNAs, depending on site productivity, timing of grazing, stocking intensity, and duration of grazing (Oregon Greater Sage-Grouse Proposed RMPA/Final EIS 2018, p. 4-6). Alternative 2 would result in 21,959 fewer undisturbed acres within Oregon available for additional research in plant communities important to GRSG (Oregon Greater Sage-Grouse Proposed RMPA/Final EIS 2019, p. 4-7). The small size of the RNAs likely limit any impacts of livestock grazing on larger GRSG

populations. Two key RNAs (Foster Flat and Guano Creek-Sink Lakes) would remain unavailable to livestock grazing.

In MT/DK, impacts from using applicable RDFs to mitigate potential impacts from West Nile virus when developing or modifying water developments would be the same as described for Alternative 1.

Wild Horse and Burro Management

Rangewide Environmental Consequences

Impacts from wild horse and burro management would be the same as described for Alternative 1.

Predation Management

Rangewide Environmental Consequences

Impacts from objectives to reduce opportunities for predators would be the same as described for Alternative 1.

State-Specific Environmental Consequences

Impacts from state-specific predation management objectives in CO, NV/CA, and WY would be the same as described for Alternative 1. Adding specific language to address corvid nests in UT may reduce human subsidies that attract corvids, which would reduce predation levels (Coates et al. 2015; O'Neil et al 2018).

ACEC Designation

Alternative 2 would not result in any impacts from ACEC designation since it does not include management for ACECs.

4.2.4 Alternative 3

Habitat Designation and Management

Rangewide Environmental Consequences

Under Alternative 3, all HMAs would be managed as PHMA, over double the acreage of PHMA compared with Alternatives 1 and 2 (**Table 2-3**). Management actions for PHMA, such as lek buffers, required design features, fluid mineral leasing prioritization, and habitat objectives, would be more restrictive. Managing previously designated GHMA as PHMA would minimize potential impacts to GRSG. Expanding PHMA in some states to include areas of adjacent non-habitat, unoccupied historic habitat, or areas with potential to become habitat as PHMA would decrease potential for disturbance to birds and habitat alterations because management restrictions associated with PHMA would occur over a larger area.

There are no SFAs under this alternative, but their absence would likely not reduce protections to GRSG habitat rangewide. Although management actions for PHMA would be less restrictive than those for SFAs, management restrictions in PHMA under this alternative would be more restrictive than Alternatives 1 and 2 and applied to a greater overall area, designed to promote GRSG conservation and reduce potential impacts from land-use activities. Management restrictions would only be applied to development associated with valid existing rights as no new activities would be authorized.

Impacts from mitigation would be similar to Alternative 1 as the BLM would require and ensure mitigation that achieves a net conservation gain in all HMA types. Compensatory mitigation would need to fully offset any residual effects on habitat function and value at the scale necessary to meet the RMP GRSG goals and objectives. These requirements reduce the potential for impacts from land use activities such as habitat loss or alterations. Maintaining habitat function and value would help increase nesting success and brood survival, thereby contributing to the species' persistence.

The BLM would apply a 3% cap for pre-existing authorizations or disturbances (including infrastructure, wildfire, and agriculture) at the project scale and within HAF fine scale habitat selection area (for all states except WY, which does not have fine scale HAFs; see *State-Specific Environmental Consequences*) while honoring valid existing rights. The disturbance cap would not be applicable to new authorizations since all PHMA would be closed to new infrastructure projects. If disturbance from existing infrastructure developments exceeds 3% of habitat at the project scale or HAF fine scale area, new infrastructure associated with pre-existing authorizations would be deferred. The smaller size of most HAF fine-scale areas compared to BSU-scales might result in the cap being reached more quickly. This may prevent some development and associated impacts to GRSG. Because fine scale HAFs represent an individual's home range and are determined in part by the quality and juxtaposition of resources within and between seasonal habitats, reducing disturbance in these areas may help ensure that habitat function and quality remains to support seasonal movements. There would be no disturbance cap exceptions under this alternative, which may result in a lower level of disturbance overall. Including wildfire and agriculture as part of the overall disturbance cap would also result in a lower level of disturbance, particularly since wildfire was the cause of most of the habitat loss between 2012 and 2018 (Herren et al. 2021).

Currently, the percentage of disturbance in PHMA/IHMA within fine scale HAF boundaries is well below 3% and below 1% in most areas (BLM data 2023), yet population and habitat trends are still declining (Herren et al. 2021). Implementing a 3% disturbance may result in a continuation of these trends, but to a lesser extent than if the disturbance cap were higher (or non-existent). Because habitat connectivity is important to maintaining gene flow and ensuring genetic diversity and distribution (Row et al. 2018), limiting fragmentation by adhering to disturbance caps would help maintain population connectivity.

The BLM would include an adaptive management strategy for habitat loss due to development under this alternative. However, because management is already restrictive, additional management would be limited to proactive measures, which are dependent on budget and staffing.

Effects from habitat management and conservation would be similar to those described for Alternative 1, however, Alternative 3 would include additional objectives to maintain existing connectivity between GRSG populations. This would contribute to GRSG persistence and viability by continuing to facilitate gene flow and allowing for genetic variation (Row et al. 2018). Genetic variation and connectivity are necessary for GRSG resilience as described under the affected environment.

State-Specific Environmental Consequences

In Wyoming, the BLM would apply a 3% cap (including infrastructure, wildfire, and agriculture) at the project scale and within neighborhood cluster boundaries. Clusters are used in place of fine scale HAF boundaries as HAF boundaries have not been delineated for Wyoming. Two of the Wyoming clusters (D-151 and D-147) are currently exceeding the 3% disturbance cap, and therefore, no more development could occur in these areas. Disturbance levels on the remaining 110 clusters are below 2% (BLM GIS 2023).

In Montana and the Dakotas, allowing treatments in PHMA to conserve, enhance or restore GRSG habitat and re-establishment of sagebrush cover and desirable understory plants would improve habitat quality and quantity, which would potentially contribute to GRSG persistence and viability. Lek buffers would apply to all surface disturbing activities associated with pre-existing authorizations and disturbances, and would therefore, reduce GRSG habitat loss and lek disturbance.

In NV/CA, lek-buffer protections included in 2015 and 2019 ARMPAs applies to all active or pending active leks regardless of HMA designation (see **Appendix 4** for lek definitions). This change is consistent with

FLPMA (43 United States Code (USC) 1701 Sec. 201) and BLM Manual 6840 in that it provides protections for special status species. Impacts to discretionary surface-disturbing activities include an increase in area where GRSG surveys are conducted beyond PHMA and adoption of no surface disturbance buffers within potential project areas. This would benefit GRSG by applying protective buffers to leks which otherwise might not be applied until an updated HMA model is available.

In Idaho, lek buffers would be applied to active and pending active leks according to Idaho's lek definitions (see **Appendix 4** for lek status definitions by state) with distances the same as those described under Alternative 1 (see **Appendix 19**). Lek buffers would apply to all surface disturbing activities. Since all HMA would be treated as PHMA, and PHMA would be closed to new infrastructure projects, buffers may provide limited additional protection for GRSG since PHMA allocations are more restrictive and are larger than areas protected by buffers.

In UT, all habitat would be PHMA, including GHMA from Alternative 1. PHMA would include some areas of unoccupied habitat, historic habitat where birds have not been observed in 20 years or more or may have never occurred (e.g., habitat west of Sanpete Valley), areas of non-habitat (e.g., phase 3 pinyon-juniper, rock outcrops), and areas which are currently not habitat but could become habitat through significant restoration. Including these areas under the more restrictive management of Alternative 3 raises the concern that the BLM would not use the least restrictive constraint to meet the resource protection objective in leasing restrictions for existing development rights. Under Alternative 3 in UT, all occupied leks are encompassed by PHMA.

Minerals Management

Closing PHMA to fluid mineral leasing, salable minerals, and non-energy minerals would reduce potential impacts to GRSG and habitat, such as disturbance and habitat alterations. Valid, existing leases may be developed under this alternative. Impacts would be reduced to a greater extent than Alternatives 1 and 2 since areas closed to leasing could not be developed. Closing PHMA to mineral leasing and development would protect GRSG habitat from surface-disturbing activities and associated habitat fragmentation, and maintain connectivity between leks. GRSG would not be exposed to disturbance associated with noise and human activity that accompanies construction, development, or production activities. However, restrictions to development on BLM lands might push development onto private land, which could result in indirect impacts as described under *Nature and Types of Effects*.

State-Specific Environmental Consequences

Impacts from managing coal in CO, MT/DK, UT and WY would be same as described for UT in Alternative 2. In UMRBNM in Montana, BLM land will not be disposed of other than by exchange, and only when necessary to further the protective purposes of the Monument. Protecting this area would also reduce impacts to GRSG and habitat by reducing surface disturbances associated with mineral resource management. In CO PHMA and within 4 miles of an active lek, impacts from applying siting criteria for fluid mineral development would be the same as those described for Alternative 1.

Lands and Realty Management

All PHMA would be excluded from new ROW authorizations. New linear ROWs would be allowed only in designated ROW corridors. This would decrease the potential for impacts associated with ROW development. However, the inability to site ROWs in PHMA could lead to longer ROW routes in order to bypass closed areas. Longer routes would increase surface disturbance and other impacts of ROW siting on

GRSG habitats outside of PHMA and may result in increased impacts on GRSG populations using habitat on adjacent private lands.

Renewable Energy Management

PHMA in all states would be ROW exclusion areas for wind and solar energy development. Prohibiting wind energy development would eliminate the likelihood for habitat loss, degradation, fragmentation, and direct disturbance to birds in these areas. Alternative 3 would offer more protection from renewable energy development than under Alternatives 1 and 2 because more areas would be excluded from renewable energy development with no exceptions.

Livestock Grazing Management

Rangewide Environmental Consequences

All PHMA would be unavailable for domestic livestock grazing. As a result, livestock would be removed from PHMA and impacts to GRSG and habitat associated with grazing, such as habitat alterations (*Nature and Types of Effects*) would be reduced. Removing livestock could lead to increases in herbaceous understories, which would increase forage availability and nesting habitat suitability for GRSG. However, changes would depend on factors such as current conditions, climate, other land uses, etc. Removing livestock could also result in changes to the vegetation community composition, which could alter GRSG habitat suitability depending on the change (see *Nature and Types of Effects*).

Removing livestock from PHMA would reduce the potential for disease transmission assuming removal of man-made water sources to support livestock, such as water troughs, which may house vectors for diseases, such as West Nile virus (Naugle et al. 2004). Likewise, avian predators may be reduced if range improvements, including artificial water sources and fences, are also removed (Stevens et al. 2012; Manier et al. 2013, Coates et al. 2016). However, if livestock are removed on BLM fences may be erected to fence out BLM lands from adjacent private grazing lands. Additional fencing may also be needed to keep wild horses off BLM-administered PHMA. If fencing increases in areas of mixed ownership, there would be increased potential for impacts such as injury or mortality from fence strikes and predation. Additionally, removing livestock from BLM lands may concentrate grazing on private lands, potentially leading to overgrazing and decreased GRSG habitat suitability where concentrated grazing occurs. There would be the possibility of increased wildfires without livestock to reduce fine fuels on a large portion of the landscape (see **Section 4.4** for further analysis, discussion, and citations regarding the effects of grazing on wildfires). If the potential for a large-scale wildfire were to increase, this could put large areas of GRSG habitat at risk of damage or loss from burning.

State-Specific Environmental Consequences

In MT/DK, CHMA would be available for grazing. Impacts would occur in CHMA as described under *Nature and Types of Effects*. The BLM would assess and modify as needed water features to reduce the risk of potential impacts from West Nile Virus or other disease outbreaks.

Impacts in key RNAs in Oregon would be the same as described for Alternative 1.

Wild Horse and Burro Management

Removing wild horses and burros in PHMA would increase total vegetation, grass abundance and cover, sagebrush canopy cover, species richness, and dominance of palatable forbs (Manier et al. 2013; Chambers et al. 2017). This would increase habitat quality for wildlife, including GRSG. Where range improvements, such as fences and water troughs are removed, it would decrease potential perch sites for avian predators and potential drowning hazards and/or potential for disease transmission. Gathers needed to remove wild

horses and burros from herd management areas could disturb GRSG in the short term through human presence and noise.

Predation Management

Under Alternative 3, the risk of predation may be reduced by reducing habitat disturbance, anthropogenic subsidies, and stopping or slowing the incursion of novel predators. Reduced predator numbers would help reduce predation levels and may increase GRSG persistence to a greater extent than Alternatives 1 and 2.

ACEC Designation

Under Alternative 3, all PHMA would be managed as ACECs. The management in ACECs under this alternative, and thus the associated impacts, would be the same as for PHMA.

4.2.5 Alternative 4

Habitat Designation and Management

Rangewide Environmental Consequences

Impacts from designating GRSG habitat as HMAs would be similar to those described for Alternative 1, although PHMA would increase by approximately 10% and GHMA would decrease by 1-2% (**Table 2-3**). Impacts from applying a 3% disturbance cap at the project scale and within HAF fine scale habitat selection area would be similar as to those described for Alternative 3, however, the cap would apply to both existing and proposed infrastructure authorizations (subject to valid existing rights). Additionally, wildfire and agriculture would not be included in the disturbance calculation, possibly resulting in more room for new authorizations and infrastructure projects. Since wildfire was the cause of the majority of habitat loss between 2012 and 2018 (Herren et al. 2021), the 3% cap would limit additional disturbance above habitat loss from wildfire.

Exceptions to the disturbance cap could allow for habitat fragmentation and an increased GRSG behavioral responses to the additional development. Further, habitat avoidance, changes in habitat use, and increased mortality risk from, for example, increased predators associated with developed areas, may have compounding adverse effects on GRSG populations. However, the exception would only be approved if site-specific NEPA analysis indicates that doing so will improve the condition of GRSG habitat in comparison to siting a project outside the designated corridor, so these effects are not anticipated. There would be no exceptions to the 3% PHMA (and IHMA) disturbance cap at the HAF fine scale habitat selection area, which would limit the overall level of disturbance at this scale.

The BLM would include population-level adaptive management informed by the results of state wildlife management agency analysis and TAWS, a framework developed to inform anomalies in population trends (Coates et al. 2021). If one of these thresholds is tripped, it would allow management changes in response to population declines. Adaptive management could help slow or reverse negative trends that may reduce GRSG population persistence and viability. If more than 3% of GRSG habitat within a HAF fine scale habitat area is lost from non-anthropogenic (non-development) disturbances, a soft threshold would be tripped and future new infrastructure projects or permits would be deferred within these areas until habitat services (as indicated by sagebrush recovery) are restored. Inclusion of these non-anthropogenic losses will lessen future habitat declines from anthropogenic disturbances.

State-Specific Environmental Consequences

In Colorado, the BLM would clarify the activity period for the leks being included in management allocations and decisions, increasing the amount of BLM-administered lands within buffer distances, and therefore, lands that would be subject to more intensive management decisions for lek and habitat protection. Alternative 4

would also increase the acreage of GHMA in Colorado where NSO stipulations would be applied compared to Alternatives 1 and 2. The same acreage under major stipulation (NSO) in Alternative 4 would be under moderate stipulation (CSU). This would increase the area of GRSG habitat protected from surface disturbance as described in *Nature and Types of Effects*.

CHMA in Montana and the Dakotas (**Table 2-31**) are areas of connectivity important to facilitate the movement of GRSG and maintain ecological processes, including between priority populations, adjacent states, and across international borders. Management in CHMA that leads to restrictions to land use and surface-disturbing activities would reduce the likelihood for habitat loss, fragmentation, and direct disturbance to GRSG. The restoration focus in RHMA would further improve GRSG habitat. Including more protective management in GHMA (such as ROW avoidance and utility scale solar and wind exclusion or avoidance in some areas) would make management more consistent with the state plan and reduce potential for GRSG impacts such as habitat alterations and disturbance.

In Idaho, lek buffer distances (see **Appendix 19**) would be the same as under Alternative 1, but buffers would apply to 'active' and 'pending active' leks using the Idaho lek definitions (Cook et al. 2022; see **Appendix 4** for lek status definitions). Lek buffers would apply to a total of 1,254 leks (1,093 active; 161 pending active), where 76% of these leks are in PHMA, 19% of leks in IHMA and 4% of leks in GHMA. This change from Alternative 1 could increase the amount of BLM lands where lek buffers may apply but would depend on HMA type and buffer distance. For the largest buffer distance (3.1 miles), this could result in an increase of 14% of HMA with more restricted BLM management. Effects of this increase in acres of BLM lands where lek buffers may apply would be realized where allocations for resources are open or avoided in HMA, but not for those resources with closed or exclusion allocations in PHMA, such as wind or solar energy development, or non-energy leasables or salable minerals (**Table 2-4**).

In NV/CA, impacts from clarifying use of lek-buffer protections included in 2015 and 2019 ARMPAs applies to all active or pending active leks (see **Appendix 4** for lek definitions) regardless of HMA designation would be the same as described for Alternative 3. Of the 380 known occupied leks in Utah, 366 (96.3%) are in PHMA under Alternative 4. As a result, there would be no substantial effect of impacts on small populations in former GHMA.

Minerals Management

Rangewide Environmental Consequences

Leasing would be permitted in HMAs, which would increase the HMA acres affected and potential for impacts in most states as described in *Nature and Types of Effects*. However, the BLM would include management actions to minimize potential for conflict and associated impacts from subsequent development. The BLM would also prioritize projects that avoid, minimize, reduce, rectify, and/or adequately compensate direct and indirect impacts to PHMA/IHMAs, and include applicable and technical COAs. Additionally, the 3% disturbance cap would apply at the fine scale HAF habitat selection area within PHMA/IHMA, which would help reduce overall disturbance and habitat impacts, including fragmentation. Applying an NSO stipulation within PHMA (except WY, see below), IHMA, and some RHMA would also decrease the potential for disturbance and habitat loss, alterations, and fragmentation. Reduced habitat fragmentation would help maintain habitat connectivity and population persistence and viability.

State-Specific Environmental Consequences

Expansion of the NSO stipulation to all PHMA in WY in an area that is already developed will only achieve the protections for new activities. Leks in PHMA would still be impacted by ongoing existing disturbances

due to human presence. Greater protections would result where the NSO applies to leks not experiencing as much existing disturbance.

The oil and gas lease stipulations summarized in **Appendix 2** would be applied in MT/DK, limiting the potential for impacts associated with fluid mineral leasing as described in *Nature and Types of Effects*. In all MT/DK HMAs management to refine, streamline, and make stipulations consistent would be applied. A CSU stipulation would be applied to all GHMA rather than just to a lek buffer. This would improve consistency among BLM offices and partner natural resource entities and provide clear and consistent direction to applicants and partners for cross-office boundary projects. Applying stipulations would reduce impacts to GRSG and habitat from mineral resource management as described under *Nature and Types of Effects*. Impacts from closing UMRBNM to mineral leasing and development would be the same as those described for Alternative 3.

In CO PHMA and GHMA, siting criteria would be applied to guide development of the lease or unit that would result in the fewest impacts to GRSG. The following criteria would apply: location of the proposed authorization was determined to be nonhabitat; topography/areas of non-habitat create an effective barrier to impacts; co-locating the proposed authorization with existing disturbance; and/or the proposed location would be an alternative to a similar action occurring on a nearby parcel. Applying these criteria would reduce the potential for impacts to GRSG. If the criteria do not apply but it can be demonstrated that the direct and indirect impacts of the proposed activity would be offset through compensatory mitigation, the authorized officer may consider permitting the action. Construction, drilling, and completion in CO PHMA or GHMA within 4 miles of an occupied lek during lekking, nesting, and early brood-rearing (March 1 to July 15) would be prohibited, but the TL may be adjusted based on application of the criteria described above.

In NV/CA PHMA, GHMA, and OHMA, management direction identifies six criteria used to grant exceptions to the allocation decisions (**Table 2-3**). The criteria narrow the use of mitigation to gain an exception to the allocation decisions. The changes are a benefit to GRSG by reducing consideration of surface disturbing projects that could remove GRSG habitat and/or disturb individuals, and a cost to proponent driven projects in that there would be fewer opportunities to gain exceptions.

All ID PHMA will be closed to new mineral materials development but continued use of existing pits will be allowed. An exception would be possible for new free use permits in areas with existing anthropogenic disturbance. Impacts to GRSG would continue since the disturbance is already existing.

Lands and Realty Management

Rangewide Environmental Consequences

Impacts from managing PHMA in all states, ID IHMA, MT CHMA, and some MT RHMA as ROW avoidance areas would be similar to those described for Alternative 1. Where development cannot be avoided, breeding and nesting habitats, or in limiting/high value seasonal habitats would be avoided unless certain criteria are met. This would reduce the potential for impacts described *in Nature and Types of Effects*, by precluding alteration to high value and seasonal habitats and disturbance to GRSG during important life history stages. Where major ROWs cannot be avoided, applying minimization measures (e.g., disturbance cap, seasonal constraints, tall structure limitations, RDFs, nest and perch deterrents, etc.) would also minimize potential for impacts. Residual direct and indirect impacts would be offset through compensatory mitigation. The magnitude of impacts would not be expected to be of a level that would impact GRSG population and lek persistence or viability.

Managing GHMA as ROW avoidance areas within breeding, nesting habitats and other limited seasonal habitats would reduce the potential for impacts as described *in Nature and Types of Effects*, particularly by avoiding alteration to high value and seasonal habitats and disturbance to GRSG during important life history stages (e.g., breeding, migration). The potential for GRSG to be affected may vary in GHMA depending on the location and ability to relocate the ROW. Some areas, such as plains and prairies, may be more suitable for ROW development, whereas in may be less likely for ROWs to be sited in areas with mountainous or rugged topography.

Avoiding placement of ROWs within one-half mile of PHMA or IHMA would protect those areas from indirect impacts. Because all other areas would be managed as ROW open, impacts, such as habitat alteration and disturbance, could occur, however, compensation would be required (see Alternatives).

State-Specific Environmental Consequences

Effects from applying an NSO stipulation within 0.6 miles of leks in PHMA in WY would have effects as described for Alternative 1.

In Colorado, a timing limitation would be expanded to include GHMA and added to leased areas as conditions of approval of the ROW; this would reduce impacts to GRSG and habitat as described under *Nature and Types of Effects*.

In Idaho, lek buffers would be the same as under Alternative (**Appendix 19**). Lek buffers would protect leks from new disturbance and together with other restrictions in HMA, such as RDFs, Mitigation, Disturbance Cap, would serve to ensure responsible development.

Renewable Energy Management

Rangewide Environmental Consequences

Impacts from managing PHMA in all states and some MT RHMA as ROW exclusion areas for wind and solar energy development would be similar to those described for Alternative 3 (excludes IHMAs, see state-specific environmental consequences). However, since PHMA would apply to a smaller area under this alternative, the extent of protection from disturbance associated with from renewable energy development would be less.

Managing GHMA as avoidance areas for wind and solar energy development in all states would decrease the potential for impacts associated with wind and/or solar development as described in *Nature and Types of Effects*. Where avoidance is not possible, impacts to GRSG habitat would be minimized through measures such as avoiding surface use, occupancy, or placement of utility scale wind and solar facilities within one-half mile of PHMA, within one mile of active leks, and outside limited/high value seasonal habitats and movement corridors. Such measures would protect PHMA from indirect impacts; reduce potential for habitat alterations in breeding areas, migration corridors, and high value habitat; and minimize disturbance to breeding and migrating birds. Managing GHMA and MT CHMA as avoidance areas for wind and solar energy development would limit opportunities for development but reduce potential for GRSG disturbance and habitat alterations and fragmentation, in GHMA that are adjacent to PHMA.

State-Specific Environmental Consequences

Managing ID IHMAs as exclusion areas for wind and solar energy development within 3.1 miles from active leks and avoidance in the remainder of the IHMA would decrease the potential for impacts as described in Nature and Types of Effects, but to a lesser extent than if the entire IHMA were managed as an exclusion areas as there would be greater potential for development to occur outside of 3.1 miles from leks. However,

development outside of this buffer would likely not disturb leks or alter lekking or nesting habitat. Because infrastructure would be considered only if it would not impair habitat use by GRSG and will meet RMP GRSG goals and habitat objectives, any alternations or disturbance would not impact lek or population persistence/ viability.

Because surface use, occupancy, or placement of utility scale wind and solar facilities would be prohibited within one-half mile of PHMA, adjacent PHMA would be protected from indirect impacts from development in IHMAs. This would also limit opportunities for development, but reduce potential for disturbance and habitat alterations adjacent to PHMA.

Livestock Grazing Management

Rangewide Environmental Consequences

Because the presence of GRSG HMAs would not affect whether an area is available for livestock grazing or change existing status of lands available or unavailable for livestock grazing, impacts from domestic livestock grazing management would be similar to those described for Alternative 1. The BLM would alter management objectives and actions to minimize, reduce, or correct for any impacts to GRSG and habitat, managing livestock grazing to meet or make progress toward meeting the GRSG habitat objectives. Adjustments to existing AUMs would be made based on site-specific conditions providing flexibility to adjust permits conditions to avoid or reduce impacts to GRSG or habitat. Additionally, if land health assessment conditions are not met as indicated by an assessment specific to site capability, adjustments to grazing practices would be made to provide for suitable GRSG habitat at the HAF site scale. Range management improvements and existing infrastructure would be evaluated with respect to their effect on GRSG and GRSG habitat. This could help prevent impacts associated with grazing infrastructure such as increased predation and disease transmission (Naugle et al. 2004; Coates et al. 2016; Stevens et al. 2012; Manier et al. 2013). Together, these management actions and objectives would help to minimize, reduce, or correct for GRSG disturbances and habitat alternations that could otherwise lead to impacts on population persistence and viability.

State-Specific Environmental Consequences

Impacts from permitting grazing in CHMA and from reducing the risk of potential impacts from West Nile Virus would be the same as described for Alternative 3. Impacts in key RNAs in Oregon would be the same as described for Alternative 1.

Wild Horse and Burro Management

Impacts from wild horse and burro management under Alternative 4 would be the same as described for Alternative 1.

Predation Management

Impacts from reducing opportunities for predators would be similar to those described for Alternative 1 with the exception that precluding new anthropogenic infrastructure new anthropogenic infrastructure would be avoided where possible. As such, there would be a slightly greater potential for new infrastructure to occur, which could attract predators and increase predation on GRSG. Because other measures to maintain predation at natural levels would be applied, this is not expected to increase predation to a level that would influence lek or population persistence and viability.

ACEC Designation

Alternative 4 would not result in any impacts from ACEC designation since it does not include management for ACECs.

4.2.6 Alternatives 5 and 6

Habitat Designation and Management

Rangewide Environmental Consequences

Impacts from designating GRSG habitat as HMAs would be similar to those described for Alternative 1, though the BLM would manage approximately 7% more PHMA than Alternatives 1 and 2 and 10% fewer acres of GHMA (**Table 2-3**). Impacts from applying a 3% cap would be the same as described for Alternative 4, except in WY and MT (see State-Specific Environmental Consequences). Impacts from exceeding the 3% disturbance cap would be similar to those described for Alternative 4, but more exceptions would be allowed, which may result in increased development and disturbance to GRSG and habitat. Allowing a project to proceed before compensatory mitigation is in place would result in a time lag, potentially decades, during which GRSG habitat would be fragmented and reduced in carrying capacity by project impacts. As a result, habitat and population trends may continue to decline to a greater extent compared to Alternative 4. Impacts from population and habitat adaptive management would be the same as described for Alternative 4.

State-Specific Environmental Consequences

Impacts from applying a 5% disturbance cap at the project scale in WY and MT would be similar to those described for Alternative 1. However, the 3% disturbance cap would still apply at the HAF fine scale habitat selection area, which may limit additional development reducing fragmentation of GRSG seasonal habitats and ensuring habitat function and quality remain to support seasonal movements. Additionally, WY and MT would include wildfire and agriculture in the disturbance calculation, and therefore, the level of disturbance from other sources (energy development, roads, RPWs, etc.) would be relatively lower.

In Colorado, impacts from applying a 1-mile lek buffer as the minimum threshold would be the same as described for Alternative 1. These alternatives would allow for more flexibility in development while maintaining the BLM's ability to apply site-specific criteria for GRSG habitat protection. Alternative 6 also includes potential CSU stipulations to be applied in GHMA within 1 mile of PHMA. This would allow for increased flexibility while considering indirect effects that development in GHMA may have on PHMA.

Management in Wyoming SHMA would be consistent with GHMA restrictions, which would increase protections to GRSG and habitat as described under *Nature and Types of Effects*.

Impacts from designating RHMA and CHMA in Montana and the Dakotas would be the same as described for Alternative 4. Including more protective management in GHMA (ROW avoidance within 1.2 miles of active leks and crucial winter range, and utility scale solar and wind exclusion or avoidance in some areas) would make management more consistent with the state plan and decrease potential for impacts such as habitat alterations and disturbance.

In Idaho, lek buffers would be similar as those under Alternative 2 and consistent with the 2021 Idaho Sage-grouse Plan (State of Idaho 2021). Buffers would apply to active and pending active leks (Cook et al. 2022; **Appendix 4**) resulting in a potential increase in the amount of BLM lands where lek buffers, similar to Alternative 4. Lek buffers would remain the same in PHMA , except for minor linear features where less PHMA would be protected (**Appendix 19**).

Compared to Alternative 2, buffer distances would increase in IHMA for major linear features and transmission line towers, resulting in more IHMA potentially protected from these disturbances (**Appendix 19**). Buffer distances would be decreased in IHMA for communication and meteorological towers in IHMA, and in GHMA for surface disturbances due to continuing human activities that alter or remove the natural

vegetation. These decreases in buffer distances would result in less IHMA and GHMA protected from these types of disturbances.

Compared to Alternatives 1, 3, and 4, Alternatives 5 and 6 would have reduced buffers in IHMA and GHMA (**Appendix 19**). In addition, Alternatives 5 and 6 would have buffer exception criteria, where BLM may approve actions within IHMA and GHMA if it is impracticable to locate the project outside of the buffer and impacts are avoided through project siting and design, to the extent reasonable. The reduced buffer distances in IHMA and GHMA would reduce restrictions while maintaining buffers for PHMA, and are in line with Idaho's three-tiered habitat approach. Since development and anthropogenic disturbance could occur closer to leks in IHMA and GHMA, some leks would be at higher risk of effects from development, such as avoidance behavior, reduced productivity, or decline in lek abundance. A more detailed analysis would occur during project-specific NEPA analysis.

In NV/CA, impacts from clarifying use of lek-buffer protections included in 2015 and 2019 ARMPAs applies to all active or pending active leks (see **Appendix 4** for lek definitions) regardless of HMA designation would be the same as described for Alternative 3.

In UT, Alternatives 5 and 6 would prioritize habitat management areas (PHMA and GHMA) that encompass 95.6% of the male GRSG counted on leks during 2023 surveys. This includes 2,740 (93.8%) males counted within PHMA, 54 (1.8%) counted in GHMA and 127 (4.3%) counted outside of any HMA. GHMA designations in Morgan-Summit, South Slope Uintah/Blue Bench, and Uintah Population Area (Deadman's Bench, East Bench, and Book Cliffs) would be removed, including any corresponding management actions. Because 90% of Utah's GRSG are supported by habitat in PHMA under these Alternatives there would be no substantial effect of accelerating impacts on the small populations in former GHMA.

Minerals Management

Rangewide Environmental Consequences

Impacts from mineral resource management would be similar as described for Alternative 4 with state-specific differences described below.

State-Specific Environmental Consequences

The oil and gas lease stipulations summarized in **Appendix 2** would be applied in MT/DK, limiting the potential for impacts associated with fluid mineral leasing as described in in *Nature and Types of Effects*. Applying a 5% disturbance cap at the project scale in MT and WY, and 3% disturbance cap at the HAF fine scale area could allow for more potential mineral development, which could increase disturbance and habitat alterations, including fragmentation (see **Table 2-3**). Allocations in PHMA in WY differ between Alternative 4 and Alternative 5.

Impacts from consistency in stipulations in MT/DK HMAs and from closing UMRBNM to mineral leasing and development would be similar to those described for Alternative 3.

Impacts from applying siting criteria for development in CO PHMA and GHMA would be similar to those described under Alternative 4. To grant an activity based on compensatory mitigation, the compensation project must be planned, funded, and approved in coordination with the State of Colorado.

In NV/CA, impacts from identifying criteria for granting exceptions to allocation decisions would be the same as described for Alternative 4.

Impacts from closing ID PHMA to new mineral materials development but allowing continued use of existing pits would be the same as described for Alternative 4. Impacts from reduced lek buffers in IHMA and GHMA would provide for additional opportunities for mineral resource management, specifically salable minerals and non-energy leasables.

Lands and Realty Management

Rangewide Environmental Consequences

Impacts from managing PHMA in all states, ID IHMA, MT CHMA and some MT RHMA as ROW avoidance areas and applying minimization measures where major ROWs cannot be avoided would be similar to those described for Alternative 4. Micro-siting to avoid placement near leks or in connectivity corridors to avoid dividing breeding habitat from adjacent nesting or other seasonal habitats would reduce potential for alteration to high value and seasonal habitats and disturbance to GRSG during important life history stages (e.g., breeding, migration). Because major ROWs that are located inside RMP designated ROW corridors would not need to comply with disturbance cap or compensatory mitigation requirements, habitat alteration and disturbance could occur where these corridors overlap PHMA.

Managing GHMA in all states and WY SHMA as ROW open with minimization measures and compensation, to maintain habitat supporting GRSG populations consistent with state agency habitat designations and to preclude negative impacts to any adjacent PHMA habitats would reduce the potential for impacts as described in *Nature and Types of Effects.* However, reduction of impacts would be to a lesser extent than if managed as avoidance areas.

State-Specific Environmental Consequences

In Colorado, impacts from expanding a timing limitation to include GHMA for conditions of approval of the ROW would be the same as described for Alternative 4.

In Idaho, lek buffers would be similar as those under Alternative 2 and consistent with the 2021 Idaho Sage-grouse Plan (State of Idaho 2021). Lek buffers would be reduced in IHMA and further reduced in GHMA. Effects would be similar to those described under Minerals Resource Management under Alternatives 5 and 6 (described above). These effects would be analyzed in detail during the project-level NEPA analysis.

Renewable Energy Management

Rangewide Environmental Consequences

Classifying PHMA and IHMA as avoidance areas for wind and solar energy development but exclusion in breeding/nesting habitat and limited seasonal habitat would decrease the potential for impacts as described in *Nature and Types of Effects*, but to a lesser extent than if all HMA were exclusion areas. Solar and wind development would be considered on a case-by-case basis in avoidance areas. Because development would not be allowed in breeding and nesting habitats, or in limited/high value seasonal habitats unless certain criteria are met (refer to **Table 2-10**), the magnitude of impacts, such as disturbance and habitat alterations, would not be expected to be of a level that would influence lek or population persistence/ viability.

Managing GHMA and WY SHMA as open to wind and solar energy development would result in potential impacts as described in *Nature and Types of Effects*. However, the inclusion of minimization measures and compensation to maintain habitat supporting GRSG populations consistent with state agency habitat designations (e.g., restoration, connectivity, seasonal, or other), and to preclude negative impacts to any adjacent PHMA habitats would reduce the potential for those impacts in high value and seasonal habitats.

State-Specific Environmental Consequences

In Idaho, PHMA and IHMA would be avoidance areas for utility scale wind and solar energy development (including met towers). Development would not be allowed in breeding and nesting habitats, or in limited/high value seasonal habitats unless one of the criteria below is met. Development would not be allowed within breeding and nesting habitat inside lek buffers (**Appendix 3**), but breeding and nesting habitat outside of lek buffers would be avoidance areas.

Differences in effects between Alternatives 4, 5, and 6 are described under Greater Sage-grouse, Habitat Designation and Management and Minerals Resource Management, State-specific Circumstances, Alternatives 5 and 6 above. With the increased interest in renewable energy development including utility scale wind and solar energy development in Idaho, there may be increased impacts to GRSG leks in PHMA, IHMA and GHMA under Alternatives 5 and 6. Reduced lek buffers in IHMA and GHMA and a possible buffer exception could result in possible lek abandonment, avoidance behavior, or reduced productivity due to increased anthropogenic disturbance around a lek. The extent of impacts would depend on a variety of factors, including habitat type and condition, proximity to other leks, unique seasonal habitats, or connectivity, etc. However, energy development would likely be limited by proximity to transmission line corridors and substations and would not extend to all PHMA, IHMA or GHMA. However, leks in IHMA and GHMA would be at higher risk from effects from energy development due to the reduced buffers and buffer exception under Alternatives 5 and 6 than under Alternative 4.

Livestock Grazing Management

Rangewide Environmental Consequences

Impacts from livestock grazing management under Alternatives 5 and 6 would be the same as described for Alternative 4.

State-Specific Environmental Consequences

In Montana and Dakotas impacts from permitting grazing in CHMA and from reducing the risk of potential impacts from West Nile Virus would be the same as described for Alternative 3.

In Oregon, the 15 key RNAs in Oregon would be retained under Alternatives 5 and 6. Their associated areas allocated as unavailable to grazing are proposed to be retained, modified, or re-allocated to grazing based on district-generated, site-specific updated information since the 2015 ARMPA. Regardless of availability for grazing, the key RNAs would be required to meet land health standards and other applicable BLM regulations and policies and would remain subject to management, including regulation of grazing and invasive plant removal. The amount of land within key RNAs that would be made available to grazing is small relative to the size of the species' range and any impacts of livestock grazing on GRSG populations using these areas would likely be minimal and undetectable.

Although key RNA boundaries are not being modified (with the exception of data updates and clarifications), district site visits and analysis since the 2015 ARMPA have found vegetative communities that would not be consistent with why key RNA designations for sage-grouse habitats were made. They include mountain mahogany vegetation communities (Dry Creek Bench, Mahogany Ridge, Fish Creek Rim, and Spring Mountain Key RNAs) and the old-growth juniper (Black Canyon Key RNA) vegetation community.

Wild Horse and Burro Management

Impacts from wild horse and burro management under Alternatives 5 and 6 would be similar to those described for Alternative 1. Management to the low end of the AMLs could reduce impacts from wild horses and burros on GRSG in some areas.

Predation Management

Impacts from objectives to reduce opportunities for predators under Alternatives 5 and 6 would be the same as described for Alternative 4.

ACEC Designation

Alternative 5 would not result in any impacts from ACEC designation since it does not include management for ACECs.

Under Alternative 6, the acres of ACECs would be the same as in Alternative 3, but management within ACECs would differ as described below.

Impacts from mineral development could occur as described under *Nature and Types of Effects*. Plans of operations for locatable mineral disturbances would reduce effects if measures are included to reduce disturbance to GRSG and habitat alterations.

Managing ACECs as open to fluid mineral leasing subject to NSO stipulations would decrease the HMA acres subject to effects from mineral resource development. The NSO stipulation could protect these acres from surface-disturbing activities. Limiting surface disturbance would ensure that connectivity between leks would be preserved and not contribute to fragmentation. Including an exception/modification to allow occupancy if there are drainage concerns from adjacent development and if no direct or indirect impacts can be demonstrated is not expected to result in additional impacts.

Managing ACECs as closed to new or expansion of non-energy minerals associated with existing operations (e.g., fringe leases) would reduce potential impacts to GRSG and habitat, such as disturbance and habitat alterations as described under *Nature and Types of Effects*. Managing ACECs as closed to new salable mineral/mineral material operations for all sale types except for free-use pits would reduce potential impacts to GRSG and habitat as described under *Nature and Types of Effects* but to a lesser extent than if free use pits were also prohibited.

Managing ACECs as exclusion areas for major ROWs and avoidance areas for minor ROWs would reduce potential impacts to GRSG and habitat, such as disturbance, habitat alterations, and increased potential for predation, as described under *Nature and Types of Effects.* Managing ACECs as ROW exclusion areas for wind and solar energy development would eliminate the likelihood for GRSG impacts including habitat loss, degradation, fragmentation, and direct disturbance to birds in these areas.

4.3 VEGETATION

4.3.1 Nature and Type of Effects

Greater Sage-Grouse Management

GRSG management plans incorporate objectives for maintaining, improving, or restoring vegetation communities, particularly sagebrush and riparian and wetland habitats. In the 2015 GRSG plans there is consistently-applied management across all LUPs to preserve and improve vegetation communities. However, anthropogenic disturbances, such as road construction, mineral development, and ROW development, would continue. This could influence impacts on vegetation, including removal, fragmentation of vegetation communities, loss of pollinator habitat, and conversion of areas to an earlier seral stage, which could change vegetation community succession and reduce the extent of native plant communities. Remaining vegetation could have reduced vigor or productivity due to mechanical damage, soil compaction, and dust. Soil compaction would inhibit natural revegetation in areas without active reclamation efforts and would reduce plant vigor, making plants more susceptible to disease, drought, or insect attack. Expansion of

conifer woodlands, especially pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.), is also associated with increased bare ground and increased erosion potential (Manier et al. 2013). Juniper expansion presents a threat to GRSG as it doesn't provide suitable habitat, and mature trees displace shrubs, grasses, and forbs through direct competition for resources.

Disturbance caps would influence the allowable level of disturbance within a GRSG HMA, and these would vary by alternative. In general, a lower level of allowable disturbance would have fewer impacts to vegetation including reduced sagebrush or riparian vegetation fragmentation and reduced vectors for noxious weed or invasive species introduction or spread.

An adaptive management approach is included in the event that habitat or populations continue to decline. In the event a threshold is met, more restrictive measures could be applied. This would help to ensure that actions are taken to limit impacts to habitat (and by proxy, vegetation) in an appropriate time frame to offset impacts.

Minerals Management

Mineral development requires construction of roads, well pads, wells, and other infrastructure, and associated noise, traffic, and lights that alter, degrade, and/or entirely displace native ecosystems (Manier et al. 2013). Surface disturbance associated with mineral development often removes vegetation, reduces the condition of native vegetation communities and the connectivity of habitat, and encourages the spread of invasive species (NTT 2011). Vegetation removal results in conversion of areas to an earlier seral stage, which could change vegetation community succession and reduce desired plant communities. The remaining vegetation could have reduced vigor or productivity due to mechanical damage, soil compaction, and dust. Impacts would not occur in areas closed to mineral leasing or development.

Lands and Realty Management

Permitted activities, such as construction of utility ROWs, involve vegetation removal, which reduces the condition of native vegetation communities and individual native plant species, alters age class distribution, reduces connectivity, and encourages the spread of invasive species. Construction activities could compact soils, which would inhibit natural revegetation in areas without active reclamation efforts and would reduce plant vigor, which would make plants more susceptible to disease, drought, or insect attack. In most cases, reclaimed areas would be ripped and seeded during interim or final reclamation (NTT 2011).

Aboveground linear and underground ROWs, such as transmission lines or pipelines, would temporarily remove vegetation during construction. Vegetation would be permanently removed for construction of surface linear ROWs, such as roads. Because aboveground and surface linear ROWs may extend for many miles, vegetation communities could be fragmented and the potential for weeds to be introduced or to spread may increase. Aboveground site-type ROWs and wind energy projects would remove vegetation during the life of the project, often lasting several decades, but areas would be reclaimed after the ROW is decommissioned. ROW corridors would concentrate disturbances in one area, which would cause greater impacts in this one area but would reduce the likelihood of disturbance in other areas.

ROW exclusion areas would protect vegetation from disturbance and removal. In ROW avoidance areas, the permits would be considered on a case-by-case basis. This flexibility may be advantageous where federal and private land ownership is mixed, as exclusion areas may result in more widespread development on private lands.

Livestock Grazing Management

Livestock grazing can affect soils, vegetation health, species composition, water, and nutrient availability by consuming vegetation, redistributing nutrients and seeds, trampling soils and vegetation, and disrupting microbial systems (Connelly et al. 2004; NTT 2011; Jones 2000). Grazing effects are not distributed evenly because historic practices, management plans and agreements, and animal behavior all lead to differential use of the range (Manier et al. 2013). In addition, some grass species that evolved with grazing pressure from large herbivorous mammals (such as warm season grasses *Bouteloua gracilis*) may be less affected by livestock grazing compared to species without herbivore-adapted traits (such as cold season grasses like *Agropyron spicatum, Pascopyrum smithii,* and *Festuca idahoensis*) (Mack and Thompson 1982). Cold season grass species that don't tolerate prolonged and heavy grazing are the dominant vegetation communities in the grass understories of sagebrush habitats across the biome. Livestock often use riparian and wetland areas for water and shade, which could reduce riparian community condition and hydrologic functionality. Properly managed grazing could also assist with desired vegetation objectives, modify vegetation composition, and structure, and reduce litter and fine fuel loading, which could reduce wildfire size and severity (see **Section 4.4**, Wildland Fire Ecology and Management).

While limited, improper grazing can lead to loss of vegetative cover, reduced water infiltration rates, decreased plant litter, increased bare ground, reduced nutrient cycling, decreased water quality, and increased soil erosion (Manier et al. 2013; Jones 2000). Grazing may also confer competitive advantage on pinyons and junipers through the removal of native grasses and forbs, facilitation of tree regeneration by increased shrub cover, and enhanced seed dispersal (Baker 2011). As described in **Section 2.9.7**, livestock grazing is managed to meet or make progress toward land health standards, thus reducing the likelihood of these effects.

Wild Horse and Burro Management

Wild horse and burro impacts are similar to those from livestock grazing, as wild horses and burros also forage on and trample vegetation. However, wild horse and burro use is not authorized through the permitting process and is thus not managed in the same way as livestock grazing. All herd management areas are managed for appropriate management levels (AML). Priorities for gathering excess wild horses and burros to maintain AML are based on population inventories, resource monitoring objectives, gather schedules, and budgets. Implementing management to protect GRSG generally involves reducing or otherwise restricting land uses and activities, such as wild horse and burro populations, that could reduce vegetation and water availability. By managing wild horse and burro populations to meet AML, the potential for those populations to adversely affect vegetation would be reduced. Limiting development to protect GRSG would also support vegetation habitat for wild horses and burros and limit human and surface disturbance. Reducing wild horses and burros populations in GRSG habitat management areas could assist in reducing impacts to vegetation communities in these areas. However, establishing priority for gather operations in PHMA could put herd management area that do not contain PHMA at risk for overpopulation, with associated negative affect on vegetation communities.

4.3.2 Alternative 1

Greater Sage-Grouse Management

Rangewide Environmental Consequences

Under Alternative 1 restrictions on land use and surface-disturbing activities would occur within each HMA and SFA (**Table 2-3**) and would limit impacts to vegetation as described under *Nature and Type of Effects*. More restrictive management within SFAs emphasizes protection of GRSG in these areas, and would provide the highest level of protection to vegetation. In general, restrictions on land use and surface-disturbing

activities in HMA and SFAs would reduce the likelihood of vegetation loss, sagebrush or riparian vegetation fragmentation, and introduction and spread of invasive weeds.

Structural changes to sagebrush shrublands have caused an increase in encroachment of pinyon pine, juniper, and noxious weeds that are replacing native plant communities. Treatments designed to prevent encroachment of trees and nonnative species vary across the range and would alter the condition of native vegetation communities by changing the density, composition, and frequency of species within plant communities. Fuels treatments, where allowed, would result in either more open-forested conditions, which would improve the habitat for species selecting these habitats, or decreased encroachment of juniper and pinyon species, which would improve habitats for GRSG and other sagebrush-dependent species. Habitat connectivity for GRSG could be increased over the planning time frame through vegetation manipulation designed to restore vegetation, particularly sagebrush overstory cover.

Alternative 1 would also incorporate an adaptive management strategy composed of soft and hard thresholds based on population and habitat changes. See **Section 4.2.2** for a detailed description of thresholds. In general, an adaptive management strategy would help to ensure that actions are taken to limit impacts to vegetation in an appropriate time frame to offset impacts.

Under Alternative 1, all states would include language to maintain and enhance sagebrush habitats with the intent of conserving GRSG populations. Habitat objectives would be considered when authorizing activities in GRSG habitat. The exact language varies by state, but in general, inclusion of specific habitat objectives would result in improved vegetation conditions. Following these objectives could prevent rangeland not meeting range health standards that degrade vegetation communities, reduce conifer encroachment, and reduce the introduction and spread of invasive weeds.

State-Specific Environmental Consequences

In MT and WY, a 5% disturbance cap would apply to land use activities, including wildfire and agriculture, at the project area scale in PHMA. States with higher disturbance caps could see greater levels of disturbance within a project area, and therefore greater potential for impacts to vegetation as described *under Nature and Types of Effects*. WY has no required mitigation in GHMA potentially increasing impacts to vegetation.

In CO, ID, NV/CA, OR, UT, and the Dakotas, a 3% disturbance cap would apply to land use activities (except wildfire and agriculture) at both BSU-scale and at proposed project analysis area within PHMA. In ID, the same cap would apply but it could be exceeded in utility corridors if it benefits GRSG. Calculating disturbance at the project-level means that the amount of disturbance allowed could not exceed 3% of the site-specific project area; this may prevent some development that could occur if disturbance is only calculated at a coarser scale. In addition to calculating disturbance at the project-level, disturbance would also be calculated for each BSU. Including caps at both project and BSU scales would reduce the likelihood for sagebrush or riparian vegetation removal, degradation, or fragmentation, and improve the acreage and condition of sagebrush vegetation on both the local and landscape scales.

Although all states would include an adaptive management strategy, the metrics, thresholds, timeframes, and spatial scales for evaluating and responding to thresholds would vary state by state. As a result, there would be no consistency in how thresholds are calculated across the range and responses may not be implemented across an area that encompasses an entire population group and/or seasonal habitats needed throughout the year. If management changes do not apply to all populations and habitats being affected, some vegetation communities may improve while others remain impacted.

Minerals Management

Rangewide Environmental Consequences

Leasing of fluid minerals would be allowed in PHMA and IHMA subject to NSO stipulations and/or seasonal restrictions. In general, NSO stipulations on new leases would protect vegetation in PHMA from surface-disturbing activities and would not contribute to fragmentation. Restrictions on mineral development within PHMA and GHMA as described in the 2015 EISs for CA, CO, ID, MO/DK, NV/CA, OR, UT, and WY (BLM 2015a-2015h) would reduce potential impacts to vegetation such as vegetation removal and increased weed spread as described under *Nature and Types of Effects*.

State-Specific Environmental Consequences

In WY, management of PHMA as NSO within 0.6 miles of leks would protect vegetation in these areas, though to a lesser extent than elsewhere rangewide where all PHMA would be NSO. In WY and MT PHMA fluid mineral development in areas that are already leased (and thus are exempt from NSO stipulations) would also be subject to density and disturbance limits. In CO, OR, WY, and UT NSO stipulations within lek buffers (buffer distance varies by state) in GHMA would provide increased protection to vegetation in these areas. PHMA and GHMA in CO and GHMA in OR would be closed to fluid mineral development within 1 mile of leks which would also provide increased protections to vegetation and limit impacts from surface disturbance in these areas. However, development of fluid mineral resources in GHMA would still result in the localized direct loss and fragmentation of vegetation from current use areas outside of the applicable lek buffers. The general effects of mineral development on vegetation are discussed in *Nature and Types of Effects*.

Impacts of development outside buffer areas could be offset by mitigation because operators would be required to mitigate impacts until there is a net conservation gain. However, mitigation may be conducted off-site if it would provide greater benefit to GRSG, potentially resulting in unmitigated impacts on vegetation in GHMA.

Prioritizing leasing outside of PHMA and GHMA within CO, ID, ND, NV/CA, OR, UT, WY, and parts of MT/DK (Billings, HiLine, Miles City, ND, SD) would reduce the potential for impacts to vegetation associated with mineral development as described under *Nature and Type of Effects* in these areas. There would be no similar objective in the Lewistown or Butte Field Offices, and therefore, potential for impacts would be greater. In WY and MT, salable mineral and non-energy mineral development in PHMA would also be subject to density and disturbance limits which would also reduce potential impacts to vegetation, but to a lesser extent than if they were completely closed to development. In Idaho, IHMA would be open to non-energy mineral development in Known Phosphate Lease Areas; therefore, similar impacts (e.g., direct vegetation loss, surface disturbance, and erosion) could occur in areas open to development.

Lands and Realty Management

Rangewide Environmental Consequences

Under Alternative 1, PHMA in all states and ID IHMA would be identified as ROW avoidance areas to allow for management flexibility (except for minor ROWs in WY, as described under state analysis). PHMA would be exclusion areas for wind and solar development (with some differences between states, see state-specific analysis). Classifying PHMA as exclusion or avoidance areas would decrease the potential for impacts associated with ROW development, such as disturbance and increased potential for weed spread, as described *in Nature and Types of Effects*. GHMA in all states would be open to minor ROWs with mitigation measures (except for in WY where mitigation is not required). Impacts associated with ROW development,

such as surface disturbance and increased potential for weed spread, could occur in these areas if developed, but mitigation measures would help to offset the impacts.

New ROWs in PHMA would not be allowed except in accordance with the Anthropogenic Disturbance Screening Criteria outlined in the Proposed Plan. In IHMA new ROWs could be considered if in accordance with the IHMA Anthropogenic Disturbance Development Criteria. The BLM would collocate new ROWs with existing infrastructure when possible. Alternative 1 would apply a buffer from disturbance around leks in PHMA, IHMA and GHMA, depending on the type of disturbance and based on the latest science (USGS 2014a) which would protect vegetation in the buffer. Existing ROW corridors are preferred for collocation of new ROWs but could not be widened more than 50% greater than the original footprint. These measures would protect vegetation from fragmentation and other impacts as described in *Nature and Types of Effects*.

State-Specific Environmental Consequences

PHMA in WY would be open to minor ROWs with buffers and mitigation. Buffers and mitigation would help offset the impacts, but to a lesser extent than ROW exclusion/avoidance. GHMA in WY would be open to minor ROWs and no mitigation measures would be required which would increase the potential for impacts associated in these areas.

Classifying GHMA in CO, NV/CA, and OR as avoidance areas for major ROWs would continue to reduce the potential for impacts associated with ROW development as described *in Nature and Types of Effects*. Opening UT and ID GHMA to major ROWs with minimization measures would increase the potential for impacts, but mitigation measures would help to offset the impacts. Opening GHMA in WY to major ROWs would also increase the potential for impacts, and there would be no mitigation measures to offset the impacts.

Livestock Grazing Management

Under Alternative 1, PHMA and GHMA in all states and ID IHMA would be available for domestic livestock grazing. Therefore, impacts to vegetation from grazing such as increased weed spread as described under *Nature and Types of Effects*, could occur in these areas. The BLM would prioritize SFAs and PHMA outside of SFAs for additional livestock grazing management. This would include or adjust permit terms and conditions needed to meet land health standards and GRSG habitat objectives.

Wild Horse and Burro Management

The BLM within all states where wild horses and burros overlap with GRSG habitat would need to manage populations within established AML, incorporating GRSG habitat objectives into wild horse and burros management. Monitoring wild horses and burros would gather prioritization information for GRSG habitat activities within SFAs, PHMA, IHMA (ID) and GHMA. Under Alternative 1, evaluation of land health assessments in wild horse HMA could identify vegetation conditions that would determine prioritization of areas to reduce wild horse numbers and the associated impacts on vegetation. Disturbances that are found in *Nature and Types of Effects* would have similar grazing impacts and may increase noxious weeds and invasive species presence, while also promoting conifer encroachment. Removing wild horses and burros in those PHMA with existing herd management areas in all states would increase total vegetation, grass abundance and cover, and sagebrush canopy cover, species richness, and dominance of palatable forbs (Manier et al. 2013; Chambers et al. 2017).

Hard thresholds (see **Appendix 2**) represent a trigger indicating that immediate action is necessary to stop a severe deviation from GRSG conservation objectives set forth in the BLM plans. Adaptive management strategies and the potential for changes in management would be consistent between all states and would

benefit GRSG habitat, especially in wild horse and burro areas. However, there is no consistency in the specific thresholds between states or the strategies associated with responding to those thresholds. The metrics, thresholds, and timeframes and spatial scales vary state by state, as does the level of detail that explains each of these. Similarly, the responses associated with adaptive management thresholds vary by state, with some prescribing specific actions and others identifying teams to develop a response.

4.3.3 Alternative 2

Greater Sage-Grouse Management

Rangewide Environmental Consequences

Areas managed as HMAs would vary slightly from Alternative 1 (**Table 2-3**). Rangewide effects to vegetation from GRSG habitat management and conifer encroachment treatment under Alternative 2, would be the same as those described for Alternative 1.

State-Specific Environmental Consequences

Removing SFAs in UT, WY, NV, and ID would reduce protections to vegetation by removing restrictions on land use and surface-disturbing activities in those areas. However, previous management area classifications (e.g., PHMA) would remain, but protections may be lower than what is required in SFAs. Protections afforded to vegetation from restrictions to land use and surface-disturbing activities would continue in SFAs in MT and OR, where the habitat classification would be retained; impacts would be as described under Alternative 1.

Under Alternative 2, the GHMA designation in UT would be removed with all its corresponding management actions. This would likely incentivize development in areas formally identified as GHMA, and could lead to vegetation loss, sagebrush or riparian vegetation fragmentation, and increased weed spread.

Requirements for mitigation that achieves a net conservation gain in all HMA types would apply in MT/DK, NV/CA, and OR, and impacts would be the same as described for Alternative 1. CO and ID would enforce mitigation resulting in no net loss in HMA. This would help offset impacts associated with land use activities, as described under *Nature and Types of Effects*, but to a lesser extent than Alternative 1, in which a net conservation gain would be required. In UT and WY, the net conservation gain requirement would be removed, which would increase potential for impacts.

Although the BLM would not require compensatory mitigation in HMA, it would enforce state mitigation policies and programs. In CO, ID, NV/CA, OR, UT, and WY HMA, compensatory mitigation would be voluntary unless required by laws other than FLPMA or by the State. As a result, the potential for impacts from land use activities, as described under *Nature and Types of Effects*, would increase relative to Alternative 1, in which a net conservation gain would be required.

Impacts from applying a 3% (CO, ID, NV/CA, OR, UT, and Dakotas) or 5% (MT and WY) disturbance cap in PHMA would be similar to those described for Alternative 1. However, in UT and ID the cap could be exceeded if it would benefit GRSG. The cap would be applied at the BSU and project scale, except in ID which would only apply it at the BSU scale. Consequently, some additional development could occur in ID, which may increase potential for impacts to vegetation compared to Alternative 1.

Impacts of including an adaptive management strategy would be similar to those described for Alternative 1. However, some states would include the addition of "un-triggers", meaning that the management change implemented to reverse a threshold could be revoked and the original management would be reimplemented

once the issue is resolved. Reverting to the original management that resulted in the threshold being met would likely lead to impacts to vegetation that could cause the threshold to be met again.

Minerals Management

Rangewide Environmental Consequences

Impacts from mineral development would generally be the same as described for Alternative 1 except for slight differences among the states (see state-specific analyses). Removing the recommendation for locatable mineral withdrawal in SFAs in all states (except in MT/DK, which did not have a 2019 amendment) would have no on the ground impact. The Secretary proposes and makes withdrawals according to a separate process pursuant to section 204 of FLPMA not through BLM land use planning.

State-Specific Environmental Consequences

Removing the CO PHMA closure to fluid mineral development would increase potential for disturbance and vegetation loss or degradation. This is because mineral development activities could occur in previously closed areas and cause impacts as described under *Nature and Types of Effects*. Changing GHMA from closed to fluid mineral development to NSO would likely not change impacts to vegetation because the NSO stipulation would avoid potential for disturbance and associated impacts due to surface-disturbing activities.

Impacts from prioritizing fluid mineral leasing outside of HMA in CO, ID, OR, and MT/DK offices would result in the same impacts as described under Alternative 1. Removing the objective in UT, NV/CA would increase the potential for impacts because land in PHMA and GHMA could be leased. In WY, fluid mineral leasing would be allowed in PHMA, which would increase the potential for impacts. However, if the BLM has a backlog of Expressions of Interest for leasing, the BLM would prioritize work first in non-habitat followed by lower habitat management areas (e.g., GHMA). For fluid mineral development on existing leases that could adversely affect GRSG populations or habitat, the BLM would work with the lessees, operators, or other project proponents to avoid, reduce, and mitigate adverse impacts consistent with lessees' rights.

Adding an exception criterion to salable and non-energy mineral closures for NV/CA PHMA with free use permits and allowing consideration of new free use permits for salable minerals in ID IHMA would increase the chance for activities to occur in these areas and thus the potential for associated impacts as described in *Nature and Types of Effects* would be greater.

Lands and Realty Management

Rangewide Environmental Consequences

Impacts from ROW management would be the same as described for Alternative 1 (with additional exception criteria in NV/CA, see state-specific analysis).

State-Specific Environmental Consequences

There would be additional exception criteria for ROW development in NV/CA PHMA and for wind development in NV/CA GHMA. This could increase the potential for impacts associated with ROW and renewable energy development because there would be a higher chance of development.

Livestock Grazing Management

Impacts from domestic livestock grazing management would generally be the same as described for Alternative 1, with differences across states as described below.

State-Specific Environmental Consequences

Removing SFAs in UT, WY, NV, and ID would remove the prioritization for review and processing of grazing permits in these areas. However, the BLM would still have the authority to prioritize staff time and budget to identify areas that aren't meeting land health standards and implement corrective actions in areas with the greatest GRSG habitat value.

Adding clarification of habitat objectives to land health standards in WY, ID, and NV and clarifications on grazing in riparian areas and management of range improvements in WY may, in some cases, help move vegetation toward desired conditions.

In OR, livestock grazing in the 13 key RNAs would be returned to language that pre-dated the 2015 amendments. Because this language would not specifically address habitat objectives for GRSG, these habitat objectives may not be met, and potential for impacts to vegetation and overall vegetation degradation would increase relative to Alternative 1.

Wild Horse and Burro Management

Impacts from wild horse and burro management in Alternative 2 would be the same as Alternative 1, except for the removal of references to SFAs for the states that removed them, and removal of the reference to GHMA in UT, which removed that HMA type under this alternative. This would potentially lead to disturbances in extensive portions of the PHMA, IHMA, and GHMA that aren't required to protect SFAs. Disturbances to these areas, see *Nature and Types of Effects*, would increase the likelihood of native vegetation degradation and fragmentation for GRSG habitat with an increase in bare ground soils that would potentially increase noxious weeds and invasive species establishment and conifer encroachment.

4.3.4 Alternative 3

Greater Sage-Grouse Management

Under Alternative 3, the BLM would manage the largest acreage of HMAs, all as PHMA (**Table 2-3**). In addition, the BLM would manage ACECs for GRSG. Conifer encroachment impacts and treatments for Alternative 3 would be the same as those described for Alternative I. Management actions for PHMA would be more restrictive and designed to promote GRSG conservation to a greater extent in areas previously designated as GHMA. Therefore, managing previously designated GHMA as PHMA would minimize potential impacts to vegetation to a greater extent than if they remained managed as GHMA. Expanding PHMA in some states to include areas of adjacent non-habitat, unoccupied historic habitat, or areas with potential to become habitat as PHMA would also increase protections for and minimize impacts to vegetation.

Classifying previously designated SFAs as PHMA would likely not reduce protections to vegetation rangewide. This is because although management actions for PHMA would be less restrictive than those for SFAs under other alternatives, the management restrictions in PHMA under this alternative would be more restrictive than Alternatives 1 and 2 (e.g., PHMA would be closed to fluid, salable, and non-energy minerals) and applied to a greater overall area.

Impacts from mitigation would be similar to those described for Alternative 1, as the BLM would require and ensure mitigation that achieves a net conservation gain in all HMA types. An emphasis would be placed on avoiding impacts, which would reduce potential for effects. Additionally, compensatory mitigation would need to fully offset any residual effects on habitat function and value and at the scale necessary to meet the RMP GRSG goals and objectives. These requirements would reduce the potential for impacts from land use activities, such as direct vegetation loss and sagebrush or riparian vegetation fragmentation.

The BLM would apply a 3% cap for new and pre-existing authorizations for infrastructure, wildfire, and agriculture (subject to valid existing rights) at the project scale and within HAF fine scale habitat selection area while honoring valid existing rights. Calculating disturbance at the project scale and HAF fine scale habitat selection area may prevent some development, and therefore reduce impacts to vegetation. Because fine scale HAFs typically represent a local population's home range and are determined in part by the quality and juxtaposition of resources within and between seasonal habitats, reducing disturbance in these areas may help to reduce sagebrush or riparian vegetation fragmentation and impacts to vegetation from surface disturbance.

Effects to vegetation from habitat management and conservation would be similar to those described for Alternative 1, however, Alternative 3 would include additional objectives to maintain existing connectivity between GRSG populations. Maintaining connectivity would reduce the potential for increased sagebrush or riparian vegetation fragmentation.

Minerals Management

Closing PHMA in all states to fluid mineral leasing, salable minerals, and non-energy minerals would reduce the potential for impacts to vegetation, such as direct vegetation loss, increased fragmentation, and increased weed spread as described under the *Nature and Types of Effects*. Impacts would be reduced to a greater extent than Alternatives 1 and 2 because areas closed to leasing could not be developed at any point.

Recommending PHMA for withdrawal from location and entry under the United States mining laws would have no impact. However, if the BLM were to apply for a withdrawal pursuant to section 204 of FLPMA and the Secretary were to accept the application, the BLM could initiate the process to withdraw PHMA. A withdrawal would reduce potential impacts to vegetation associated with mineral development as described under *Nature and Types of Effects* since surface disturbance associated with location and entry would be less likely to occur in withdrawn areas.

Lands and Realty Management

Under Alternative 3, all PHMA would be excluded from new ROW authorizations. New linear ROWs would be allowed only in designated ROW corridors. These restrictions would decrease the potential for impacts to vegetation in PHMA to a greater extent than under Alternatives 1 and 2. However, the inability to site ROWs in PHMA could lead to longer ROW routes in order to bypass closed areas which would in turn increase surface disturbance overall and other impacts of ROW siting on vegetation outside of PHMA.

Livestock Grazing Management

Under Alternative 3, all PHMA would be unavailable for domestic livestock grazing. As a result, livestock would be removed from PHMA and impacts to vegetation associated with livestock grazing, as described under *Nature and Types of Effects* would not occur. Alternative 3 would reduce the likelihood for spread of weeds, would allow for native understory perennial plant recovery, and would increase herbaceous vegetation cover (Strand and Launchbaugh 2013). Not utilizing livestock as a tool available for implementing fuels management treatments or invasive species control in sagebrush habitat areas could make PHMA more susceptible to a large-scale wildfire that would decrease native vegetation and increase the potential for noxious weed and invasive species growth in sagebrush vegetation communities within PHMA. Increased risk of wildfire would decrease protection of sagebrush habitats and may require repeated post-fire rehabilitation treatments to recover habitat function and continuity.

Wild Horse and Burro Management

Under Alternative 3, no wild horse and burro herd management areas would be designated in PHMA and wild horses and burros would be removed in areas where there are currently herd management areas. This could potentially increase protections for native plant communities within PHMA and decrease the potential for introduction and spread of noxious weeds and invasive species. Reducing ground disturbances to the herd management areas in PHMA would improve GRSG habitat and would assist in reducing the potential for conifer encroachment opportunities from compacted and bare soils.

4.3.5 Alternative 4

Greater Sage-Grouse Management

Under Alternative 4, more PHMA and less GHMA would be managed than Alternatives 1 and 2 (**Table 2-3**). Restrictions within HMAs would improve GRSG habitat by increasing acres and conditions of vegetation communities, connect sagebrush or riparian vegetation fragmented areas, mitigate noxious weed or invasive species introduction and spread, and decrease conifer encroachment. HMA protections would be expanded to new areas based on updated science.

The disturbance cap would be applicable to new authorizations under Alternative 4. Disturbance cap calculations would also be specific to activities that would remove vegetation and increase the potential for noxious weeds due to an increase in bare-ground areas. This would require more mitigation that could assist in preserving native vegetation populations or reducing invasive plants and noxious weeds for GRSG management. However, areas of GRSG non-habitat within the HMA boundaries would either be removed from the HMA or would be recategorized with decreased protections. Removing areas from HMA classification would have noticeable impacts to native vegetation in those areas and increase the potential for noxious and invasive species as well as soil degradation from surface disturbing activities. The 3% disturbance cap would include all acres of habitat classified as PHMA (and IHMA in Idaho). Areas outside those designations could experience disturbance and be converted to an earlier seral stage that would change vegetation community succession and reduce the extent of native plant communities.

As under Alternative 1, BLM would continue to include language to maintain and enhance sagebrush habitats with the intent of conserving GRSG populations under Alternative 4. However, habitat objectives tables would be updated based on best available science which would reinforce current or provide new thresholds. The updated language would allow for flexible management that could identify problems sooner and assist in reducing potential vegetation disturbances and invasive plants and noxious weeds spread. Adaptive management attempts would more accurately reflect GRSG habitat conditions and strive for better manage vegetation to support GRSG.

Minerals Management

Alternative 4 and NSO stipulations would be similar to Alternative 1, including in WY where the NSO stipulations would be expanded to include all of PHMA. Leasing would be focused to areas that have the least potential for conflicts. BLM would evaluate parcels identified in Expressions of Interest (EOIs) associated with GRSG HMA and determine which to potentially analyze for potential inclusion in a lease sale. This would be applied to a larger area compared with Alternative 1 due to the increase in acres that would be managed as PHMA. As a result, Alternative 4 could reduce fragmentation of vegetation communities and could maintain the extent and condition of native populations where development doesn't occur.

The BLM would work with project proponents to promote measurable GRSG conservation objectives such as, but not limited to, consolidation of project related infrastructure to reduce habitat fragmentation and

loss and to promote effective conservation and connectivity of seasonal habitats and PHMA (and IHMA). Vegetation communities in HMA that are considered to have least potential for conflicts with GRSG management and therefore more likely to be considered for development would see a potential increase in impacts to vegetation communities and in invasive plants and noxious weeds.

Lands and Realty Management

Alternative 4 would be similar to Alternative 1 with varying PHMA and IHMA exclusions for utility scaled ROWs. State-specific differences for facilities and activities would be guided by the strategy to avoid, minimize, or mitigate impacts on GRSG habitat. Wind and solar energy development would be excluded in PHMA and within specified areas of IHMA. Vegetation and soils disturbance from energy development would be eliminated in GRSG habitat containing sagebrush/perennial grass vegetation communities. By exclusion of development, the vegetation and soil conditions would neither be adversely nor beneficially impacted, but rather maintain current conditions and trends. Alternative 4 would exclude wind and solar energy testing and generation facilities in PHMA and in IHMA exclusions would apply within 3.1 miles from active leks that would reduce impacts compared to Alternative 1. Maintaining current conditions in PHMA and IHMA would provide consistent habitat for GRSG, reduce noxious weed and invasive species introduction, and decrease sagebrush or riparian vegetation fragmentation.

Livestock Grazing Management

Impacts to GRSG habitat from Alternative 4 would be the same as Alternative 1, although no SFAs would be managed under Alternative 4. As a result, these areas would not receive additional priority for grazing management. However, the BLM would still have the authority to prioritize staff time and budget to identify areas that aren't meeting land health standards and implement corrective actions in areas with the greatest GRSG habitat value.

Wild Horse and Burro Management

Alternative 4 is similar to Alternative 1 with the exception of references to SFAs, for all states, would be removed from the management plan. Removal of SFAs would have similar impacts to vegetation communities as states that have removed them under Alternative 2.

4.3.6 Alternative 5

Greater Sage-Grouse Management

Under Alternative 5, more PHMA and less GHMA would be managed than Alternatives 1 and 2 (**Table 2-3**). Lands would be managed for avoiding and minimizing direct and indirect disturbances on sagebrush vegetation and sagebrush communities that would require compensatory mitigation to achieve no net habitat loss. No net habitat loss and disturbance limits would not apply to the removal of invasive or encroaching vegetation, where such removal creates habitat. Therefore, this alternative could improve more acres of vegetation for GRSG habitat than Alternative 1. Alternative 5 habitat objectives would be similar to Alternative 4.

Minerals Management

Under Alternatives 5, fluid mineral development could be more flexible compared with Alternative 1 due to WEMs, though adherence to the WEM criteria would ensure no impacts to GRSG within 0.6 miles of leks or provide for off-setting effects through compensatory mitigation in PHMA beyond 0.6 miles (except in WY, where the NSO only applies within 0.6 miles). In addition, compensatory mitigation could be used more frequently under Alternative 5 to offset both direct and indirect adverse impacts on riparian and sagebrush habitats in PHMA and GHMA. Protective effects of PHMA would increase under Alternative 5 compared to

Alternative 1, as PHMA would be expanded (**Table 2-3**). Approved mineral developments would cause surface disturbances that would lead to vegetation community degradation, sagebrush or riparian vegetation fragmentation, and increases in noxious weeds and invasive species presence.

Lands and Realty Management

Avoidance for utility scale wind and solar in Alternative 5 would be similar to management under Alternative 1 but would keep GHMA open for utility scale developments with minimization measurements. This would result in more impacts on native vegetation and GRSG habitats from renewable energy development, in comparison to Alternative 1 where GHMA are only open in ID and WY for solar and wind. Under Alternatives 5, GRSG habitat would be fragmented from new ROW developments in GHMA resulting in an increase in the potential for invasive species and noxious weeds throughout the open ROW areas from impacts as described under *Nature and Types of Effects*.

Livestock Grazing Management

Impacts from livestock grazing management under Alternative 5 would be the same as those described for Alternative 4.

Wild Horse and Burro Management

Impacts from wild horse and burro management under Alternative 5 would be the same as described for Alternative 4. Under Alternative 5, BLM would manage WHB in the low end of AML and would reduce the potential for impacts from wild horses and burros on vegetation such as those described under Nature and Type of Effects, compared with Alternatives 1, 2, and 4.

4.3.7 Alternative 6

All impacts would be the same as described for Alternative 5 except for those from ACECs. ACECs under Alternative 6 would cover the same areas as Alternative 3 and would provide further protection to vegetation communities from surface disturbing activities as described under *Nature and Types of* Effects.

4.4 WILDLAND FIRE ECOLOGY AND MANAGEMENT

4.4.1 Nature and Type of Effects

Impacts on wildfire management result from changes in wildfire frequency and intensity and the ability to employ wildfire-suppression methods, both of which would affect management of wildfire and related costs within the planning area. Surface disturbance caused by development would generally contribute to the modification of the composition and structure of vegetation communities (including increases in noxious weed proliferation) around developed areas. This would then be more likely to fuel high-intensity wildfires, which could increase program costs because of the increased potential for wildfire.

Livestock grazing is the most widespread land use across the sagebrush landscape (Connelly et al. 2004) and it can be used to achieve resource objectives. Livestock grazing can alter an ecosystem's fuel characteristics, particularly fine fuel loads; however, this effect depends on weather conditions and plant community characteristics (Strand et al. 2014). In shrub-steppe, grazing with cattle may not be effective when shrub cover is high enough to serve as the primary carrier of the wildfire (Schachtschneider 2016) nor is it likely to be effective under extreme burning conditions (Strand et al. 2014). Several small-scale studies (Davies et al. 2010, Davies et al. 2016, and Davies et al. 2017) indicate cattle grazing can reduce grass fuels, alter potential wildfire behavior, and protect restoration investments, particularly when used on annual grasses prior to the wildfire season (Strand et al. 2014). Sagebrush grassland grazed at 30 to 50% utilization has been found to have lower percent cover of perennial grasses and total herbaceous species, as well as larger gaps in fuels (Davies et al.

2010). At higher wind speeds, targeted grazing at a utilization of 50% reduced flame lengths below 4 feet, allowing direct attack by firefighters (Decker 1998). Burned areas that were grazed at 40% utilization had less cheatgrass and more perennial grasses compared with ungrazed burned areas (Davies et al. 2009). For invasive, annual, grass-dominated landscapes, high-intensity grazing is typically needed to suppress invasive annuals and thereby change wildfire behavior (Mosley and Roselle 2006). By coupling knowledge of fuel characteristics with foraging habits of different livestock, prescriptions of the appropriate intensity can be developed to target specific components of the fuel load, and grazing can be applied effectively to reduce the risk associated with fine fuels. Such management would be consistent with Executive Order 13855, Promoting Active Management of America's Forests, Rangelands, and other Federal Lands to Improve Conditions and Reduce Wildfire Risk.

4.4.2 Alternative 1

A comprehensive strategy for wildland fire management would be implemented under Alternative 1, including the FIAT. The FIAT would identify PHMA areas and management strategies to reduce the threats to GRSG from invasive annual grasses, wildfires, and conifer expansion. It would incorporate recent scientific research on resistance and resilience of Great Basin ecosystems as well as interdisciplinary team knowledge. Potential management strategies include proactive measures, such as fuels management and habitat restoration and recovery, and reactive measures, such as fire operations and post-fire rehabilitation. Together, these actions would improve wildland fire management, given the limited resources available, and would target those areas that need most protection. The likelihood for wildfire would be reduced and subsequent impacts on vegetation, particularly vegetation that meets GRSG habitat requirements, described under **Section 3.2**. would also be reduced. Providing adequate rest from livestock grazing would improve the likelihood that ESR seedings would stabilize the site, compete effectively against invasive annuals, and successfully establish native vegetation over the long term.

4.4.3 Alternative 2

Impacts on wildland fire management under Alternative 2 would be the same as described for Alternative 1.

4.4.4 Alternative 3

Under Alternative 3, all PHMA would be unavailable for livestock grazing. This could limit the BLM's ability to achieve resource objectives as described under the *Nature and Type of Effects*, and could alter the risk of large-scale wildfires.

4.4.5 Alternative 4

Impacts on wildland fire management under Alternative 4 would be the same as described for Alternative 1.

4.4.6 Alternatives 5 and 6

Impacts on wildland fire management under Alternatives 5 and 6 would be the same as described for Alternative 1.

4.5 FISH AND WILDLIFE

4.5.1 Nature and Type of Effects

Minerals Management

Mineral exploration and development could result in impacts on the fish and wildlife species and habitat identified in **Chapter 3**. During minerals management, increased human disturbance activities could result

in temporary habitat avoidance or direct impacts on fish and wildlife species, causing mortality or injury. Other direct impacts include the removal or degradation of habitat from vegetation removal and increased potential for the spread of noxious weeds. Continuous (24-hours per day) operations often associated with fluid minerals exploration and development or mining can result in long-term impacts on wildlife and their habitat from displacement or other noise-related disturbance. Displacement of species could increase competition for resources in adjacent habitats. These activities could remove and fragment habitats due to road development and use, facility construction and placement, and creation of well pads and pipelines. Wildlife may avoid developed areas over the long term, or may adapt and recolonize sites, including after reclamation of temporarily disturbed areas.

Both short term, loud noise (such as from vehicles or construction) and long-term, low-level noise (such as from industrial activities such as oil and gas development) have been documented to cause physiological effects on wildlife species. These include increased heart rate, altered metabolism, and changes in hormones, foraging, anti-predator behavior, reduced reproductive success, density, and community structure (Radle 2007; Barber et al. 2009a). In addition, noise can impact wildlife through the disruption of communication and environmental cues (US Department of Transportation, Federal Highway Administration 2023). Determining the effect of noise is complicated because different species and individuals have varying responses, and certain species rely more heavily on acoustic cues than others (Radle 2007; Barber et al. 2009b). Impacts would be both short- and long-term, depending on the type and source of noise, and the depending on the species.

Impacts on big game populations would result from disturbance and/or loss of seasonally important habitat (for example, critical winter, breeding, or rearing habitats). Big game species could also be impacted by interference with seasonal migration or movement patterns (Kauffman et al. 2022) that decreases the ability of a species to breed or overwinter successfully. If effects are severe enough, this could lead to population declines.

Restricting surface-disturbing activities during minerals management actions would reduce impacts on wildlife and their habitat. Such management actions include stipulations to protect GRSG habitat, closure of areas to mineral leasing and development, and restrictions within ACECs. Areas closed to mineral leasing and development or managed under NSO stipulations would reduce surface disturbance and associated impacts from mineral development in certain areas. Wildlife on BLM-administered lands may be affected by disturbances from mineral development in adjacent lands.

Lands and Realty Management

Although transmission and power line construction does not generally result in substantial direct habitat loss, it would disturb wildlife species in habitat along the ROW due to the associated human activity, equipment, and noise, and would contribute to habitat fragmentation. In addition, transmission lines provide perches and nest sites for predators such as ravens and raptors, resulting in indirect negative impacts on prey species. Over the long term, ROWs may cause mortality of birds and bats due to collisions with power lines or guy lines. Collocation of transmission lines could reduce impacts by siting new developments in areas that are previously disturbed. Roads associated with energy transmission facilities can also reduce the extent and quality of habitat or serve as inroads for invasive plants to establish, further reducing habitat quality.

In areas managed as ROW exclusion, the BLM would prohibit all development of ROWs, with some exceptions provided; in areas managed as ROW avoidance, the BLM would consider allowing ROWs on a case-by-case basis. This flexibility may be advantageous where federal and private landownership areas are

mixed and exclusion areas may result in more widespread development on private lands if BLM-administered could not be used.

Renewable Energy Management

The type of effects on fish and wildlife species from renewable energy development and associated infrastructure (including construction and operation of distribution and transmission lines, substations, and access roads) would largely be similar to the type of effects resulting from ROW management, including habitat removal, alteration, or fragmentation, and direct injury or mortality, disturbance, and displacement. The development of wind energy could cause habitat loss and fragmentation, and both short- and long-term impacts to wildlife habitat. Disturbances during installation of towers, roads, and infrastructure could force wildlife away from preferred habitat. Some smaller prey species will avoid and abandon areas where overhead structures such as power lines and towers are present due to the increased risk of avian predators. Construction of wind turbines throughout the planning area create collision hazards for raptors, bats, and multiple avian species. Studies have documented deaths of avian and bat species from wind turbines, although the levels of collision and death vary in the scientific research (Cohn 2008; Madders and Whitfield 2006; Frick et al. 2017). Specific wildlife impacts from wind energy development have been shown for some big game species. Mule deer are displaced from suitable habitat by human activity related to the development and operation of gas wells in western Wyoming (Sawyer et al. 2006). Recent study regarding interactions of a transplanted elk population with an operating wind facility in Oklahoma found no evidence that turbines had a significant impact on elk use of the surrounding area (Walter et al. 2006). Similarly, Johnson et al. (2000) found no effect on pronghorn use of the Phase I and II Foote Creek Rim project in Wyoming.

Solar-specific impacts would be similar to wind disturbances during development that would lead to habitat removal, alteration, fragmentation, and collision risks. Wildlife, such as small mammals, big game, reptiles, and amphibians, would be more vulnerable to habitat fragmentation due to the large geographic range (DOE 2021). Additionally, the risk for collision would increase for avian species that migrate, nest, or forage in or around solar developments if they are attracted to the solar panels as they resemble large bodies of water.

Livestock Grazing Management

The direct and indirect impacts of livestock grazing on plants, as described in **Section 4.3**, Vegetation, can have indirect impacts on insect pollinators, particularly bees. Trampling can also have negative impacts on pollinator nesting sites, destroying active nests and causing soil compaction which can prevent new nest construction. Livestock may also trample nests of ground-nesting birds.

While limited, improper grazing management can lead to loss of vegetation cover, reduced nesting habitat quality (for ground-nesting species), reduced forage availability, reduced water infiltration rates due to soil compaction, change in vegetation composition, decreased plant litter, increased bare ground, reduced nutrient cycling, decreased water quality, increased soil erosion, and reduced overall habitat quality for wildlife (Manier et al. 2013). Grazing may contribute to the spread of nonnative, invasive plants and noxious weeds in sagebrush ecosystems by reducing cover of native bunchgrass (Reisner et al. 2013). It may increase desertification or worsen the impacts of climate change on rangeland (Beschta et al. 2014). Properly managed grazing may be compatible with wildlife habitat, does not preclude healthy rangelands, and may reduce wildfire in sagebrush ecosystems by reducing fuel loads in certain circumstances (Strand and Launchbaugh 2013; Svejcar et al. 2014; NTT 2011). As described in **Section 2.9.7**, livestock grazing is managed to meet or make progress toward land health standards, thus reducing the likelihood of adverse effects.

Structural range improvements, such as fences (especially woven-wire fences) represent potential wildlife movement barriers and predator perches, restricting movement and increasing predation pressure (Coates et al. 2016). Additional range improvements for water availability would place troughs that can create drowning risks for wildlife if not properly constructed with adequate escape ramps and maintained. Generalist predators can be abundant in anthropogenic-influenced areas, including areas developed for minerals management, livestock grazing, and other uses, where they can reduce prey populations. Common ravens (*Corvus corax*) prey on eggs and young of numerous other wildlife species, including GRSG. Ravens have been documented to prey on other special status species in the western US, including desert tortoises (*Gopherus agassizii*; Boarman 1992), least terns (*Sterna antililarum*; Avery et al. 1995), and western snowy plovers (*Charadrius alexandrines nivosus*; Strong et al. 2021).

Wild Horse and Burro Management

Wild horses and burros may alter habitat conditions for fish and wildlife species, including reduced total vegetation and grass abundance and cover, lowered sagebrush canopy cover, increased shrub canopy fragmentation, lowered species richness, increased compaction in surface soil horizons, and increased dominance of unpalatable forbs (Manier et al. 2013). Wild horses and burros also have direct impacts on wildlife and compete for forage and water as they have been documented aggressively defending water sources from native ungulates (Perry et al. 2015). In addition, herd populations over AML can degrade riparian areas, decrease water quantity and quality, and increase soil erosion. These effects can reduce habitat quality for fish and wildlife species. Effects on habitats may also be more pronounced during periods of drought or vegetation stress (NTT 2011).

Fences used to manage livestock distribution represent a potential source of movement barriers and increased predation, as described in *Livestock Grazing*, above. In addition, water must be available year-round in Herd Management Areas and wild horse territories, in compliance with the Wild and Free-Roaming Horses and Burros Act of 1971. This can lead to riparian areas receiving year-long use by wild horses and could modify riparian areas with additional fencing and troughs to accommodate year-long wild horse use. The range improvements would increase potential perch sites for avian predators and increase potential drowning hazards (water troughs). Man-made water sources of water may also increase the risk of West Nile virus in GRSG (Naugle et al. 2004). Moreover, there would be less water available for fish and wildlife in these areas. Conversely, range improvements are typically developed consistent with program guidance such as bird ladders to reduce drownings, maintain adequate water flow to maintain the spring source (BLM 2014).

Predation Management

Predation management would have similar effects as those described in **Section 4.2** for GRSG and would ultimately benefit wildlife species that overlap with GRSG habitats because there would be less predation pressure in these areas. Conversely, predator management may also adversely affect predatory wildlife populations that are the source of threats to GRSG.

ACEC Designation

ACECS are special management areas that are designed to protect important values such as fish and wildlife resources and habitat through restrictions on uses and surface disturbing activities. Management of the ACEC is designed to focus on the resource or natural hazard of concern, however this differs from area to area. Currently there are existing ACECs in Oregon that include GRSG as an important value (See **Section 4.11.1**, *ACECs and Research Natural Areas).* There is also considerable overlap of existing ACECs and GRSG habitat, which provides secondary protection for GRSG as well as other wildlife species. ACEC designation

may be a useful tool for the BLM to effectively manage habitat not only for GRSG but for other wildlife species by restricting land use operation and disturbances in these areas.

4.5.2 Alternative 1

Under Alternative 1, lands would be managed to conserve, enhance, and restore sagebrush ecosystems. By separating GRSG habitat into SFAs, PHMAs, IHMAs, and GHMAs, management actions would then be applied within identified designations, as well as in certain areas outside of PHMA, IHMA, and GHMA, including vegetation objectives to achieve improvements in GRSG habitat. SFA designations would have the most restrictions, and therefore the most protection for wildlife species that occupy these habitat types.

In most of the planning area, priority will continue to be given to leasing and development of fluid mineral resources, including geothermal, outside of PHMAs and GHMAs, or within the least impactful areas within PHMA, IHMA, and GHMA if avoidance is not possible. Applying a disturbance cap can help reduce effects to wildlife within the areas, as well as applying seasonal restriction when wildlife species are more vulnerable to disturbance. Impacts on wildlife species from mineral development would be as described under *Nature and Types of Effects*. Allowing exceptions to lease stipulations, COAs, and terms and conditions to be considered on a case-by-case basis during restricted time periods could lead to additional surface disturbing activities and functional habitat loss.It is unknown, however, what type or degree of exceptions would occur, because the outcome is dependent on each lease and the habitat where the lease is being developed.

Fluid Minerals Management

Under Alternative 1, restrictions on fluid mineral leasing, application of the disturbance cap, and use of conservation measures would reduce the extent of direct habitat loss for terrestrial wildlife species whose ranges overlap PHMA. However, scale of disturbance (both direct and indirect) would depend on lease size and configuration. In instances where several small leases occur entirely within PHMA or the 4-mile lek perimeter, pad and road development may have substantial impacts on wildlife species. Excluding or reducing surface-disturbing activities in PHMA would shift development into other areas and may influence those species that use non-sagebrush communities for nesting, cover, and forage.

Under this alternative, NSO and CSU stipulations would be applied to protect GRSG, which would further reduce wildlife habitat loss and degradation caused by fluid mineral development. While GHMA would be available for fluid minerals leasing and other types of minerals and energy development, such activities would be subject to conservation measures (i.e., net conservation gain, lek buffers, and RDFs). This would generally have a local protective impact on some wildlife in those areas.

The primary impacts on wildlife species (especially big game) from minerals development within the planning area would be the reduction in usable wildlife habitat and disruption of migration corridors that link crucial habitats (winter range) and parturition areas. Reductions would be particularly severe in areas with continuous surface disturbance. As discussed by Bartmann et al. (1992), crowding of animals may have a density-dependent impact of reducing animal survival and damaging resources. Human disturbance of big game results in increased energy costs (Bromley 1985) and disturbed big game animals incur a physiological cost, either through excitement (preparation for exertion) or locomotion. A fleeing or displaced animal incurs additional costs through loss of food intake and potential displacement to poorer (lower) quality habitat. If the disturbance becomes chronic or continuous, these costs can result in reduced animal fitness and reproductive potential (Geist 1978). Additionally, a fleeing or displaced animal is also more visible to predators and at a higher risk for predation. Displacement of fluid mineral development outside of suitable GRSG habitats could negatively affect raptors and migratory birds that commonly nest in pinyon-juniper and

other treed areas. Direct removal or modification that compromises nest stand character would reduce the habitat quality or carrying capacity for local raptor and migratory bird populations.

Salable Mineral Management

All salable mineral pits located in PHMA that are no longer in use would be restored to meet GRSG habitat conservation objectives. As such, this alternative would benefit those wildlife species whose ranges and habitats are coincident with PHMA. Surface-disturbing activities from salable minerals development would be relocated outside of PHMA. This would result in habitat loss or modification of other vegetation types (mountain shrub and pinyon-juniper), with negative impacts on those wildlife species associated with non-sagebrush communities.

Nonenergy Leasable Minerals

Under Alternative 1, no new nonenergy mineral leasing would be allowed in PHMA and existing mines would not be permitted to expand. RDFs would be applied for solution mining wells in PHMA. By reducing the amount of direct habitat loss, this alternative would retain habitat for terrestrial wildlife species whose ranges or habitats are coincident with PHMA.

Locatable Minerals Management

SFAs were recommended for withdrawal from the Mining Law of 1872, as amended. Such a withdrawal, if it occurs, would close the SFA to location and entry under the Mining Law of 1872, subject to valid existing rights. The BLM would request that operators include appropriate mitigation and applicable seasonal restrictions in plans of operation which would reduce impacts on fish and wildlife.

Lands and Realty Management

Under Alternative 1, PHMA in CO, NV/CA, ID, and OR would be managed as an avoidance area. ROW projects would be allowed in PHMA if the project would not adversely affect GRSG populations. GHMA would also be managed as avoidance for ROWs. Additionally, no aboveground structures would be authorized within 1 mile of active leks in occupied habitat. As a result protections would be greater under this alternative for those species that overlap all GRSG habitat. Both PHMA and GHMA would be managed as avoidance for large transmission lines, except for several ongoing projects.

Alternative 1 in UT would provide management flexibility in developing infrastructure, focusing on GRSG habitat. PHMA would be ROW avoidance for new linear and site type ROWs, permits, and leases; high voltage transmission lines ROWs (100 kV or greater); major pipelines; and communication sites. Additional protection would be provided by managing PHMA and GHMA as ROW exclusions areas for solar energy development and PHMA as ROW exclusion areas for wind energy development. RDFs would be applied to further reduce impacts. Ensuring a net conservation gain to GRSG under the regional mitigation strategy may require projects to avoid, minimize, or compensate for their potential impacts on GRSG, which could reduce the loss or disturbance of habitat from specific projects. Offsite mitigation may not always benefit species impacted at the disturbed site. Therefore, there could be a local impact on certain species.

In WY there would be an increase in ROW avoidance areas that could reduce ROW construction activities and related impacts to wildlife habitat. Existing ROWs would be used whenever possible for placement of new linear facilities, which would minimize overall habitat loss and fragmentation. Exceptions could occur, and in those cases disturbance is to be limited and mitigated. New projects would have seasonal stipulations that would help prevent disturbance to wildlife species during those timeframes. Management for construction would consider impacts to GRSG populations and be designed to minimize impacts through project design and mitigation. The considerations could reduce the impacts from disturbance and habitat

loss for other wildlife species. Requiring raptor perching deterrents could reduce the effects to prey species from hunting by predatory bird species; however, predatory birds would not benefit from hunting perches.

Under Alternative 1, a 3% disturbance cap (5% on lands in WY and MT which would include fire, agriculture, and urban development [MT only]) on discrete anthropogenic disturbances would be applied in PHMA and IHMA in ID, at both the BSU and project levels. Additionally, a limit would be placed on the density of energy and mining facilities, which would reduce impacts on wildlife habitat caused by such disturbances. Including transmission lines outside of transmission corridors in the 5% disturbance calculation could reduce wildlife habitat loss and reduce disruptions in habitat connectivity. Disturbance and development can create travel or migration barriers which can alter distribution patterns, increasing stress and energy loss and fitness in wildlife species.

Renewable Energy Management

Under Alternative 1, renewable energy development would be permitted in some states. As a result, sagebrush associated wildlife species would experience reduced potential for disturbance, habitat alterations, and habitat fragmentation as described *in Nature and Types of Effects*. Within exclusion areas, direct impacts would be eliminated on wildlife species, but development in avoidance areas would have more effects on wildlife as some development would occur on a case-by-case basis. Impacts include altered habitat, habitat fragmentation, and noise associated with development. Additionally, the potential exists for both solar and wind facilities to cause direct mortality of some wildlife, particularly birds and bats (Frick et al. 2015; DOE 2021).

Mitigation and Adaptive Management

Under Alternative 1, anthropogenic disturbances in PHMA, IHMA, and GHMA would be mitigated to ensure a net conservation gain to GRSG, which would also maintain habitat for other wildlife species that use GRSG habitat. Conservation measures would be imposed to complement mitigation and further reduce anthropogenic disturbance in PHMA and GHMA, including RDFs and lek buffers.

Application of Habitat Objectives

The habitat objectives would identify the desired outcome for habitat on BLM-administered lands in all GRSG HMAs. Some wildlife species that co-exist in sagebrush communities with GRSG and which have similar habitat requirements would benefit most from the desired habitat conditions. These include management of activities to support suitable GRSG habitat at multiple scales, supporting connected mosaics of sagebrush to provide seasonal habitats and dispersal. The specific tables identifying indicators and benchmarks supported by various scientific publications throughout the range would be retained in the monitoring appendix as a tool through which suitability is informed.

Livestock Grazing Management

Under this alternative, site-specific reviews during grazing permit renewals could allow for adjustments to the number of AUMs on federal lands. Within SFAs prioritization of grazing permit/lease review not meeting Land Health Standards, with a focus on those containing riparian and wet meadow vegetation would improve riparian and wet meadow vegetation. This action would also protect wildlife, for which riparian and wet meadow habitats provide important habitat.

Adjustments in grazing use or management of BLM-administered lands to meet Standards for Rangelands Health could also result in actions that would balance the impacts of grazing while sustaining wildlife species and their habitat. Adjusting grazing management because of monitoring could provide overall improvements

in landscape health, prevent or reduce the spread of invasive, nonnative plant species, provide additional forage, and allow for greater cover habitat for wildlife.

Wild Horse and Burro Management

Alternative 1 would place some restrictions on the management of wild horses and burros, however the BLM would consider all resource values in conjunction with GRSG when managing wild horses. These management strategies would benefit wildlife species whose ranges overlap herd management areas within PHMA or GHMA.

ACEC Designation

Alternative 1 does not include management for ACECs.

4.5.3 Alternative 2

Habitat Management Area Alignments

Impacts from designating GRSG habitat as SFAs, PHMA, IHMAs, and GHMA (**Table 2-3**) would be similar to those described for Alternative 1. However, some SFAs would be removed in states as described under state impacts. Impacts from language to maintain and enhance sagebrush habitats would be the same as described for Alternative 1.

Removal of GHMA in UT and associated management may reduce some indirect protection for all wildlife species, including crucial habitat for big game species that rely on the area for wintering and fawning/calving within mapped GHMA. Impacts on big game are considered negligible because big game uses a variety of habitat types beyond sagebrush. Additionally, GHMA is not the only management for these areas but is merely complimentary to management of habitat under applicable RMPs and according to BLM Land Health Standards. Removing GHMA minimization measures that, as noted above would not preclude development, would not likely result in additional impacts that are not already addressed by management of crucial habitats in existing land use plans.

The offsite mitigation in PHMA to replace impacted habitat in occupied GRSG habitat outside of PHMA may not always benefit the same other wildlife species that were impacted at the disturbed site. While it could lead to a local improvement for species in treated areas, especially those that rely on sagebrush habitats, it could also result in an unmitigated loss in the quantity and quality of habitat at the location of the impact. As the amount of development increases in the GRSG habitat outside PHMA, the impact from disturbances mitigated in PHMA would mount and could affect the use patterns of wildlife in those areas.

Fluid Minerals Management

Impacts on fish and wildlife species from the leasing objective would be similar to Alternative 1, except it would not be relevant in UT or NV/CA. In WY, leasing would be allowed in PHMA, which would increase the potential for impacts on wildlife species that occupy PHMA and surrounding habitat. Impacts from fluid mineral development is discussed under *Nature and Types of Effects*.

Impacts on fish and wildlife species from WEMs would be similar to Alternative 1, except that they would no longer be applied in NV/CA and UT. Allowing placement of developments in non-habitat portions of PHMA may increase impacts on certain wildlife and migratory birds whose habitat requirements do not overlap sagebrush areas. Adjacent non-sagebrush habitats could see an increase in development and disturbance when trying to avoid and minimize disturbance to sagebrush communities.

Salable Mineral Management, Nonenergy Leasable Minerals, and Locatable Minerals

Impacts on wildlife species would be the same as Alternative 1, except PHMA in ID allows consideration of new free use permits and NV/CA added exception criteria to the closure. Increased potential for related impacts as outlined in *Nature and Types of Effects* would result from providing consideration of new free use permits for salable minerals in ID IHMA and adding an exemption criterion to salable and non-energy mineral closures for NV/CA PHMA. This is because there would be a higher likelihood of salable and/or non-energy mineral activities taking place in these areas. Removing the recommendation for locatable mineral withdrawal in SFAs in all states (except in MT/DK, which did not have a 2019 amendment) has no impact. This is because a recommendation to withdraw lands under the Mining Law of 1872 has no impact. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

Lands and Realty

Under Alternative 2, impacts from ROWs on wildlife species would be the same as Alternative 1, with additional exception criteria added in Nevada. Alternative 2 proposes to remove the requirement to consider burying transmission lines (except when not technically feasible) and allow increased flexibility to consider site-specific impacts and minimization options. This action could lead wildlife such migratory birds, small mammals, and reptiles by increasing predator perches from unburied lines that may lead to increased take of migratory birds and their nests by raptors and corvids; however, impacts of predator perches could be minimized on a site-scale by use of perch deterrents on poles. Additionally, Alternative 2 would result in more aboveground power lines that increases the risk of birds and bat collisions (Frick et al. 2017). There could be beneficial impacts on big game and migratory bird habitat by not burying transmission lines because it offers more protection for sensitive habitat areas. Removal of sagebrush and associated vegetation can be avoided with placement of surface lines, which minimizes habitat disturbance and potential for weeds.

In addition, there would be a 3% disturbance cap, not including wildfire or agriculture for CO, ID, NV/CA, OR, UT, and the Dakotas. In UT the cap may be exceeded if it will benefit GRSG. The 3% cap may be exceeded at either scale if a technical team determines that site specific GRSG habitat and population information, combined with project design elements indicates the project will improve the condition of GRSG habitat within the proposed project analysis area or within the PHMA in the population area where the project is located. Factors considered by the team will include GRSG abundance and trends, movement patterns, habitat amount and quality, extent and alignment of project disturbance, location and density of existing disturbance, project design options and other biological factors. Such exceptions to the 3% disturbance cap may only be approved by the BLM Authorized Officer with the concurrence of the State Director. The finding and recommendation shall be made by the technical team, which should consist of, at least, a BLM field biologist, other local GRSG experts, and biologists and other representatives from the appropriate State of Utah agency.

Allowing exceedances to the disturbance and density caps in PHMA could affect wildlife by a reduced level of protection for habitat from disturbance. These disturbance impacts may increase by allowing exceptions to the disturbance cap, especially within areas of non-sagebrush, therefore impacting wildlife species that use these other habitat types (e.g., pinyon-juniper woodlands and pinyon jays); however, exceptions to the disturbance and density cap may also benefit some wildlife species with habitats that overlap with GRSG. This would come about by improving habitat conditions through the increased potential for voluntary vegetation treatments.

Renewable Energy Management

Impacts from renewable energy would be similar under Alternative 1. However, in Nevada, PHMA would have additional exception criteria added. This could increase the potential for impacts associated with ROW and renewable energy development because there would be a higher chance of development. These impacts are described under *Nature and Types of Effects*.

Mitigation and Adaptive Management

Maintaining a mitigation strategy in PHMA that leads to a planning area-wide improvement of GRSG habitat would include management for vegetation communities. Generally, these areas include habitats that are dominated by grasses and shrubs than by trees. However, the removal of trees such as pinyon and juniper are included in some habitat management strategies. While each individual project proponent would no longer be required to increase habitat to obtain an authorization for use of public lands, the effects of habitat improvements that were described in the 2015 Final EIS would continue to be achieved: namely, increasing the quantity and quality of sage-steppe vegetation communities in early- to mid-seral condition. Additionally, the effects of habitat improvements would still occur where voluntary mitigation occurs. This would increase habitats for wildlife species with habitats that overlap that of GRSG; however, it would also generally decrease habitat availability for wildlife species or seasonal habitats of species that are not sage dependent.

Application of Habitat Objectives

Impacts from habitat objectives would be the same as for Alternative 1.

Livestock Grazing Management

Impacts from domestic livestock grazing management would be the same as described for Alternative 1, except for in the states described below. In UT, WY, and NV/CA, the prioritization for review and processing of grazing permits was removed; however, the BLM would still have the authority to prioritize staff time and budget to identify areas that aren't meeting land health standards and implement corrective actions in areas with the greatest GRSG habitat value.

Wild Horse and Burro Management

Impacts on wildlife species would be the same as Alternative 1.

ACEC Designation

Impacts would be the same as described under Alternative 1.

4.5.4 Alternative 3

Habitat Management Area Alignments

Managing the largest area as PHMA would minimize potential impacts on wildlife species that occupy previously designated GHMA as there would be more restrictions in the areas. Expanding PHMA in some states to include areas of adjacent non-habitat, unoccupied historic habitat, or areas with potential to become habitat as PHMA would also decrease potential for disturbance to sagebrush associated wildlife species and habitat alterations because management restrictions associated with PHMA would occur over a larger area.

Minerals Management

Closing PHMA in all states to fluid mineral leasing, salable minerals, and non-energy minerals would reduce potential impacts to wildlife that occupy GRSG range, such as disturbance and habitat alterations. The type of impacts associated with mineral development are described in detail under *Nature and Types of Effects*. Compared to the other Alternatives 1 and 2, the impacts would be lessened. This is because areas closed to

leasing would not be developed and there would be a decrease of HMA acres that would be subjected to effects from mineral development. Closing PHMA to mineral leasing and development would protect habitat for wildlife in these areas from surface-disturbing activities as well as subsurface activities (e.g., directional drilling), maintain connectivity between leks and big game habitat, and not contribute to fragmentation. Sagebrush associated wildlife would not be exposed to disruption that is often associated with the noise and human activity that accompanies construction, development, or production activities in PHMA. However, restrictions to development on BLM lands might push development onto private land, which could result in indirect as described under *Nature and Types of Effects*.

Recommending PHMA for withdrawal from location and entry under the United States mining laws would have no impact. However, if the BLM were to apply for a withdrawal pursuant to section 204 of FLPMA and the Secretary were to accept the application, the BLM could initiate the process to consider withdrawing PHMA from location and entry under the Mining Law of 1872. Such a withdrawal would reduce potential impacts to wildlife associated with GRSG range and habitat associated with locatable minerals as described under *Nature and Types of Effects*. This is because surface disturbance associated with location and entry would be less likely to occur in withdrawn areas because only claimants who demonstrate a valid existing right would be able to proceed.

Excluding or reducing surface-disturbing activities in PHMA could shift development into habitats outside of PHMA. This may influence those species that use non-sagebrush communities for nesting, cover, and forage. Of note would be woodland raptors and migratory birds that commonly nest in pinyon-juniper. Direct removal or modification that compromises nest stand character would reduce the habitat quality or carrying capacity for local raptor and migratory bird. Additional development in habitats outside of PHMA would affect small mammals and big game populations and connectivity between habitats could be reduced by habitat loss and degradation. This would depend largely on the amount and distribution of development.

Lands and Realty

Compared to Alternatives 1 and 2, new infrastructure development would be far more restricted. All PHMA would be excluded from new ROW authorizations. Only new linear ROW would be allowed in designated ROW corridors. The potential impacts on wildlife that occupy PHMA would be decreased because of the exclusion of ROWs. In PHMA, there would be a decreased probability of habitat degradation and fragmentation. However, because ROWs cannot be placed in the PHMA, more lengthy ROW routes may be necessary to go around closed areas. Longer routes could have more negative effects on wildlife species using habitat outside of PHMA because the ROW would be located in PHMA adjacent habitats, non-federal lands, or private lands.

Renewable Energy Management

Under Alternative 3, PHMA in all states would be ROW exclusion areas for wind and solar energy development. Prohibiting wind energy development would eliminate the likelihood for habitat loss, degradation, fragmentation, direct mortality to birds and bats and direct disturbance to wildlife in PHMA. Alternative 3 would offer more protection from renewable energy development compared to Alternatives 1 and 2 because more areas would be excluded from renewable energy development with no exceptions. Impacts from wind and solar developments are described under *Nature and Types of Effects*.

Mitigation and Adaptive Management

Impacts on wildlife species from mitigation would be similar as described for Alternative 1, because the BLM would require and ensure mitigation that achieves a net conservation gain in all HMA types. These

requirements would reduce the potential for impacts from land use activities, such as habitat loss or alterations. Maintaining habitat function and value would benefit wildlife species associated with sagebrush habitats.

Application of Habitat Objectives

Impacts from habitat objectives would be similar to those described for Alternative 1. Since the habitat objectives would be modified under this alternative, the species affected may vary slightly.

Livestock Grazing Management

Alternative 3 would make all PHMA unavailable for livestock grazing and therefore would have the fewest direct impacts on terrestrial wildlife. The reduction in herbivory from livestock grazing under this alternative would allow for herbaceous forage and cover for wildlife to increase and would prevent impacts as described under *Nature and Type of Effects*. There would also be less trampling or compacting of vegetation and/or soils, and less competition for forage, water, space, and habitat alteration.

In contrast, livestock grazing may reduce invasive species and noxious weeds or enhance forage and brood-rearing conditions for some wildlife species, so the removal of livestock grazing may increase the risk of invasion of noxious or invasive weeds. Relatedly, without a reduction in fine fuels, there may be an increased risk of large-scale wildfire that would remove wildlife habitat. Additionally, more fencing may be needed to separate PHMA from adjacent non-federal grazed lands, which could increase collision risk, change or prevent movements by some wildlife species, and increase predator perching opportunities for some species.

Wild Horse and Burro Management

Under Alternative 3, wild horses and burros would be removed from herd management areas within PHMA. This would increase habitat quality for wildlife because there would be a reduction in grazing competition, which could result in improvements to vegetation cover, forb abundance, forage for native wildlife, and spring habitat. Where range improvements, such as water troughs are removed, there would be a reduction in potential drowning hazards and/or potential for disease transmission. Additional fencing may also be needed to keep wild horses off BLM-administered HMAs which could increase collision risk, change or prevent movements by some wildlife species, and increase predator perching opportunities for some species.

ACEC Designation

Under Alternative 3, all PHMA would be managed as ACECs. The management of ACECs under this alternative would be the same as for areas managed as PHMA under this alternative and impacts would be as discussed under *Nature and Types of Effects*.

4.5.5 Alternative 4

Habitat Management Area Alignments

Under Alternative 4, PHMA boundaries would be expanded compared with Alternatives 1 and 2 and acres managed as GHMA would decrease (**Table 2-3**). By managing these areas, wildlife species whose range overlaps with GRSG would benefit from management actions to protect GRSG to a greater extent where PHMA and other HMA designations have expanded. Under this alternative, impacts on wildlife would be similar under to those described under alternatives 1 and 2 with a focus on improving GRSG habitat by increasing acres and conditions of vegetation communities, habitat connectivity, mitigation of noxious weeds and/or invasive species, and decrease conifer encroachment.

Minerals Management

Range wide, leasing would be permitted in HMAs, which would increase potential impacts to wildlife in these areas as described in the *Nature and Types of Effects*. The BLM would, however, implement management strategies that would reduce the possibility of conflict and associated consequences from potential development in GRSG habitats or linking regions as described in **Section 4.2.3**. Giving preference to lands that would not obstruct the suitability and proper operation of GRSG habitat, considering their proximity to already-existing development, potential for development, and the presence of significant GRSG habitats or connectivity areas, would minimize potential impacts to wildlife species that overlap GRSG habitat. In contrast, this may shift operations to nonfederal lands and impact other wildlife species whose range does not overlap GRSG.

The fluid mineral development and leasing objective would consider leasing in areas where there is the least potential for conflicts with GRSG and its habitat. The avoidance strategy will ensure minimal disturbance on wildlife species that overlap GRSG range. However, impacts may be shifted to non-federal lands which may pose greater impacts for wildlife species that do not overlap with GRSG habitat. Those impacts are discussed under *Nature and Types of Effects*.

Other impacts from minerals management would be similar to those described for Alternative 1.

Lands and Realty

Under Alternative 4, in all states managing PHMA (IHMA in ID) as ROW avoidance areas would be similar to Alternative 1. In areas where development cannot be avoided, there would be additional protection by avoiding important GRSG habitat such as leks and nesting/early brood-rearing habitat. This would reduce impacts on wildlife species who also utilize high value GRSG habitat, however, this may shift impacts to other potentially important wildlife habitat that doesn't overlap with GRSG. Impacts on wildlife species are described in *Nature and Types of Effects*.

GHMA would also be managed as ROW avoidance areas within breeding and nesting habitats, along with other limited seasonal use habitats. Avoiding placement of ROWs within one-half mile of PHMA or IHMA would help protect or buffer those areas from indirect impacts. Because all other areas would be managed as ROW open, impacts, such as habitat alteration and disturbance, could occur, however, compensation would be required (see Alternatives). Similar to impacts from PHMA management described above, potential for impacts on wildlife whose range overlaps with GRSG habitats would be reduced, while other wildlife species whose range is outside of GRSG habitat may have increased potential for impacts. Those impacts are described in *Nature and Types of Effects*.

Since HMAs would be extended to additional regions based on best available science, restrictions inside HMAs would lessen impacts on wildlife species whose range overlaps with GRSG, as discussed under *Nature and Types of Effects*. Alternative 4 would have restrictions on disturbance caps between states that would decrease surface disturbances impacting wildlife habitat and improve protection for GRSG habitat within new HMA boundaries.

Renewable Energy Management

Under Alternative 4, wind and solar development would be managed by HMA, and proximity to lek locations, similar to Alternative 3. Management stipulations for PHMA would be exclusion for utility scale wind and solar development. For IHMA exclusion would be within 3.1 miles of active lek locations and avoidance strategies for the remainder. All GHMA would be managed as avoidance. Within the exclusion areas impacts on wildlife that overlap GRSG habitat would be reduced as development would not be permitted. As a

result, development would likely shift to areas outside of GRSG habitat, causing direct impacts on wildlife species whose range does not overlap with GRSG. Those impacts are described under *Nature and Types of Effects*.

Mitigation and Adaptive Management

Impacts under this alternative would likely be higher than Alternative 3 because more projects would take place if PHMA, IHMA, and GHMA were not closed to new projects. There would also be the addition of required compensatory mitigation that would meet the requirements set by the state wildlife agency or appropriate authority (See alternatives). Depending on GRSG population triggers there may be additional mitigation in some areas, and the BLM would coordinate with state wildlife management agencies to consider project activities, direct and indirect impacts, and restoration success rate. Impacts on wildlife would potentially be minimized depending on GRSG population triggers in the area and the overlap of wildlife habitat with GRSG habitat. On the contrary, management actions may be shifted to non-federal lands or other wildlife habitat where development and disturbance may occur. These impacts are discussed under *Nature and Types of Effects*.

Application of Habitat Objectives

Impacts on wildlife from application of habitat objectives under this alternative would be the same as Alternative 3.

Livestock Grazing Management

Impacts on wildlife would be similar to those described under Alternative 1. However, because SFAs would not be managed, Alternative 4 does not include a programmatic prioritization strategy. However, the BLM would still have the authority to prioritize staff time and budget to identify areas that aren't meeting land health standards and implement corrective actions in areas with the greatest GRSG habitat value. In addition, the BLM would include additional management objectives and actions that give GRSG and GRSG habitat further protection from livestock grazing impacts. Some of these management objectives and actions include site-specific adjustments to AUMs, flexibility to adjust permits, and meeting land health conditions. These added management objectives and actions would potentially reduce impacts to other wildlife species that overlap GRSG range. The impacts are further discussed under *Nature and Types of Effects*.

Wild Horse and Burro Management

Impacts on wildlife from wild horse and burro management would be the same as described for Alternative 1.

ACEC Designation

Alternative 4 does not include management for ACECs and thus there would be no effects on fish and wildlife from ACEC management under this alternative.

4.5.6 Alternative 5

Impacts on fish and wildlife from fluid, salable, nonenergy leasable, and locatable minerals management would be the same as described for Alternative 2. Impacts from application of habitat objectives and minimizing threats from predation would be the same as described for Alternative 3. Impacts from the fluid mineral development and leasing objectives, mitigation, adaptive management, and grazing would be the same as described for Alternative 4.

Habitat Management Area Alignments

Under Alternative 5, the BLM would manage protections in more PHMA and less GHMA compared with Alternatives 1 and 2. This would lead to increased protection for other wildlife whose ranges overlap with PHMA but less protection for those whose ranges overlap with GHMA.

Lands and Realty

Impacts under this alternative would be similar to those described under Alternative 4 in comparison to the management of PHMA and IHMA in ID as ROW avoidance areas with the application of minimization measures in areas where major ROWs cannot be avoided.

Renewable Energy Management

Under this alternative, PHMA and IHMA would be classified as avoidance areas. This would minimize the potential impacts from wind and solar development, but to a lesser degree than exclusion areas because development would be considered on a case-by-case basis, whereas development would be prohibited in exclusion areas. Impacts from wind and solar development are described under *Nature and Types of Effects.*

In high value GRSG habitat such as leks and nesting/early brood-rearing habitat, development would not be permitted, therefore impacts to other wildlife species in these areas would be negligible unless certain criteria are met (nonhabitat/unsuitable habitat or the project prevents indirect impacts).

Managing GHMAs as open to wind and solar energy development range wide would result in potential for impacts on wildlife species as described in *Nature and Types of Effects*. However, the inclusion of minimization measures and compensation to maintain GRSG habitats consistent with state agency habitat designations (e.g., restoration, connectivity, seasonal, or other), and to preclude negative impacts to any adjacent PHMA habitats would reduce the potential for those impacts on wildlife in high value and seasonal GRSG habitats.

Under this alternative, a 3% disturbance cap would be applied range wide at the fine scale, similar to Alternative 4, however, there would be a 5% disturbance cap for the project scale in MT and WY (which would include fire, agriculture, and urban development (MT only)). Impacts on wildlife species under this alternative would be similar as described under Alternative 4 but with more exceptions which would potentially result in more development and disturbance in GRSG habitat.

Wild Horse and Burro Management

Impacts from wild horse and burro management under Alternative 5 would be similar to those described for Alternative 1. Management to the low end of the AMLs could reduce impacts from wild horses and burros on fish and wildlife in some areas.

4.5.7 Alternative 6

Impacts would be the same as described for Alternative 5 but with the additional designation of ACECs. The acres of ACECs would be the same as in Alternative 3, but management within ACECs would differ as described below.

Under this alternative, ACECs would be open to fluid mineral leasing with NSO stipulations. These stipulations would minimize impacts on wildlife in these areas, however, this would increase the HMA acres that are potentially at risk to effects from mineral development that are discussed in *Nature and Types of Effects*. While limiting surface disturbance would ensure habitat connectivity between lek locations, this would benefit other wildlife that utilize sagebrush habitat in these areas. On the contrary, this may push surface disturbance into other important wildlife habitats that do not overlap with GRSG habitat.

Managing ACECs and salable mineral/mineral material operations as closed to new or expansion of non-energy minerals associated with existing operations (e.g., fringe leases) would reduce potential impacts on wildlife species and habitat. Management of these resources would reduce potential impacts on wildlife and habitat such as disturbance and habitat degradation or alteration which is discussed in *Nature and Types of Effects*. However, salable mineral/mineral material operations would not close all free-use pits and would have more impacts than if not permitted.

Management of ACECs as exclusion areas for major ROWs and wind and solar development and avoidance areas for minor ROWs would reduce potential impacts on wildlife and associated sagebrush habitat, such as disturbance, habitat alterations, and increased potential for predation, as described under *Nature and Types of Effects*. While ROWs would not be permitted in exclusion areas, they would be evaluated on a case-by-case basis in avoidance areas, therefore impacts would be reduced to a greater extent in exclusion areas compared to avoidance areas.

4.6 SPECIAL STATUS SPECIES

4.6.1 Nature and Type of Effects

The nature and type of effects on special status fish and wildlife species would be similar to those described for fish and wildlife species in **Section 4.5.3**. Effects on special status plants would be similar to those described for vegetation in **Section 4.3.3**. However, impacts on special status species may be greater than impacts on common species because population viability is already uncertain for special status species.

4.6.2 Effects Analysis

In general, impacts on special status fish and wildlife species would be similar to those discussed under **Section 4.5**, Fish and Wildlife, and **Section 4.2**, Greater Sage-Grouse, while impacts on special status plant species would be similar to those discussed under **Section 4.3**, Vegetation. A detailed analysis of impacts on federally listed and proposed species and designated and proposed critical habitat will be prepared in the biological assessment for this RMPA/EIS. The biological assessment is under development and will be included with the Final RMPA/EIS.

Those species more closely associated with sagebrush communities or whose ranges are largely coincident with PHMA and GHMA (e.g., Brewer's sparrow and to a lesser extent white-tailed prairie dog, black-footed ferret, pygmy rabbit, western burrowing owl, ferruginous hawk, Holmgren lupine, Beatley's buckwheat, and squalid milkvetch) would benefit from conservation measures designed to protect GRSG and sagebrush habitat.

Conversely, excluding or avoiding development in GRSG habitats most likely outside of PHMA and IHMA, in GHMA inclusions, may lead to increased activity in other vegetation types (e.g., pinyon-juniper, mountain shrub, and aspen/spruce/fir). Special status species associated with these habitat types, such as pinyon jay, northern goshawk, BLM-sensitive bat species, Canada lynx, Columbian sharp-tailed grouse, sand cholla, Reese River phacelia, and Eastwood milkweed, may be adversely influenced to varying degrees, depending on alternative and development scenarios.

4.7 WILD HORSES AND BURROS

4.7.1 Nature and Type of Effects

Impacts under all alternatives would be limited to any future changes that may result in AML and/or acreage adjustment as well as reconsideration of herd management area designations that are based on achievement of GRSG habitat objectives for improving GRSG habitat conditions. Similar to livestock grazing, wild horse and burro grazing has similar impacts in terms of their effect on soils, vegetation health, species composition,

water, and nutrient availability by consuming vegetation, redistributing nutrients and seeds, trampling soils and vegetation, and disrupting microbial systems. The impacts from wild horse and burro management on these resources are discussed in their respective sections.

Most herd management areas contain GRSG habitat in a sagebrush vegetation community. Overall management direction is to manage for healthy populations of wild horses and burros to achieve a thriving natural ecological balance with respect to wildlife, livestock use, and other multiple uses. All herd management areas are managed to achieve and maintain the AML. Initially, the AML for herd management areas are established in RMPs at the outset of planning and adjusted based on monitoring data throughout the life of the RMP. Priorities for gathering excess wild horses and burros to achieve and maintain AML are based on population inventories, resource monitoring objectives, gather schedules, holding space availability, and budget. Gathers can be conducted in emergency situations when the health of the population is at risk due to lack of forage or water. In some situations, wildfire may be considered as reasoning for an emergency gather. Across all alternatives, use of contraceptives and other population growth suppression to manage wild horse and burro numbers would be implemented to assist in the achievement and maintenance of AML.

Implementing management for the protection of GRSG generally involves reducing or otherwise restricting land uses and activities to levels that are more consistent with the protection of GRSG and their habitat. Ground disturbing activities such as mineral extraction, recreation, or construction activities in ROWs all may remove vegetation and thus reduce forage availability, reduce the ability of wild horses and burros to move freely across herd management areas, or cause general disturbance of an individual band of wild horses or burros (refer to **Table 3-6**). **Table 3-6** displays the total number of herd management areas, and their associated AMLs, that overlap with GRSG HMAs. Protecting areas from surface disturbing activities for the purpose of protecting GRSG would also protect forage for wild horses and burros and limit conflicts with humans or surface disturbance. These land uses and activities typically reduce forage and water availability or otherwise unintentionally disturb wild horse and burro populations, which may necessitate the need to adjust the established AML to meet GRSG habitat objectives.

Impacts on wild horses and burros and the ability of herd management areas to support AMLs may occur within herd management areas where management options are restricted for the protection of GRSG. Impacts from range improvement restrictions would generally vary based on type of range improvement affected; restrictions on fences would improve wild horse and burro habitat by allowing free range, while limitations on projects that could enhance forage and water availability would not help to support the established AML. For instance, herd management area within the planning area may not have open water, and thus wild horses and burros are supported exclusively through water developments.

4.7.2 Alternative 1

Alternative 1 would require a 3% disturbance cap on human surface-disturbing activities in PHMA. It would incorporate RDFs consistent with applicable law in PHMA, GHMA, and IHMA and would also require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required.

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, could exclude infrastructure placement in the most cost-effective locations, and would result in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Protections afforded to GRSG and their PHMA or GHMA habitats would benefit wild horses and burros where herd management areas overlap these areas. This is because habitat conditions and forage would be improved, there would be less impact from human disturbances, and wildfire would be strategically managed in habitats. However, temporary or long-term management changes to wild horses and burros may be necessary to achieve and maintain the desired habitat condition. Examples are reducing AMLs, designations, removals, movement patterns, and forage access. Alternative 1 would require more intensive management, particularly in the boundaries of SFAs.

4.7.3 Alternative 2

Alternative 2 would remove references to management within SFAs in some states and remove reference to GHMA in Utah. Because management is more restrictive on lands within SFAs to emphasize protection of GRSG, management for SFAs provides the highest level of protection to forage. Without these protections, there could be additional surface disturbance, and thus removal of forage as described in the *Nature and Type of Effects*. Removal of SFAs would increase impacts on wild horses and burros when compared with Alternative 1. Impacts on wild horses and burros, herd management areas, and AML under Alternative 2 within PHMAs would be the same as those described under Alternative 1.

4.7.4 Alternative 3

Under Alternative 3, no new designation of herd management areas would occur in any herd areas that overlap with PHMA unless the area outside of the PHMA boundary could still support a herd management area. All wild horses and burros would be removed from existing PHMA, which would result in short-term disturbance of herds by human presence and round up activities. Round ups would occur based on congressional funding for these actions, therefore the exact timeline is unknown. However, in the long-term, all wild horses and burros would be removed from PHMA and moved to holding facilities per wild horse and burro herd-removal guidelines under Public Law 92-195 as amended and 43 CFR Part 4700. Acres of herd management areas in PHMA under Alternative 3 are shown in **Table 4-4**.

Wild horses and burros outside of herd management areas in PHMA but in adjacent lands could be impacted by changes in management within the herd management area. Because herd management areas would no longer be managed for AML under this alternative, there is potential for removal of resources, primarily water developments. Additionally, under Alternative 3, livestock grazing would become unavailable within PHMA, and thus range and water improvements may be removed or reclaimed, which would decrease the availability of developed water sources, as described in the *Nature and Type of Effects* section.

4.7.5 Alternative 4

Impacts on wild horses and burros under Alternative 4 would be similar to those under Alternative 1, with additional management direction to remove reference to SFAs.

4.7.6 Alternative 5

Impacts from wild horse and burro management under Alternative 5 would be similar to those described for Alternative 1. Management to the low end of the AMLs could reduce wild horse and burro populations in some areas.

4.7.7 Alternative 6

Under Alternative 6, the BLM would additionally manage ACECs. These ACEC would cover the same areas as under Alternative 3, however management would include restrictions on fluid minerals, non-energy minerals, major ROWs, wind, and solar developments. As a result, ACEC management would provide

further protection to forage for wild horses and burros from surface disturbing activities outside of the HMA, as described under *Nature and Types of* Effects.

4.8 LIVESTOCK GRAZING

4.8.1 Nature and Type of Effects

Impacts on livestock grazing are generally the result of activities that affect forage levels, areas available for grazing, the class or kind of livestock, the timing of use, the interval between grazing periods, intensity of grazing, placement and management of range improvements, and livestock handling techniques in grazing allotments.

Greater Sage-Grouse Management

Protecting GRSG habitat can directly affect livestock grazing if management requires limitations on areas open to grazing or available AUMs, modification of grazing strategies, or limitations on maintenance or construction of range improvements. This could increase time and cost to permittees and lessees or impact the ability of permittees and lessees to fully use permitted AUMs. The impacts of additional direct costs on permittees and operators are analyzed in **Section 4.12**, Social and Economic Conditions.

Minerals Management

Energy and mineral development can directly impact livestock grazing. During the exploration and testing phase of mineral development, the footprint of disturbance is usually small and localized; therefore, minimal acres available for livestock grazing would be directly impacted. However, during the exploration phase, development and human presence can lead to impacts on livestock dispersal and unauthorized grazing use could occur, increasing time and cost to permittees and lessees. Outside of the exploration and testing phase, surface-disturbing mineral development directly affects areas of grazing in the short-term during construction of well pads, roads, pipelines, and other associated facilities. Potential impacts include an increased potential for the introduction and proliferation of invasive plants that are often unpalatable. Other potential impacts are changes in available forage, reduced forage palatability because of dust on vegetation, limits on livestock movement, harassment, and temporary displacement of livestock.

Improving roads for mineral development can facilitate livestock management if it improves operator's ability to maintain infrastructure or improve grazing distribution. In addition, development may also provide other indirect benefits including but not limited to access to locations for supplement placement. Properly implemented BMPs and reclamation mitigation measures could help to maintain rangeland health and forage levels for livestock. Reducing mineral development in GRSG habitat could reduce potential impacts on grazing, as described under *Nature and Type of Effects, Greater Sage-Grouse Management.*

Renewable Energy Management

Similar to mineral development, wind and solar energy development could directly impact livestock through limitations on use of the portions of developed areas. Solar energy development typically leads to removal of livestock grazing within the footprint of the developed site. ROWs used to gain access to developed sites could remove forage permanently. As required by the BLM's grazing regulations, the BLM would notify permittees at least 2 years in advance of any proposed reduction in authorized use in the allotment, including complete removal of grazing within a portion of or the entirety of an allotment.

Lands and Realty Management

Areas managed as ROW avoidance or exclusion could hinder or prevent obtaining access to an allotment or installing a structural range improvement. However, restrictions on ROWs may indirectly benefit livestock grazing by reducing construction impacts (such as dust, displacement, and introduction of invasive

plants) from development of other types of ROWs in the long term. Restrictions on ROWs may indirectly impact livestock grazing by reducing construction impacts from development of these ROWs (such as dust, displacement, and introduction of invasive plants) in the long term. Lands and realty actions taken to protect GRSG habitat would involve avoiding or excluding ROWs (e.g., for power lines, pipelines, and other structures) or land transfers in GRSG habitat. They may also slightly decrease disturbance in these areas. However, should development be relocated to areas outside of GRSG habitat, but still within a grazing allotment, these areas may see an increase in construction-related disturbance or displacement of livestock.

Livestock Grazing Management

Changes in livestock grazing management could impact grazing opportunities in a variety of ways. For example, implementing livestock grazing management requirements to benefit GRSG could affect livestock grazing by changing required management actions. Management requirements could increase short-term and long-term costs to permittees and lessees and decrease AUMs, particularly when they require one or more of the following:

- Removal or modification of structural and nonstructural range improvements
- Modification of a grazing strategy and terms and conditions of permits, including but not limited to:
- Changes to the kind or class of livestock grazed
- Change in season-of-use
- Timing or duration of grazing use
- Changes to the pattern of rest-rotation within allotments and pastures
- Changes to area of use

These management requirements could result in direct and indirect economic impacts on individuals, companies, and the local community. For example, if a ranch is dependent seasonally on forage on public lands, reducing or eliminating AUMs on public lands would affect the entire ranching operation by reducing the total amount of available forage (Torell et al. 2002).

Some management changes may require a short-term output of cost for permittees and lessees but could result in long-term benefits. For example, construction of structural range improvements such as fencing or water developments, or use of nonstructural range improvements such as mineral blocks to improve livestock distribution and allow use of a larger portion of the rangeland would generally enhance rangeland health in the long term. However, these management changes would have short-term costs which may be borne by the BLM, permittees or lessees, or other partners. Constructing off-site water sources and fencing riparian vegetation and spring sources could keep livestock away from sensitive riparian areas and provide a cleaner more reliable source of water for livestock, as described under *Nature and type of Effects, Vegetation Management*. However, water developments and fencing could increase costs for permittees and lessees should they be fully or partially responsible for the cost of construction. Other requirements could increase annual operating costs. Examples of this are increased time feeding animals on base property, more complex pasture rotations or increased stockmanship such as herding or fence riding, which would require increased labor and fuels costs for moving animals.

Where lands are devoted to another public purpose excluding grazing, the agency may have to compensate the permittee or lessee for the range improvement projects constructed under a range improvement permit or cooperative agreement, in accordance with 43 CFR Part 4120.3-6(c) (1995).

Wild Horse and Burro Management

When livestock and wild horses occupy the same area, their needs for water and forage may be competitive. In extreme circumstances, wild horses could outcompete livestock temporarily and could preclude livestock access to certain water sources. Livestock and wild horse and burro conflicts could include fence damage. Prioritizing wild horse and burro gathers in herd management areas and HAs in priority GRSG habitat to meet established AMLs would reduce any current levels of forage competition between wild horses and burro and livestock.

4.8.2 Alternative 1

Greater Sage-Grouse Management

Alternative 1 could directly impact livestock grazing through its requirement through BLM's management to meet GRSG-specific habitat objectives in PHMA, GHMA, and other HMAs, as well as other actions to achieve desired GRSG habitat conditions. In addition to restricting management in GRSG habitat management areas and including livestock grazing-specific actions in GRSG habitat (e.g., prioritizing reviews), the BLM would manage SFAs, which provide additional restrictions on development and disturbance.

These management actions, designed to enhance GRSG habitat on BLM-administered lands, could affect livestock grazing by the following:

- Modifying grazing strategies or rotation schedules
- Changing duration and the season of use
- Changing the kind or class of livestock
- Reducing livestock numbers
- Reducing AUMs

Management to achieve these desired conditions would also impact permittees by increasing the amount of time permittees spend to manage livestock on BLM-administered lands and the total costs to a livestock operation. However, restricting development in SFA would reduce disturbance on livestock and their forage.

Indirectly, implementing management direction to achieve desired conditions in GRSG seasonal habitat could impact livestock grazing in the long term. It would do this by implementing management that improves rangeland conditions. Improved rangeland condition could also contribute to increased forage production.

Minerals Management

During the planning initiative that culminated in the 2015 RMP decisions, carried forward here as Alternative 1, SFAs were recommended for withdrawal from location and entry under the Mining Law of 1872, subject to valid existing rights. The BLM applied for a withdrawal of the recommended area and the Secretary accepted the application. The Secretary initiated a separate withdrawal process in 2015 pursuant to Section 204 of FLPMA. That process is currently underway. If the Secretary were to withdraw the lands identified in the proposed withdrawal, any resulting reduction in locatable mineral development would reduce impacts on livestock grazing through protection of forage from surface disturbance and a reduction in harassment of livestock from disturbance; the greatest reduction would be in allotments in SFA.

Under Alternative 1, PHMA would be closed to new mineral materials sales, but GHMA would be open. While these restrictions would limit livestock and forage disturbance, they could push development to allotments outside of PHMA. Additionally, PHMA would be managed as closed to new nonenergy leasable mineral leasing, and impacts would be similar to those described above and under *Nature and Type of Impacts*.

Alternative 1 would prioritize development of fluid minerals outside PHMA, GHMA, and IHMA. This approach would reduce disturbance to livestock and would maintain forage condition in allotments that fall in GRSG occupied habitat. Implementing the GRSG disturbance cap, mitigation strategy, monitoring framework, and hard trigger adaptive management responses under Alternative 1 would ensure that this reduction in disturbance of livestock, while forage condition would be maintained.

Lastly, SFA would be managed as NSO without waivers, exceptions, or modifications. Unleased fluid mineral actions would be subject to objectives and screening criteria in GRSG habitat. This approach would not increase disturbance to livestock and forage in allotments that fall in GRSG-occupied habitat, but it would result in the fewest reductions in permitted use and the fewest restrictions on range improvement construction. This approach would also result in fewer reductions in permitted livestock use.

Renewable Energy Management

Increased restrictions on renewable energy development under Alternative 1 would reduce impacts on forage and harassment of livestock. Alternative 1 would designate PHMA and SFA as ROW exclusion for utility-scale commercial wind and solar energy facilities. There would be fewer potential reductions in permitted livestock use due to forage destruction and quality reduction. Fewer acres would be subject to restrictions on range improvement construction.

Management direction prohibiting solar and wind development in PHMA and restricting development in GHMA and IHMA would limit any impacts of ground disturbances from developing these resources. This management direction would limit the direct impacts of development and surface disturbances on rangelands, which would be beneficial to livestock grazing. However, this may shift impacts in areas outside of priority and general GRSG habitats.

Lands and Realty Management

Under Alternative 1, ROW development would be limited in avoidance and exclusion areas within PHMA. This would maintain forage sustainability and would not increase disturbance to livestock. Most of GHMA would remain open to ROW development. As a result, ROW development and associated disturbance to livestock and their forage are likely to be concentrated in designated corridors and GHMA. Implementing the GRSG mitigation strategy, monitoring framework, and hard trigger adaptive management responses under Alternative 1 would maintain livestock forage.

Alternative 1 would retain all public lands in public ownership; therefore, there would be no effect on current grazing operations. As discussed under *Nature and Type of Impacts*, limits on human disturbance, mitigation strategy, lek buffers, and other conservation measures would further limit disturbance. This would result in reduced indirect impacts on livestock and their forage in PHMA.

As described above, Alternative 1 would include a cap on human disturbance; the 3% disturbance cap (5% in MT and WY) on discrete human disturbances would be applied in PHMA. Human disturbances in PHMA, GHMA, and IHMA would be mitigated to ensure a net conservation gain to GRSG. In addition, conservation measures would be implemented, such as adaptive management and defined monitoring protocols (**Appendix 2**).

Livestock Grazing Management

Under Alternative 1, the effect of livestock grazing management could increase the management actions necessary to maintain GRSG objectives in PHMA, GHMA, and IHMA.

Impacts could include modifying grazing strategies or rotation schedules, changing the season of use, changing the kind and class of livestock, deferring grazing use until a set objective is met, or reducing livestock numbers. Implementing this management direction could reduce AUMs on some allotments and present challenges to livestock operation viability.

Impacts from modification of grazing strategies could result in a decline in permitted grazing, anticipated over time as permits are modified to meet objectives. Under the Alternative 1, priority for land health assessment and permit renewal on BLM-administered lands would be tiered to include SFA first, followed by PHMA outside the SFA. Existing permits and leases in these areas not meeting Land Health Standards would be given priority, with a specific focus on those containing riparian areas, including wet meadows. The timeline for changes in management would generally follow this priority. In the long term, this prioritization could improve rangeland conditions for livestock and wildlife by focusing management on PHMA that are in most need of improvement.

In GHMA and PHMA, the potential risk to GRSG and its habitats from existing structural range improvements will be evaluated, and modifications of those structural range improvements identified as posing a risk will be addressed. Supplements and supplemental feeding will continue to be authorized where appropriate. New range improvement projects would be designed to monitor, adjust, and limit impacts from new and existing water and structural range improvements, as well as fences. Existing range improvements would be evaluated to make sure they conserve, enhance, or restore GRSG habitat. Consideration of GRSG habitat needs would likely limit the number and types of constructed range improvements. In some instances, improvements may be removed to help attain GRSG habitat objectives.

Under Alternative 1, all or portions of 15 key RNAs would be unavailable to grazing. In those areas, permittees and lessees would need to locate alternative forage or reduce AUMs, with the potential for economic impacts as described under *Nature and Type of Effects*.

Modifications to grazing systems could be required to meet seasonal habitat objectives, increasing costs to lessees and permittees. Acres within nesting habitat may be more likely to require changes to grazing management, due to the desired conditions for this habitat type. Impacts would occur on an allotment scale as permit renewal and related management changes were implemented. The level and intensity of impacts would vary on a site-specific basis.

Under Alternative 1, voluntary relinquishment of grazing permits and leases would be permitted. The BLM may determine if relinquished permits and leases and associated allotments should remain available for livestock grazing or be used for other resource management objectives, in accordance with WO IM 2013-184. This may result in some reduction of overall available AUMs, but relinquishment is likely to remain uncommon.

Wild Horse and Burro Management

Management to adjust or reduce AMLs would enhance vegetation productivity and sustainable forage, particularly where rangeland conditions could be improved. Tiered prioritization of gathers in HMAs in SFA, followed by PHMA, GHMA, and IHMA to meet established AMLs would reduce any current levels of forage competition between wild horses and burros and livestock on allotments in PHMA.

4.8.3 Alternative 2

Greater Sage-Grouse Management

Rangewide Environmental Consequences

Impacts from designating GRSG habitat as SFAs, PHMA, IHMAs, and GHMA (**Table 2-3**) would be similar to those described for Alternative 1.

State-Specific Environmental Consequences

SFAs would be removed in UT, WY, NV/CA, and ID, thereby reducing restrictions due to GRSG habitat protection on livestock grazing operations in those areas. However, removing SFAs would prevent restrictions on land use and surface disturbing activities, and the impacts on livestock grazing from those surface disturbing activities would be as described under *Nature and Type of Impacts*. While difficult to quantify, removing restrictions on SFAs would likely result in fewer impacts on livestock grazing operations when compared with Alternative 1. Protections afforded to forage from restrictions to land use and surface-disturbing activities would continue in SFAs in MT and OR, where the habitat classification would be retained; impacts would be as described under Alternative 1.

Under Alternative 2, the GHMA designation in UT would be removed with all corresponding management actions from the 2015 plan amendments. The removal of GHMA and their associated management actions would likely lead to development in areas formally identified as GHMA and could therefore lead to removal of forage and increased human-livestock conflicts, which would increase impacts on livestock grazing operations when compared with Alternative 1, as described under *Nature and Type of Impacts*.

Requirements for mitigation that achieves a net conservation gain in all HMA types would apply in MT/ND, NV/CA, and OR, and impacts would be the same as described for Alternative 1. CO and ID would enforce mitigation resulting in no net loss in HMAs. In UT, there would be a requirement to minimize or eliminate threats affecting the status of GRSG or to improve the condition of GRSG habitat. These requirements would help reduce impacts on livestock grazing associated with land use and surface disturbing activities, as described under *Nature and Types of Effects*, but to a lesser extent than Alternative 1, in which a net conservation gain would be required. In WY, the net conservation gain requirement would be removed, which would increase potential for impacts.

Although the BLM would not require compensatory mitigation in HMAs, it would enforce state mitigation policies and programs in CA, CO, ID, OR, UT, and WY. Compensatory mitigation would be voluntary unless required by laws other than FLPMA or by the state. As a result, the potential for impacts from land use activities, as described under *Nature and Types of Effects*, would increase relative to Alternative 1, in which a net conservation gain would be required.

Impacts from applying a 3% disturbance cap in CO, ID, NV/CA, OR, UT, and the Dakotas or a 5% disturbance cap in MT and WY in PHMA would be like those described for Alternative 1. However, in UT and ID, the 3% disturbance cap could be exceeded if it would benefit GRSG. The cap would be applied at the BSU and project scale, except in ID which would only apply it at the BSU scale. Consequently, some additional development could occur in ID, which may increase potential for forage loss. The ability to exceed the disturbance and density caps could result in loss and degradation of livestock forage and increased human-livestock conflicts. Surface disturbing projects that would be precluded under if no exceedances were allowed could proceed under Alternative 2; however, exceedances to the caps would only be allowed if site-level analysis indicates the project, in combination with all voluntary and required design features, will improve the condition of GRSG habitat, thus likely improving forage conditions.

Minerals Management

Rangewide Environmental Consequences

Impacts on livestock grazing operations from fluid mineral management in PHMA and GHMA would be the same as described for Alternative 1, except in CO PHMA and CO GHMA (see State-Specific Environmental Consequences, below).

Impacts from salable mineral management in PHMA and GHMA would be the same as described for Alternative 1, except in ID IHMAs and NV/CA PHMA (see State-Specific Environmental Consequences, below).

Impacts from non-energy mineral management in PHMA and GHMA would be the same as described for Alternative 1, except in NV/CA PHMA (see State-Specific Environmental Consequences, below).

Removing the recommendation for withdrawal of the SFAs in all states (except in MT and Dakotas, which did not have a 2019 amendment) from location and entry under the Mining Law of 1872 would have no impact. This is because recommendations for withdrawal do not restrict any activities; therefore, such recommendations have no impact. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

State-Specific Environmental Consequences

Removing the closure of CO PHMA to fluid mineral development would increase potential for surface disturbance, forage loss, and human-livestock conflicts as described under *Nature and Type of Effects*. This is because mineral development activities could occur in previously closed areas. Changing GHMA from closed to fluid mineral development to NSO would likely not change impacts to livestock grazing operations because the NSO stipulation would avoid potential for surface disturbance and forage loss or degradation.

Impacts from prioritizing fluid mineral leasing outside of HMAs in CO, ID, OR, and MT/Dakotas would result in the same impacts in these states as described under Alternative 1. Removing the objective in UT, NV/CA would increase the potential for impacts because land in PHMA and GHMA could be leased. In WY, fluid mineral leasing would be allowed in PHMA, which would increase the potential for impacts. However, if the BLM has a backlog of interest for leasing, the BLM would prioritize work first in non-habitat followed by lower-tier habitat management areas (e.g., GHMA).

Adding an exception criterion to salable and non-energy mineral closures for NV/CA PHMA and allowing consideration of new free use permits for salable minerals in ID IHMA would increase the potential for associated impacts on livestock grazing operations as described in Nature and Types of Effects. This is because there would be a greater chance for salable and/or non-energy mineral activities to occur in these areas.

Lands and Realty Management

Rangewide Environmental Consequences

Impacts from ROW management would be the same as described for Alternative 1, with additional exception criteria in NV/CA (see State-Specific Environmental Consequences, below).

State-Specific Environmental Consequences

There would be additional exception criteria for ROW development in NV/CA PHMA and for wind development in NV/CA GHMA. This could increase the potential for impacts associated with ROW and renewable energy development because there would be a higher chance of development.

Renewable Energy Management

Rangewide Environmental Consequences

Impacts from renewable energy management would be the same as described for Alternative 1 (with additional exception criteria in NV/CA (see State-Specific Environmental Consequences, below).

State-Specific Environmental Consequences

There would be additional exception criteria for ROW and wind/solar development in NV/CA PHMA and for wind development in NV/CA GHMA. This could increase the potential for impacts associated with ROW and renewable energy development because there would be a higher chance of development and surface disturbance.

Livestock Grazing Management

Rangewide Environmental Consequences

Impacts from domestic livestock grazing management would be the same as described for Alternative 1, except for in the states described below.

State-Specific Environmental Consequences

In UT, WY, and NV, the prioritization for review and processing of grazing permits was removed; however, the BLM would still have the authority to prioritize staff time and budget to identify areas that aren't meeting land health standards and implement corrective actions in areas with the greatest GRSG habitat value.

The additional clarification of habitat objectives to land health standards in WY, ID, and NV/CA and clarifications on grazing in riparian areas and management of range improvements in WY may lead to a loss of AUMs in some cases, prohibitions or limitations on range improvements and water developments. However, over the long term, movement towards desired conditions under land health standards could improve overall forage conditions.

Wild Horses and Burro Management

Impacts from wild horse and burro management would be the same as described for Alternative 1.

4.8.4 Alternative 3

Livestock Grazing Management

Under Alternative 3, all PHMA (see **Table 2-3**) would be made unavailable to livestock grazing. The BLM would have to construct and maintain a large amount of fencing, particularly in areas with mixed surface ownership, to effectively make grazing unavailable. Removing the ability to graze livestock would directly impact permittees/operators through a reduction in income provided by grazing livestock on BLM lands across the rangewide planning area (see **Section 4.12**).

The requirement to remove livestock grazing in PHMA would result in direct and indirect economic impacts on individuals, companies, and the local community. Most ranches are dependent seasonally on forage on public lands, and some are dependent year-round. Eliminating AUMs on public lands would affect the entire ranching operation by reducing the total amount of available forage, as described under *Nature and Type of Impacts*. Without the opportunity to graze public lands, ranchers would be incentivized to sell their private lands leading to an increased potential for urbanization in some areas, leading to a loss of forage for both livestock and native grazers, and would remove the opportunity to graze livestock in the future, should management decisions change in subsequent resource management and land use plans.

In addition, removal of grazing means less landscape-scale removal of fine fuels. The elimination of livestock grazing may increase the potential for large and severe wildfires as fuel loads increased in the absence of managed grazing. There would be potential for BLM to conduct targeted grazing as a means to reduce fine fuels but would not be near the scale that currently exists.

Where areas are made unavailable for grazing due to a permit or lease is being relinquished, the agency may have to compensate the permittee or lessee for the range improvement projects constructed under a range improvement permit or cooperative agreement, in accordance with 43 CFR Part 4120.3-6(c).

4.8.5 Alternative 4

Greater Sage-Grouse Management

Impacts on livestock grazing operations from designating GRSG habitat as HMAs (**Table 2-3**) would be similar to those described for Alternative 1. Impacts from applying a 3 percent disturbance cap at the project scale would be similar as to those described for Alternative 2, however, the disturbance cap would apply to both existing and proposed infrastructure authorizations, subject to valid existing rights, while wildfire and agriculture would not be included in the disturbance cap calculation. Therefore, the level of disturbance from other sources such as energy development, roads and ROWs, and other surface disturbing activities would be higher than if wildfire and agriculture were included in the disturbance calculation. The disturbance cap could be exceeded at the project scale under certain conditions, which may lead to more development and increased impacts on livestock grazing operations, forage, and increased human-livestock conflicts. There would be no exceptions to the 3 percent PHMA (and IHMA) disturbance cap at the HAF fine scale habitat selection area, which would limit removal of forage or disturbance livestock at this scale.

Minerals Management

Increasing the acres subject to NSO Alternative 4 compared with Alternative 1 would reduce the HMA acres affected and potential for impacts as described in *Nature and Types of Effects*. Prioritizing projects that avoid, minimize, reduce, rectify, and/or adequately compensate for direct and indirect impacts to PHMA/IHMAs and including applicable and technical COAs would also reduce impacts on livestock grazing operations and forage.

Lands and Realty Management

Impacts on livestock grazing from managing PHMA in all states and ID IHMAs as ROW avoidance areas would be like those described for Alternative 1. Where development cannot be avoided, additional protection would arise unless certain criteria are met (see **Chapter 2**). This would reduce the potential for impacts described in *Nature and Types of Effects*.

Managing GHMA as ROW avoidance areas within limited GRSG habitats to meet the RMP GRSG goals and habitat objective would reduce the potential for impacts on forage as described in *Nature and Types of Effects*. Within ROW avoidance areas in GHMA, the potential for livestock grazing operations and forage to be affected may vary depending on the location. Avoiding placement of ROWs within one-half mile of PHMA or IHMA would protect those areas from impacts. Because all other areas would be managed as ROW open, impacts, such as surface disturbance or forage removal could cause a reduction in AUMs, thus reducing the amount of forage available for grazing.

Renewable Energy Management

Rangewide Environmental Consequences

Impacts from managing PHMA in all states as ROW exclusion areas for wind and solar energy development would be similar to those described for Alternative 2. However, since PHMA would apply to a smaller area

under this alternative, the extent of reduction in impacts on livestock grazing from disturbance associated with from renewable energy development would be less.

Managing GHMA as avoidance areas for wind and solar energy development in all states would decrease the potential for impacts associated with wind and/or solar development as described in *Nature and Types of Effects*, but to a lesser extent than exclusion areas. Where avoidance is not possible, impacts to livestock grazing and forage would be minimized through certain measures such as avoiding surface use and occupancy. Such measures would protect PHMA and the forage within from indirect impacts.

State-Specific Environmental Consequences

Managing ID IHMAs as exclusion areas for wind and solar energy development within 3.1 miles from active leks and avoidance in the remainder of the IHMA would decrease the potential for impacts on livestock grazing and forage as described in Nature and Types of Effects, but to a lesser extent than if the entire IHMA were managed as an exclusion area. This is because solar and wind development would be considered on a case-by-case basis in avoidance areas, whereas it would be prohibited in exclusion areas. As such, there would be greater potential for development to occur in avoidance areas.

Livestock Grazing Management

Because the presence of GRSG HMAs would not affect whether an area is available for livestock grazing (except in Oregon key RNAs) and existing areas designated would be maintained as available or unavailable for livestock grazing, impacts from livestock grazing management would be the similar to those described for Alternative 1.

The BLM would include additional livestock grazing management objectives and actions to minimize or reduce impacts to GRSG and habitat. For example, in HMAs, livestock grazing would be managed to toward meeting land health standards the GRSG habitat objectives, avoid direct adverse impacts to key GRSG habitats from range improvements, and employ grazing management strategies that avoid concentrating livestock on key GRSG habitats during key seasons. This could lead to prohibition of range improvement construction as well as adjustments to existing AUMs to meet these management objectives. As such, there would be increased flexibility to adjust the terms and conditions of grazing permits conditions to help avoid or reduce impacts to GRSG or habitat.

Additionally, where the land health standards for GRSG habitat are not met - as indicated by an unsuitable site-scale HAF assessment specific to site capability – and existing livestock grazing is a significant causal factor, adjustments to livestock grazing practices would be made at the authorization, allotment, or activity plan level and in accordance with applicable regulations (43 CFR Part 4180.2(c)(1) or subsequent changes to regulations or policy). Range improvements and other existing infrastructure, such as water developments, would be evaluated with respect to their effect on GRSG and GRSG habitat. These evaluations could lead to limitations on the placement, repair, or construction of range improvements; impacts from these limitations are discussed under *Nature and Type of Effects.*

Wild Horses and Burro Management

Impacts from wild horse and burro management would be the same as described for Alternative 1.

4.8.6 Alternatives 5 and 6

Greater Sage-Grouse Management

Rangewide Environmental Consequences

Impacts from applying a 3 percent disturbance cap would be the same as described for Alternative 4, except in WY and MT (see State-Specific Environmental Consequences). Impacts from exceeding the 3 percent disturbance cap under certain conditions would be similar to those described for Alternative 4, but more exceptions would be allowed, which may result in increased development, leading to a potential reduction in forage availability.

State-Specific Environmental Consequences

Impacts from applying a 5 percent disturbance cap at the project scale in WY and MT would be similar to those described for Alternative 1. However, the 3 percent disturbance scale would still apply at the HAF fine scale habitat selection area, which may prevent some additional development within those areas, reducing impacts on livestock grazing operations. Additionally, WY and MT would include wildfire and agriculture in the disturbance calculation, and therefore, the level of disturbance from other human-made surface disturbing activities would be relatively lower than if wildfire and agriculture were not included in the disturbance calculation, similar to Alternative 2.

Minerals Management

Impacts on livestock grazing from mineral resource management would be the same as described for Alternative 4. The exception is in WY and MT, where applying a 5 percent disturbance cap at the project scale could allow for more potential mineral development, depending on the degree to which wildfire and agriculture contribute to disturbance in a given area, which could increase surface disturbance and forage removal, as well has increased human-livestock conflicts.

Renewable Energy Management

Classifying PHMA and IHMA as avoidance areas for wind and solar energy development would increase the potential for surface disturbing impacts and disturbance to livestock as described in *Nature and Types of Effects*, compared with Alternative 1 under which most PHMA would be exclusion areas.

Managing GHMA as open to wind and solar energy development in all states would result in potential for surface disturbing and limitation on livestock grazing availability as described in *Nature and Types of Effects*.

Lands and Realty Management

Impacts from managing PHMA in all states and ID IHMAs as ROW avoidance areas and applying minimization measures where major ROWs cannot be avoided would be similar to those described for Alternative 4.

Compared with Alternative 1, managing GHMA in all states as open to ROW with minimization measures and compensation would increase the potential for ground disturbing impacts and disturbance to livestock as described in *Nature and Types of Effects*. However, such management would benefit grazing in the instances where a ROW is needed to access an allotment or where a structural range improvement is desired.

Livestock Grazing Management

Rangewide Environmental Consequences

Impacts from livestock grazing management would be the same as described for Alternative 4.

State-Specific Environmental Consequences

In OR, the 15 key RNAs would be retained; however, their associated areas allocated as unavailable to grazing are proposed to be retained, modified, or re-allocated to grazing based on district-generated, site-specific updated information since the 2015 ARMPA. This would result in an increase in acreage available for grazing in the Black Canyon, Dry Creek Bench, North Ridge Bully Creek, South Ridge Bully Creek, and Spring Mountain Key RNAs (see **Appendix 3**).

Wild Horse and Burro Management

Impacts from wild horse and burro management under Alternative 5 would be similar to those described for Alternative 1. Management to the low end of the AMLs could reduce forage competition between wild horse and burro populations and livestock in some areas.

4.9 LANDS AND REALTY (INCLUDING WIND AND SOLAR)

4.9.1 Nature and Type of Effects

The effects on the lands and realty program are typically the result of management that excludes or avoids ROWs in certain areas, authorizes of leases or permits, or requires stipulations on land use activities.

Within a BLM ROW exclusion area, the authorization of new ROWs is not allowed under any conditions. A ROW avoidance area may be available for ROW location but may require special stipulations such as resource surveys and reports, construction and reclamation engineering, long-term monitoring, special design features, special siting requirements, Standards for Boundary Evidence risk assessment certificates, and timing limitations.

Management that restricts ROW development in a certain area will likely eventually increase the concentration of ROW development in adjacent areas where restrictions are not present. Increased ROW density can limit new siting options in non-restricted areas, decrease service reliability to rural areas, increase conflict among facilities, and intensify impacts on other resources and uses.

Collocating infrastructure in existing ROWs, corridors, or disturbed areas reduces land use conflicts, limits disturbance to the smallest footprint, and limits impacts on GRSG and their habitats. Where restrictions are applied, impacts would be mitigated where exceptions were allowed for co-location of new ROWs within existing ROWs. Collocation policies also clarify the preferred locations for utilities and potentially simplify processing on BLM-administered lands. However, collocating can limit options for infrastructure development and could reduce network redundancy and potentially affect service reliability in some areas and add mileage and construction costs to the transmission line.

Impacts Common to All Alternatives

All action alternatives for each state would increase the restrictions of ROWs in PHMA by applying exclusion and avoidance areas. This would result in adverse effects to lands and realty and renewable energy since it would decrease the acreage available to new development, which could lead to more complex designs, exclude infrastructure placement in cost effective locations, result in overall greater development cost and increased review periods. Additionally, such stipulations could limit future access, delay or increase the cost of energy supplies, or delay or restrict communications service availability. However, ROW exclusion and avoidance areas decrease the amount of land available for new development and could promote collocation. Collocating of new infrastructure within existing ROWs could reduce land use conflicts, additional land disturbances, and demarcate the preferred locations for utilities, which would simplify the processing on BLM-administered lands.

Avoidance areas require ROW applicants to meet additional project criteria, which could influence project location, delay the availability of energy supply (by delaying or restricting pipelines or transmission lines) or delay or restrict communications service availability. Within exclusion areas, new ROW development would be prohibited, which would prevent the lands and realty program from approving new applications in these areas and shifting them to GHMA and nonhabitat areas where fewer restrictions would apply. Where applied, these restrictions would prevent the BLM from accommodating future demand for ROW development within the decision area.

4.9.2 Alternative 1

Under alternative 1 the entire plan area with the exception of Wyoming would limit lands used for ROWs in PHMA (or IHMA in Idaho) and GHMA for GRSG. Variations range from blanket restrictions on ROW development in PHMA and GHMA to variable restrictions by industry or project type. Plan details are derived from each state's 2015 ARMPA. **Table 4-1** provides each state's proposed management of ROWs under Alternative 1 for all ROW types including wind and solar and acres associated with the RFD are in **Appendix 12**.

Under Alternative 1, the majority of the states would manage PHMA and GHMA as ROW avoidance areas. PHMA would be managed as exclusion areas for ROWs including wind and solar major ROWs if the state has sufficient solar potential and differentiates solar ROWs.

Key elements in the planning area include the following:

- All states except North Dakota, South Dakota, and Utah would each have some form of disturbance caps on surface disturbing activities.
- Colorado, Idaho, Southwest Montana, and Utah would have land use authorizations that require avoiding disturbance to any BSU.
- Nevada, Northeastern California, Idaho, Southwest Montana, Utah, and Wyoming would require lek buffers.
- All states except for Colorado and Oregon would have requirements and/or restrictions for power lines.
- In Nevada, Northeastern California, Idaho, Southwest Montana, and Utah ROWs would be allowed if they could be demonstrated to provide a net conservation gain for GRSG habitat. A further description of this is located in **Appendix 2**. Existing GRSG Management.

Additionally, in Oregon, BLM would manage SFA and PHMA outside of SFA as ROW exclusion areas for wind and solar, with the exception of Lake, Harney, and Malheur Counties. Within the avoidance areas of Lake, Harney, and Malheur Counties, Alternative 1 would establish a hierarchy to development opportunities, beginning with nonhabitat as the first preference, followed by poor quality GRSG habitat before considering high quality GRSG habitat.

Allowing future development in Lake, Harney, and Malheur Counties would accommodate future demand since these areas contain the most developable wind resources in the state. Demand for new transmission lines, access roads, and related ancillary features to serve new wind generation projects in Lake, Harney, and Malheur Counties, GHMA, and in nonhabitat or private lands could result in new ROW applications in PHMA.

As a result, in areas where the ROW avoidance and exclusion restrictions listed above would apply the impacts would be as described in the *Nature and Type of Effects*, above.

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective or environmentally-suitable locations and potentially resulting in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications for activities and longer, more complicated review periods for those that are proposed in GRSG habitat.

4.9.3 Alternative 2

Alternative 2 is derived from each region's respective 2019 RMPA/EIS, if completed by the state. Three of the states updated their plans with respect to lands and realty management. Colorado, Idaho, Montana, Oregon, North Dakota, and South Dakota did not provide a new or updated management for lands and realty and thus impacts would be as described under Alternative 1 for these states.

State-Specific Environmental Consequences

In Nevada, Alternative 2 would update the HMA boundaries for PHMA, GHMA, and OHMA to reflect the best available science, and outline a process for periodically revising these boundaries in the future as new data becomes available. Updating the HMA boundaries would result in a relatively minor shift in PHMA (-0.5 percent) and GHMA (+0.5 percent); these changes would not result in discernible differences from Alternative 1. The decrease in OHMA (-17 percent) would have negligible impacts on land use and realty, as there are limited allocation decisions tied to OHMA; therefore, the difference between the nature and types of impacts described would be negligible. These impacts are discussed under Alternative 1.

In Utah, Alternative 2 would remove the GHMA designation for GRSG from the 2015 plan. This would decrease impacts on lands and realty projects by allowing site-specific GRSG habitat analysis and population information, as well as proponent-developed project design elements, to be considered on a project-specific basis. If those voluntary measures were to improve GRSG habitat, both the disturbance and density caps could be exceeded, allowing for more flexibility to allow consideration of infrastructure projects. Rather than lands and realty projects being precluded entirely if the cap were met, there would be an option to exceed the cap by proponents developing measures that improve GRSG habitat. This would provide more opportunities for ROW development within PHMA.

The mitigation strategy for Alternative 2 in Utah would no longer require proponents to provide for compensatory mitigation on a project-by-project basis to show a net conservation gain. While the strategy would be similar ("improve the condition of GRSG habitat"), it would be achieved by the totality of GRSG management actions applied by the BLM. Not requiring proponents to pay for vegetation and habitat treatments could decrease project costs, providing more opportunities for ROW development in PHMA; however, during project design, the BLM would consider voluntary compensatory mitigation actions as a component of compliance with the State of Utah law, statute, or policy or when offered voluntarily by a project proponent. If such mitigation were volunteered, impacts would be the same as those described under the No-Action Alternative of the 2019 EIS; however, determining which projects would apply such measures would be made on a project-by-project basis.

Under Alternative 2 in Utah, changes in MA-SSS-3B[1] that allow site-specific GRSG habitat analysis and population information and project design elements to be considered on a project-specific basis, could potentially lessen impacts on renewable energy as it would allow for more flexibility to allow infrastructure projects that exceed the disturbance cap if they meet the described criteria. However, this would likely have

[1] MA-SSS-3B – 2015 ARMPA Decision Number

little impact on renewable energy development because PHMA would still be closed to commercial wind and solar development unless the project meets the exception criteria identified in MA-SSS-1.

In Wyoming under Alternative 2, impacts on the lands and realty program as a result of changes to habitat management areas would likely be minor over the landscape, with site-specific impacts potentially occurring where new restrictions are applied in areas that previously did not have restrictions (i.e., new PHMA in what was previously GHMA). This would require some projects to have additional restrictions and others to have fewer restrictions (i.e., projects in areas that transitioned from PHMA to GHMA designations). Depending on the magnitude of the change in acreage, impacts on lands and realty would likely be negligible.

Wind development in PHMA in Wyoming would continue to be managed under the 2014 and 2015 decisions. If additional PHMA were identified in areas that were previously GHMA, then it could become more challenging for wind energy development to occur in those newly identified PHMA due to the restrictions on wind energy development in PHMA. However, if any areas were identified as GHMA (that were previously PHMA), those areas would then be available and open to wind energy development.

There would be no impact on solar energy development in Wyoming, beyond that identified under Alternative 1.

4.9.4 Alternative 3

Under Alternative 3 all HMAs would be managed as PHMA, there would not be GHMA classification and GRSG habitats would not be differentiated. This would result in all habitat being considered and managed as PHMA, which would result in the most restrictions to lands and realty of all the alternatives.

Limitations on new ROWs and above-ground linear features, such as transmission lines and pipelines could restrict the availability of energy or service availability and reliability for communication systems. ROW exclusion areas could extend the processing time for renewals of existing ROW authorizations and make siting of new linear or block ROWs more difficult. For linear ROWs, avoiding GRSG habitat could lead to the abandonment of the project based on increased costs or the inability to locate the project without using public lands. Costs also would be incurred as a result of requirements for mitigation in areas with limits on surface disturbance.

In some areas, there is a high concentration of intermixed landownership, corridors, oil, gas, and geothermal development, and existing authorizations. In these areas, restrictions on the ability to authorize ROWs and land tenure/landownership adjustments would have a greater impact than in areas with lesser degrees of intermixed ownership, ROW corridors, minerals development, and existing authorizations. Despite these restrictions, the existing network of developed ROWs could provide opportunities for the collocation of compatible authorizations however these could be limited due to size and availability but only if the upgrading can be accommodated within the existing ROW and as long as it does not affect the integrity of, or the ability to operate facilities or their ability to operate their facilities (43 CFR Part 2807.14)

Managing habitat as exclusion areas for utility-scale wind and solar energy ROW development would eliminate the BLM's ability to accommodate any new wind or solar energy demand on that portion of GRSG habitat. This would shift the burden to adjacent non-federal lands that do not have the siting requirements or mitigation standards and could potentially increase costs. ROW exclusions would also inhibit development on adjacent private and state land where transmission infrastructure would be needed across BLM-administered lands.

4.9.5 Alternative 4

Under Alternative 4, areas (regardless of P, G, or I HMA status) within 0.5 miles of PHMA/IHMA would be designated as ROW avoidance areas to address the impacts to adjacent PHMA/IHMA. If these areas are mapped, then the remainder of GHMA that lies outside the 0.5-mile buffer, would be managed as open to major ROWs. If these areas are not mapped, the entire GHMA would be managed as ROW avoidance areas and the habitats would be identified during implementation. These restrictions would have impacts as described under the *Nature and Type of Effects* section. Designated corridors would be managed as open to ROWs and all habitats would be subject to mitigation, this would result in a less restrictive planning process for projects. Additionally, GHMA would be managed as ROW avoidance areas within breeding, nesting, and limited-seasonal habitats. The identification of these habitats would be the responsibility of each state's wildlife agency. This would allow for states to have an additional involvement in the planning process.

Utility scale wind and solar projects in PHMA would be managed as ROW exclusion areas. IHMA would be managed as ROW exclusion areas within 3.1 miles of active leks, outside of the 3.1-mile buffer, and IHMA would be managed as ROW avoidance areas. Areas within 0.5 miles would be managed as ROW avoidance areas to address the indirect impacts to the adjacent PHMA and IHMA. GHMA not included in the 0.5-mile buffer would be managed as ROW avoidance areas for utility scale wind and solar projects. These restrictions would have impacts as described under the *Nature and Type of Effects* section.

The impacts under Alternative 4 would result in standardized management practices across the project area and would remove State-by-State restrictions. This would allow for easier planning for large interstate projects such as transmission lines and simplify management expectations across the planning area.

4.9.6 Alternative 5

Under Alternative 5, lands encompassing major ROWs and utility scale wind and solar in PHMA would be managed as ROW avoidance areas, while in GHMA they would be managed as open to ROWs. GHMA would be subject to mitigation measures for both major ROWs and utility scale projects. Designated corridors would remain open to ROW development and mitigation would not be required.

Similar to Alternative 4 the impacts would result in standardized management practices across the planning area. The impacts to ROWs would be less than all other alternatives since the BLM would not designate ROW exclusion areas, mitigation would not be required in corridors, and buffers would not be placed in areas surrounding HMAs.

4.9.7 Alternative 6

Impacts would be the same as Alternative 5. Additionally, management of ACECs as ROW exclusion under Alternative 6 could prevent ROWs from being developed, could increase costs, or could increase development pressure on adjacent lands.

4.10 MINERAL RESOURCES

4.10.1 Fluid Minerals (Including Geothermal)

Nature and Type of Effects

Closing areas within GRSG habitat to fluid mineral leasing would directly impact the fluid minerals program by prohibiting the development of those resources on federal mineral estate. In some cases, fluid mineral operations would be limited in their choice of project locations and might develop in areas that are more challenging to access or result in less efficient development because more ideal areas could be closed to leasing, or operators may choose not to develop within the area at all. Under more restrictive Alternatives,

restrictions on BLM and federally administered lands might push development onto non-federal and private land and have indirect effects on GRSG and federal fluid minerals.

Management actions that prohibit or restrict surface occupancy or disturbance (such as TLs, NSO, CSU, and limitations on the density of surface disturbance) overlying federal fluid mineral resources would also directly impact the development of those resources by placing limitations on the siting, design, and operations of fluid mineral development projects. This, in turn, could force operators to use more costly development methods than they otherwise might have used. The application of widespread TLs could result in equipment shortages and other development inefficiencies because of bottlenecks during the limited time period in which certain activities would be allowed.

In areas where NSO stipulations are applied, federal fluid minerals could be leased, but the leaseholder/operator would have to use offsite methods such as directional or horizontal drilling to access and develop the mineral resource. The area where directional and horizontal drilling can be effectively used is limited, meaning some minerals may be inaccessible in areas where an NSO stipulation covers a large area, where no leasing is allowed on surrounding lands, or in geologic formations where horizontal drilling is ineffective.

Application of CSU stipulations allows some use and occupancy of the surface. While less restrictive than an NSO, a CSU stipulation allows the BLM to require special operational constraints beyond those specified in 43 CFR Part 3101.1-2, or to require protective measures (e.g., restrictions on noise levels) to protect GRSG. While not prohibiting surface-disturbing activities, a CSU stipulation can influence the location and level of operations within the subject area.

TL stipulations may be necessary to protect GRSG from impacts of development. These stipulations are necessary if impacts cannot be mitigated within the standard 60-day suspension of operation period afforded by regulation. Areas where TL stipulations are applied would be temporarily closed to fluid mineral exploration and development, surface-disturbing activities, and intensive human activity during identified time frames based on seasons or GRSG breeding times. While some operational activities would be allowed at all times (e.g., production and maintenance), construction, drilling, completions, and other operations considered to be intensive in nature would not be allowed during the restricted time frame. Most activities, however, can be initiated and completed outside of the restricted dates specified in the TL stipulation.

Applying COAs, which include RDFs and conservation measures, to existing leases would directly impact fluid mineral operations. These RDFs and conservation measures would include standards such as noise restrictions, height limitations on structures, design requirements, water development standards, remote monitoring requirements, and reclamation standards. Application of these requirements through COAs could impact fluid mineral operations by increasing costs if it resulted in the application of additional requirements or use of more expensive technology (such as remote monitoring systems) than would otherwise have been used by operators. Impacts of these COAs would be mitigated where exceptions limit their application. This would occur where a COA was not applicable (e.g., a resource is not present on a given site) or where site-specific consideration merited slight variation. When considering exploration and development on areas leased for fluid mineral resources in PHMAs (and IHMA in ID), including geothermal, application of the RMP lease stipulations, minimization measures, and RDFs/BMPs as APD COAs will be considered through completion of the environmental record of review (43 CFR Part 3162.5 and 36 CFR Part 228.108), including appropriate documentation of compliance with NEPA.

Placing limits on geophysical exploration could reduce the availability of data on fluid mineral resources and could increase costs and risks of fluid mineral development if the limits required use of more expensive technology or did not allow detailed characterization of some areas. TLs on geophysical exploration would delay exploration and development activities and could cause equipment shortages because much of the exploration would need to occur during the same time period.

Requiring master development plans and unitization could cause direct impacts on fluid minerals through increased costs of fluid mineral extraction resulting from delays in the permit approval process until additional site-specific planning efforts are completed. However, unitization typically has been initiated at the operator's discretion and can increase development efficiency.

Management actions creating ROW exclusion or avoidance areas could prevent or increase the cost of fluid mineral extraction by limiting the available means for transporting fluid minerals to processing facilities and markets. For example, new natural gas pipelines could not be built in an ROW exclusion area. Impacts would be mitigated where exceptions were allowed for co-location of new ROWs within existing ROWs. Identification of ROW avoidance areas, while not creating absolute barriers to use of the area for access roads or pipelines, or for locating surface facilities on federal lands for the purpose of accessing private minerals, could make permissible facilities infeasible for technical or economic reasons. Some other potential management actions or BMPs could also affect costs that would make a project infeasible, for example, ROW collocating requirements applied to a new pipeline along an existing road that follows a long, indirect, or topographically difficult route. ROW exclusion and avoidance areas will limit natural gas line construction which would lead to more flaring of gas, which has resource waste and air quality implications. This would hamper the ability to get natural gas to domestic and export markets.

Alternative 1

Rangewide Environmental Consequences

All states include language to maintain and enhance sagebrush habitats with the intent of conserving GRSG populations. The exact language varies by state, see the state headings below for more details. This Alternative affirms habitat management area (HMA) boundaries from 2015 amendments (as maintained).

Most states are NSO (in PHMA and IHMA) and/or have seasonal restrictions. Wyoming and Montana are also subject to density and disturbance limits. Colorado closes PHMA within 1 mile of leks to fluid mineral leasing. This Alternative maintains the Sagebrush Focal Areas (SFAs) from the 2015 amendments.

If a state is not specifically mentioned under its own environmental consequences heading, the rangewide consequences would apply.

Colorado Environmental Consequences

Management actions related to lands and realty in conjunction with protection of GRSG and its habitats and use area could adversely impact fluid minerals leasing and development. This potential for impacts includes reduced availability, reduced accessibility, and increased costs.

Reduced availability is the least significant impact from lands and realty actions. This is because the BLM does not require a lands action (i.e., issuance of a ROW grant) for surface occupancy of federal lands to drill into federal minerals. However, accessibility to federal minerals with new leases could be significantly reduced or precluded when management of specific areas as ROW exclusion areas would prohibit access roads or pipelines into those areas.

Identification of ROW avoidance areas, while not creating absolute barriers to use of the area for access roads or pipelines, or for locating surface facilities on federal lands for the purpose of accessing private minerals, could make permissible facilities infeasible for technical or economic reasons. Some other potential management actions or BMPs could also affect costs that would make a project infeasible, for example, ROW collocating requirements applied to a new pipeline along an existing road that follows a long, indirect, or topographically difficult route.

Alternative 1 would manage all PHMA and GHMA (**Table 2-3**) as ROW avoidance areas with exceptions for pending large transmission lines. Additionally, no aboveground structures would be authorized within 1 mile of active leks. Avoidance areas would require that impacts be avoided. Nevertheless, the ROW could be allowed, subject to COAs, all applicable surface use stipulations, and any site-specific stipulations identified through the NEPA process. Potentially large local impacts on access of fluid minerals where the PHMA and GHMA are open for large transmission lines. Areas open to large transmission lines could preclude development of facilities required for access to fluid minerals.

New leasing would be prohibited within 1 mile of all active leks. Potentially large local impacts on access of fluid minerals where the PHMA and GHMA are open for large transmission lines. No modifications or waivers would be permitted, and the BLM Authorized Officer may grant an exception to this NSO stipulation only where the proposed action:

1. Would not have direct, indirect, or cumulative effects on GRSG or its habitat
2. Is proposed to be undertaken as an alternative to a similar action occurring on a nearby parcel, and would provide a clear conservation gain to GRSG

Exceptions based on conservation gain (number 2, above) may only be considered in PHMA of mixed ownership where federal minerals underlie less than 50 percent of the total surface, or areas of the public lands where the proposed exception is an alternative to an action occurring on a nearby parcel subject to a valid federal fluid mineral lease existing as of the date of this RMP. Exceptions based on conservation gain must also include measures, such as enforceable institutional controls and buffers, sufficient to allow the BLM to conclude that such benefits would endure for the duration of the proposed action's impacts.

Any exceptions to this NSO lease stipulation may be approved by the BLM Authorized Officer only with the concurrence of the State Director. The BLM Authorized Officer may not grant an exception unless the applicable state wildlife agency, the USFWS, and the BLM unanimously find that the proposed action satisfies 1 or 2, above. Such finding would be made initially by a team of one field biologist or other GRSG expert from each respective agency. In the event the initial finding is not unanimous, the finding may be elevated to the appropriate BLM State Director, USFWS State Ecological Services Director, and state wildlife agency head for final resolution. In the event their finding is not unanimous, the exception would not be granted.

Approved exceptions would be made publicly available at least quarterly. Because all of PHMA would be managed as NSO with very rare potential for exceptions, impacts would be increased difficulty of access, increased costs, and decreased efficiency of oil and gas development in PHMA.

The following BMPs have the potential to significantly affect the economic feasibility of individual oil and gas projects. Those with the greatest potential for affecting future developments are the following:

- Place liquid gathering and storage facilities outside PHMA—Potentially cost prohibitive where a well pad would be located several miles from the storage tanks due to the additional piping costs when water or liquid condensates are produced in very small quantities from a natural gas well and more

efficiently hauled off-site with trucks. However, because all PHMA would be NSO with limited exceptions under this alternative, very few well pads might be subject to this BMP.

- Place new utility developments in existing utility or road corridors—Potentially cost prohibitive where the road follows a long and topographically complex route, thereby lengthening the utility development and potentially requiring one or more lift stations for liquids.
- Bury electric distribution lines—Potentially cost-prohibitive where a well pad would be located a long distance from the nearest utility tie-in, compared to the cost of constructing an aboveground line fitted with raptor deterrents.
- Limit noise to less than 10 decibels above ambient levels at sunrise at a lek perimeter during the lek season and require noise shields during the lek, brood-rearing, and winter-use seasons—This could increase development costs if it were to require erecting expensive, site-specific, acoustical barriers for wells.
- Locate all new compressors outside PHMA—This could be cost prohibitive or not technically feasible in certain situations, depending on the topography over which gas-gathering pipelines are installed, the pressure of the natural gas at the wellhead, and the location and availability of a permissible compressor in relation to commercial pipelines, access roads, and other utilities.
- Incorporate GRSG habitat requirements in reclamation—This is unlikely to be an issue for well pad reclamation. However, very long road or pipeline corridors could be prohibitively expensive if they require including GRSG components if planting or transplanting sagebrush is required instead of including sagebrush in a seed mix with native perennial bunchgrasses and forbs.

Overall, a determination of the extent to which increased costs and decreased efficiency would affect fluid minerals development is a function of project- and site-specific considerations and of market forces at the time. However, it is possible that some well pads, access roads, pipelines, and other facilities would be affected to the extent that marginal projects are economically nonviable, reducing the number of future oil and gas wells to an extent that may be considered significant at the local, state, or regional levels.

Idaho Environmental Consequences

Impacts from Lands and Realty Management

Under Alternative 1, all PHMA and IHMA would be managed as ROW avoidance areas. However, because all acres in PHMA and IHMA would be either closed to leasing or open subject to NSO stipulations, no oil and gas activities on future leases within these areas would require new rights-of-way. Therefore, oil and gas activity in PHMA and IHMA would not be impacted by management of ROW avoidance areas under Alternative 1.

All GHMA would be managed as ROW avoidance for high voltage transmission lines and major pipelines but open to other fluid mineral-related ROW location under Alternative 1. Transportation of fluid minerals might be impacted by the major pipeline ROW avoidance but fluid minerals beneath those acres would be unlikely to be significantly impacted by the ROW avoidance area.

Application of RDFs, BMPs, buffers, and seasonal timing restrictions to ROW construction in all GRSG habitat would also limit construction of new ROWs for oil and gas development. If these limitations made it uneconomic to develop a ROW for oil and gas development, development of federal oil and gas resources in the planning area could decrease.

Impacts from Fluid Minerals Management

Under Alternative 1, approximately 257,400 unleased acres with medium development potential (33 percent of the federal oil and gas estate with medium development potential) would remain closed to oil and gas leasing. Closing unleased lands to leasing, especially those with medium potential, would have the greatest impact on fluid minerals resources in Idaho by prohibiting oil and gas development. Impacts of closing these areas to leasing are the same type as those described under Nature and Type of Effects.

Approximately 348,100 acres, or 44 percent of unleased federal oil and gas estate with medium development potential (including all areas in PHMA and IHMA not already closed) would be open to oil and gas leasing subject to NSO stipulations. Under this alternative there would be no waivers or modifications to the NSO stipulation, and only one exception would exist. A total of approximately 77 percent of unleased federal oil and gas estate with medium oil and gas potential in the decision area would be inaccessible, either due to closure or NSO, under Alternative 1.

Under Alternative 1, approximately 121,900 unleased acres, or 17 percent of the unleased federal oil and gas estate with medium development potential would be open to oil and gas leasing, subject to lek buffers and TL stipulations. This would include all areas in GHMA not already closed. These stipulations would restrict the timing and location of oil and gas exploration and development activities, as described under *Nature and Type of Effects*.

Under Alternative 1, it is reasonably foreseeable for planning purposes that 15 new oil and gas exploratory wells would be developed on federal fluid mineral estate in the decision area in the next 20 years.

The BLM could not apply COAs that would eliminate reasonable opportunities to develop an existing lease. Therefore, although restrictions on development would increase where COAs were applied, oil and gas development would still be allowed in these areas.

Geophysical exploration would be allowed on the over 8 million acres of federal mineral estate within PHMA but would be subject to TLs and other restrictions. Most notably, geophysical exploration would be allowed only for gathering information about fluid mineral resources outside PHMA. Because of these limitations and the fact that PHMA would be closed to fluid mineral leasing, geophysical exploration in PHMA would decrease under this alternative. Decreases in geophysical exploration in PHMA could impact the fluid minerals program, as described under *Nature and Type of Effects*.

Under Alternative 1, RDFs would be applied as COAs to existing leases on PHMA and GHMA overlying federal mineral estate. However, only management actions related to master development plans and unitization would apply. Impacts of these restrictions would be the same type as those described under *Nature and Type of Effects*.

Application of the 3 percent disturbance cap in PHMA and IHMA could impact both new and existing fluid mineral activities by preventing or restricting new surface development. New fluid mineral activities and new surface development on existing leases could be affected or temporarily delayed if the cap were exceeded. Application of lek buffers in GHMA could impact both new and existing fluid mineral activities by preventing or restricting new surface development. Applying lek buffer distances when approving actions could also restrict development of infrastructure related to fluid mineral development.

Under Alternative 1, RDFs would be applied as COAs to existing leases on occupied habitat overlying federal mineral estate. These RDFs would include such requirements as surface disturbance limitations, TLs, noise restrictions, structure height limitations, design requirements, water development standards, remote

monitoring requirements, and reclamation standards. The types of impacts from these COAs are the same as those described under *Nature and Type of Effects*. The BLM could not apply COAs that would eliminate reasonable opportunities to develop the lease. Therefore, although restrictions and costs on development would increase where COAs were applied, oil and gas development would still have reasonable opportunity to occur.

Geothermal

Impacts from Fluid Minerals Management

Under Alternative 1, 11,296,800 acres, or 44 percent of planning areas, would remain closed to geothermal leasing. This includes 2,832,200 acres with moderate to high geothermal potential (32 percent of the moderate to high geothermal potential acres in the decision area). An additional 8,464,000 acres (34 percent) with no or low geothermal potential would remain closed to geothermal leasing. Geothermal resource potential may be outdated or inaccurate in some areas and it is possible that developable resources exist in these areas. New technologies such as Enhanced Geothermal Systems (EGS) could make areas considered low or moderate feasible in the future, therefore it is difficult to predict the impacts of closure of low to moderate geothermal potential areas.

In addition to fluid mineral closures, 3,834,400 acres would be subject to TL and CSU stipulations (including 1,278,100 acres in moderate to high geothermal potential areas) and 9,630,000 acres would be subject to NSO stipulations (including 2,906,800 acres in moderate to high geothermal potential areas).

Under the Alternative 1, RDFs and BMPs would be applied as COAs when a geothermal drilling permit or other post-lease activity is approved. In addition to affecting new leases, the COAs would be applied to the 25,571 acres of existing leases within GRSG habitat, consistent with existing lease terms and special stipulations. These RDFs and proposed management actions would include such requirements as noise restrictions, structure height limitations, design requirements, water development standards, remote monitoring requirements, and reclamation standards.

The BLM could not apply COAs that would eliminate reasonable opportunities to develop an existing lease. Therefore, although restrictions on development would increase where COAs were applied, geothermal development would still be allowed in these areas.

Impacts from Lands and Realty Management

Under Alternative 1, 8,365,000 acres (33 percent) of BLM-administered surface in the decision area (including all PHMA) would be managed as ROW avoidance areas, where development of new ROWs for geothermal development could not occur unless the Anthropogenic Disturbance Development and Screening Criteria (AD-3 and AD-4) were satisfied (including the requirement that the project would not exceed the 3 percent disturbance threshold and would be collocated within existing the footprint of existing infrastructure). These restrictions would only allow new ROWs to be developed pursuant to a valid existing authorization.

Another 1,013,800 acres (4 percent) of BLM-administered surface in the decision area (including all IHMA) would be managed as ROW exclusion areas where development of new ROWs for geothermal development could not occur unless the Anthropogenic Disturbance Development Criteria (AD-4) were satisfied (including the requirement that the project would not exceed the 3 percent disturbance threshold). Lessees would be unable to site off-lease features, such as transmission lines, roads, and pipelines that may be necessary to transport the product to market, on public lands. These actions could result in the stranding of a geothermal lease and its resources, if surrounded by federal lands subject to these constraints.

Application of RDFs, BMPs, buffers, and seasonal timing restrictions to ROW construction in GRSG habitat would also limit the construction of new ROWs for geothermal development to certain times of the year or in certain locations. If these limitations made it uneconomic to develop a ROW for geothermal development, development of federal geothermal resources in the planning area could decrease.

Impacts from Anthropogenic Disturbance Management, Adaptive Management, and Coordination

Under Alternative 1, anthropogenic disturbance, including leasable mineral development, would be limited to 3 percent of nesting and wintering habitat within PHMA and IHMA within a Conservation Area (i.e., BSUs). In BSUs where the 3 percent cap is already exceeded, new development of federal leasable mineral resources would be prohibited until enough habitat was restored to maintain the area under the threshold. Development of federal leasable mineral resources that would result in exceedance of the 3 percent cap in a BSU would also be prohibited. Impacts would be greatest where these caps limit development in unleased portions of high geothermal potential because these areas have the highest potential for leasable mineral development. The uncertainty wrought by this limitation could decrease the value of any future lease, disincentivize geothermal energy development in the western United States, and could affect the ultimate scope of rights authorized under any lease offered in the future.

Montana Environmental Consequences

Under Alternative 1, priority will be given to leasing and development of fluid mineral resources, including geothermal, outside of PHMA and GHMA. When analyzing leasing and authorizing development of fluid mineral resources, including geothermal, in PHMA and GHMA, and subject to applicable stipulations for the conservation of GRSG, priority will be given to development in non-habitat areas first and then in the least suitable habitat for GRSG. Where a proposed fluid mineral development project on an existing lease could adversely affect GRSG populations or habitat, the BLM will work with the lessees, operators, or other project proponents to avoid, reduce, and mitigate adverse impacts to the extent compatible with lessees' rights to drill and produce fluid mineral resources.

Alternative 1 would apply an NSO stipulation within all GRSG PHMAs and apply an NSO stipulation within 0.6 miles of GRSG leks in Restoration Areas and GHMAs. Development on existing leases within PHMAs would be subject to density and disturbance limits. CSU stipulations would be applied within RAs in order to maintain GRSG habitat. TL stipulations would be applied from March 1 to June 15 in GRSG nesting habitat within 3 miles of a lek within RAs and GHMAs, and from December 1 to March 1 within designated GRSG winter range within 3 miles of a lek.

In PHMA, this alternative would implement an anthropogenic disturbance cap of 5% at the BSU and project area scale and implement a density cap of an average of 1 energy and mining facility per 640 acres.

Nevada Environmental Consequences

Alternative 1 would require a 3 percent disturbance cap on human surface-disturbing activities in PHMA and would incorporate RDFs consistent with applicable law in PHMA, GHMA, and OHMA. It would also require all human disturbances to result in a net conservation gain for GRSG and their habitat, and lek buffers would be required.

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective locations, and potentially resulting in overall greater development costs.

A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA. Implementing the GRSG habitat conservation management actions listed above would also place NSO stipulations on fluid mineral development in PHMA, which would further reduce the demand for new ROW development in those areas.

North Dakota Environmental Consequences

Impacts from Lands and Realty

Under Alternative 1, all BLM-administered surface in PHMA (32,900 acres, or approximately 100 percent of BLM-administered surface in the decision area) would be managed as ROW avoidance areas for oil and gas-related activities. However, because all fluid mineral development in PHMA would be subject to NSO stipulations under Alternative 1, managing ROW avoidance areas in PHMA would have no impact on fluid minerals.

All GHMA would be open to ROW location for oil and gas-related activities under Alternative 1. However, identification of conservation measures to minimize surface disturbance and disrupting activities could increase the expense of developing facilities for oil and gas operations by limiting routing options and requiring the use of more expensive technology.

Impacts from Fluid Minerals (Including Mineral Split Estate)

Application of the density and disturbance caps in PHMA and lek buffers in PHMA and GHMA could impact both new and existing oil and gas activities by preventing or restricting new surface development. New oil and gas activities could be precluded if the cap were exceeded in a BSU or a proposed project analysis area. New surface development on existing leases could be restricted if the cap were exceeded. However, the BLM would not apply the density and disturbance caps in a manner that would eliminate reasonable opportunities to develop an existing lease. Applying lek buffer distances when approving actions could also restrict development of infrastructure-related fluid mineral development. Under Alternative 1, except that the lack of waivers and modifications, combined with the limited exceptions for NSO stipulations under Alternative 1 Amendment, would further restrict oil and gas activities.

Under Alternative I, federal oil and gas estate in PHMA would be open to fluid mineral leasing subject to NSO stipulations. The unleased federal oil and gas estate in PHMA would be subject to these stipulations. Under this alternative, there would be no waivers and modification, and limited exceptions for NSO stipulations which would further restrict oil and gas activities.

All GHMA would be subject to CSU stipulations. Impacts of these stipulations would be the same type as those described under *Nature and Type of Effects* in **Section 4.2.1** above.

Under Alternative 1, it is projected that 51 new exploratory and development wells would be drilled on federal oil and gas estate in the short term. Of these new wells, 42 are expected to be producing oil and gas wells in the long term**.**

In addition to RDFs and limitations on disturbance, structure height restrictions would apply under Alternative 1. Closing areas within GRSG habitat to fluid mineral leasing would directly impact the fluid minerals program by prohibiting the development of those resources on federal mineral estate. Fluid mineral operations would be limited in their choice of project locations and may be forced to develop in areas that are challenging to access or have less economic resources because more ideal areas could be closed to leasing. No quantitative percentage limit, surface occupancy buffers, or TL would apply to surface

disturbance; rather, surface disturbance would prevent or minimize disturbance to GRSG and their habitat. Unitization would occur on a case-by-case basis.

Geophysical exploration would be allowed, except for in PHMA, where geophysical exploration would be limited to use of existing roads and trails, as well as helicopter-portable methods on the 61,197 acres of federal oil and gas estate but would be subject to TLs and other restrictions, reducing exploration opportunities.

Oregon Environmental Consequences

Impacts from Lands and Realty Management

Under Alternative 1, all BLM-administered surface in PHMA (totaling 4,547,000 acres, or approximately 36 percent of BLM-administered surface in the decision area) would be managed as ROW avoidance areas for fluid mineral-related activities. However, because all PHMA would be subject to NSO stipulations on fluid mineral leases, no fluid mineral activities on future leases within these areas would require new ROWs. Therefore, managing PHMA as ROW avoidance areas would have minimal impact on fluid minerals development, but could impact the location of fluid mineral transportation pipelines if any were proposed.

All BLM-administered surface in GHMA (totaling 5,662,600 acres, or 45 percent of BLM-administered surface in the decision area) would be managed as ROW avoidance for high voltage transmission lines and major pipelines but open to other fluid mineral-related ROW location under Alternative 1. Fluid minerals beneath those acres would be impacted by the ROW avoidance area, as described in the *Nature and Type of Effects*.

Impacts from Fluid Leasable Minerals Management

Under Alternative 1, 4,333,700 acres (31 percent of the federal mineral estate decision area), including all federal mineral estate in PHMA, would be subject to NSO stipulations; 4,319,800 acres subject to NSO stipulations would be unleased, so this management would apply NSO stipulations to 31 percent of the 14,147,900 unleased acres in the decision area. Application of NSO stipulations to leases on these acres would directly impact the fluid minerals program in the manner described in the *Nature and Type of Effects*. The lack of waivers and modifications combined with the limited exceptions for NSO stipulations under Alternative 1 would further restrict oil and gas and geothermal activities. SFA would be subject to NSO stipulations with no waivers, exceptions, or modifications.

Approximately 4,847,400 acres of federal mineral estate would be subject to CSU and TL stipulations. This includes all federal mineral estate in GHMA not subject to other existing stipulations, or 34 percent of the federal mineral estate decision area; 4,715,500 of these acres are unleased. Application of CSU and TL stipulations to leases on these acres would directly impact the fluid minerals program in the manner described under *Nature and Type of Effects.*

Under Alternative 1, the BLM would manage lands to conserve, enhance, and restore GRSG habitat. PHMA and GHMA would be designated, and the BLM would implement numerous conservation measures to reduce impacts from human activities in PHMA, including a maximum 3 percent disturbance cap to human activities, not including wildfire, in PHMA. Application of the 3 percent disturbance cap in PHMA and lek buffers in GHMA could impact both new and existing fluid mineral activities by preventing or restricting new surface development. New fluid mineral activities could be precluded if the cap were exceeded in an Oregon priority area of conservation (PAC; also known as BSU) and the proposed project area. New surface development on existing leases could be restricted if the cap were exceeded. However, the BLM would not apply the disturbance cap in a manner that would eliminate reasonable opportunities to develop an existing lease.

Applying lek buffer distances when approving actions could also restrict development of infrastructure related to fluid mineral development.

Geophysical exploration would be allowed on the 11,234,800 acres of federal mineral estate within GRSG habitat but would be subject to seasonal restrictions. Because of these limitations, geophysical exploration in GRSG habitat would decrease under this alternative. Decreases in geophysical exploration in GRSG habitat would impact the fluid minerals program, as described under *Nature and Type of Effects.*

Under Alternative 1, conservation measures in addition to RDFs would be applied as COAs to the five federal leases in PHMA. These RDFs and conservation measures would include such requirements as surface disturbance limitations, TLs, noise restrictions, structure height limitations, design requirements, water development standards, remote monitoring requirements, and reclamation standards. However, the only conservation measures applied would relate to master development plans and unitization. Impacts of these restrictions would be the same type as those described under *Nature and Type of Effects*.

South Dakota Environmental Consequences

Impacts from Lands and Realty Management

Under Alternative 1, all BLM-administered surface in PHMA, exclusive of GRSG winter range, would be managed as ROW exclusion areas for fluid mineral-related activities. GHMA and GRSG winter range would be ROW avoidance areas. However, because all PHMA would be subject to NSO stipulations on fluid mineral leases, no fluid mineral activities on future leases within these areas would require new ROWs. Therefore, managing PHMA as ROW exclusion areas would have minimal impact on fluid minerals development, but could impact the location of fluid mineral transportation pipelines if any were proposed.

Impacts from Fluid Leasable Minerals Management

Under Alternative 1, 152,100 acres (45 percent of the federal mineral estate decision area), including all federal mineral estate in PHMA and GRSG winter range in GHMA, would be subject to NSO stipulations. Application of NSO stipulations to leases on these acres would directly impact the fluid minerals program in the manner described in the *Nature and Type of Effects***.** The lack of waivers and modifications combined with the limited exceptions for NSO stipulations under Alternative 1 would further restrict oil and gas and geothermal activities.

Approximately 21,175 acres of federal mineral estate would be subject to CSU stipulations and 1,169 acres subject to TL stipulations. This includes all federal mineral estate in GHMA in nesting and brood-rearing habitat near leks. Application of CSU and TL stipulations to leases on these acres would directly impact the fluid minerals program in the manner described under *Nature and Type of Effects.*

Under Alternative 1, the BLM would manage lands to conserve, enhance, and restore GRSG habitat. PHMA and GHMA would be designated, and the BLM would implement numerous conservation measures to reduce impacts from human activities in PHMA, including a maximum 3 percent disturbance cap to human activities in a BSU and 5 percent cap including wildfire and agriculture at the project level. Application of the disturbance cap in PHMA and lek buffers in GHMA could impact both new and existing fluid mineral activities by preventing or restricting new surface development. New fluid mineral activities could be precluded if the cap were exceeded in a BSU and the proposed project area. New surface development on existing leases could be restricted if the cap were exceeded. However, the BLM would not apply the disturbance cap in a manner that would eliminate reasonable opportunities to develop an existing lease. Applying lek buffer distances when approving actions could also restrict development of infrastructure related to fluid mineral development.

Under Alternative 1, conservation measures in addition to RDFs would be applied as COAs to federal leases in PHMA. These RDFs and conservation measures would include such requirements as surface disturbance limitations, TLs, noise restrictions, structure height limitations, design requirements, water development standards, remote monitoring requirements, and reclamation standards. Impacts of these restrictions would be the same type as those described under *Nature and Type of Effects*.

Utah Environmental Consequences

Application of the 3 percent disturbance cap in PHMA could impact both new and existing fluid mineral activities by preventing or restricting new surface development. New fluid mineral activities could be precluded if the cap were exceeded in a BSU or a proposed project analysis area. New surface development on existing leases could be restricted if the cap were exceeded. However, the BLM would not apply the disturbance cap in a manner that would eliminate reasonable opportunities to develop an existing lease. Currently there are no population areas where the level of disturbance exceeds the disturbance cap. However, there are areas within 4 miles of a lek in population areas that are near or exceeding the disturbance cap, including in the Carbon and Uintah Population Areas where there is higher potential for oil and gas.

Application of lek buffers in GHMA could impact new and existing fluid mineral activities by restricting new surface development. Lek buffers in PHMA would not impact fluid mineral development because all PHMA would be subject to NSO stipulations. Any development for which the limited exception to the NSO stipulation were granted would not be within the lek buffer. In GHMA, applying lek buffer distances when approving actions for linear features, infrastructure related to energy development, tall structures (including transmission lines), surface disturbance, and noise could also restrict development of infrastructure related to fluid mineral development, especially in areas of high potential for oil and gas.

In PHMA, the density of energy and mining facilities would be limited to one energy/mining facility per 640 acres. When calculated at the project level, this requirement would push developers to consolidate facilities and, where technically feasible, directionally or horizontally drill from outside of GRSG habitat.

RDFs would be applied in PHMA and GHMA. However, exceptions to the application of RDFs could mitigate impacts on fluid minerals. Exceptions would occur where a design feature was not applicable (e.g., a resource is not present on a given site) or where the design feature would not actually provide additional protection for GRSG or its habitat. In addition to the RDFs, disturbance cap, lek buffers, and density restrictions, additional conservation measures in PHMA would include net conservation gain requirements (also a requirement in GHMA), restrictions on noise and tall structures, and seasonal restrictions. All of these combined would restrict oil and gas development. In the Carbon and Uintah Population Areas, where oil and gas potential is relatively high and some areas are at or exceeding the disturbance cap, the cumulative effect of all of the restrictions would likely reduce opportunities for oil and gas development on public lands.

Exploration would be allowed on federal mineral estate within GRSG habitat but would be subject to seasonal restrictions.

<u>Infrastructure Development (including all ROWs and utility corridors)</u>

Management actions for programs related to infrastructure development other than lands and realty would not impact fluid minerals. Therefore, only the impacts from lands and realty management actions are discussed in the paragraphs below.

Under Alternative 1, all BLM-administered surface within PHMA not already managed as ROW exclusion would be managed as ROW avoidance for new linear and site-type ROWs (including transmission lines, pipelines, and roads), except for within ROW corridors designated for aboveground use. However, because all acres in PHMA would be either closed to leasing or open subject to NSO stipulations, no oil and gas activities on future leases within these areas would require new ROWs.

Under Alternative 1, 3,219,000 acres (97 percent) of BLM-administered surface within the decision area in Utah would continue to be open to ROW location. However, wherever there is overlap between federal oil and gas leases and the 94,800 acres (3 percent) of BLM-administered surface in the decision area that would continue to be managed as ROW avoidance or exclusion under this alternative, the fluid minerals program could be indirectly impacted by the resulting limits on the available means for transporting fluid minerals to processing facilities and markets. Impacts would be mitigated where new ROWs could be collocated within existing ROWs. Additionally, leases within units would not be impacted as much because infrastructure within these unitized leases is exempt from ROW requirements.

Impacts would be mitigated for existing leases in PHMA because collocation of new ROWs close to existing ROWs and minimal construction of new roads would be allowed. In PHMA, ROW development that was able to occur would be subject to RDFs, lek buffers, the disturbance cap, and limitations for tall structures, and net conservation gain requirements, which could impact fluid minerals development. The expense of these mitigation activities would increase the costs of oil and gas development.

Under Alternative 1, GHMA would be available for the types of ROW location that could impact fluid minerals development, except for 17,600 acres already managed as exclusion. While fluid minerals development would not be directly impacted because of ROW avoidance or exclusion areas, ROW development in GHMA would be subject to RDFs, lek buffers, and net conservation gain requirements, which could impact fluid minerals development. The expense of these mitigation activities would increase the costs of oil and gas, oil shale, and tar sands development.

Mineral Development

Management actions for mineral programs other than mineral materials and fluid minerals would not impact fluid minerals. Therefore, only the impacts from mineral materials and fluid mineral management actions are discussed in the paragraphs below.

Mineral Materials

Under Alternative 1, PHMA in Utah would be closed to commercial mineral material disposal. PHMA on lands in the Utah portion of the planning area would be closed to commercial mineral material disposal. This includes 1,196,000 acres with mineral material occurrence (92 percent of federal mineral estate with mineral material occurrence in the decision area). Closing these areas to mineral material disposal could indirectly impact fluid minerals in the areas by reducing the amount of readily available material for road and pipeline construction. This could limit the available means for accessing fluid mineral resources and transporting those resources to processing facilities and markets and could ultimately decrease the amount of development of federal fluid minerals in the planning area.

Free use permits and expansion of existing active pits in PHMA would be subject to the disturbance cap, density of energy/mining facilities restrictions, lek buffers, RDFs, noise restrictions, seasonal restrictions, and net conservation gain requirements. These requirements, particularly on the expansion of existing active pits, would further restrict access to mineral materials and increase costs associated with fluid minerals development.

Fluid Minerals

Outside of the areas closed to new fluid mineral leasing, the remaining PHMA would be open to new oil and gas leasing subject to an NSO stipulation. Of this area, NSO stipulations on approximately 7 percent of federal mineral estate would not be available with waivers, exceptions, or modifications. These areas are in the Rich and Box Elder Population Areas. The Box Elder Population Area does not have high potential for oil and gas, so impacts would be minimal. The potential in the Rich Population Area is high. Most federal mineral estate in the Rich Population Area is already under lease, and many oil and gas fields have already been depleted. Therefore, impacts of the 233,400 acres subject to NSO with no waivers, exceptions, or modifications would be minimal.

In the remainder of PHMA, an exception to the NSO stipulation could be granted if the activity would not have direct, indirect, or cumulative effects on GRSG or its habitat or is proposed as an alternative to a similar action occurring on a nearby parcel and would provide a clear conservation gain to GRSG. Any exception must have to concurrence of the state wildlife agency and the USFWS. As such, exceptions would only be granted on rare occasions. Any development that did occur in PHMA would be subject to the pertinent management for discretionary activities (e.g., mitigation measures, disturbance cap, minerals/energy density restrictions, lek buffers, seasonal restrictions, and RDFs). Impacts of which are discussed under Special Status Species – GRSG.

Approximately 30,000 acres in GHMA would also be closed to fluid mineral leasing. GHMA near leks would be managed as NSO, the NSO buffer from the leks would vary by office. In GHMA, development would be subject to the disturbance cap, mitigation, lek buffers, and RDFs.

Wyoming Environmental Consequences

Under Alternative 1, 883,670 acres in Wyoming would be closed to oil and gas leasing. This, in addition to other restrictions, such as NSO on 441,690 acres and CSU on 6,438,480 acres within PHMAs and GHMAs would reduce the number of projected oil, gas, and CBNG wells projected under this alternative. In total, 12,355 oil and gas and 2,462 CBNG wells are projected over the life of the plan under this alternative. Drainage of federal minerals on areas closed to leasing or on leases that are shut in on an annual basis due to timing and distance limitations may occur due to development on adjacent private or state lands.

Density limitations of one oil and gas or mining location per 640 acres and a 5% disturbance cap within PHMAs (core only) would slow mineral development and could also lead to the relocation of well pads, access roads, pipelines, and ancillary facilities. Relocation of these proposed facilities could cause temporary delays in developing oil and gas resources and limit oil and gas activities in these areas.

Applying BMPs to federal mineral estate where the surface ownership is non-federal could restrict the ability of mineral operators to efficiently develop mineral resources. Depending on the stipulations required, these requirements could increase delays in mineral development.

Avoiding primary and secondary roads within 1.9 miles of the perimeter of occupied GRSG leks and prohibiting other new roads within 0.6 miles of the perimeter of occupied GRSG leks within PHMAs could lead to the relocation of well pads, access roads, pipelines, and ancillary facilities. Relocation of these proposed facilities could cause temporary delays in developing oil and gas resources and could limit oil and gas activities in these areas.

Alternative 2

Rangewide Environmental Consequences

In PHMA management would be the same as Alternative 1, except Colorado has no closed areas. In GHMA, management would be the same as Alternative 1, except Colorado changed the closure areas to NSO.

Mitigation: The BLM in Montana, North Dakota, South Dakota, Nevada, California, and Oregon would apply the same mitigation as Alternative 1. BLM does not require compensatory mitigation but will enforce state mitigation policies and programs. Colorado and Idaho provide mitigation resulting in no net loss. Utah and Wyoming removed the net conservation gain requirement. Colorado, Idaho, Nevada/California, Oregon, Utah, and Wyoming specify that compensatory mitigation would be voluntary, unless required by laws other than FLMPA or by the State.

The 3% disturbance cap does not include wildfire or agriculture. In Idaho the cap can be exceeded in utility corridors if there is a demonstrated benefit to GRSG. In Utah the disturbance cap can be exceeded if it will benefit GRSG. The cap is applied at the BSU and project scale except in Idaho which just applies it at the BSU scale. In Montana and Wyoming, a 5% disturbance cap which includes disturbance from wildfire and agriculture, is applied at the project area scale in PHMA.

In Colorado, Idaho, Oregon, and Montana and Dakotas field offices, priority will be given to leasing and development of fluid mineral resources, including geothermal, outside of PHMAs and GHMAs, or within the least impactful areas within PHMA and GHMA if avoidance is not possible. In Utah, Nevada/California, and the Lewistown and Butte field offices no similar objective exists.

In Wyoming, Leasing would be allowed in PHMA, and if the BLM has a backlog of Expressions of Interest for leasing, the BLM will prioritize work to first process Expressions of Interest in non-habitat, followed by lower habitat management areas (e.g., GHMA). In Wyoming for fluid mineral development on existing leases that could adversely affect GRSG populations or habitat, the BLM would work with the lessees, operators, or other project proponents to avoid, reduce, and mitigate adverse impacts consistent with lessees' rights.

In Montana/Dakotas, Oregon, and Wyoming no waivers or modifications would be issued. An exception can be considered if the excepted action is an alternative to action on nearby parcels that would be more harmful to GRSG (with partner agency approval).

In Idaho no waivers or modifications would be issued in PHMA, IHMA or GHMA. An exception can be considered if the excepted action is an alternative to action on nearby parcels that would be more harmful to GRSG, no concurrent approval from other agencies is required.

Colorado, Nevada/California, and Utah developed state-specific exceptions, modifications, and waivers. If a state is not specifically mentioned under environmental consequences, the rangewide consequences would apply.

Colorado Environmental Consequences

In Colorado, the BLM anticipates differing effects for this fluid minerals. Under Alternative 2, approximately 224,200 acres that are closed to fluid mineral leasing under the Alternative 1 would be open for fluid mineral leasing subject to NSO stipulations. Opening the 224,200 acres for fluid mineral leasing means that there is the potential for revenue generation associated with leasing and developing fluid mineral resources.

Approximately 34 percent of the federal mineral estate in PHMA is currently unleased, including approximately 29 percent with high potential for oil and gas. There are numerous considerations that

operators take into account before acquiring and developing leases, including market value of the commodity being produced (oil, natural gas, or associated hydrocarbons), operational costs, ease of access to lease minerals, practicality of necessary infrastructure such as roads and pipelines, and technological capabilities. As a result, it is difficult to predict if these changes to availability of leases and increased flexibility of the WEMs (Waivers, Modifications, and Exceptions) would lead to additional oil and gas development or a varied approach to the same level of development. In GHMA the closure to leasing under Alternative 1 would change to open to leasing with an NSO stipulation under Alternative 2, this would make more acres available for leasing, potentially resulting in increased production of fluid mineral resources.

Idaho Environmental Consequences

In Idaho, the BLM anticipates differing effects for fluid minerals. PHMA and IHMA not already closed to leasing would be open to oil and gas leasing subject to NSO stipulations. This alternative would maintain Sagebrush Focal Areas (SFAs) from Alternative 1.

Montana Environmental Consequences

Montana did not complete a 2019 Plan Amendment, management and impacts on fluid minerals under this alternative would be the same as described under Alternative 1.

Alternative 3

Rangewide Environmental Consequences

Under this alternative, all areas managed for GRSG would be PHMA and fluid minerals in these areas would be closed to leasing. Some states are considering expanding HMAs to include areas of adjacent non-habitat, unoccupied historic habitat, or areas with potential to become habitat as PHMA. For valid existing rights, if a lease doesn't intersect a road, the ROW exclusion within PHMA could preclude development of a lease.

ACECs will be considered under this alternative, though because of the restrictive nature of the PHMA management under this alternative, there would be no different allocations between the PHMA and the potential ACEC boundaries.

In areas with development potential for oil and gas resources, closing PHMA to leasing would result in a reduction in oil and gas development and production as described under *Nature and Type of Effects*.

Alternative 4

Rangewide Environmental Consequences

The amount of fluid mineral acreage available for leasing under this alternative is similar to Alternative 1, but the amount that will be leased under Alternative 4 is difficult to predict because leasing in GRSG habitat areas will occur following a process in which parcels for lease are identified by received EOIs and evaluated based on fluid mineral and GRSG habitat criteria in order to determine which parcels are offered for lease. Parcels could be nominated and leased with potentially prohibitive stipulations which could discourage operators from further development. Geothermal leasing would occur following a similar process as described above but evaluation criteria would be adjusted to recognize the differences between geothermal development and petroleum fluid mineral development.

Compared to existing management this alternative would apply similar NSO stipulations to leasing in PHMA and IHMA, and around Leks in GHMA. In some states this alternative would make more acreage available for leasing, but because of the prioritization process for leasing EOIs it is possible that fewer acres could be offered for lease sale. State specific changes for Colorado and Oregon are discussed below. A 3% disturbance cap would apply at the HAF fine scale habitat selection area in PHMA/IHMA, which could limit development,

however very few areas are over or near the disturbance cap at this time. This cap could result in a delay in the timing of future fluid mineral exploration or development; however, the magnitude of the delay would depend on site-specific factors including the current level of habitat assessment that has been conducted to date. If a state is not specifically mentioned under environmental consequences, the rangewide consequences would apply.

Colorado Environmental Consequences

In Colorado, the BLM anticipates differing effects for fluid minerals. Under Alternative 4 more acreage would be available for leasing EOIs and potential leasing than under Alternative 1, this is because under Alternative 4 the plan would no longer apply closures within one mile of leks in GHMA.

Oregon Environmental Consequences

In Oregon, the BLM anticipates differing effects for fluid minerals. Under Alternative 4 more acreage would be available for leasing EOIs and potential leasing than under Alternative 1, this is because under Alternative 4 the plan would no longer apply closures within one mile of leks in GHMA.

Wyoming Environmental Consequences

In Wyoming, the BLM anticipates differing effects for fluid minerals. Unlike in other states, in WY NSO stipulations would be applied to leasing only within 0.6 miles of leks in PHMA and within 0.25 miles of leks in GHMA. Compared to Alternative 1, this alternative would make more acres available for leasing without NSO stipulations.

Alternative 5

Rangewide Environmental Consequences

Impacts on fluid minerals under Alternative 5 would less than those described for Alternative 4 because fewer acres would be subject to an NSO stipulation (e.g., PHMA in WY would be 0.6-mi NSO around leks with TL stipulations in the rest of PHMA). Under this alternative more flexible WEMs would be considered in all states, allowing compensatory mitigation and the potential for more areas open to leasing with reduced major and minor operational constraints.

Alternative 6

Rangewide Environmental Consequences

Impacts would be the same as those described for Alternative 5 with the additional designation of ACECs. Management of ACECs as open to leasing subject to NSO stipulations with an exception/modification to allow occupancy if there are drainage concerns from adjacent development and if it can be demonstrated that no direct or indirect impacts on GRSG will occur would increase impacts on fluid minerals compared with Alternative 1.

4.10.2 Non-Energy Solid Leasable Minerals

Nature and Type of Effects

Closing an area to non-energy solid mineral leasing would directly impact non-energy solid leasable minerals to the extent such minerals are known to exist by removing the possibility any such mineral resources in that area from being accessed and extracted.

Management actions creating ROW exclusion or avoidance areas would indirectly impact nonenergy solid leasable mineral extraction by limiting the available means for accessing mineral resources and transporting nonenergy solid leasable minerals to processing facilities and markets. For example, new roads to access a mine for nonenergy solid leasable minerals could not be built in a ROW exclusion area. Nonenergy solid

leasable mineral operations may be moved to private lands where access is easier, thereby resulting in a loss of federal royalty income if the federal minerals could not be accessed from the private lands, but also reducing the number of operations on federal mineral estate. Because ROW avoidance areas could allow for limited ROW development, impacts of avoidance areas would be less severe than those of ROW exclusion areas. Impacts would be mitigated where exceptions were allowed for collocation of new ROWs within existing ROWs.

Application of RDFs, including such standards as noise restrictions, height limitations on structures, design requirements, water development standards, remote monitoring requirements, and reclamation standards, would place additional requirements on exploration and development.

Alternative 1

Rangewide Environmental Consequences

Under Alternative 1 most of the PHMA and IHMA in the planning area is closed to new leasing of non-energy leasable minerals but states can consider expansion of existing leases. However, in Idaho, all IHMA in Known Phosphate Lease Areas is open to leasing. Wyoming keeps the Known Sodium Leasing Area open to exploration and consideration for leasing and development and outside the Known Sodium Leasing Area considers sodium leasing on a case-by-case basis subject to conditional requirements. Wyoming has seasonal restrictions, and Wyoming and Montana are subject to density and disturbance limits. In GHMA most states propose minimization measures to protect GRSG.

Application of the 3 percent disturbance cap in PHMA and lek buffers in PHMA and GHMA could impact both new and existing non-energy leasable minerals activities by preventing or restricting new surface development and reducing ultimate recovery of the resource. New non-energy leasable minerals activities could be precluded if the cap were exceeded in a BSU or a proposed project analysis area. New surface development on existing leases could be restricted if the cap were exceeded. However, the BLM would not apply the disturbance cap in a manner that would eliminate all reasonable opportunities to develop an existing lease.

Applying lek buffer distances when approving actions could also restrict development of infrastructure related to non-energy solid leasable mineral development, as could application of RDFs.

Idaho Environmental Consequences

In Idaho, the BLM anticipates differing effects for non-energy leasable minerals.

<u>Impacts from Non-energy Solid Leasable Minerals Management</u>

In Idaho, all IHMA in Known Phosphate Lease Areas is open to leasing. No leases are currently on BLM-administered lands in IHMA. All other areas of IHMA would be closed to leasing except for consideration of the expansion of existing leases. Under Alternative 1, 16,270,500 acres, or 59 percent of the federal non-energy leasable mineral estate decision area (including all federal non-energy leasable mineral estate in PHMA outside Known Phosphate Lease Areas) would be closed to prospecting and leasing. Fringe leases and modifications to existing leases would be allowed in PHMA. Approximately 2,899,800 acres, or 10 percent of federal non-energy solid leasable mineral estate in the decision area (including all federal non-energy leasable mineral estate in IHMA outside Known Phosphate Lease Areas), would be open to leasing consideration but only if the Anthropogenic Disturbance Development and Criteria (AD-4) were satisfied (including the requirement that the project would not exceed the 3 percent disturbance threshold). Development on these acres would also be subject to RDFs, BMPs, and buffers for exploration and initial mine development, and compensatory mitigation once mining commences.

Development of federal non-energy leasable minerals within GHMA would also be subject to RDFs, BMPs, and buffers on exploration and initial mine development. These limitations could increase costs of federal non-energy leasable mineral development in the planning area.

Because Known Phosphate Lease Areas in IHMA would remain open to non-energy solid mineral leasing, which would allow continued development in most of the planning area, impacts on federal non-energy solid leasable mineral development in Idaho would be lessened compared to a full closure of all IHMA. The areas considered to have moderate potential for future development in the decision area would not be constrained by a closure. RDFs would be applied to phosphate development projects in IHMA. These RDFs could increase the cost of phosphate mining in the decision area.

Impacts from Anthropogenic Disturbance Management, Adaptive Management, and Coordination

Under Alternative 1, anthropogenic disturbance, including non-energy leasable mineral development, would be limited to 3 percent of nesting and wintering habitat on new leases and prospecting permits within IHMA within a Conservation Area (i.e., BSUs). In BSUs where the 3 percent cap is already exceeded, new parcels would not be offered for lease until enough habitat was restored to maintain the area under the threshold. New leases for federal non-energy solid leasable mineral resources that would result in exceedance of the 3 percent cap in a BSU would also be prohibited. This cap could potentially impact activities on 2,900,100 acres of unleased federal non-energy solid leasable mineral estate in IHMA, including 400 unleased acres within Known Phosphate Lease Areas. Impacts would be greatest where these caps limited development in unleased portions of Known Phosphate Lease Areas because these areas have the highest potential for non-energy leasable mineral development. The 16,270,500 acres that would be closed to non-energy solid mineral leasing under Alternative 1 would not be impacted by the disturbance cap because no new non-energy leasable solid mineral development could occur in the closed areas.

Nevada Environmental Consequences

In Nevada, the BLM anticipates some differing effects for non-energy leasable minerals.

Alternative 1 would require a 3 percent disturbance cap on human surface-disturbing activities in PHMA, and it incorporates RDFs consistent with applicable law in PHMA, GHMA, and OHMA. It would also require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required.

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective locations and potentially resulting in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Management actions for mineral programs other than non-energy leasable minerals would not impact non-energy leasable mineral development. Therefore, only the impacts from non-energy leasable minerals management actions are discussed in the paragraphs below.

Impacts from Non-energy Leasable Minerals Management

Under the Alternative 1, 10,739,100 acres of the decision area would be closed to non-energy leasable mineral development. Expanding existing leases would be considered in PHMA. Impacts of this closure would be the same type as those described under Nature and Type of Effects.

Alternative 1 includes applying RDFs on all GRSG habitat, which would mean additional conservation measures for the protection of GRSG consistent with applicable law. Impacts from the RDFs would likely result in higher costs and longer time frames for developing non-energy leasable minerals. RDFs would require placing operations and facilities as close together as possible, would minimize site disturbance through site analysis and planning, and would phase development with concurrent reclamation.

Oregon Environmental Consequences

Impacts from Lands and Realty Management

Under Alternative 1, all BLM-administered surface in PHMA would be managed as ROW avoidance areas for non-energy leasable-related activities. However, because all PHMA would be closed to new leases and prospecting permits, managing PHMA as ROW avoidance areas would have no impact on non-energy leasable minerals.

All BLM-administered surface in GHMA would be managed as ROW avoidance for high voltage transmission lines, major pipelines, but open to other non-energy leasable mineral-related ROW location under Alternative 1.

Impacts from Non-energy Leasable Minerals Management

The BLM would close all PHMA to non-energy solid mineral leasing under Alternative 1. This would result in 7,247,900 acres (51 percent) of federal mineral estate in the decision area being closed to prospecting and leasing.

Utah Environmental Consequences

As discussed in the Minerals section of **Chapter 3**, production rates for gilsonite and phosphate are expected to remain steady for the life of the LUPs covered by this LUPA. However, total phosphate production in the Utah Sub-region may increase with the possible opening of a new phosphate mine in Utah.

Application of the 3 percent disturbance cap in PHMA and lek buffers in PHMA and GHMA could impact both new and existing non-energy leasable minerals activities by preventing or restricting new surface development. New non-energy leasable minerals activities could be precluded if the cap were exceeded in a BSU or a proposed project analysis area. New surface development on existing leases could be restricted if the cap were exceeded. However, the BLM would not apply the disturbance cap in a manner that would eliminate all reasonable opportunities to develop an existing lease. Currently there are no population areas where the density of disturbance exceeds the 3 percent cap. However, there are areas within 4 miles of a lek in population areas that are near or exceeding the disturbance cap, including in the Uintah Population Area where there is high occurrence and existing development of phosphate.

Applying lek buffer distances when approving actions for linear features, infrastructure related to energy development, surface disturbance, and noise could also restrict development of non-energy leasable minerals.

RDFs would be applied as under the action alternatives in PHMA and GHMA. In addition to the RDFs, disturbance cap, lek buffers, and density restrictions, additional conservation measures in PHMA would include net conservation gain requirements (also a requirement in GHMA), restrictions on noise, and seasonal restrictions. All of these combined could further restrict non-energy leasable minerals development. Based on the disturbance cap and these other restrictions, it is unlikely that the existing phosphate and gilsonite mines could expand or that new phosphate or gilsonite mines would be approved on federal mineral estate in the decision area.

However, all sodium occurrence in the decision area is in PHMA and, under Alternative 1, PHMA would be closed to new non-energy minerals leases. However, the occurrence of sodium is largely present outside of GRSG HMAs, so the overall impact on sodium development in Utah would be minimal.

Approximately 673,600 acres (16 percent) of federal mineral estate in the decision area would be open to leasing consideration for both surface and underground mining, all of which would be in GHMA. In GHMA, development would be subject to mitigation and lek buffers.

Gilsonite. Under Alternative 1, all federal mineral estate with gilsonite potential in the decision area would be within GHMA and would be open to non-energy leasable mineral leasing. However, new leases in GHMA would be subject to mitigation and lek buffers. The 2,700 acres of authorized gilsonite leases in mapped occupied habitat would lie within GHMA and would be subject to current lease-specific surface disturbance limitations and/or BMPs included in those leases or approved plans governing the leases.

Phosphate. Under Alternative 1, 186,700 acres (88 percent) of federal mineral estate with phosphate potential in the decision area (including all federal mineral estate in PHMA) would be closed to new non-energy leasable mineral prospecting and exploration and leasing, including all of federal mineral estate with high phosphate potential in the decision area (42,700 acres), however new leases adjacent to existing operations would be allowed. This allowance for new leases adjacent to existing operations would reduce impacts on locatable minerals from the closure of PHMA to new non-energy leasable mineral leasing by allowing continued development around ongoing operations. These new leases would be subject to restrictive management which would likely preclude new surface development associated with new and existing phosphate leases, where existing surface infrastructure could be used for underground development on new leases development would continue, but if that were not feasible operations in PHMA could be forced to close once existing reserves are exhausted.

The mineral potential report for the Vernal RMP identifies continued development of phosphate on nonfederal mineral estate during the period of analysis (through 2017). It does not anticipate any development on federal mineral estate during the period of analysis. However, since completion of that report, the phosphate mine in PHMA has changed ownership. Given current mineral holdings on private lands, it is anticipated that mining operations will be able to continue on private lands for 15 years. However, as the current mine on private lands expands, it is foreseeable that existing mining operations would progress to the edge of the nonfederal mineral estate. Then, because development of federal mineral estate would likely not be consistent with the disturbance cap, the mine would have to be redirected to other areas with nonfederal minerals or change mining methods (e.g., underground mining).

These changes would increase the cost of phosphate mining or, if the cost were deemed too high by the developer, potentially result in phosphate ore being left in place on federal mineral estate. Depending on the size of the federal minerals tract, this could result in either a loss (temporary lack of mining) or waste (permanent lack of mining if the remaining federal mineral resource is not economical to return to develop later) of federal mineral resources. This is because the mine on private lands would be reclaimed, then, if at some future date the federal minerals are available for mining, the minerals on the federal tract would generally not be economical to return to mine. While mining operations would be able to continue, there would be an increase in costs to the mine to use underground mining, move operations around the federal tracts, or redirect to other portions of the private lands. Restricting access to phosphate could hamper the production of fertilizer products needed to produce food.

Sodium. Under Alternative 1, none of the federal mineral estate with sodium occurrence in the decision area would be open to non-energy leasable mineral leasing. This would reduce the availability and potentially the amount of development of sodium in Utah.

Wyoming Environmental Consequences

In Wyoming the Known Sodium Leasing Area would remain open to exploration and consideration for leasing and development but would be closed to prospecting permits. In the Kemmerer and Rock Springs Field Offices sodium leasing outside the Known Sodium Leasing Area would be considered on a case-by-case basis and would be subject to conditional requirements. Seasonal restrictions, and density and disturbance limits would be applied to nonenergy leasable mineral development.

Alternative 2

Rangewide Environmental Consequences

In PHMA all states would apply the same management and expect the same resulting impacts on non-energy leasable minerals as described under Alternative 1 above. The only change is that Nevada would add exception criteria to the closure in PHMA, described under the Nevada Environmental Consequences section below.

In GHMA all states would apply the same management and expect the same resulting impacts on non-energy leasable minerals as described under Alternative 1 above.

Montana, North Dakota, South Dakota, Nevada/California, and Oregon would apply the same mitigation as Alternative 1. BLM does not require compensatory mitigation but will enforce state mitigation policies and programs. Colorado and Idaho require mitigation resulting in no net loss. Utah and Wyoming removed the net conservation gain requirement. Colorado, Idaho, Nevada/California, Oregon, Utah, and Wyoming specify that compensatory mitigation would be voluntary unless required by laws other than FLMPA, or by the State.

Under Alternative 2, in all states except Montana and Wyoming, the 3% disturbance cap does not include wildfire or agriculture. In Idaho, the cap can be exceeded in utility corridors if it will benefit GRSG. In Utah the 3% disturbance cap can be exceeded if will benefit GRSG. The cap is applied at the BSU and project scale except in Idaho where it is applied at the BSU scale only. In Montana and Wyoming, a 5% disturbance cap is applied at the project area scale in PHMA, it includes disturbance from wildfire and agriculture.

Nevada Environmental Consequences

Nevada added exception criteria to the closure in PHMA, allowing leasing of non-energy leasable minerals under certain circumstances. This would improve the availability of non-energy leasable minerals in the planning areas compared to Alternative 1.

Alternative 3

Rangewide Environmental Consequences

Under this alternative, all PHMA and IHMA would be closed to new non-energy mineral leasing; there would be no GHMA. Impacts of this closure would be the same type as those described under Nature and Type of Effects. However, because 100 percent of the decision area (including acreage already closed) would be closed under Alternative 3, impacts would increase compared with Alternative 1. COAs would be applied to existing leases where applicable and feasible. These COAs would include no new surface occupancy on existing leases within 1 mile of active leks, and within 2 miles of active leks within PHMA. If the lease is entirely within the active lek buffer, require any development to be placed in the area of the lease least harmful to GRSG based on vegetation, topography, or other habitat features. This Alternative would limit

permitted disturbances to 1 disturbance per 640 acres average across the landscape in PHMA. Disturbances may not exceed 3 percent in PHMA in any biologically significant unit and proposed project analysis area.

Idaho Environmental Consequences

Impacts from Non-energy Solid Leasable Minerals Management

Impacts under Alternative 3 are the same as those described under Alternative 1, except that more acres would be affected by closures (21,629,700 acres, or 78 percent of the non-energy leasables decision area). As a result, the magnitude of impacts under this alternative would increase compared with Alternative 1 since 473 acres of existing phosphate leases on BLM-administered lands would occur in PHMA. Less than one percent of the acres closed to leasing would be within Known Phosphate Lease Areas. Because the number of unleased acres within Known Phosphate Lease Areas that are closed would increase compared with Alternative 1, impacts on non-energy solid leasable minerals would increase under this alternative.

Approximately 5,730 acres of existing unmined federal non-energy leasable mineral leases in PHMA and GHMA would be subject to RDFs. This would limit surface disturbance, vehicle use, siting, and design of mineral development operations, in addition to imposing reclamation requirements. Application of RDFs would have the types of impacts described under Nature and Type of Effects**.** Because these RDFs would not be applied under Alternative 1, impacts would increase under Alternative 3.

Under Alternative 3, 19,167,400 acres, or 69 percent of the federal non-energy solid leasable mineral estate decision area (including all federal non-energy solid leasable mineral estate in PHMA), would be closed to prospecting and leasing. New leases to expand existing mines for phosphate would not be permitted in areas managed as closed.

Utah Environmental Consequences

Under Alternative 3 all federal mineral estate in the federal mineral estate decision area (4,008,600 acres) would be closed to new prospecting and exploration and leasing. Management under this alternative would close more federal mineral estate to non-energy leasable mineral prospecting and exploration and leasing than management under Alternative 1. This allocation decision would impact gilsonite, phosphate, and sodium. New leases to expand existing mines for these minerals also would not be permitted. Closing areas to non-energy mineral leasing would result in the same type of impacts as those described under *Nature and Type of Effects*.

Under Alternative 3, exploration would be prohibited on all 4,008,600 acres of federal mineral estate within the decision area. Closing the decision area to exploration could reduce the availability of data on non-energy leasable mineral resources outside the decision area and could increase costs of non-energy leasable mineral development if it resulted in the need to conduct exploration for resources outside the decision area via less easily accessible locations than the locations within the decision area from which exploration might otherwise occur. Operators with existing leases would still be able to conduct new exploration on those leases.

Alternative 4

Rangewide Environmental Consequences

Under this alternative, non-energy leasable minerals would be managed the same as under Alternative 1; the impacts would be the same as described under Alternative 1 above, but would be applied to different HMA areas. In Idaho, 1 acre of existing phosphate leases would be within IHMA and 472 acres would be within GHMA.

Nevada and Northeastern California Environmental Consequences

In Nevada and northeastern California, exceptions to the non-energy leasable mineral closure in PHMA under may allow for increased development of non-energy leasable minerals in some locations.

Alternative 5

Rangewide Environmental Consequences

Under this alternative, non-energy leasable minerals would be managed the same as under Alternative 1; ; the impacts would be the same as described under Alternative 1 above, but would be applied to different HMA areas. In Idaho, no existing phosphate leases would be within HMAs on BLM-administered lands.

Nevada and Northeastern California Environmental Consequences

Impacts would be the same as described for Alternative 4.

Alternative 6

Rangewide Environmental Consequences

Under this alternative, impacts would be the same as described under Alternative 5 except that any existing non-energy leasable operations within ACECs would not be able to expand on federal mineral estate and no new operations would be permitted in ACECs.

4.10.3 Coal

Nature and Type of Effects

Closing an area to new coal leasing would directly impact coal production. This would be the result of removing the possibility of coal resources in that area from being accessed and extracted. In some cases mining operations may move to nearby private lands, thereby reducing the number of operations on federal mineral estate. Indirect impacts include loss of coal production for public use and for generating sales and tax revenues and federal royalties from production, as well as higher cost of location of surface facilities and adverse financial impact on lessee to accessing a portion of mineral estate from nearby private land.

Reduced access to existing coal leases such as NSO or equivalent on all or parts of new leases, ROW exclusions on lands needed for road and utility access, and restrictions on amount or location of surface disturbing activities on new or existing leases would impact coal production. Indirect impacts include reduced coal production for public use and for generating lease sales and tax revenues and federal royalties from production.

In areas with reduced access, applying NSO stipulations would restrict the ability of coal resources to be developed or extracted. To avoid these restrictions, operators may relocate, which would reduce coal development on federal mineral estate and resulting royalties.

Management actions creating ROW exclusion or avoidance areas could indirectly impact coal extraction by limiting the available means for accessing coal resources and transporting coal to processing facilities and markets. For example, new roads to access a mine could not be built in a ROW exclusion area. Coal operations may be moved to nearby state or tribal lands where access is easier, thereby reducing the number of operations on federal mineral estate. Because ROW avoidance areas could allow for limited ROW development, impacts of avoidance areas would be less severe than those of ROW exclusion areas. Impacts would be mitigated where exceptions were allowed for collocation of new ROWs within existing ROWs. Impacts would be mitigated where the area needed for coal processing and transportation infrastructure is included in the lease boundary. Indirect impacts include reduced coal production for public use and for generating lease sales and tax revenues and federal royalties from production.

Measures such as seasonal closures, burial requirements for electric distribution lines, noise abatement, visual screening, and specialized fencing would reduce development in otherwise permissible areas (fewer leases, fewer or smaller expansions of existing mines), particular for marginal coal resource areas or during periods of low market prices for coal. Indirect impacts include reduced production of coal for public use and for generating lease sale and tax revenues and federal royalties from production as well as adverse financial impact on lessee (especially for restrictions on existing leases).

Alternative 1

Rangewide Environmental Consequences

Under Alternative 1, Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming manage PHMA as "essential habitat" for unsuitability evaluation. In GHMA there is no state specified special coal management.

Idaho, Nevada, California, and Oregon did not address coal due to absence of coal mineral in deposits with a reasonably foreseeable possibility of development.

Colorado Environmental Consequences

Under this alternative, the BLM would find coal resources unsuitable for future leasing when GRSG cannot be adequately protected. In addition, the BLM would have flexibility in approving projects with adequate design and mitigation, subject to a 3 percent disturbance cap. Restrictions on land use and other authorizations would be included under the Alternative 1, as follows:

- Managing both PHMA and GHMA as ROW avoidance areas
- Prohibiting aboveground structures within 1 mile of active leks
- Restricting surface disturbance to 3 percent in PHMA

This Alternative provides opportunity for new or expanded mines, subject to restrictions on the amount of surface disturbance in PHMA and ADH areas.

Impacts of the restrictions and authorizations would be as described under *Nature and Type of Effects,* above.

Montana Environmental Consequences

Coal exploration under Alternative 1 would not be allowed on about 93,925 acres of BLM-administered coal mineral estate pursuant to 43 CFR Part 3410.1-1(a)(1) and 43 CFR Part 3465.1(d). About 13,659 acres where exploratory coal drilling would be disallowed fall within the areas designated as coal with development potential.

In areas where coal exploratory drilling would be allowed mitigation such as specialized design features, or requiring maintenance of habitat functionality or avoidance would likely be required. These actions would delay permitting and increase the operator's costs for exploratory coal drilling. However, requirements for specialized design features or mitigation would allow the operation to occur.

North Dakota Environmental Consequences

There has been no coal development within the planning area. While the Bowman-Gascoyne Known Recoverable Coal Resource Area intersects PHMA and GHMA, no additional development of this field is anticipated within the planning period. This Known Recoverable Coal Resource Area has low development potential, and no interest has been expressed in developing the area.

Lignite is being mined in other areas of the state. The Known Recoverable Coal Resource Area within the planning area was not designated as a Coal Study Area because it was determined not to have sufficient economic coal resources. Because no coal development is foreseeable in the planning area, coal resources in the planning area are not expected to be impacted by management actions proposed in this RMPA. However, potential future surface mining could be precluded as a result of suitability determinations in PHMA (87,443 acres) under Alternative 1.

Utah Environmental Consequences

Measures to protect GRSG and its habitat (disturbance cap, lek buffers, net conservation gain requirements, and restrictions on noise and season) could affect the feasibility of new underground coal leases or the expansion of existing underground operations (e.g., increased costs and development delays due to limits on the timing of activities) but would not preclude them.

Application of a 3.1-mile lek buffer could affect mine placement, though the required buffer distance could be adjusted based on local topography.

Wyoming Environmental Consequences

Consideration of coal leasing within GRSG core, connectivity, and general habitat areas would allow for future development of these resources. Areas available for coal leasing would be dependent on the results of the coal screening process and the application of appropriate mitigation measures. Allowing coal exploration would enhance the development of these resources. Designating PHMA as "essential habitat" for unsuitability evaluation would impact 338,533 acres which would restrict the ability to develop coal over 2% of GRSG habitat areas.

Alternative 2

Rangewide Environmental Consequences

In all states except Utah management and impacts on coal resources would be the same as described under Alternative 1. Colorado, Montana, North Dakota, South Dakota, and Wyoming all PHMA would be "essential habitat" for unsuitability evaluation. Idaho, Nevada California, and Oregon did not address coal due to absence of coal mineral in deposits with a reasonably foreseeable possibility of development.

Utah Environmental Consequences

In Utah essential habitat would be identified as part of future unsuitability criteria, compared to Alternative 1 where all PHMA would be considered as "essential habitat" for unsuitability evaluation this might give flexibility to consider leasing in small areas that were included in PHMA but do not meet the criteria for essential habitat, such as important connectivity areas. Impacts would likely be minimal because the amount of PHMA that does not meet essential habitat criteria is small. Impacts would otherwise be the same as described under Alternative 1.

Alternative 3

Rangewide Environmental Consequences

All areas managed for GRSG would be PHMA. All essential habitat would be identified as part of future unsuitability criteria. compared to Alternative 1 where all PHMA would be considered as "essential habitat" for unsuitability evaluation, this change in management might give flexibility to consider leasing in small areas that were included in PHMA but do not meet the criteria for essential habitat, such as important connectivity areas. Impacts of this management change would likely be minimal because the amount of PHMA that does

not meet essential habitat criteria is small. Impacts of this alternative would otherwise be the same as described under Alternative 1.

Idaho, Nevada, California, and Oregon did not address coal due to absence of coal mineral in deposits with a reasonably foreseeable possibility of development.

Alternative 4

Rangewide Environmental Consequences

Under Alternative 4 the consideration of PHMA as essential habitat for unsuitability evaluation in CO, MT/DK, UT, and WY state that PHMA would be removed as some areas of PHMA do not meet essential habitat criteria. However almost all essential habitat is likely to overlap with PHMA so the impacts would be approximately the same as described under Alternative 1. The plan will not modify any existing suitability and unsuitable determinations. The proposed management under this alternative would apply rangewide, but the planning area in Idaho, Nevada, California, and Oregon does not have coal mineral in deposits with a reasonably foreseeable possibility of development so no impacts on coal would occur in these states.

Alternatives 5 and 6

Rangewide Environmental Consequences

The proposed management and impacts under Alternatives 5 and 6 would be the same as under Alternative 4.

4.10.4 Locatable Minerals

Nature and Type of Effects

Under Alternative 3, BLM would recommend that certain areas are withdrawn from location and entry under the Mining Law. Recommending areas for closure to the mining laws for locatable exploration or development does not restrict any activities and therefore, such recommendation does not have any impacts. However, the BLM could ask the Secretary of the Interior to propose and make a withdrawal of the land from location and entry under the Mining Law of 1872 pursuant to Section 204(a) of FLMPA. Proposing and making a withdrawal is not a land use planning process. Should the Secretary propose a withdrawal, the proposal would require environmental and other analysis under NEPA and other applicable authorities before the land could be withdrawn. For purposes of this planning initiative, the alternatives analysis includes a description of the likely environmental effects should the Secretary propose and make a withdrawal in the future (e.g., reduced potential for behavioral disturbance and habitat loss/alterations).

If lands are withdrawn by the Secretary, the only locatable mineral resources that may be developed on withdrawn lands during the term of the withdrawal are those associated with mining claims that the BLM has determined to be valid; consequently, production of locatable mineral resources on federal mineral estate may decrease during the term of the withdrawal if such resources are situated on lands where there are no valid mining claims. However, if minerals of interest are not known to occur on the lands within the withdrawal, then the withdrawal would not have an effect, even where there are no mining claims.

Even where there are valid claims existing as of the effective date of the withdrawal or preceding segregation, production of locatable mineral resources may also be reduced by a withdrawal due to the additional administrative and financial requirements associated with exploration and mining on withdrawn lands. For example, BLM will not approve a plan of operations to proceed on withdrawn lands until it verifies that each mining claim on the lands where the proposed surface disturbance will occur was valid before the date of withdrawal and continues to be valid. This BLM verification process can take several years in some cases. Additionally, operators are required by regulation to pay the cost for BLM's verification of mining claim

validity. Taken together, the additional regulatory process and cost could delay or curtail mineral exploration and development on withdrawn lands during the term of the withdrawal, assuming minerals of interest occur within the withdrawn lands. Indeed, in BLM's experience, few operators have been willing to undertake the time and expense associated with verification of mining claim validity.

The BLM may designate areas as ACECs as a conservation measure. Designating areas as ACECs in an RMP could impact production of locatable mineral resources because such designations would impose additional administrative and financial requirements certain exploration operators. Specifically, operators are required to file a plan of operations for any surface disturbing activities in those areas greater than casual use, regardless of the acreage involved, in accordance with 43 CFR Part 3809.11(c)(3). The requirement for plans of operations within ACECs could result in longer timeframes and additional costs to developers (including the cost of preparing an EIS, if an EIS is required) for those exploration operations occurring on fewer than five acres that would otherwise have been allowed under a notice.

Under all alternatives, BLM would request that locatable mineral operations apply design features to locatable minerals operations to benefit GRSG. These measures could be voluntarily implemented by the operator and would become enforceable if incorporated in the plan of operations approval. To the extent a design feature or best management practice to benefit GRSG is required to comply with applicable state or federal law, or is otherwise required to prevent unnecessary or undue degradation as defined in 43 CFR Part 3809, BLM may require the operator to incorporate the design feature or best management practice in its plan of operations.

Where disturbance caps are applied, surface disturbance from locatable operations would be counted towards the disturbance cap, but BLM may not prevent, unduly restrict, or require operations to perform compensatory mitigation in areas where the disturbance cap was exceeded.

Alternative 1

Rangewide Environmental Consequences

In all states, Alternative 1 recommended the withdrawal of all SFAs from location and entry under the United States mining laws. After publication of the RODs in 2015, the BLM applied for these lands to be withdrawn and the Secretary accepted the application. The BLM then initiated a process to consider the withdrawal, pursuant to section 204 of FLPMA. That process is currently underway. If the Secretary decides to withdraw the proposed lands, this would likely result in a decrease in the exploration and development of locatable minerals in these areas. The types of impacts are the same as those described under *Nature and Type of Effects*. Application of seasonal restrictions, if deemed necessary in other areas, could restrict the timing, feasibility, or costs associated with locatable mineral development.

Colorado Environmental Consequences

Under Alternative 1, locatable minerals operations in PHMA would require appropriate effective mitigation for conservation to the extent necessary to comply with the standards and requirements under 43 CFR Subparts 3715, 3802, and 3809. Also, seasonal restrictions would be applied if deemed necessary to comply with the standards and requirements under 43 CFR Subparts 3715, 3802, and 3809. In ADH areas and in PHMA where mitigation is not otherwise required to comply with the standards and requirements, operators could be requested to voluntarily agree to suggested design features.

Access roads needed to access claims or mines would be constructed in accordance with 43 CFR Part 3809.420(b) and applicable MSHA or State standards. If it is determined by the authorized officer that an

engineered road is warranted, then BLM would typically require engineered design by the operator. This would also apply where an engineered road is warranted for exploration activities.

Idaho Environmental Consequences

Under Alternative 1, 2,968,200 acres of federal locatable mineral estate (including all acres in the SFA) were recommended for withdrawal from location and entry under the United States mining laws. The BLM initiated a separate process for the Secretary to consider whether to withdraw these lands, pursuant to section 204 of FLPMA. That process is currently underway. If the Secretary ultimately withdraws all of these lands, when combined with the 5,380,200 acres already withdrawn, the acreage of withdrawn federal lands in the decision area would total 8,348,400 acres, or 28 percent of the federal locatable mineral estate.

Of the 56 plans of operations and notices currently authorized within the decision area for Alternative 1, 7 (13 percent) are on lands that would be within the SFA under this alternative and therefore within the area previously recommended for withdrawal.

Nevada-California Environmental Consequences

Under Alternative 1, 2,731,600 acres of the decision area were recommended for withdrawal from mineral entry. As mentioned above, pursuant to the separate process currently underway, if the Secretary ultimately withdraws all of these lands, when combined with the 521,600 acres already withdrawn, the acreage of withdrawn federal lands in the decision area would total 3,253,200 acres, or 20 percent of the federal locatable mineral estate, and 80 percent (13,273,400 acres) are not recommended for withdrawal.

Alternative 1 would require RDFs to all GRSG habitat as additional conservation measures where necessary to comply with the applicable standards and requirements under 43 CFR Subparts 3715, 3802, and 3809.

North Dakota and South Dakota Environmental Consequences

In North Dakota and South Dakota zero acres were recommended for withdrawal from mineral entry.

Oregon Environmental Consequences

Under Alternative 1, 1,835,800 acres of the decision area, specifically land designated as SFA, were recommended for withdrawal from mineral entry. As mentioned above, pursuant to the separate process currently underway, if the Secretary ultimately withdraws all of these lands, when combined with the 1,435,900 acres already withdrawn, the acreage of withdrawn federal lands in the decision area would total 3,271,700 acres, or 23 percent of the federal mineral estate decision area.

Under this alternative, 117 mining claims, 1 plan of operations, and 9 exploration notices would be in the SFA. As such, all would be in the area that was recommended for withdrawal. This represents 21 percent of the 609 claims, plans, and notices in occupied GRSG habitat.

Under Alternative 1, 715,049 acres of BLM-administered surface in the decision area would be designated as ACECs. A plan of operations would be required for exploration operations disturbing five acres or less in these ACECs**.**

Utah Environmental Consequences

Under Alternative 1, 235,000 acres (6 percent) of the decision area, including the SFA, were recommended for withdrawal from mineral entry. As mentioned above, pursuant to the separate process currently underway, if the Secretary ultimately withdraws all of these lands, when combined with the 445,900 acres already withdrawn, the acreage of withdrawn federal lands in the decision area would be total 680,900 acres.

Under Alternative 1, 1,800 acres (less than 1 percent) of federal mineral estate with high potential in the decision area was recommended for withdrawal.

Of the 39 existing authorized locatable mining operations in the decision area, none would be in the SFA under Alternative 1. However, 11 mining claims would be in the SFA. As mentioned above, pursuant to the separate process currently underway, if the Secretary ultimately withdraws all lands in SFA, as recommended under Alternative 1, BLM would not authorize new operations on any existing mining claims in SFA until BLM confirmed that the mining claim was valid on the date of the withdrawal and remains valid.

Under Alternative 1, BLM could limit surface-disturbance in PHMA if necessary to comply with the standards and requirements in 43 CFR Parts 3715, 3802, or 3809. Similarly, BLM would apply the disturbance cap, minerals/energy density, RDFs, and seasonal restrictions in PHMA and mitigation for net conservation gain and lek buffers in PHMA and GHMA if necessary to comply with the standards and requirements in 43 CFR Parts 3715, 3802, or 3809 and prevent unnecessary or undue degradation.

Wyoming Environmental Consequences

On BLM-administered lands the BLM previously recommended for withdrawal from mineral entry within SFA portions of PHMA of 1,146,130 acres. As mentioned above, pursuant to the separate process currently underway, if the Secretary ultimately withdraws all of the recommendation, these withdrawals in combination with existing withdrawals on 1,761,550 acres, the total acreage of withdrawn federal lands in the decision area would total 2,907,680 acres.

Alternative 2

Rangewide Environmental Consequences

No recommendations for the withdrawal of SFAs from mineral entry are made under this alternative, except in Montana which would continue the recommendation for withdrawal of SFAs as described under Alternative 1. In all states, except Montana, the removal of any recommendation for withdrawal under Alternative 2 would have no impact. Recommendations to withdraw lands from location and entry under the Mining Law of 1872 have no impact. Only the Secretary or her designee may withdraw lands and this is done not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

Montana Environmental Consequences

Montana did not remove the recommendation for withdrawal of SFAs from mineral entry as described under Alternative 1. Impacts on locatable minerals in Montana under Alternative 2 would be the same as described under the *Montana Environmental Consequences* section of Alternative 1.

Alternative 3

Rangewide Environmental Consequences

Under Alternative 3, all PHMA would be recommended for withdrawal from mineral entry. Impacts would be similar in nature and type to those described under Alternative 1, but a much larger area would be recommended for withdrawal under this alternative (see **Table 2-3** which shows the acres of PHMA by state). If the Secretary were to decide to withdraw these areas, after the completion of the process outlined in section 204 of FLPMA, there may be limited opportunities for locatable mineral development in the decision area as described in the *Nature and Type of Effects*.

Alternatives 4 and 5

Rangewide Environmental Consequences

Alternative 4 would not designate any SFAs and would not recommend any areas for withdrawal from mineral entry. The impacts on locatable minerals under this alternative would be the same as described under Alternative 2. This alternative would not recommend the modification of any existing withdrawals or modify any existing recommendations for withdrawal not associated with GRSG management.

Montana Environmental Consequences

In Montana under Alternative 4, no SFAs would be designated and no recommendations for withdrawal would be made. Just as in Alternative 1, the removal of any recommendation for withdrawal under this alternative would have no impact.

Alternative 6

Rangewide Environmental Consequences

Alternative 6 would designate ACECs in the same areas as under Alternative 3, along with a requirement (per 43 CFR Part 3809.11(c)(3)) to prepare a plan of operations for exploration operations disturbing five acres or less. Processing plans of operations is more time-consuming than processing an exploration notice. Additionally, designation of an ACEC would increase costs to those operators who would otherwise conduct exploration under a notice, and potentially reduce development of locatable mineral resources on BLM-administered mineral estate in the planning area that would have resulted from exploration that could have been done under a notice.

4.10.5 Mineral Materials

Nature and Type of Effects

The predominant mining method for mineral materials is surface mining; therefore, any restrictions on surface-disturbing activities effectively close the subject areas to mineral material mining unless an exception is provided. Demand for mineral materials is generated primarily from road maintenance needs, as well as commercial projects and public use. Closing areas to mineral material disposal would directly impact mineral materials by removing the possibility of mineral resources in that area from being accessed and extracted for use. In areas closed to mineral material disposal users would have to transport materials needed for road maintenance and other uses from farther away resulting in increased costs associated with transportation of the material and make projects more expensive to pursue in some areas which would cause cancelled projects and poorer road conditions in some areas. Where areas are closed to mineral material disposal, new pits could relocate to nearby areas open to disposal if feasible. If demand for mineral materials could not be met by pits operated on federal lands, pits could be moved onto private or state lands where resources exist, this would generally increase costs associated with road construction and maintenance and other uses conducted by state, county and local governments which are able to develop federal mineral materials free of charge under free use permits. Closing an area to mineral material sales but not to new free use permits would remove this impact of increased costs from road maintenance and other mineral material uses by state, county, and local governments and non-profit organizations which are eligible for free use permits, but would still result in impacts on commercial and private users. Another effect is the potential for mineral materials mining to shift from BLM to state or private lands. In that case, the impacts of mining (such as noise, dust and truck traffic) could be shifted to areas where such impacts would be a nuisance to farmers and residential areas. Management which proposes closing existing mineral materials pits would exacerbate these impacts by causing more immediate relocation of sources and reductions in mineral materials production. In areas where closed but with an exception for expansion of existing pits impacts on

both private users and state, county and local governments would likely be reduced in the short term as these users could continue using existing sources, but if resources at and around existing locations are exhausted as is likely at some locations in the longer term

Applying TLs and seasonal travel restrictions could delay extraction of mineral material resources. County road districts and other users would be required to schedule their projects around the TL, which could result in the need to stockpile materials off-site and handle materials twice, thereby increasing costs.

Management prohibiting or restricting the construction of new roads and limiting reroutes and upgrades could make accessing mineral material deposits more costly or infeasible.

Managing areas as ROW avoidance or exclusion would decrease new construction of infrastructure (e.g., roads) and thereby decrease demand for mineral materials in those areas. This, in turn, could result in a decrease in the amount of material extracted, and the number or size of mineral material pits on federal mineral estate. In some cases, new mineral material pits may not be able to be developed in areas managed as ROW avoidance or exclusion because new infrastructure to these pits could not be constructed in exclusion areas and would be difficult to construct in avoidance areas. However, in many cases access needed is to a mineral material development is included as part of the permitted operational area and as a result would not need a separate ROW permit. Also, in most cases areas managed as ROW exclusion would also be managed as closed to mineral material development.

In ROW avoidance areas BLM may manage and maintain existing routes. Some route improvements could be made for fuel breaks and to allow for quicker wildfire suppression response in GRSG habitat. In these situations, there will be a demand material for road maintenance and improvement (via Free Use Permit to BLM) from pits in GRSG HMAs.

Closing areas to fluid mineral leasing would preclude oil and gas development in those areas which would reduce demand for mineral materials for use constructing well pads and roads. Application of NSO stipulations could have the same effect if the stipulations prevented oil and gas development.

Alternatives requiring restoration of salable mineral pits in HMA that are no longer in use, to meet GRSG habitat conservation objectives could depending on application, reduce the availability of salable minerals in some cases, for example if a pit with a history of only being used once every few years were considered no longer in use and closed for restoration it would no long be available.

Alternative 1

Rangewide Environmental Consequences

Under Alternative 1, PHMA would be closed to new mineral material sales, but open for new free use permits, and expansion of existing pits for both free use permits and material sales. As discussed under the *Nature and Type of Effects* heading this would prevent mineral materials from being sold from new locations, but would allow continued use of existing pits. It would also allow new free use permits in both existing and new locations, which would allow state, county, and local governments and non-profit organizations the flexibility to cost-effectively locate mineral material sources. This could result in the displacement of mineral material mining to different areas further from locations where they are needed which would increase costs associated with use. No states would close GHMA to mineral material disposal, but most would apply minimization measures such as RDFs/BMPs and mitigation. Colorado, Idaho and Wyoming would apply state specific management, discussed under the state specific headings for those states below.

Colorado Environmental Consequences

Under this alternative, PHMA would be closed to new mineral material sales, but open to new free use permits and expansion of existing pits where certain criteria are met.

Idaho Environmental Consequences

Under Alternative 1, 15,529,000 acres (56 percent) of federal mineral material estate in the decision area (including all PHMA) would be closed to mineral material disposal except for the expansion of existing pits, unlike other states, in Idaho this closure extends to new free use permits. Closing PHMA to new free use permits would result in increased costs to local government road departments for road maintenance and could result in worsening road conditions in these areas. Approximately 3,079,100 acres of federal mineral material estate in the decision area (including all IHMA) would be open to mineral material disposal but only if the Anthropogenic Disturbance Development and Criteria were satisfied (including the requirement that the project would not exceed the 3 percent disturbance threshold). Mineral material activities in IHMA and GHMA would also be subject to RDFs, buffers, and seasonal timing restrictions. The types of impacts from these closures are the same as those discussed under Nature and Types of Effects

Mineral material sales from the 47 existing community pits in GRSG habitat would be subject to timing restrictions. These timing restrictions could impact some operations and therefore reduce overall sales of federal materials in the planning area.

Impacts from Anthropogenic Disturbance Management, Adaptive Management, and Coordination

Under the Alternative 1, anthropogenic disturbance, including mineral material development, would be limited to 3 percent of nesting and wintering habitat within PHMA and IHMA within a Conservation Area (i.e., BSUs). In BSUs where the 3 percent cap is already exceeded, new development of federal mineral material resources would be prohibited until enough habitat was restored to maintain the area under the threshold. Development of federal mineral material resources that would result in exceedance of the 3 percent cap in a BSU would also be prohibited. This cap could potentially impact activities on 3,079,100 acres of federal mineral material estate in IHMA.

Nevada Environmental Consequences

Alternative 1 would require a 3 percent disturbance cap on human surface-disturbing activities in PHMA and would incorporate RDFs consistent with applicable law in PHMA, GHMA, and OHMA. It would also require all human disturbances to result in a net conservation gain for GRSG and their habitat, and lek buffers would be required.

Collectively, these GRSG management actions would result in the impacts described under *Nature and Type of Effects*.

Oregon Environmental Consequences

Application of the 3 percent disturbance cap and in PHMA and lek buffers in PHMA and GHMA could impact mineral material activities by preventing new surface development. New mineral material pits or expansion of existing pits could be precluded if the cap were exceeded in an Oregon PAC (also known as BSU) and proposed project area. In cases where development was allowed, mitigation requirements would increase the cost of development. Applying lek buffer distances when approving actions would also restrict mineral material development in some areas.

Utah Environmental Consequences

Under Alternative 1, the application of the 3 percent disturbance cap in PHMA could impact mineral material activities by preventing new surface development. New mineral material pits or expansion of existing pits could be precluded if the cap were exceeded in a BSU or a proposed project analysis area. In cases where development was allowed, mitigation requirements would increase the cost of development.

Applying lek buffer distances when approving actions for surface disturbance could restrict mineral materials development in GHMA and could cause development to move away from desired locations.

Under Alternative 1, all BLM-administered surface within GHMA would be available for ROW location, except for 17,600 acres already managed as exclusion. While these areas would be open, ROW development in GHMA would be subject to lek buffers and net conservation gain requirements, which could impact mineral material development as discussed above. If disturbance is pushed to areas without restrictions, then overall demand for mineral materials will not be affected. However, if the area of new disturbance decreases across the landscape, the demand for mineral materials could be reduced.

Under Alternative 1, PHMA would be closed to mineral material disposal. This includes 1,196,900 acres with mineral material occurrence. Impacts would be somewhat mitigated because new free use permits and expansion of existing pits would be allowed, subject to restrictions. The types of impacts from these closures would be the same as those discussed under *Nature and Type of Effects*. There are approximately 24,000 acres under a mineral material permit within GRSG habitat statewide. Further, with approximately 1,100 acres of existing disturbance associated with those mineral material pits there are opportunities for existing pits to expand within their existing permitted areas. Because less than 5 percent of the existing permitted area has been disturbed expansion would fall under the disturbance cap at the project level for most pits. Therefore, while there may be site-specific instances where a new pit in occupied GRSG habitat is denied, the potential for this is low because there is additional development opportunity at existing sites.

Wyoming Environmental Consequences

Under Alternative 1, in Wyoming salable mineral development (e.g., mineral material exploration, sales and free use permits) would be allowed in GRSG core, connectivity, general habitat areas which would allow for the continued use and development of these resources.

Prohibiting surface disturbing activities on 337,860 acres would result in the same type of impacts on mineral material development as those described under *Nature and Type of Effects*. Restricting surface disturbance on 160,630 acres Density limitations of a 5% disturbance cap within PHMAs (core only) would Prevent the development of new mineral material developments in areas at or above the cap. Prohibiting surface occupancy and disruptive activities within 0.6 miles of occupied leks and seasonal restrictions in GRSG nesting/early brood-rearing habitat and winter concentration areas could result increased cost associated with mineral material development as described under *Nature and Type of Effects*.

Applying RDFs as mandatory stipulations and conservation objectives and applying BMPs to federal mineral estate where the surface ownership is non-federal would result in increased development costs. Avoiding primary and secondary roads within 1.9 miles of the perimeter of occupied GRSG leks and prohibiting other new roads within 0.6 miles of the perimeter of occupied GRSG leks within PHMAs would reduce the area where new roads needed for mineral development could be constructed.

The management of ROW exclusion areas (285,930 acres) within PHMAs and GHMAs would prevent the construction of access roads for mineral material sites, however if mineral material development were

otherwise allowed in the area, sites could be constructed along existing roads which could reduce the impacts of this management.

Alternative 2

Rangewide Environmental Consequences

Under Alternative 2 proposed management and impacts would be similar to those described under Alternative 1, except in Idaho and Nevada.

Idaho Environmental Consequences

Under Alternative 2 in PHMA and IHMA managed as closed to mineral material development, Idaho would allow consideration of new free use permits. Compared to Alternative 1 this would reduce impacts on road conditions and high road maintenance costs on local governments which would no longer have to transport mineral materials required for road maintenance from outside these areas. Impacts would otherwise be the same as described under Alternative 1.

Nevada Environmental Consequences

Under Alternative 2 Nevada would exception criteria to the mineral material disposal closure in PHMA. In PHMA, GHMA, and OHMA, the State Director (in coordination with NDOW, Sagebrush Ecosystem Technical Team, and/or CDFW) may grant an exception to the allocations and stipulations proposed if one of the following applies:

i. The location of the proposed activity is determined to be unsuitable (by a biologist with GRSG experience using methods such as (Stiver et al. 2015); lacks the ecological potential to become marginal or suitable habitat; and would not result in direct, indirect, or cumulative impacts on GRSG and its habitat. Management allocation decisions would not apply to those areas determined to be unsuitable because the area lacks the ecological potential to become marginal or suitable habitat.

ii. The proposed activity's impacts could be offset to result in no adverse impacts on GRSG or its habitat, through use of the mitigation hierarchy consistent with Federal law and the state's mitigation policies and programs. In cases where exceptions may be granted for projects with a residual impact, voluntary compensatory mitigation consistent with the State's management goals could be one mechanism by which a proponent achieves the RMPA goals, objectives, and exception criteria. When a proponent volunteers compensatory mitigation as their chosen approach to address residual impacts, the BLM can incorporate those actions into the rationale used to grant an exception. The final decision to grant a waiver, exception, or modification would be based, in part, on criteria consistent with the state's GRSG management plans and policies.

iii. The proposed activity would be authorized to address public health and safety concerns, specifically as they relate to federal, state, local government and national priorities.
iv. Renewals or re-authorizations of existing infrastructure in previously disturbed sites or expansions of existing infrastructure that do not result in direct, indirect, or cumulative impacts on GRSG and its habitat.

iv. The proposed activity would be determined a routine administrative function conducted by federal, state, or local governments, including prior existing uses, authorized uses, existing rights, and existing infrastructure (i.e., rights-of-way for roads) that serve a public purpose and would have no adverse impacts on GRSG and its habitat, consistent with the state's mitigation policies and programs.

v. Exceptions to lands that are identified for retention would be considered for disposal or exchange if they were identified for disposal through previous planning efforts, either as part of the due process of carrying out Congressional Acts (e.g., the respective Lincoln and White Pine County

Conservation, Recreation, and Development Acts) or the agency can demonstrate that the disposal, including land exchanges, would have no direct, indirect or cumulative impacts on GRSG and its habitat.

These criteria could increase the time to get approval for new mineral material developments but would also provide certainty about the conditions under which exemptions would be granted.

Alternative 3

Rangewide Environmental Consequences

Under Alternative 3, all areas managed for GRSG would be PHMA and salable minerals would be closed to disposal in all PHMA. Some states are considering expanding HMAs to include areas of adjacent non-habitat, unoccupied historic habitat, or areas with potential to become habitat as PHMA. Impacts would be the same as described under *Nature and Type of Effects* but would apply across a much larger area than under Alternative 1, the magnitude of all impacts would increase under this alternative.

ACECs would also be considered under this alternative, though because of the restrictive nature of the PHMA management under this alternative, there would be no different allocations between the PHMA and the potential ACEC boundaries.

Under Alternative 3 all PHMA would be managed as ROW exclusion (outside of designated corridors), however, because all PHMA would be closed to mineral materials disposal under this alternative, the ROW exclusion areas would not impact the mineral materials program.

This alternative has the greatest impacts on salable minerals because restrictions would be applied to the greatest number of acres, increasing the potential for reduced availability, reduced access, and increased development costs for accessing salable minerals.

Colorado Environmental Consequences

For existing mineral material disposal sites, no new road construction would be permitted within a 4-mile buffer of a GRSG lek. Road realignments or route upgrades could occur only in certain specified situations, and closing and revegetating unneeded routes to restore GRSG habitat would apply in ADH and PHMA.

Oregon Environmental Consequences

Under Alternative 3, existing mineral materials pits in occupied habitat would also be closed to new sales. The impacts from this closure would be the same as those discussed under *Nature and Type of Effects* but impacts on availability of mineral materials would occur more quickly in Oregon because existing sites in closed areas could not continue to supply mineral materials.

Alternatives 4 and 5

Rangewide Environmental Consequences

Under Alternatives 4 and 5, proposed management and impacts on mineral material development would be the same as described under Alternative 1, except in Idaho as discussed under the state specific heading below.

Idaho Environmental Consequences

In Idaho, exceptions to the mineral material closure in PHMA under Alternative 2 may allow for increased development of mineral materials in some locations.

Alternative 6

Rangewide Environmental Consequences

Under Alternative 6, proposed management and impacts on mineral material development would be the same as described under Alternative 4, except that ACECs would also be considered under this alternative. Under Alternative 6, ACECs would be closed to new all new mineral material sales and operations, except for free-use permits issued in order to support maintenance needs for existing local roads to ensure public safety. New mineral material sites for free-use should avoid ACECs, however if avoidance is not possible sites would need to comply with all the minimization measures identified for PHMA.

4.10.6 Oil Shale and Tar Sands

Nature and Type of Effects

Certain management actions and allocation-based decisions could impact the feasibility, amount, and type of development. For example, depending on the alternative selected, areas within GRSG habitat may be subject to surface disturbance thresholds, timing restrictions, and other GRSG protection measures. In addition, managing surrounding lands as ROW exclusion or avoidance areas could impact road and facility construction to access and develop those leases.

Alternative 1

Rangewide Environmental Consequences

Colorado, Idaho, Utah, and Wyoming contain significant oil shale resources overlapping the planning area. Colorado, Idaho, and Wyoming manage these resources the same as fluid leasable minerals so management and impacts would be same as described under Fluid Minerals Alternative 1 in **Section 4.10.1**, above.

Proposed management and impacts in Utah are described below. Tar sands resources overlapping the planning area only exist in Utah, management and impacts on tar sands in Utah are described below.

In Utah, the BLM anticipates differing effects for this oil shale and tar sands. See the Utah Environmental Consequences for oil shale and tar sands.

Utah Environmental Consequences

Alternative 1 does not include leasing allocation decisions for oil shale and tar sands in Utah because the ROD for the Allocation of Oil Shale and Tar Sands Resources on Lands Administered by the BLM in Colorado, Utah, and Wyoming closed all mapped occupied GRSG habitat on BLM-administered lands to oil shale and tar sands leasing and development with the exceptions of the pending lease application in the Asphalt Ridge Special Tar Sands Area and the White River Oil Shale Research, Development, and Demonstration site and Preference Lease Right Area (BLM 2013). Within these two areas, leasing and development would be allowed to occur; however, certain management actions and allocation-based decisions being considered could impact the feasibility, amount, and type of development. For example, depending on the alternative selected, GRSG habitat that overlaps the above-mentioned areas may be subject to surface disturbance thresholds, timing restrictions, and other GRSG protection measures. In addition, managing surrounding lands as ROW exclusion or avoidance areas could impact road and facility construction to access and develop those leases.

Under Alternative 1, no disturbance cap would be applied to anthropogenic disturbance in GHMA. Because the existing and pending leases would be in GHMA under this alternative, oil shale and tar sands development could continue to occur subject to stipulations and other restrictions applied in the Vernal RMP (for the White River Oil Shale Preference Right Lease Area) and site-specific NEPA analyses.

However, oil shale and tar sands development in GHMA would be subject to RDFs, lek buffers, and net conservation gain requirements, which could impact oil shale and tar sands development by restricting new surface development. GHMA would be available for the types of ROW location needed for oil shale and tar sands development. However, ROW development in GHMA would be subject to lek buffers and net conservation gain requirements. Applying lek buffer distances when approving actions for linear features, infrastructure related to energy development, tall structures (including transmission lines), surface disturbance, and noise could also restrict development of infrastructure related to oil shale and tar sands development.

Alternative 2

Rangewide Environmental Consequences

Colorado, Idaho, Utah, and Wyoming contain significant oil shale resources overlapping the planning area. Colorado, Idaho, and Wyoming manage these resources as fluid leasable minerals so management and impacts would be same as described in under Fluid Minerals Alternative 2 in **Section 4.10.1**, above. Management and impacts in Utah are described below. Tar sands resources overlapping the planning area only exist in Utah, management and impacts on tar sands in Utah are described below.

In Utah, the BLM anticipates differing effects for this oil shale and tar sands. See the Utah Environmental Consequences for oil shale and tar sands.

Utah Environmental Consequences

Alternative 2 does not include leasing allocation decisions for oil shale and tar sands in Utah because the ROD for the Allocation of Oil Shale and Tar Sands Resources on Lands Administered by the BLM in Colorado, Utah, and Wyoming closed all mapped occupied GRSG habitat on BLM-administered lands to oil shale and tar sands leasing and development with the exceptions of the pending lease application in the Asphalt Ridge Special Tar Sands Area and the White River Oil Shale Research, Development, and Demonstration site and Preference Lease Right Area (BLM 2013). Within these two areas, leasing and development would be allowed to occur; however, certain management actions and allocation-based decisions being considered could impact the feasibility, amount, and type of development. For example, depending on the alternative selected, GRSG habitat that overlaps the above-mentioned areas may be subject to surface disturbance thresholds, timing restrictions, and other GRSG protection measures. In addition, managing surrounding lands as ROW exclusion or avoidance areas could impact road and facility construction to access and develop those leases.

Alternative 2, would allow exceptions for projects to exceed the disturbance and density caps in PHMA, and allow exceptions to avoidance and minimization measures in PHMA if the area is non-habitat and indirect impacts would not occur. Allowing an exceedance to the disturbance and density caps based on site-specific habitat condition, population information, and proponent-volunteered project design elements could allow mineral development to proceed in areas that might otherwise have been precluded by the No-Action Alternative. Allowing consideration or proposed developments that could exceed the 3 percent disturbance cap or density cap provides the ability to potentially avoid precluding leasing/permitting, development, or consideration of associated infrastructure. However, authorizing the exceedances to the disturbance and density caps would only be allowed if voluntarily developed minimization or mitigation improves GRSG habitat. As such, while there is more flexibility and projects may no longer be precluded by the caps, proponents with potential developments may still need to evaluate GRSG conditions or propose habitat improvement projects. While projects may not be precluded by the caps, voluntarily applying the criteria could result in additional costs to implement mitigating measures. This could increase project costs and

could make a proposed project uneconomical. Allowing exceptions to avoidance and minimization measures in PHMA if the area is non-habitat and indirect impacts would not occur could allow consideration of leasing/permitting and development for mineral operations.

Alternative 2 would also would no longer require proponents to provide for compensatory mitigation on a project-by-project basis to show a net conservation gain. The BLM would cooperate with the State of Utah to analyze applicant-proposed, or state required or recommended compensatory mitigation to offset residual impacts. BLM may authorize such actions consistent with NEPA analysis and the governing RMP. Not requiring proponents to pay for vegetation and habitat treatments could decrease project costs, providing more opportunities for oil shale and tar sands development projects to move forward in PHMA and former GHMA.

Alternative 3

Rangewide Environmental Consequences

Colorado, Idaho, Utah, and Wyoming contain significant oil shale resources overlapping the planning area. Colorado, Idaho, and Wyoming manage these resources as fluid leasable minerals so management and impacts would be same as described in under Fluid Minerals Alternative 2 in **Section 4.10.1**, above. Management and impacts in Utah are described below. Tar sands resources overlapping the planning area only exist in Utah, management and impacts on tar sands in Utah are described below.

In Utah, the BLM anticipates differing effects for this oil shale and tar sands. See the Utah Environmental Consequences for oil shale and tar sands.

Utah Environmental Consequences

Under Alternative 3, disturbance in PHMA would be subject to a 3 percent cap, which would include wildfire. Approximately 2,320 acres of the White River Oil Shale Preference Right Lease Area and all 2,120 acres of the pending federal lease within the Asphalt Ridge Special Tar Sands Area would be in PHMA. The Uintah Population Area, where the White River Oil Shale Preference Right Lease Area is located, is currently just under the 3 percent disturbance cap. New development could push the area over the cap and prevent new surface disturbance in this portion of the Preference Right Lease Area until areas are reclaimed to the point where disturbance is below the threshold. All BLM-administered surface in PHMA would be managed as exclusion under Alternative 3. There could be indirect impacts resulting from the limits on access and the available means for transporting oil shale and tar sands to processing facilities and markets.

Alternatives 4 and 5

Rangewide Environmental Consequences

Under Alternatives 4 and 5, proposed management and impacts on oil shale and tar sands development would be the same as described under Alternative 1.

Alternative 6

Rangewide Environmental Consequences

Under Alternative 6, proposed management and impacts on oil shale and tar sands development would be the same as described under Alternative 1, except that ACECs would also be considered under this alternative. Under Alternative 6, ACECs would have NSO stipulations applied to leases which could increase the costs of development or prevent the development of some oil shale and tar sands in the planning area.

4.11 ACECs AND RESEARCH NATURAL AREAS

4.11.1 Greater Sage-Grouse ACECs

General Description

ACEC designations highlight areas where special management attention is needed to protect important historical, cultural, and scenic values, or fish and wildlife or other natural resources. This analysis identifies impacts among the alternatives for other resources and resource uses to prevent irreparable damage to the relevant and important values associated with each ACEC within the rangewide planning area (see **Section 3.10.1**, Greater Sage-Grouse ACECs for existing conditions of ACECs that overlap mapped occupied GRSG habitat). The analysis of impacts on ACECs is necessarily an analysis of impacts on the relevant and important values that are given special management attention through the designation of ACECs. For a more nuanced exploration connecting the *Nature and Type of Effects* with specific relevant and important values, refer to **Appendix 5**, Evaluation of Areas of Critical Environmental Concern for Greater Sage-Grouse Habitat. A complete evaluation of impacts on these relevant and important values is incorporated here and into the appropriate impact analysis sections addressing Cultural Resources (**Section 4.16**), Soil Resources (**Section 4.14**), Water Resources (**Section 4.15**), Vegetation Management (**Section 4.3**), and Fish and Wildlife (**Section 4.5**).

4.11.2 Nature and Type of Effects

In general, management actions that protect resources (such as surface-disturbance restrictions and management for desired habitats) would help maintain and improve the relevant and important values within ACECs. Management actions that create the potential for resource degradation (such as mineral development, improper livestock grazing, infrastructure development, and other surface-disturbing activities) could impact the relevant and important values for which an ACEC is designated.

Improper livestock grazing could impact ACEC values, depending on what the values are for each ACEC, by increasing the potential for soil erosion, increasing annual grasses, reducing perennial native vegetation, and affecting the plant communities that are the values for which the ACEC was designated. As another group of large grazing ungulates, wild horses and burros, have the capability of overutilizing vegetation, causing degradation of soil and vegetative resources as described for livestock grazing. Closing ACECs to livestock grazing could help protect relevant and important values by eliminating soil and vegetation disturbance associated with livestock grazing; however, this could also increase the risk for wildfire due to increased fuel loads. Further, as described in **Section 2.9.7**, livestock grazing is managed to meet or make progress toward land health standards, thus reducing the likelihood of adverse effects.

Energy and mineral development could impact ACEC values by increasing soil erosion potential and by removing or disrupting unique vegetation. Where GRSG habitat exists, energy and mineral development could degrade and fragment habitat. Construction, operation, and maintenance could disturb GRSG populations. However, the protections and limitations needed to maintain the relevant and important values of each ACEC are included in the plans that manage those ACECs. Additionally, closing ACECs to fluid mineral leasing or applying NSO stipulations would help protect relevant and important values in unleased areas.

Identifying ACECs as ROW exclusion or avoidance areas would protect relevant and important values by reducing (for avoidance areas) or eliminating (for exclusion areas) impacts from development requiring a ROW permit. Such developments include utilities, access roads, and renewable energy projects. Impacts from ROW development on GRSG habitat include compaction, erosion, and potentially habitat fragmentation.

PHMA, IHMA, and GHMA allocations provide a comprehensive management framework, covering a diverse array of management actions and restrictions in Alternatives 1-6, effectively capturing GRSG habitat and most ACECs. However, ACEC designation adds a layer of specificity, enabling a more targeted approach to address unique relevant and important values that might not be fully covered by the broader allocations. ACEC designation emphasizes and prioritizes specific concerns within designated areas, offering a mechanism to address nuances that may not be sufficiently addressed by the overarching PHMA/IHMA framework.

4.11.3 Alternative 1

Rangewide Environmental Consequences

Under Alternative 1, PHMA, IHMA and GHMA would continue to be available for livestock grazing, except in Oregon where all or portions of RNAs would be unavailable. The BLM would continue to prioritize monitoring and renewal of grazing in SFAs and PHMA outside of SFAs. Impacts on the relevant and important values from areas available to livestock grazing would continue to be determined by variations in site-specific management actions that strive to minimize concentrated compaction and aim to maintain or improve soil conditions. Within the areas available for livestock grazing, the appropriate BLM Authorized Officer may include or adjust permit terms and conditions needed to meet land health standards. In turn, these management actions would continue to help minimize local impacts on relevant and important values from the areas available to livestock grazing, which would also help minimize rangewide impacts for long-term relevant and important values as described under the *Nature and Types of Effects*.

Under Alternative 1, management of fluid minerals, salable minerals, and nonenergy mineral development in PHMA, GHMA, and IHMA would continue to vary by state and includes areas that are open or closed (see **Chapter 2** alternatives for minerals management). These various restrictions on areas of land protected from or open to surface disturbing activities within PHMA, IHMA, and GHMA would continue to help minimize impacts on the relevant and important values as described under the *Nature and Types of Effects*.

Classifying PHMA as exclusion or avoidance areas to major and minor ROWs and wind and solar would continue to decrease the potential for impacts on relevant and important values associated with ROW development, such as the surface-disturbing activities described under the *Nature and Types of Effects*. This is because development of ROWs would be prohibited in exclusion areas and would be considered on a case-by-case basis in avoidance areas.

Other restrictions on ROWs, such as requirements to meet the Anthropogenic Disturbance Screening Criteria and measures to encourage collocation would protect relevant and important values from the surface-disturbing activities as described under *Nature and Types of Effects*. GHMA in all states would continue to be open to minor ROWs with mitigation measures, except Wyoming would not require mitigation. Impacts on relevant and important values associated with these surface-disturbing activities could occur in these areas if developed, but mitigation measures would help to lessen the impacts.

State-Specific Environmental Consequences

In Oregon, where all or portions of RNAs would be unavailable to livestock grazing, the potential impacts on the relevant and important values from areas open to livestock grazing would be eliminated.

In Wyoming and Montana, fluid mineral development in PHMA would continue to be subject to density and disturbance limits. Implementing density and disturbance limits would continue to reduce potential impacts on relevant and important values associated with fluid mineral development as described under the *Nature and Types of Effects*, but to a lesser extent than if they were closed to fluid mineral development or classified as NSO. GHMA would continue to be subject to NSO stipulations for fluid mineral development within two

(Colorado), one (Oregon) or 0.25 (Wyoming) miles of leks. GHMA in Utah would also continue to be subject to NSO stipulations but the distance varies by site-specific management. PHMA and GHMA in Colorado and GHMA in Oregon would continue to be closed to fluid mineral development within one mile of leks. Fluid mineral development would continue to be subject to Controlled Surface Use (CSU, seasonal restrictions and/or buffers) stipulations in Idaho, Nevada/California Oregon, Wyoming GHMA. Applying these restrictions to fluid mineral development would continue to further reduce potential impacts on relevant and important values associated with fluid mineral development as described under *Nature and Types of Effects*.

For both salable mineral and nonenergy mineral development, Wyoming PHMA would continue to be subject to seasonal restrictions, while Wyoming and Montana PHMA would continue to be subject to density and disturbance limits. These additional restrictions would continue to further reduce potential impacts on the relevant and important values associated with salable mineral development as described under *Nature and Types of Effects*. In Idaho, IHMA would continue to be open to nonenergy mineral development in Known Phosphate Lease Areas; the impacts described under *Nature and Types of Effects* could occur in areas open to development.

PHMA in Wyoming would be open to minor ROWs with buffers and mitigation. Surface disturbance effects from ROWs could occur as described under *Nature and Types of Effects*; buffers and mitigation would help reduce the impacts on relevant and important values, but to a lesser extent than ROW exclusion and avoidance. GHMA in Wyoming would be open to minor ROWs and no mitigation measures would be required. There would be a greater potential for impacts on relevant and important values associated with ROWs in these areas.

Colorado, Nevada/California, Montana/Dakotas, and Oregon GHMA would continue to be identified as avoidance areas for major ROWs, which would continue to reduce impacts on relevant and important values associated with these surface-disturbing activities as described under *Nature and Types of Effects*. Idaho and Utah GHMA would continue to be open to major ROWs with minimization measures, while WY GHMA would continue to be open to major ROWs. Effects from ROWs could occur as described under *Nature and Types of Effects*; in Idaho and Utah, minimization measures would continue to help reduce the impacts, but to a lesser extent than ROW exclusion and avoidance.

In WY, PHMA would continue to be designated avoidance areas for wind development. Idaho IHMA would continue to be avoidance areas for solar and wind development. PHMA in Oregon would continue to be avoidance areas for wind and solar development in Lake, Harney, and Malheur Counties. Classifying PHMA as avoidance areas would continue to decrease the potential for impacts on relevant and important values from the surface-disturbing activities as described in *Nature and Types of Effects*, but to a lesser extent than exclusion areas. This is because development of ROWs would continue to be considered on a case-by-case basis in avoidance areas, whereas it would be prohibited in exclusion areas.

GHMA in Colorado, Nevada/California, and Oregon would continue to be avoidance areas for major ROWs and would continue to decrease the potential for impacts on relevant and important values associated with areas open to ROW development, such as the surface-disturbance as described in the *Nature and Types of Effects*. Opening Utah and Idaho GHMA to major ROWs with minimization measures would continue to increase the potential for impacts on relevant and important values, such as surface-disturbance, but mitigation measures would help to lessen the impacts. Opening GHMA in Wyoming to major ROWs would continue to increase the potential for impacts on relevant and important values, and there would be no mitigation measures to reduce the impacts.

GHMA in Colorado, Montana/Dakotas, Nevada/California, and Oregon would continue to be avoidance areas for wind development, and GHMAs in Colorado, Montana/Dakotas, and Oregon would be avoidance areas for solar development. GHMA in Nevada/California and Utah would continue to be exclusion areas for solar development. This would continue to decrease the potential for impacts on relevant and important values associated with areas open to wind and/or solar development. Because GHMA in Idaho, Utah and Wyoming would continue to be open to wind development and GHMAs in Idaho and Wyoming are open to solar development, there would continue to be a greater potential for impacts on relevant and important values as described in the *Nature and Types of Effects*.

4.11.4 Alternative 2

Rangewide Environmental Consequences

Under Alternative 2, impacts to relevant and important values from areas available to livestock grazing would be similar to those described under Alternative 1. However, there would be more exceptions to restrictions on areas available to livestock grazing than under Alternative 1, which would increase potential impacts on relevant and important values in PHMA or IHMA as described under the *Nature and Types of Effects*.

Impacts from areas open to fluid minerals in PHMA and GHMA would be similar to those described under Alternative 1, except in Colorado PHMA and Colorado GHMA (see state-specific environmental consequences below). Impacts from areas open to salable mineral management in PHMA and GHMA would be similar to those described under Alternative 1, except in Idaho IHMA and Nevada PHMA (see state-specific environmental consequences below). Impacts from areas open to nonenergy mineral management in PHMA and GHMA would be similar to those described under Alternative 1, except in Nevada PHMA (see state-specific environmental consequences below). Removing the recommendation for locatable mineral in SFAs in all states (except in Montana/Dakotas, which did not have a 2019 amendment), under Alternative 2, would increase the potential for impacts on relevant and important values caused by areas of land protected from or open to surface-disturbing activities. This is because locatable mineral activities could occur and cause negative impacts on relevant and important values as described under the *Nature and Types of Effects*.

Impacts from areas of land protected from or open to ROW and renewable energy management would be similar to those described under Alternative 1, with additional exception criteria in Nevada/California (see state-specific environmental consequences below).

Under Alternative 2, removing the prioritization objective for PHMA and GHMA would not directly impact relevant and important values because prioritization does not permit or preclude leasing in PHMA. The NSO stipulations and conservation measures in place for PHMA would protect relevant and important values; however, the prioritization objective could potentially result in temporarily deferring a parcel in PHMA from leasing to a later sale, but only in instances of large lease sales where staff capacity would be incapable to analyzing all the nominated parcels. In an area with high levels of disturbance, such a delay could provide time for vegetation conditions and soil health to improve before new developments are implemented. As the amount of development increases in former GHMA, the consecutive effects of mitigating disturbances in PHMA could mount and could possibly affect relevant and important values. Site-specific planning and other management from local resource management plans, and adhering to the land health standards, would reduce negative impacts on relevant and important values in former GHMA with the use of BMP and other project mitigation design features.

Under Alternative 2, a 5 percent disturbance cap would apply and would exclude wildfire. The disturbance cap would also not be calculated on all lands, regardless of ownership, but rather only federal and state lands.

By calculating the disturbance cap across such a large area, locally significant impacts could still occur even if the disturbance cap is not reached. As compared to Alternative 1, Alternative 2 would allow the 3 percent cap to be exceeded if a technical team determines the project, in concert with all its design features, will improve the condition of GRSG habitat. This action would allow projects to exceed the disturbance cap; however, in so doing, it could result in voluntary habitat improvement projects that could change vegetation conditions in the project area to shift away from a vegetation community more dominated by trees to one more dominated by grasses and shrubs, which could impact relevant and important values as described in the *Nature and Type of Effects*.

Under Alternative 2, ACEC relevant and important values would be the most adversely impacted as compared with Alternative 1. This is because no additional stipulations and caps on surface-disturbing activities would be included under this alternative.

State-Specific Environmental Consequences

Under Alternative 2, removing the closure of Colorado PHMA to fluid mineral development would increase potential for surface-disturbing impacts on relevant and important values, as compared to Alternative 1. This is because mineral development activities could occur in previously closed areas and cause negative impacts as described under *Nature and Types of Effects*. Changing GHMA from closed to fluid mineral development to NSO would likely not change impacts on relevant and important values because the NSO stipulation would avoid potential for areas available to surface-disturbing activities.

Compared with Alternative 1, the additional exception criterion to salable and nonenergy mineral closures for Nevada PHMA and allowing consideration of new free use permits for salable minerals in Idaho IHMA would increase the potential for associated impacts on relevant and important values as described under the *Nature and Types of Effects*. This is because there would be a greater chance for salable and/or nonenergy mineral activities to occur in these areas.

Under Alternative 2, there would be an additional exception criterion for ROW and wind and solar development in Nevada PHMA and for wind development in Nevada/California GHMA. Compared with Alternative 1, this could increase the potential for impacts on relevant and important values associated with ROW and renewable energy development because there would be a higher chance of development. However, the exception criteria would likely avoid major impacts on relevant and important values.

4.11.5 Alternative 3

All areas managed for GRSG would be PHMA (**Table 2-3**). **Table 2-14** presents the acreage totals for ACECs across different alternatives. Compared with Alternative 1, Alternative 3 would contain greater restrictions on other resources and would most greatly reduce the potential for impacts on relevant and important values as described under the *Nature and Type of Effects*.

Under Alternative 3, PHMA would be unavailable to livestock grazing and all allotments would be removed from the rangewide planning area. This would include any allotments completely or partially within PHMA. This would eliminate the possibility of the short-term, site-specific impacts from areas available to livestock grazing and the associated impacts on relevant and important values as described under the *Nature and Types of Effects*. Areas made unavailable livestock grazing under Alternative 3 could contribute to increased fine fuels, potentially heightening susceptibility to wildfires, which in turn could pose a threat to relevant and important values. Compared with Alternative 1, Alternative 3 contains the greatest restrictions on livestock grazing and would be the most protective of relevant and important values from impacts related to livestock grazing. See **Appendix 5**, Evaluation of Areas of Critical Environmental Concern for Greater Sage-Grouse

Habitat, for more detailed examination on location specific relevant and important values. Additionally, under Alternative 3 in GRSG ACECs, management actions will be implemented to address the presence of wild horses and burros, aiming to reduce similar impacts on the landscape.

Compared with Alternative 1, Alternative 3 would have greater restrictions on new areas of land protected from or open to ROWs, fluid mineral leasing, and other mineral developments and thus on development in these areas that would otherwise have lower potential to impact relevant and important values. PHMA in all states would be closed to fluid mineral leasing, salable minerals, and nonenergy minerals would reduce potential impacts on relevant and important values, such as areas available to surface-disturbance activities associated with mineral development as described under the *Nature and Types of Effects*. Effects would be reduced to a greater extent than under Alternative 1. This is because areas closed to leasing could not be developed at any point. Recommendation to withdraw PHMA from location and entry under the United States mining laws would have no impact. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

New infrastructure development would be substantially limited as compared with Alternatives 1 and 2. All PHMA would be excluded from new ROW authorizations. New linear ROWs would be allowed only in designated ROW corridors. The inability to site ROWs in PHMA would decrease the potential for impacts on relevant and important values associated with ROW development. The inability to site ROWs in PHMA could lead to longer ROW routes to bypass closed areas. Longer routes would increase surface disturbance and other impacts of ROW siting on relevant and important values outside of PHMA and may result in increased impacts on relevant and important values on adjacent private lands.

Under Alternative 3, PHMA would be ROW exclusion for wind and solar energy development. Prohibiting wind energy development would eliminate impacts on relevant and important values from areas of land protected from or open to this type of surface-disturbing activity in these areas.

4.11.6 Alternative 4

Under Alternative 4, there would be no ACECs, and the relevant and important values that would have been protected through ACECs would instead by protected through management of PHMA, IHMA and GHMA.

Under Alternative 4, compared with Alternative 1, livestock grazing in GRSG PHMA, IHMA, and GHMA would generally be permitted, except in Oregon where availability is subject to further determination. Alternative 4 would emphasize monitoring and coordination at the implementation level to meet land health standards and ensure suitable GRSG habitat. Alternative 4 would incorporate thresholds, responses, and additional terms and conditions in areas lacking suitable habitat. Under Alternative 4, range infrastructure design would focus on minimizing impacts on GRSG and their habitat. Impacts on relevant and important values from areas available to livestock grazing within GRSG HMAs would not be considered, which would prevent aligning with the specific indicators of impacts for ACEC relevant and important values as described under the *Nature and Types of Effects*. However, Alternative 4 would aim to preserve GRSG habitat and, in turn, indirectly help protect relevant values through tailored management practices.

Under Alternative 4, specific management measures would be introduced for fluid mineral leasing in GRSG habitat areas, distinguishing it from Alternative 1. Under Alternative 4, the BLM would evaluate parcels identified in Expressions of Interest within GRSG habitat management areas, considering proximity to existing oil and gas developments, presence in important GRSG habitats or connectivity areas, and potential for development. Leasing decisions would be balanced based on established preferences. For areas already

leased, the BLM would apply stipulations and measures to address exploration and development, focusing on minimizing impacts to GRSG habitat and, in turn, reduce potential impacts on the relevant and important values as described in the *Nature and Types of Effects*.

Under Alternative 4, the management approach for fluid mineral leasing in GRSG habitat areas would provide a comprehensive framework to minimize conflicts and impacts to the relevant and important values as described in the *Nature and Types of Effects*. The evaluation of parcels and the consideration of development proximity, habitat significance, and potential contribute to the preservation of relevant and important values. Additionally, the application of measures, stipulations, and conservation objectives would help in mitigating impacts on GRSG habitat. Collaboration with project proponents and the recognition of valid existing rights further enhance the conservation efforts and would help reduce the impacts to relevant and important values as described under the *Nature and Types of Effects.*

Under Alternative 4, there would be specific management measures for ROW areas in PHMA in all states and IHMA, compared with Alternative 1. PHMA would be designated as exclusion areas for utility-scale wind and solar development. This classification would decrease the potential for impacts on relevant and important values associated with ROW development as described under the *Nature and Types of Effects*. New ROWs in PHMA would generally not be allowed, except in accordance with Anthropogenic Disturbance Screening Criteria. In IHMA, new ROWs could be considered based on IHMA Anthropogenic Disturbance Development Criteria. The focus would be on collocating new ROWs with existing infrastructure which would help minimize the overall impacts on relevant and important values as described under the *Nature and Types of Effects*. Mitigation measures would be in place to address impacts on relevant and important values in GRSG GHMA for minor ROWs. While impacts could still occur in GHMA from surface-disturbing activities associated with ROWs, these measures would help mitigate the impacts on relevant and important values as described under the *Nature and Types of Effects*.

In terms of wind and solar development, under Alternative 4, PHMA would be excluded from utility-scale projects, IHMA would have an exclusion zone within 3.1 miles from active leks, and avoidance measures would be applied in the remainder. Areas within 0.5 miles of PHMA/IHMA would also be avoidance to address indirect impacts to relevant and important values as described under the *Nature and Types of Effects*. GHMA would be avoided for utility-scale wind and solar projects, with specific avoidance within breeding/nesting/limited-seasonal habitats. Designated corridors would remain open for transmission ROWs. These management actions would also help reduce impacts to relevant and important values as described under the *Nature and Types of Effects*.

4.11.7 Alternative 5

For Alternative 5, impacts would be similar to those described for Alternative 4 since no ACECs would be managed. Moreover, the relevant and important values that would have been protected through ACECs would instead be protected through management of PHMA, IHMA and GHMA. BLM would evaluate parcels identified in Expressions of Interest within GRSG habitat management areas giving preference to lands that would not result in impairing habitat suitability and proper function.

4.11.8 Alternative 6

Under Alternative 6, compared with Alternative 1, livestock grazing in GRSG PHMA, IHMA, and GHMA would generally be permitted, with availability subject to further determination in Oregon. Alternative 6, compared with Alternative 1, would emphasize monitoring and coordination at the implementation level to meet land health standards and ensure suitable GRSG habitat. Alternative 6 incorporates thresholds,

responses, and additional terms and conditions in areas lacking suitable habitat. Range infrastructure design under Alternative 6, similar to Alternative 1, continues to prioritize minimizing impacts on GRSG and their habitat. The impacts on relevant and important values from areas available to livestock grazing within GRSG HMAs are considered, aligning with the indicators of impacts for ACECs as described under the *Nature and Types of Effects*. Alternative 6 aims to preserve GRSG habitat and protect relevant and important values, as described under the *Nature and Types of Effects,* through tailored management practices.

Under Alternative 6, specific management measures are introduced for fluid mineral leasing in GRSG habitat areas, distinguishing it from Alternative 1. Under Alternative 6, the BLM would evaluate parcels identified in Expressions of Interest within GRSG habitat management areas, considering proximity to existing oil and gas developments, presence in important GRSG habitats or connectivity areas, and potential for development. Leasing decisions would be balanced based on established preferences. For areas already leased, the BLM would apply stipulations and measures to address exploration and development, focusing on minimizing impacts to GRSG habitat. Conservation objectives, consolidation of infrastructure, and collaboration with project proponents promote effective conservation and connectivity. Valid existing rights are respected, and efforts are made to site projects in the least sensitive habitats. Through these measures, Alternative 6 would mitigate impacts and ensure the conservation of relevant and important values associated with ACECs.

Under Alternative 6, ACECs would be open to leasing subject to NSO stipulations (major constraints) with an exception/modification to allow occupancy if there are drainage concerns from adjacent development and if no direct or indirect impacts can be demonstrated. For areas already leased, the BLM would apply stipulations and measures to address exploration and development, focusing on minimizing impacts to GRSG habitat. Valid existing rights are respected, and efforts are made to site projects in the least sensitive habitats. The blanket NSO may have a negative impact on the relevant and important value of ACECs in areas where there are existing leases due to the restriction of options for siting projects in the least impactful areas. In areas where there are no existing leases the blanket NSO would preclude a surface disturbance during development of fluid minerals that may occur from a surface location outside the ACEC. The evaluation of parcels and the consideration of development proximity, habitat significance, and the potential to contribute to the preservation of relevant and important values. Additionally, the application of measures, stipulations, and conservation objectives demonstrate a commitment to mitigating impacts on GRSG habitat. Collaboration with project proponents and the recognition of valid existing rights further enhance the conservation efforts. Overall, Alternative 6 prioritizes the conservation of ACEC relevant and important values and promotes effective management within GRSG habitat areas.

Under Alternative 6, PHMA in all states would continue to be identified as ROW avoidance areas, allowing for management flexibility. PHMA would be designated as exclusion areas for utility-scale wind and solar development. This classification would further decrease the potential impacts on relevant and important values associated with ROW development. Development of ROWs would be prohibited in exclusion areas and evaluated on a case-by-case basis in avoidance areas. New ROWs in PHMA would generally not be allowed, except in accordance with the Anthropogenic Disturbance Screening Criteria. In IHMA, new ROWs could be considered if they meet the IHMA Anthropogenic Disturbance Development Criteria. The focus would be on collocating new ROWs with existing infrastructure and minimizing overall impacts on relevant and important values. Existing ROW corridors would be preferred for collocation, with limitations on widening beyond 50 percent of the original footprint. These measures would help protect relevant and important values from impacts associated with surface-disturbing activities as described under the *Nature and Type of Effects*. In terms of wind and solar development, PHMA would be avoided for utility-scale projects, GHMA would be open with minimization measures, and designated corridors would remain open.

Major ROWs in PHMA would be avoided, while GHMA would be open with minimization measures. Impacts on relevant and important values could still occur in these areas if developed, but mitigation measures would help mitigate the impacts as described under the *Nature and Type of Effects*. Alternative 6 provides a modified approach to protect relevant and important values associated with ACECs and GRSG habitat by emphasizing avoidance, minimizing impacts, and considering existing infrastructure.

4.11.9 Research Natural Areas (Oregon Only)

Restrictions on uses could also impact RNAs. RNAs could be impacted by management actions that prohibit natural processes to proceed to the detriment of the plant communities for which the RNAs were created. Management actions that do not promote the maintenance of plant communities could also impact RNAs.

For all alternatives, closing ACECs to livestock grazing could especially impact RNAs. Closing all or portions of RNAs that contain plant communities important to GRSG could provide the BLM with areas for baseline vegetation monitoring without the influence of BLM-permitted activities. This could allow natural succession processes to proceed, enabling the BLM to use these areas as comparative controls to treated areas. In addition, the BLM could research the impacts of climate change on plant communities within these undisturbed vegetation communities. However, the consequences of closing livestock grazing from all or portions of RNAs result in other impacts. This involves an escalation in fine fuels, contributing to an increased occurrence of wildfires. Furthermore, a conspicuous surge in annual invasive vegetation is observed—a concern that properly timed livestock grazing has demonstrated effectiveness in eliminating (see **Section 4.4**). Management to protect GRSG under the various alternatives would likely provide additional protections for existing ACECs and, at a minimum, would provide complementary management. This would be particularly true in ACECs where GRSG conservation was identified as a value. Additionally, RNAs would not experience impacts due to the restrictions and limitations on uses in place to protect RNAs. Impacts would not be expected to vary greatly between the alternatives.

4.12 Social and Economic Conditions (Including Environmental Justice)

4.12.1 Nature and Type of Effects

There are different types of social and economic impacts that could occur from BLM-management decisions outlined under the alternatives. Impacts could be associated with market conditions or nonmarket and social conditions. Effects on social and economic conditions and environmental justice populations could be temporary or long term. Communities and groups could be directly impacted or indirectly impacted. Lastly, impacts on economic contributions, social conditions, and environmental justice populations could vary across different geographical regions. These differences in types of social, economic, and environmental justice impacts are discussed in the following subsections with how they relate to potential changes from BLM-management decisions that change each resource.

Fluid Minerals (Oil and Gas) Management

BLM-management decisions regarding changes in restrictions and stipulations on mineral leasing for the protection of GRSG could affect local economies and social conditions within communities throughout the planning area by inhibiting new oil and gas development or by making it more difficult to sustain current levels of mineral activity in the future (See **Section 4.10.1**, Fluid Minerals, for the impacts of changes in restrictions and stipulations on oil and gas development and production).

Some market impacts from changes in oil and gas operations include changes in jobs, income, economic output, and tax revenue that result from drilling and completion expenditures as well as oil and gas production revenue. Direct market impacts are the changes in economic contributions that occur to the oil

and gas industry, such as displaced mineral jobs. Secondary market impacts include changes in jobs, income, and economic output that occur in industries other than mining industries, such as job reductions in manufacturing industries that supply the equipment needed for mineral extractions or economic output reductions in the retail sector due to reduced personal expenditures of mineral employees.

Another secondary market impact could stem from changes in the provision of public services and infrastructure as a result of changes in spending by the government sector. Declines in production will reduce revenue streams to state and local governments and likely lead to budget shortfalls, which will create challenges to provide existing levels, quality, or quantity of public services as well as maintaining existing infrastructure. These public services and infrastructure that are funded by mineral revenue, such as education, road maintenance, parks and recreation, policy and fire management, as well as social services, provide lots of value to local communities because they help support and ensure safeguards are in place for those who might not have the resources themselves. These public services are especially important to small rural communities that have limited alternatives for these services.

Closely interconnected with the impacts on market and economic activity are impacts on nonmarket and social conditions.[2] These impacts on social and nonmarket conditions due to changes in fluid mineral development are impacts that cannot be measured through market mechanisms, and they include direct changes to the lifestyles and culture of those who rely on the mining industry for employment and income. Secondary nonmarket or social impacts on the surrounding communities from potential changes in oil and gas development and production could include changes in access to clean air, health and safety from changes in air quality and GHG emissions, and visitor and viewer enjoyment from changes in air quality (Su and Lee 2022). Communities could face adverse impacts on these resources under alternatives and in areas where fluid mineral leasing would be managed as CSU, if there is an increase in mineral development (see **Section 4.13**, Air Resources and Climate, for more information on impacts on air quality and GHG emissions).

Additionally, potential changes in oil and gas development could impact surrounding communities through changes in preservation of non-use values. Non-use values include those placed on protected open spaces and GRSG and other wildlife for future use, for the use of future generations, or for merely its existence, which would especially impact communities of interest who value protection of GRSG. The non-use values also include those placed on preserving the economics and culture of historical mining towns for potential future enjoyment, for the use of future generations or for merely its existence; these non-use values would especially impact those communities of interest who value mineral development.

Economic and social impacts from changes in fluid minerals due to BLM-management decisions would vary substantially across regions, depending on how reliant the regions are on the oil and gas and mineral sectors compared with the reliance on other sectors. The regions in the analysis areas that historically have relied on the mineral industry for employment and labor income and that have had large volumes of oil and gas production on federal lands are most of the analysis area in Colorado, southeastern and northeastern Montana, southern Nevada, southwestern North Dakota, northwestern South Dakota, central and northeastern Utah, and most of the analysis area in Wyoming (see **Figures A-1 to A-10** in **Appendix 13**). Changes to economic and social conditions from changes in the oil and gas industry as described above (i.e. market impacts on jobs and income, support for public services funding, and non-market factors such as quality of life factors and preservation of non-use values) would impact the communities in these regions more than other regions in the analysis areas (see **Section 3.11**, Social and Economic Conditions (Including

[2] Impacts on other social conditions that are not considered in this effort, such as impacts on social conditions due to changes in visual resources, will be considered during the implementation level NEPA analysis.

Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report, for more information on demographics and current economic and social conditions).

Many market and nonmarket impacts from changes in oil and gas operations are likely to occur gradually over the long term, with some impacts beginning in the near-term. This is due to the fact that management changes would generally be applied to new leases. Impacts would be concentrated in regions with economies that are dependent on mineral activities. In these regions, economic impacts would likely last until the displaced mining workforce can train and find jobs in other industries. Once the displaced employees find employment in other industries, there will likely be a return of social cohesion and culture across local communities. However, if the displaced workers are unable to find sufficient employment opportunities in other industries, then the impacts could continue. Communities that experience significant out migration due to workers searching for other employment opportunities may not recover the shared culture and sense of community that was enjoyed during more prosperous times.

Nonenergy Leasable Minerals Management

Many of the market impacts associated with potential changes in nonenergy leasable minerals due to changes in restrictions and stipulations on leasable minerals would be similar to the market impacts associated with changes in oil and gas operations (See **Section 4.10.2**, Nonenergy Leasable Minerals, for the impacts of changes in restrictions and stipulations on nonenergy leasable minerals extractions). These include changes in direct and secondary jobs, income, and economic output, tax revenue, and public services and infrastructure that result from changes in nonenergy leasable extraction expenditures expenditure and associated public revenues.

Additional economic and social impacts from potential changes in nonenergy leasable mineral extraction due to an increase in restrictions could occur from secondary impacts on prices and availability of household products, especially those products made from trona, which is a nonenergy leasable mineral largely found in southwest Wyoming (90 percent of trona comes from this region; see **Section 3.9.2**, Nonenergy Leasable Minerals, for more information on current conditions of trona). Restrictions on mineral leasing on BLM-administered lands could increase costs associated with mineral extraction by requiring operators to find other lands that are outside of GRSG HMAs, if other nearby lands are available and hold the desired subsurface minerals; however, there are often not nearby alternative lands, since nonenergy leasable minerals are not abundantly available. The increase in costs will likely be passed onto consumers in the form of higher prices for household products containing trona, such as glass and baking soda, in the short term. These household products are considered consumer staples and the demand for consumer staples tend to be inelastic, which means consumers are limited in their abilities to react or adjust their purchase quantities when there are fluctuations in price (Anderson et al. 1997). Impacts on prices of consumer staples tend to affect populations with lower income more than other populations due to the limited disposable income that is available to absorb the increases in prices (see the subsection on Environmental Justice below for more discussions on impacts from potential changes in trona extraction on low-income and other environmental justice populations). Restrictions on mineral leasing will likely not result in immediate closures of mines, and many current mines have stashes of trona built up that could be used to sustain production in the short term. However, as restrictions on nonenergy leasing continue in the long term or if it is not possible to find nearby lands outside of GRSG HMAs with nonenergy leasable materials, there could be impacts on the availability of household products made from trona due to the potential continued constraints on nonenergy leasable mineral extractions. These secondary impacts on product prices and availability can be just as important for local economies as the direct impacts, especially in areas where trona extraction plays a large role in the economic, such as in Wyoming, as well as in rural areas and areas with large low-

income populations (see **Section 4.10.2**, Nonenergy Leasable Minerals, for more details on impacts from BLM management decisions on trona extraction).

Nonmarket and social impacts from changes in nonenergy leasable mineral extraction due to the BLM-management decisions are the same as those from changes in oil and gas operations.[3] These impacts include direct changes to lifestyles and culture, especially for those who rely on the mining industry for employment and income and those in the mineral communities of interest. Secondary nonmarket or social impacts on the surrounding communities from changes in nonenergy leasable minerals due to fewer restrictions could include changes in access to and clean air, health and safety from changes in air quality and GHG emissions, and visitor and viewer enjoyment from changes in air quality. Additionally, potential changes in nonenergy leasable minerals could impact surrounding communities through changes in preservation of non-use values. Non-use values include those placed on protected open spaces and GRSG and other wildlife for future use, for the use of future generations, or for merely its existence, which would especially impact communities of interest who value protection of GRSG. The non-use values also include those placed on preserving the economics and culture of historical mining towns for potential future enjoyment, for the use of future generations or for merely its existence; these non-use values would especially impact those communities of interest who value mineral development.

Economic and social impacts from changes in nonenergy leasable minerals would have larger impacts in regions that are reliant of leasable mineral sectors compared with the reliance of other sectors. These regions that have historically had higher percentages of employment and labor income than the state and have had nonenergy leasable mineral production on federal lands are Rio Blanco County in northwestern Colorado, Caribou County in southeastern Idaho, Carbon and Emery counties in central Utah, and Sweetwater County in southwestern Wyoming (see **Figures A-1 to A-10** in **Appendix 13** and **Section 3.11**, Social and Economic Conditions (Including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report for more information on demographics and current conditions).

Similar to impacts from changes in oil and gas operations, market and nonmarket impacts from changes in nonenergy leasable mineral extractions are likely to occur over the long term. This could result in some mining operations closing if they were unable to expand or moving future operations to other locations. These impacts are likely to last until the displaced mining workforce is able to gain employment with other companies or in other industries; however, if the workers are required to leave the area to find employment, then the social and economic impacts in the regions that were dependent on mining could last longer.

Locatable Minerals Management

The implications of potential withdraws from locatable mineral entry for the protection of GRSG are explained in detail in **Section 4.10.4**, Locatable Minerals. Many of the market impacts associated with potential changes in locatable mineral extraction would be similar to the market impacts associated with leasable mineral extractions. These include changes in direct and secondary jobs, income, and economic output, tax revenue, and public services and infrastructure that result from changes in locatable extraction expenditures and associated public revenues. If the Secretary were to withdraw lands pursuant to the separate process outlined in Section 204 of FLPMA, existing mining claims within the withdrawal area would not be withdrawn, even if they are within GRSG HMAs; however, BLM-management decisions on protection for GRSG would impact existing claims through the requirements of future validity examinations, which

[3] Impacts on social conditions due to changes in other resources that are not considered in this effort, such as impacts on social conditions due to changes in visual resources, will be considered during the implementation level NEPA analysis.

would increase costs to the claimants and could delay timing of development (see **Section 3.9.4**, Locatable Minerals, **Section 3.11**, Social and Economic Conditions (Including Environmental Justice), and **Appendix 13**, Socioeconomic Baseline Report for more information on current conditions of locatable minerals and validity examinations).

Nonmarket and social impacts from changes in locatable mineral extraction due to the BLM-management decisions are the same as those associated with changes in leasable mineral extractions. These impacts include direct changes to lifestyles and culture, especially for those who rely on the mining industry for employment and income and those in the mineral communities of interest. Secondary nonmarket or social impacts on the surrounding communities from changes in locatable minerals due to fewer restrictions could include changes in access to clean air, health and safety from changes in air quality and GHG emissions, and visitor and viewer enjoyment from changes in air quality. Additionally, potential changes in locatable mineral extraction could impact surrounding communities through changes in preservation of non-use values. Non-use values include those placed on protected open spaces and GRSG and other wildlife for future use, for the use of future generations, or for merely its existence, which would especially impact communities of interest who value protection of GRSG. The non-use values also include those placed on preserving the economics and culture of historical mining towns for potential future enjoyment, for the use of future generations or for merely its existence; these non-use values would especially impact those communities of interest who value mineral development.

Economic and social impacts from changes in locatable minerals would have larger impacts in regions that are reliant on locatable mineral sectors than other areas. Counties in the analysis areas in Nevada and Wyoming, where there are higher potential for locatable minerals, would likely face larger impacts on economic and social conditions due to the large number of existing open claims in the states (see **Figures A-1 to A-10** in **Appendix 13** and **Section 3.11**, Social and Economic Conditions (Including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report for more information on demographics and current conditions).

Similar to impacts from changes in leasable minerals, market and nonmarket impacts from changes in locatable mineral extractions are likely to occur over the long term. This could result in some mining companies closing or moving operations to other locations. The economic and social impacts would likely last until the displaced mining workforce is able to gain employment with other companies or in other industries; however, if the workers are required to leave the area to find employment, then the social and economic impacts in the regions that were dependent on mining could last longer.

Mineral Materials Management

Market impacts associated with potential changes in mineral materials extraction due to BLM-management decisions on lands closed to mineral materials disposal largely relate to changes in costs to those who extract mineral materials due to reduced access to free resources (see **Section 4.10.5**, Mineral Materials for impacts on mineral materials extraction due to the BLM-management decisions for the protection of GRSG). In areas where federal sources of mineral materials are closed to noncommercial disposal, those who extract mineral materials would likely need to relocate to nearby areas open to disposal on federal lands, if available. If nearby areas on federal lands are not available, extraction would need to relocate to nearby private or state lands where resources exist. This change in location of extraction would increase costs due to the need to transport the minerals from the new location to where they are needed; the further away the mineral materials pits are from where they are needed, the higher the cost and the more potential for increases in noise, dust, and truck traffic from transporting mineral materials. The increase in cost could

cause delays or cancelations in projects that use mineral materials, such as road maintenance and construction of infrastructure. Delays and cancelations in construction and maintenance projects would impact the surrounding communities who rely on the roads and infrastructures (see **Section 3.10.5**, Mineral Materials, **Section 3.12**, Social and Economic Conditions (Including Environmental Justice), and **Appendix 13**, Socioeconomic Baseline Report for more information on current conditions of mineral materials).

Secondary impacts from BLM-management decisions on lands closed to mineral materials could occur from changes in the ability to use mineral materials to improve road access for fire suppression activities. The construction, maintenance, and effectiveness of fuel breaks can be impacted by availability of mineral material pits.

A change in access to mineral materials due to the BLM-management decisions would likely have impacts on nonmarket and social conditions for the surrounding communities. These impacts include access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality under alternatives with lands that are not closed to mineral materials disposal and extraction. On the other hand, in areas where the BLM-managed lands are closed to mineral materials disposal, and there is a shift of the mineral materials extraction to state or private lands, the sites of extraction could be closer to local residents and there could be more potential for interaction between local residents and communities and mining operations. This shift in location of mining activities could impact qualify of life in the nearby communities by resulting in an increase in noise, dust, and traffic. The magnitude of the impacts on the nearby communities depends on the local characteristics, and further analysis would need to be conducted during the implementation level NEPA to determine the location and intensity of impacts.

Economic and social impacts from changes in public access to mineral materials would have larger impacts in regions that have higher numbers of new or existing free-use permits issued or quantity of extractions under the free-use permits; these regions include counties in the analysis areas in Colorado, Idaho, Montana, Nevada, and Wyoming (see **Figures A-1 to A-10** in **Appendix 13** and **Section 3.12**, Social and Economic Conditions (Including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report for more information on demographics and current conditions).

Market and nonmarket impacts from changes in public access of mineral materials are likely to be short term. The economic and social impacts, such as increased costs, would likely occur for near-term infrastructure construction or maintenance projects, which could range from a season to several years. Those with free-use permits would likely be able to locate other sources of mineral materials, given the wide-spread availability of the resource. In some areas, resources might be available in nearby BLM lands outside of HMAs, allowing for continued use of free-use permits; however, in other areas, users would need to purchase the extracted mineral materials, which could lead to impacts for as long as the minerals are needed.

Renewable Energy (Geothermal, Wind, and Solar) Management

BLM-management decisions regarding changes in restrictions and stipulations on renewable energy, including geothermal, wind and solar energy, for the protection of GRSG could affect local economies by restricting the siting of new renewable energy developments (See **Section 4.9**, Lands and Realty (Including Wind and Solar) and **Section 4.10**, Mineral Resources, for the impacts of changes in the amount of land managed as ROW avoidance and exclusions areas on wind and solar development and the changes in restrictions and stipulations on geothermal development and production, respectively). Changes in the land closed to leasing for geothermal development and the land open to leasing but with stipulations could impact the local jobs,

income, economic output, and tax revenue that results from changes in well drilling and completion expenditures as well as production of geothermal energy and associated public revenues. Direct market impacts from changes in geothermal development include changes in economic activity that occur in industries related to renewable energy, such as water well drilling and related structures and electric power generation. Secondary market impacts include changes in economic contributions that occur in industries other than the renewable energy sector as well as changes in public services and infrastructure due to reduced tax revenues, including state tax revenues on wind, solar, and geothermal production and nameplate capacity. For wind and solar, changes in land managed as ROW avoidance and exclusions areas could result in operators choosing other locations for wind or solar facilities, however, choosing an alternative location might not be possible or feasible or it could be very costly if there is not available transmission, as ROW avoidance and exclusion areas also applies to transmission line projects. Potential secondary impacts could include impacts on economic conditions due to restrictions on siting of renewable energy facilities and transmission on federal lands that would also impact siting on nonfederal lands, especially in areas where the BLM-administered lands are not contiguous. These potential secondary impacts on economic conditions could include reductions in lease rents for renewable energy on state lands, which could impact disbursements to local governments and public services that rely on these funds.

In addition to impacts on economic conditions from changes in potential renewable energy development due to BLM-management decisions, there could be impacts on social and nonmarket conditions from the BLM-management decisions regarding renewable energy ROW. These impacts include access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality due to less restrictions. Way of life, culture, and visitor and viewer enjoyment could be affected if there is an increase in renewable energy development due to less restrictions, especially for those communities of interest that value open spaces and historical agricultural areas.

Economic impacts from changes in renewable energy development due to BLM-management decisions could vary across regions, depending on the quality of the renewable resource and the potential for renewable energy. The counties in the Nevada analysis area would be most impacted by BLM-management decisions that change geothermal development and production due to the high potential for future development (see **Appendix 12**, Reasonably Foreseeable Development Scenario for more information). The states that have operating wind and solar projects in the analysis areas are Nevada, Oregon, Utah, and Wyoming (see **Figures A-1 to A-10** in **Appendix 13)**. Changes in economic activity stemming from changes in renewable energy development would impact these regions more than other regions in the planning area (see **Section 3.11**, Social and Economic Conditions (Including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report for more information on demographics and current economic and social conditions). Counties in the analysis areas in Idaho, North Dakota, South Dakota, and Wyoming that collect taxes on wind, solar, or geothermal production and nameplate capacity would also be more impacted by potential changes in renewable energy activities than other areas due to the potential loss in tax revenue.

Impacts on economic conditions, such as increased construction costs, due to changes in lands available for ROW for wind and solar development would likely be short term, and the impacts would be diminished upon completion of the wind or solar facilities or transmission lines. However, if the changes in lands available for wind or solar ROW development prevent any solar or wind developments in nearby areas due to lack of available transmission lines, the impacts would likely be longer-term. Economic impacts from changes in potential geothermal development are likely to occur over the long term, as displace workers look for employment elsewhere or in other industries.

Livestock Grazing Management

BLM-management decisions regarding changes in lands available for livestock grazing for the protection of GRSG affects local economies and social conditions of communities throughout the planning area by restricting levels of livestock grazing in the future (See **Section 4.8**, Livestock Grazing, for the impacts of changes in lands available for livestock grazing on available forage).

Some market impacts from changes in livestock grazing include changes in jobs, income, and economic output. Direct market impacts are the changes in economic contributions that occur to industries associated with livestock animal production, such as reduced labor income for workers in these industries. Secondary market impacts include changes in jobs, income, and economic output that occur in industries other than livestock animal production industries, such as job reductions in manufacturing industries that supply the equipment needed for livestock grazing or ranching or economic output reductions in the retail sector due to reduced personal expenditures of workers in livestock animal production industries. Changes in livestock grazing due to BLM-management could also impact the local and regional economic resilience and stability for ranching and farming communities, especially if these communities also are susceptible to boom and bust economic cycles due to a reliance on mineral development for economics.

Another secondary market impact is associated with changes in prices and availability of meat products due to rangewide restrictions on livestock grazing. An increase in restrictions on livestock grazing on BLM-administered lands would likely require many ranchers and farmers to use private lands to provide forage for their livestock, which could result in increases in costs to ranchers and farmers. An increase in cost for forage could lead to ranchers passing on the costs to consumers in the form of an increase in price of meat and animal products, or an increase in cost could result in closures of ranches and farms that are unable to operate with the higher costs, especially as margins for meat producers have tightened recently (Casey 2023). If there are a large number of ranch closures, there could be impacts on availability of meat and animal products to the local and regional communities. In the long term, as restrictions continue, there will likely be greater impacts on prices and availability of meat and animal products. The level of impacts would depend on the level to which any proposed management resulted in changes to the overall availability of public land forage and livestock operators' ability to adapt production practices and mitigate increased production costs. While changes to the market are seen more at a regional or national scale, secondary impacts on prices and availability of meat can be a large concern for certain local economies, especially in rural areas and areas with large low-income populations (see the subsection on *Environmental Justice* for more discussions on impacts from potential changes in livestock grazing on low-income and other environmental justice populations, and see **Section 4.8**, Livestock Grazing, for more information regarding impacts on livestock grazing due to BLM-Management decisions).

Changes in livestock grazing on public lands can also impact other market mechanisms such as property values. Research has demonstrated that in most cases BLM-administered land grazing permits increase ranch property value beyond the additional price of forage provided because federal permits are perceived as adding semi-private open space to the property (see for example Rimbey, Torrel and Tanka 2007). Thus, restrictions to grazing on BLM-administered lands could affect property values for ranches that serve as base property for affect grazing permits. The extent of any impact could vary depending on the extent of restrictions of grazing on BLM-administered and National Forest System lands, whether a grazing permit is not renewed in its entirety, and the land management decisions in the selected alternative. It should be noted that any premium to property values associated with a federal grazing permit is a result of amenity perception rather than ownership – since federal grazing permits authorize the grazing of livestock on public lands but do not convey any right, title, or interest of the lands to the permit holder.

Closely interconnected with the impacts on market and economic activity associated with livestock grazing are impacts on nonmarket and social conditions. These impacts on social and nonmarket conditions due to changes in livestock grazing include direct changes to the lifestyles, culture, and sense of place of those who rely on access to forage on federal land for their farming and ranching operations. Some changes in access to the lifestyle value of ranching are associated with nonmarket values such as reduced access to use values of open spaces and western ranch scenery and non-use values of the cultural icon of the American cowboy that are important to some residents and visitors.

Many rural communities have expressed concerns that ranching operations could go out of business if there were more restrictions on livestock grazing on BLM-administered lands. Reductions in BLM-managed lands available for livestock grazing would likely require ranching operators to acquire leases or permits for forage from non-federal lands or purchase additional feed to continue livestock production. Purchased feed and forage from non-federal lands tend to be more costly, so the increase in input costs could put economic strain on some ranches. Due to the increased costs, some ranches might decide to sell all or part of their land to create ranchettes or for development activities, which could create land fragments with more fencing. Additional land fragmentation in GRSG habitat could have an adverse impact on GRSG populations. Selling and fragmenting longstanding ranches could affect social conditions and nonmarket values, such as social cohesion and loss of quality of nonmarket values associated with open space, and it could result in unexperienced or out-of-state buyers taking ownership of the land, which could further reduce social cohesion or lead to land degradation due to improper grazing techniques from the unexperienced buyers (Gosnell and Travis 2005). Additionally, ranch closures would affect the well-being of the local population and community as well as lead to less social cohesion across the communities and impact the quality of infrastructure and public services.

Economic and social impacts from changes in livestock grazing due to BLM-management decisions would vary substantially across regions, depending on how many permits within BLM-managed allotments would be affected, the availability of alternative forage in the area, , how reliant the region is on the agriculture industry compared with the reliance on other industries, and the type of ranches in the area (see **Section 3.11**, Social and Economic Conditions (Including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report for a discussion on types of ranches in the analysis area). Changes to economic and social conditions from changes in livestock grazing would more heavily impact the communities in regions that rely on grazing on federal lands and in regions that have a large quantity of small and midsize family farms and ranches where the operators' primary occupation is farming or ranching.[4] Small and midsize ranches tend to have fewer resources and flexibility to adjust business operations due to changes in livestock grazing on federal lands than other types of ranches. These ranches could be more sensitive to changes in cost, leading to more closures or more decisions to sell their private lands, which could lead to more land fragmentation, as discussed above. These small and midsize ranches are located across most of the analysis area in each state of the planning area (see **Section 3.11**, Social and Economic Conditions (Including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report for more information on demographics and current economic and social conditions).

[4] Small family ranches are those with annual gross cash farm income less than $350,000 and midsize family ranches are those with annual gross cash farm income of at least $350,000 but less than $1 million. See **Section 3.11**, Social and Economic Conditions (Including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report for more information on the types of ranches in the analysis area).

Changes in livestock grazing from BLM-management decisions are likely to have long term impacts on market and nonmarket conditions, especially in rural areas that rely on the agriculture industry due to the limited alternative resources and opportunities for employment in these areas.

Wild Horse and Burro Management

As discussed in Chapter 3, some stakeholders value the existence of wild horses due to their symbolism in of the American west and value the opportunity to view wild horse and burros on the range. In the long term, removal of wild horses could therefore impact social values associated with the existence of wild horses, and the ability to view and enjoy horses and burros.

In addition, wild horses and burros can provide recreation opportunities (i.e. in terms of wildlife viewing), which in turn can result in visitor spending and associated economic contributions. One example is the opportunities provided for wild horse and burro viewing along scenic byways.

The level of impacts of management would depend on the degree to which wild horse and burros would remain part of the landscape on BLM administered lands, and the level to which the ability to continue to view wild horse and burros would be impacted. As noted in the Wild Horses and Burros section, the timeline for implementation of any management changes would be impacted by congressional funding and the associated wild horse management including gathers, storage capacity, and adoption rate. As a result, impacts to values associated with wild horse and burros would be likely occur over time.

Greater Sage Grouse Conservation

As described in Chapter 3, economists and policy makers have long recognized that rare, threatened, and endangered species have nonmarket values composed of use and non-use values as well as economic values, including those associated with active use through viewing or hunting and those associated with existence, option, and bequest values. Studies published in peer-reviewed scientific journals for bird species with similar characteristics find average stated willingness-to-pay between $19 and $77 per household per year in order to restore a self-sustaining population or prevent regional extinction (see **Appendix 13**, Socioeconomic Baseline Report, for more information on nonmarket values of greater sage grouse conservation; Loomis and Ekstrand 1997; Stevens et al. 1991; Bowker and Stoll 1988; Kotchen and Reiling 2000; Reaves et al. 1999; Myers 2014). Since GRSG protection is a public good available to all households regardless of where they are located, if similar per-household values apply, then the aggregate regional nonuse value as well as impacts on access to these values if changes were made from BLM-management decisions could be substantial. However, the BLM did not quantify the aggregate value because of several factors, including uncertainty associated with the comparability of the existing studies to the GRSG context and the documented difference between stated and actual willingness-to-pay.

There are many resource and social values of GRSG ecosystems that could be impacted by BLM-management decisions. Non-market values associated with populations of GRSG, including use value associated with wildlife viewing as well as non-use value generally correspond to the degree of habitat protection associated with each alternative. In general, the more restrictive an alternative is on habitat disturbance, the more it will favor non-market values associated with the GRSG and their habitat, however, the specific level of habitat protection associated with maximizing non-market value has not been determined. Additional social impacts from BLM-management decisions on GRSG conservation include impacts on tribal interests and cultural resources, especially subsistence, from changes in GRSG populations. On the other hand, habitat conservation could negatively impact road realignment projects near tribal reservations and plans to expand reservation boundaries because the reservation is surrounded by PHMA.

Environmental Justice

Environmental justice populations could be disproportionately and adversely impacted directly and indirectly through changes in several resources due to BLM-management decisions.

Environmental justice populations could be directly disproportionately and adversely impacted by BLM-management decisions on GRSG through disturbance of cultural resources such as locations or landscapes associated with trust or treaty assets, traditional beliefs, sacred sites, resource gathering areas, hunting and fishing areas, ancestral sites, and human remains. Under alternatives with fewer stipulations and restrictions on resource use and less protection of GRSG populations, ground disturbance would likely impact these cultural resources. These ground disturbing activities that impact cultural resources in the planning area include mineral exploration and development, renewable energy development, construction of road or pipelines, and other surface disturbing activities. Cultural resources are especially important to those who identify as American Indian and Alaska Native for spiritual, traditional, and cultural activities, so BLM-management decisions that result in disturbance or alter visual qualities of these cultural resources could disproportionately impact American Indian and Alaska Native populations. These impacts on environmental justice populations are likely to be stronger in areas that were identified as containing environmental justice populations and areas that have more surface disturbing activities, such as mining and livestock grazing, and the impacts are likely to be long term and last until the end of the surface disturbing activity. See **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

BLM-management decisions that impact conservation of GRSG habitats and access to the cultural values of GRSG through fewer restrictions on surface disturbing activities would adversely and disproportionately impact environmental justice populations. For example, subsistence resource availability could be reduced from decisions and activities that impact wildlife habitats such as mineral development. Under alternatives with fewer restrictions on surface disturbing activities and less protection of GRSG habitats, changes to availability of subsistence resources and uses would adversely and disproportionately impact environmental justice populations. Subsistence is an important use of BLM-administered lands for American Indian and Alaska Native populations and some low-income populations across the analysis area. Decreased subsistence resource availability would adversely affect sociocultural systems due to the importance of subsistence in the cultural identity of American Indian and Alaska Native populations, social organization, social cohesion, transmission of cultural values, and community and individual well-being. Decreases in subsistence resource availability would reduce opportunities for engaging in subsistence activities potentially increasing social problems. Due to the importance to American Indian and Alaska Native populations of subsistence hunting, environmental justice populations would be disproportionately impacted from reduced access to big game habitats. Additionally, low-income populations would bear disproportionate effects of reductions in access to subsistence resources because they are more likely to lack the resources to purchase an equivalent quality of food or to travel greater distances to find it. See **Section 4.5**, Fish and Wildlife, for more information on impacts to wildlife habitats and **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Environmental justice populations could be indirectly disproportionately and adversely impacted through regional or national market changes in prices and availability of meat and household products due to rangewide restrictions on grazing or restrictions on mineral development. As discussed in *Nonenergy Leasable Minerals* and *Livestock Grazing* subsections, above, restrictions in grazing or mineral development on BLM-administered lands could increase the costs of producing meat and household products (especially products made from trona), which could then be passed onto consumers through higher prices. Meat and household

products are considered consumer staples, and consumption of these products is usually consistent across seasons, so they tend to have inelastic demands, which means consumers of these products have limited ability to adjust consumption as prices increase. Over the long term, if restrictions continue, there could be impacts on availability of meat and household products. Increases in prices and decreases in availability of food and household products tend to disproportionately impact low-income households and individuals, because low-income populations have more limited alternatives for food and household products than the general public and because food and household product purchases make up a higher percentage of disposable income for low-income households. These impacts on environmental justice populations are likely to be stronger in areas that were identified as containing environmental justice populations. The impacts on environmental justice populations from price and availability of food and household products through BLM-management decisions on greater restrictions are likely to occur over the long term, based on implementation of changes to GRSG management. See subsections in this section on *Nonenergy Leasable Minerals* and *Livestock Grazing* as well as **Section 4.10.2**, Nonenergy Leasable Minerals, and **Section 4.8**, Livestock Grazing, for more information.

BLM-management decisions that impact nonmarket and social conditions from changes in air quality through increased exposure to particulate matter, increased risk of wildfire smoke, and increased fugitive dust emissions, under alternatives with fewer restrictions on mineral extraction and surface disturbing activities, could disproportionately impact environmental justice populations. Environmental justice populations often face greater vulnerabilities to particulate matter pollution, wildfires, and fugitive dust from surface disturbance (Davies et al. 2018). Increased exposure to particulate matter can cause a variety of health problems, including respiratory infections, heart disease, or cancer. Because environmental justice populations are often located near sources of PM pollution, they are more likely to be exposed to higher levels of particulate matter pollution (Tabuchi and Popovich 2021). See **Section 4.13**, Air Resources and Climate for more information on air quality impacts.

BLM-management decisions that impact nonmarket and social conditions from changes in GHG emissions could disproportionately impact environmental justice populations, under alternatives with fewer restrictions on surface disturbing activities and in areas where fluid mineral leasing would be managed as CSU, if there is an increase in mineral development and activities. Environmental justice populations are often located in areas that are vulnerable to impacts from climate change, such as areas that are prone to drought or flooding (Cho 2020). If mineral exploration and development and other surface disturbing activities are not managed in a way that minimizes GHG emissions, environmental justice populations could be adversely and disproportionately impacted due to GHG emissions that could have a negative impact on the climate (Cho 2020). Vegetation disturbance could reduce the ability to absorb carbon dioxide and lead to decreased carbon sequestration around communities, including environmental justice populations. The decrease in carbon sequestration could contribute to climate change impacts, which could disproportionately and adversely impact environmental justice populations. See **Section 4.13**, Air Resources and Climate, for more information.

The loss of economic activity stemming from the closure of GRSG PHMA or making PHMA unavailable for authorized uses, as described in the subsections of the *Nature and Type of Effects* above in terms of affected jobs and labor income, may result in some additional communities meeting low-income criteria for consideration as potential environmental justice communities in the future. 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.

4.12.2 Alternative 1

Fluid Minerals (Oil and Gas) Management

Rangewide Environmental Consequences

Table 4, in **Appendix 18**, Economic Contribution Supplemental Tables, show the average annual number of jobs, labor income, and total economic output that could result from projected oil and gas development from 2023 to 2042, under Alternative 1, for the analysis area counties combined as well as each state combined. On annual average, oil and gas production revenue and well development expenditures in the analysis areas is expected to result in a range of about 73,000 to 94,000 total jobs (from 28,000 to 34,000 direct jobs in the drilling oil and gas wells sector and the oil and gas extraction sector), $5.8 billion to $7.6 billion in total labor income (from $3.0 billion to $3.8 billion in direct labor income), and about $27.6 billion to $34.2 billion in economic output (from $19.0 billion to $22.8 billion in direct economic output) combined across 8 states. Below is a discussion on quantitative impacts shown in this table as well as a qualitative discussion on the market and nonmarket impacts from potential changes in oil and gas operations in each state with reasonably foreseeable future development of oil and gas.[5]

As noted in **Section 3.11,** Social and Economic Conditions (Including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report, fiscal revenue is generated on the production of federal minerals at the federal, state, and in some states at the local level. Many western states and local governments are heavily dependent upon these mineral revenues for a significant portion of their annual budgets. For all states in the planning area, BLM-management decisions on GRSG HMAs, under Alternative 1, are not expected to change tax revenue and public services from current conditions. Below is a discussion on royalty and state tax revenues for each state. Additionally, for all states in the planning area, BLM-management decisions on GRSG HMAs, under Alternative 1, are not expected to change social and nonmarket values and conditions such as lifestyles and culture of those communities of interest that value mineral extraction from current conditions.

Under Alternative 1, in most of the planning area PHMA (IHMA in Idaho), except as noted under the state-specific sub-headings below, fluid mineral leasing would continue to be managed as NSO. In these areas, emissions sources and surface disturbing activities would continue to be eliminated, which would reduce impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and visitor and viewer enjoyment from changes in air quality. However, fluid mineral development will likely continue in other locations, which would lead to relocation of impacts on the nonmarket and social conditions associated with air quality and GHG emissions, as described in the *Nature and Types of Effects*.

Colorado

On annual average, oil and gas production revenue and well development expenditures in the Colorado analysis area is expected to result in a range of about 22,000 to 43,000 total jobs (from 7,000 to 13,000 direct jobs in the drilling oil and gas wells sector and the oil and gas extraction sector), $1.9 billion to $3.7 billion in total labor income (from $791 million to $1.5 billion in direct labor income), and about $7.0 billion to $13.7 billion in economic output (from $4.0 billion to $7.7 billion in direct economic output) throughout the state. Most of the impacts on employment and economic output from oil and gas production revenue and well development expenditures would occur in the analysis area, accounting for about 87.0 percent of the total economic output.

[5] California and Oregon did not have reasonably foreseeable future oil and gas development in the planning area, so they are not included in the discussion.

Under Alternative 1, the total royalty revenue generated from oil and gas production in Colorado could range from about $453 million to $878 million. The Colorado severance tax revenue is expected to range from about $31.8 million to $61.7 million, under Alternative 1, and the oil and gas conservation fee could generate a range of $3.0 million to $5.8 million. Assuming an average tax rate of 5 percent across counties in the analysis area, oil and gas production could generate a range of about $119 million to $230 million in county revenues from ad valorem taxes. These revenues that are disbursed to counties would continue to support local public services.

Idaho

On annual average, oil and gas production revenue and well development expenditures in the Idaho analysis area is expected to result in about 14 total jobs (about 6 direct jobs in the drilling oil and gas wells sector and the oil and gas extraction sector), $759,000 in total labor income (about $360,000 in direct labor income), and about $3.2 million in economic output (about $1.9 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from oil and gas production revenue and well development expenditures would occur in the analysis area, accounting for about 94.1 percent of the total economic output.

Under Alternative 1, fluid mineral leasing would continue to be managed as NSO in Idaho IHMA and as CSU in GHMA. In IHMA, impacts on nonmarket and social conditions would be the same as described in *Rangewide Environmental Consequences*; however, within GHMA, if there is an increase in mineral development and activities, there would likely continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in *Nature and Types of Effects*.

Montana

On annual average, oil and gas production revenue and well development expenditures in the Montana analysis area is expected to result in about 5,000 total jobs (about 2,000 direct jobs in the drilling oil and gas wells sector and the oil and gas extraction sector), $485 million in total labor income (about $285 million in direct labor income), and about $1.9 billion in economic output (about $1.3 billion in direct economic output) throughout the state. Most of the impacts on employment and economic output from oil and gas production revenue and well development expenditures would occur in the analysis area, accounting for about 97.6 percent of the total economic output.

Under Alternative 1, the total royalty revenue generated from oil and gas production in Montana would be about $112 million. The Montana severance tax revenue is expected to be about $62.6 million, under Alternative 1, and the state is expected to generate about $1.8 million from the privilege and license tax. These revenues that are disbursed to counties would continue to support local public services.

Nevada

On annual average, oil and gas production revenue and well development expenditures in the Nevada analysis area is expected to result in about 42 total jobs (about 18 direct jobs in the drilling oil and gas wells sector and the oil and gas extraction sector), $2.2 million in total labor income (about $249,000 in direct labor income), and about $11.7 million in economic output (about $6.4 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from oil and gas production revenue and well development expenditures would occur in the analysis area, accounting for about 98.0 percent of the total economic output.

Under Alternative 1, the total royalty revenue generated from oil and gas production in Nevada would be about $520,000. The Nevada severance tax revenue is expected to be about $114,000, under Alternative 1. Additionally, oil and gas production could generate about $5,000 across the analysis area in administration fees. These revenues that are disbursed to counties would continue to support local public services.

Under Alternative 1, Nevada GHMA would continue to be managed as open to fluid mineral leasing, subject to CSU stipulations. If there are increased mineral development and activities in GHMA, there would likely continue to be impacts on nonmarket and social conditions due to changes in access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in *Nature and Types of Effects*.

North Dakota

On annual average, oil and gas production revenue and well development expenditures in the North Dakota analysis area is expected to result in about 573 total jobs (about 275 direct jobs in the drilling oil and gas wells sector and the oil and gas extraction sector), $48 million in total labor income (about $32 million in direct labor income), and about $471 million in economic output (about $406 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from oil and gas production revenue and well development expenditures would occur in the analysis area, accounting for about 99.0 percent of the total economic output.

Under Alternative 1, the total royalty revenue generated from oil and gas production in North Dakota would be about $51.6 million. The North Dakota severance tax revenue is expected to be about $14.7 million, under Alternative 1. Additionally, oil and gas production could generate about $15.5 million across the analysis area in oil extraction tax revenues. These revenues that are disbursed to counties would continue to support local public services.

South Dakota

On annual average, oil and gas production revenue and well development expenditures in the South Dakota analysis area is expected to result in about 271 total jobs (about 91 direct jobs in the drilling oil and gas wells sector and the oil and gas extraction sector), $16.1 million in total labor income (about $7.2 million in direct labor income), and about $69 million in economic output (about $35 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from oil and gas production revenue and well development expenditures would occur in the analysis area, accounting for about 91.5 percent of the total economic output.

Under Alternative 1, the total royalty revenue generated from oil and gas production in South Dakota would be about $2.4 million. The South Dakota severance tax revenue is expected to be about $644,000, under Alternative 1. These revenues that are disbursed to counties would continue to support local public services.

Utah

On annual average, oil and gas production revenue and well development expenditures in the Utah analysis area is expected to result in about 7,000 total jobs (about 2,000 direct jobs in the drilling oil and gas wells sector and the oil and gas extraction sector), $454 million in total labor income (about $162 million in direct labor income), and about $2.5 billion in economic output (about $1.6 billion in direct economic output) throughout the state. Most of the impacts on employment and economic output from oil and gas production revenue and well development expenditures would occur in the analysis area, accounting for about 86.7 percent of the total economic output.

Under Alternative 1, the total royalty revenue generated from oil and gas production in Utah would be about $186 million. The Utah severance tax revenue is expected to be about $55.7 million, under Alternative 1, and the conservation fee is expected to generate about $223,000. Additionally, oil and gas production could generate about $55.6 million across the analysis area in county revenues from ad valorem taxes. These revenues that are disbursed to counties would continue to support local public services.

Under Alternative 1, Utah GHMA would continue to be managed as NSO near leks or CSU based on allocations in the plans that predate the 2015 amendment. In areas managed as NSO, impacts on nonmarket and social conditions would be the same as described in *Rangewide Environmental Consequences;* however, in areas managed as CSU, if there is an increase in mineral development and activities, there would likely continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in *Nature and Types of Effects*.

Wyoming

On annual average, oil and gas production revenue and well development expenditures in the Wyoming analysis area is expected to result in about 37,000 total jobs (about 17,000 direct jobs in the drilling oil and gas wells sector and the oil and gas extraction sector), $2.9 billion in total labor income (about $1.8 billion in direct labor income), and about $15.6 billion in economic output (about $11.6 billion in direct economic output) throughout the state. Most of the impacts on employment and economic output from oil and gas production revenue and well development expenditures would occur in the analysis area, accounting for about 99.9 percent of the total economic output.

Under Alternative 1, the total royalty revenue generated from oil and gas production in Wyoming would be about $972 million. The Wyoming severance tax revenue is expected to be about $350 million, and the oil and gas conservation tax could generate about $2.9 million, under Alternative 1. Additionally, oil and gas production could generate about $367 million across the analysis area in county revenues from ad valorem taxes. These revenues that are disbursed to counties would continue to support local public services.

Under Alternative 1, in Wyoming, GHMA would be managed as NSO within 0.25 miles of leks, and seasonal limitations within 2 miles of leks, while PHMA would continue to be managed as NSO within 0.6 miles of leks and as CSU or with timing limitations outside. In areas managed as NSO, impacts on nonmarket and social conditions would be the same as described in *Rangewide Environmental Consequences;* however, in areas managed as CSU, if there is an increase in mineral development or activities, there would likely continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in *Nature and Types of Effects*.

Nonenergy Leasable Minerals Management

Under Alternative 1, most of the PHMA and IHMA in the planning area are closed to new leasing of nonenergy leasable minerals but states can consider expansion of existing leases. Across all states in the planning area, there would continue to be economic activity and nonmarket and social values associated with the extraction of federal nonenergy leasable minerals. There could be economic and social impacts, as detailed in **Section 4.2.1**, *Nature and Type of Effects,* due to current BLM-management decisions regarding access to nonenergy leasable mineral extractions in certain locations, such as Wyoming, where nonenergy leasable minerals are important to the local economies; however, it is not anticipated that these impacts would be large due to the adaptive management and allowing the Known Sodium Leasing area to remain open to exploration and consideration for leasing development.

Locatable Minerals Management

Under the 2015 ROD, carried forward as Alternative 1, all states recommended the withdrawal of all SFAs from locatable mineral entry. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA. In 2015, the Secretary proposed to withdraw the SFA lands and a separate process to consider this withdrawal is currently underway. If after the completion of this process, the Secretary decided to withdraw these lands, there could be impacts on economic activity and social conditions, as discussed in *Nature and Types of Effects*. There could be a decrease in jobs, labor income, and economic output due to the potential decrease in exploration and development. Potential for impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in *Nature and Types of Effects,* from locatable mineral development would continue in all GHMA and PHMA (IHMA in Idaho), except in all SFAs, if the Secretary withdraws these lands.

Mineral Materials Management

Under Alternative 1, except the states discussed below, PHMA in all other states would be closed to new mineral material sales, but open for new free use permits, and expansion of existing pits for both free use permits and material sales, which would lead to continued impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in *Nature and Types of Effects*. Additionally, extraction could take place in other locations outside of GRSG habitat. Given the other opportunities to extract mineral materials in other locations, the impacts on economic activities and social conditions associated with mineral materials is likely to be minimal, under Alternative 1.

Idaho

Under Alternative 1, all PHMA would be closed to mineral material disposal except for the expansion of existing pits, unlike other states, in Idaho this closure extends to new free use permits. Closing PHMA to new free use permits would result in increased costs to local government road departments for road maintenance and could result in worsening road conditions in these areas.

Renewable Energy (Geothermal, Wind, and Solar) Management

Rangewide Environmental Consequences

Below is a discussion on the economic impacts from BLM-management decisions on restrictions and stipulations on geothermal leasing, under Alternative 1, for each state that had projected geothermal development. These include impacts on the number of jobs, labor income, and economic output from expenditures on geothermal development for each state in the planning area (as shown in **Table 10** in **Appendix 18**). The RFD does not anticipate future geothermal development in Montana, North Dakota, and South Dakota due to limited geothermal potential in the analysis areas. On annual average, geothermal development, across 7 states in the planning area, is expected to result in about 634 total jobs (about 330 direct jobs), $41.2 million in total labor income (about $20.0 million in direct labor income), and about $120 million in economic output (about $28.4 million in direct economic output). For the 7 states in the planning area that are anticipated to see geothermal development, BLM-management decisions on GRSG HMAs, under Alternative 1, are not expected to change tax revenue and public services from current conditions.

Under Alternative 1 the entire plan area with the exception of Wyoming would limit lands used for ROWs in PHMA (or IHMA in Idaho) and GHMA for Greater Sage-Grouse (see **Appendix 12**, Reasonably Foreseeable Development Scenario, for more detail). These BLM-management decisions could result in operators relocating development of wind and solar facilities to other locations that are not restricted.

However, if there are constraints on transmission in nearby areas, relocating wind and solar operations might be costly or it might not be possible, because ROW avoidance and exclusion areas would restrict transmission lines as well as renewable energy development. This could result in barriers to development, which could result in impacts on economic contributions of wind and solar. These impacts would more likely occur in Nevada, Oregon, Utah, and Wyoming, where there have been the most wind and solar developed on federal lands. There are various factors that operators use when deciding where to site wind and solar projects that prevent further analysis on state-level impacts on the level of solar and wind development and associated impacts on economic output due to BLM-management decisions (see **Section 4.9**, Lands and Realty (Including Wind and Solar) for more details).

California and Nevada

On annual average, geothermal development in the states of California and Nevada is expected to support about 540 total jobs (about 276 direct jobs), $36.0 million in total labor income (about $17.1 million in direct labor income), and about $106 million in economic output (about $24.4 million in direct economic output).

Colorado

On annual average, geothermal development in the state is expected to support about 16 total jobs (about 8 direct jobs), $1.1 million in total labor income (about $537,000 in direct labor income), and about $2.7 million in economic output (about $761,000 in direct economic output).

Idaho

On annual average, geothermal development in the state is expected to support about 36 total jobs (about 22 direct jobs), $1.8 million in total labor income (about $1.0 million in direct labor income), and about $4.9 million in economic output (about $1.4 million in direct economic output).

Under Alternative 1, in GHMA where lands would continue to be open for wind and solar development and in IHMA that would continue to be managed as avoidance for solar and wind development and only excluded for utility scale projects, there would continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality from changes in surface disturbance due to potential wind and solar development, as described in *Nature and Types of Effects.*

Nevada

Under Alternative 1, in GHMA that would continue to be managed as avoidance for wind projects or in PHMA that would be open for non-utility-scale solar and wind projects, there would continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality from changes in surface disturbance due to potential wind and solar development, as described in *Nature and Types of Effects.*

Oregon

On annual average, geothermal development in the state is expected to support about 11 total jobs (about 6 direct jobs), $577,000 in total labor income (about $297,000 in direct labor income), and about $1.5 million in economic output (about $402,000 in direct economic output).

Under Alternative 1, in PHMA that would continue to be managed as avoidance for solar and wind development and only excluded for utility scale projects, there would continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer

enjoyment from changes in air quality from changes in surface disturbance due to potential wind and solar development, as described in *Nature and Types of Effects.*

Utah

On annual average, geothermal development in the state is expected to support about 22 total jobs (about 12 direct jobs), $1.3 million in total labor income (about $743,000 in direct labor income), and about $3.6 million in economic output (about $1.1 million in direct economic output).

Under Alternative 1, in GHMA that would continue to be open to solar and wind projects and in PHMA that would continue to be open to wind projects within 5 miles of leks, there would continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality from changes in surface disturbance due to potential wind and solar development, as described in *Nature and Types of Effects.*

Wyoming

On annual average, geothermal development in the state is expected to support about 9 total jobs (about 6 direct jobs), $432,000 million in total labor income (about $288,000 in direct labor income), and about $1.3 million in economic output (about $388,000 in direct economic output).

Under Alternative 1, in PHMA where it would still be open to solar and wind development, there would continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality from changes in surface disturbance due to potential wind and solar development, as described in *Nature and Types of Effects.*

Livestock Grazing Management

Rangewide Environmental Consequences

Table 16, in **Appendix 18**, shows the average annual number of jobs, labor income, and total economic output that could be supported from projected billed AUMs (total for cattle and sheep), under Alternative 1, for the analysis area counties combined as well as each state combined. On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the analysis areas for all states combined is expected to support about 2,000 total jobs (about 841 direct jobs in the animal production and ranching sectors), $120 million in total labor income (about $67.6 million in direct labor income), and about $380 million in economic output (about $204 million in direct economic output) across all states in the planning area. Below is a discussion on quantitative impacts shown in this table as well as a qualitative discussion on the market and nonmarket impacts from potential changes in livestock grazing on BLM-administered lands in each state.

Under Alternative 1, PHMA, IHMA, and GHMA would continue to be available for livestock grazing, which would continue to support current levels of economic and social conditions. BLM-management decisions on GRSG HMAs, under Alternative 1, are not expected to impact social conditions such as lifestyles and culture of ranchers and farmers and those communities of interest that value livestock grazing on public lands, as those impacts described in the *Nature and Types of Effects* (see **Section 4.8**, Livestock Grazing, for more information).

California

BLM-management decisions on GRSG HMAs, under Alternative 1, are not expected to change economic contributions from livestock grazing from current conditions. On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the California analysis area is

expected to support about 22 total jobs (about 7 direct jobs in the animal production and ranching sectors), $3.4 million in total labor income (about $2.1 million in direct labor income), and about $8.4 million in economic output (about $4.6 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from livestock grazing would occur in the analysis area, accounting for about 88.6 percent of the total economic output.

Colorado

On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Colorado analysis area is expected to support about 82 total jobs (about 50 direct jobs in the animal production and ranching sectors), $3.2 million in total labor income (about $1.8 million in direct labor income), and about $9.8 million in economic output (about $5.1 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from livestock grazing on these allotments would occur in the analysis area, accounting for about 91.9 percent of the total economic output.

Idaho

On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Idaho analysis area is expected to support about 221 total jobs (about 77 direct jobs in the animal production and ranching sectors), $22.8 million in total labor income (about $13.3 million in direct labor income), and about $57.3 million in economic output (about $28.5 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from livestock grazing on these allotments would occur in the analysis area, accounting for about 97.4 percent of the total economic output.

Montana

On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Montana analysis area is expected to support about 381 total jobs (about 186 direct jobs in the animal production and ranching sectors), $21.0 million in total labor income (about $10.5 million in direct labor income), and about $67.3 million in economic output (about $33.2 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from livestock grazing on these allotments would occur in the analysis area, accounting for about 96.5 percent of the total economic output.

Nevada

On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Nevada analysis area is expected to support about 236 total jobs (about 82 direct jobs in the animal production and ranching sectors), $23.6 million in total labor income (about $13.7 million in direct labor income), and about $76.7 million in economic output (about $42.1 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from livestock grazing on these allotments would occur in the analysis area, accounting for about 97.6 percent of the total economic output.

North Dakota

On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the North Dakota analysis area is expected to support about 1 total jobs (about 1 direct jobs in the animal production and ranching sectors), $64,000 in total labor income (about $39,000 in direct labor income), and about $235,000 in economic output (about $143,000 in direct economic output) throughout

the state. Most of the impacts on employment and economic output from livestock grazing on these allotments would occur in the analysis area, accounting for about 97.2 percent of the total economic output.

Oregon

On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Oregon analysis area is expected to support about 206 total jobs (about 78 direct jobs in the animal production and ranching sectors), $14.1 million in total labor income (about $6.5 million in direct labor income), and about $50.0 million in economic output (about $25.2 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from livestock grazing on these allotments would occur in the analysis area, accounting for about 95.4 percent of the total economic output.

South Dakota

On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the South Dakota analysis area is expected to support about 10 total jobs (about 5 direct jobs in the animal production and ranching sectors), $402,000 in total labor income (about $186,000 in direct labor income), and about $2.5 million in economic output (about $1.4 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from livestock grazing on these allotments would occur in the analysis area, accounting for about 95.0 percent of the total economic output.

Utah

On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Utah analysis area is expected to support about 90 total jobs (about 54 direct jobs in the animal production and ranching sectors), $6.2 million in total labor income (about $4.6 million in direct labor income), and about $16.9 million in economic output (about $10.8 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from livestock grazing on these allotments would occur in the analysis area, accounting for about 96.2 percent of the total economic output.

Wyoming

On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Wyoming analysis area is expected to support about 552 total jobs (about 301 direct jobs in the animal production and ranching sectors), $25.1 million in total labor income (about $14.7 million in direct labor income), and about $91.3 million in economic output (about $52.6 million in direct economic output) throughout the state. Most of the impacts on employment and economic output from livestock grazing on these allotments would occur in the analysis area, accounting for about 98.9 percent of the total economic output.

Greater Sage Grouse Conservation

Rangewide Environmental Consequences

Management under Alternative 1 to conserve, enhance, and restore sagebrush ecosystems by separating GRSG habitat into SFAs, PHMAs, IHMAs, and GHMAs, would provide protection for GRSG conservation values. As a result, the BLM-management decisions would continue to support nonmarket values associated with GRSG conservation, which would especially impact habitat conservation communities of interest (see discussion in *Nature and Type of Effects* and **Section 3.11**, Social and Economic Conditions (Including Environmental Justice) for more information on the values and beliefs of these communities of interest).

Under Alternative 1, BLM-management decisions would support the protection of GRSG ecosystems, which would continue to provide value to the surrounding communities through impacts on tribal interests and cultural resources, especially subsistence, from changes in GRSG populations. Conversely, habitat conservation could result in impacts to communities who would benefit from development. Some examples include impacts to road realignment projects near tribal reservations and plans to expand reservation boundaries if the reservation is surrounded by PHMA.

Environmental Justice

Rangewide Environmental Consequences

Under Alternative 1, cultural resources could be impacted by BLM-management decisions by allowing surface disturbing activities, such those discussed in *Nature and Type of Effects.* These impacts on cultural resources would result in disproportionate and adverse impacts on American Indian and Alaska Native populations who value and use these resources. These impacts could occur across all states in the planning area where there are cultural resources and where there are identified environmental justice populations (especially minority or American Indian and Alaska Native environmental justice populations), such as in Colorado, where there are known concentrations of archaeological resources in pinyon-juniper vegetation that provide value to American Indian and Alaska Native populations, and in California and Nevada, where there are traditional pine nutting areas that are valuable to American Indian and Alaska Native populations. However, project-specific Section 106 compliance and government-to-government consultation with tribes should mitigate the effects of development on BLM-administered lands outside of sagebrush-dominated areas. See **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Under Alternative 1, surface-disturbing activities could negatively impact subsistence resource availability, as discussed in *Nature and Type of Effects*. This would likely disproportionately impact environmental justice populations due to the importance of subsistence activities to American Indian and Alaska Native populations, low-income populations, and some minority populations. However, the disturbance cap, under Alternative 1, could help to reduce the impacts to wildlife and subsistence resources, which could reduce impacts on environmental justice populations. These impacts would occur across the planning area; however, level of impact would likely vary geographically depending on the level of subsistence use in the region and the location of surface disturbance; a site-specific analysis would be needed to further analyze the impacts. See **Section 4.5**, Fish and Wildlife, for more information on impacts to wildlife habitats and **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Under Alternative 1, in most of the planning area PHMA (IHMA in Idaho), except as noted under the state-specific subheadings below for Idaho, Nevada, Oregon, Utah, and Wyoming, current stipulations and BLM-management decisions would continue and would likely reduce the impacts on GHG emissions and air quality from particulate matter, risk of wildfire smoke, and surface-disturbing activities, as described in *Nature and Type of Effects*. However, mineral development will likely continue in other locations, which would lead to relocation of impacts on the nonmarket and social conditions associated with air quality, such as access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment, as described in the *Nature and Types of Effects*. The impacts on air quality would affect all communities, including environmental justice populations, and the extent to which these impacts would disproportionately affect environmental justice populations would depend on site-specific factors and would require a site-specific analysis. See **Section 4.13**. Air Resources and Climate for more information on air quality impacts.

Impacts from BLM-management decisions on environmental justice populations vary by geographic region. Many impacts would require site-specific analyses to determine if BLM-management decisions would result in disproportionate and adverse impacts on environmental justice populations at a local level; however, for the purposes of this rangewide EIS, a discussion of adverse and disproportionate impacts on environmental justice populations by state is included below, where information is available.[6]

California

BLM-management decisions, under Alternative 1, that impact low-income environmental justice populations would likely have disproportionate and adverse impacts on environmental justice populations in the California analysis area, since both counties in analysis area were identified as meeting the criteria for containing low-income populations. These impacts include impacts on access to subsistence resources, as discussed above in the *Rangewide Environmental Consequences* subsection and *Nature and Type of Effects*.

Colorado

BLM-management decisions, under Alternative 1, that impact low-income and American Indian and Alaska Native environmental justice populations would likely have disproportionate and adverse impacts on environmental justice populations in the Colorado analysis area, since seven of counties in analysis area were identified as meeting the criteria for containing low-income populations and two of the counties were identified as meeting the threshold for American Indian and Alaska Native populations. These impacts include impacts on access to cultural and subsistence resources, as discussed above in the *Rangewide Environmental Consequences* subsection and *Nature and Type of Effects*.

Idaho

The Idaho analysis area had 25 counties that met criteria for minority, low-income, and American Indian and Alaska Native environmental justice populations. All of the BLM-management decisions, under Alternative 1, that impact environmental justice populations, as described above in the *Rangewide Environmental Consequences* subsection and *Nature and Type of Effects,* would likely have disproportionate and adverse impacts on environmental justice populations in the Idaho analysis area.

Under Alternative 1, in GHMA, fluid mineral leasing would continue to be managed as CSU and lands would continue to be open to wind and solar development and in IHMA, only utility-scale wind and solar projects would be excluded. If there would be an increase in mineral and ROW development and activities in GHMA and IHMA, there would likely continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in *Nature and Types of Effects*. These impacts could lead to disproportionate and adverse impacts on environmental justice populations, depending on where the environmental justice populations are located within each county in relation to the change in air quality.

Montana

The Montana analysis area had 18 counties that met criteria for minority, low-income, and American Indian and Alaska Native environmental justice populations. All of the BLM-management decisions, under Alternative 1, that impact environmental justice populations, as described above in the *Rangewide Environmental Consequences* subsection and *Nature and Type of Effects,* would likely have disproportionate and adverse impacts on environmental justice populations in the Montana analysis area.

[6] There were no counties in the North Dakota analysis area that met the threshold for environmental justice populations, so North Dakota is not included in the state-by-state discussion.

Nevada

The entire Nevada analysis area (a total of 10 counties) met criteria for minority, low-income, and American Indian and Alaska Native environmental justice populations. All of the BLM-management decisions, under Alternative 1, that impact environmental justice populations, as described above in the *Rangewide Environmental Consequences* subsection and *Nature and Type of Effects,* would likely have disproportionate and adverse impacts on environmental justice populations in the Nevada analysis area.

Under Alternative 1, within GHMA, where fluid mineral leasing would continue to be managed as CSU and lands would continue to be managed as avoidance for wind projects and in PHMA, where only utility-scale wind and solar projects would be excluded, if there is an increase in mineral development and activities, there would likely continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in *Nature and Types of Effects*. These impacts could lead to disproportionate and adverse impacts on environmental justice populations, depending on where the environmental justice populations are located within each county in relation to the change in air quality.

Oregon

The Oregon analysis area had 7 counties that met criteria for minority, low-income, and American Indian and Alaska Native environmental justice populations. All of the BLM-management decisions, under Alternative 1, that impact environmental justice populations, as described above in the *Rangewide Environmental Consequences* subsection and *Nature and Type of Effects,* would likely have disproportionate and adverse impacts on environmental justice populations in the Oregon analysis area.

Under Alternative 1, in PHMA, where only utility-scale wind and solar projects would be excluded, there would likely continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in *Nature and Types of Effects*. These impacts could lead to disproportionate and adverse impacts on environmental justice populations, depending on where the environmental justice populations are located within each county in relation to the change in air quality.

South Dakota

BLM-management decisions, under Alternative 1, that impact low-income environmental justice populations would likely have disproportionate and adverse impacts on environmental justice populations in Butte County, South Dakota, since the county was identified as meeting the criteria for containing low-income populations. These impacts include impacts on access to subsistence resources, as discussed above in the *Rangewide Environmental Consequences* subsection and *Nature and Type of Effects*.

Utah

BLM-management decisions, under Alternative 1, that impact low-income and American Indian and Alaska Native environmental justice populations would likely have disproportionate and adverse impacts on environmental justice populations in the Utah analysis area, as discussed above in the *Rangewide Environmental Consequences* subsection and *Nature and Type of Effects,* since 18 counties in analysis area were identified as meeting the criteria for containing low-income or American Indian and Alaska Native populations.

Under Alternative 1, within GHMA, where fluid mineral leasing would continue to be managed as NSO near leks or CSU based on allocations in the plans that predate the 2015 amendment and lands would continue to be open to solar and wind projects and in PHMA, where lands would continue to be open to wind projects within 5 miles of leks, if there is an increase in development, there would likely continue to be

impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in *Nature and Types of Effects*. These impacts could lead to disproportionate and adverse impacts on environmental justice populations, depending on where the environmental justice populations are located within each county in relation to the change in air quality.

Wyoming

The Wyoming analysis area had 15 counties that met criteria for minority, low-income, and American Indian and Alaska Native environmental justice populations. All of the BLM-management decisions, under Alternative 1, that impact environmental justice populations, as described above in the *Rangewide Environmental Consequences* subsection and *Nature and Type of Effects,* would likely have disproportionate and adverse impacts on environmental justice populations in the Wyoming analysis area.

Under Alternative 1, within GHMA, where fluid mineral leasing would continue to be managed as NSO within 0.25 miles of leks with seasonal limitations within 2 miles of leks, and within PHMA, where fluid mineral leasing would continue to be managed as NSO within 0.6 miles of leks and as CSU or with timing limitations outside and where it would still be open to solar and wind development, if there is an increase in development and activities, there would likely continue to be impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality due to less restrictions than other areas, as described in *Nature and Types of Effects*. These impacts could lead to disproportionate and adverse impacts on environmental justice populations, depending on where the environmental justice populations are located within each county in relation to the change in air quality. In areas open to fluid mineral leasing with CSU stipulations or timing limitations, if there is an increase in mineral development and activities, potential for impacts on air quality would continue to exist.

4.12.3 Alternative 2

Fluid Minerals (Oil and Gas) Management

Rangewide Environmental Consequences

The number of wells anticipated to be drilled and completed over the planning period would be the same as under Alternative 1 in Montana, Nevada, North Dakota, South Dakota, Utah, and Wyoming, so the market impacts on jobs, labor, income, economic output from oil and gas development and operations would also be the same as described under Alternative 1 for these states (see **Table 5** in **Appendix 18**). Under Alternative 2, oil and gas production revenue and well development expenditures are expected to increase in Colorado and Idaho due to BLM-management decisions (see **Section 4.10**, Mineral Resources, for more information). On annual average, this increase is expected to support about 325 more jobs (almost 100 additional direct jobs), about $27 million more in total labor income (about $11.5 million in additional direct labor income), and about $102 million in additional economic output (about $58 million in additional direct economic output) than under Alternative 1, across these two states. Additional details on economic and social impacts specific to Colorado and Idaho are discussed below.

Mineral development would continue to support federal, state, and local mineral revenues at levels similar to those estimated under Alternative 1, except for described below for impacts in Colorado and Idaho. Changes in mineral revenues available to fund public services and infrastructure in Montana, Nevada, North Dakota, South Dakota, Utah, and Wyoming would be negligible relative to those under Alternative 1. Below is a discussion on royalty and state tax revenues for Colorado and Idaho.

Under Alternative 2, impacts on nonmarket and social conditions such as impacts on access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in the *Nature and Types of Effects* would be the same as under Alternative 1, except in Colorado as described under the state-specific sub-heading below. Social values in terms of way-of-life, culture, and social cohesion for the communities who value mineral extraction in Montana, Nevada, North Dakota, South Dakota, Utah, and Wyoming would be similar to those described under Alternative 1.

Colorado

Under Alternative 2, on annual average, oil and gas production revenue and well development expenditures and well development in the Colorado analysis area is expected to support about 320 more total jobs (about 95 additional direct jobs), about $27million more in total labor (about $11 million in additional direct labor income), and about $100 million in economic output (about $57 million in additional direct economic output) on annual average across the state relative to Alternative 1.

The increase in projected oil and gas activity could result in a small increase in tax revenues compared with Alternative 1. Under Alternative 2, the total royalty revenue generated from oil and gas production in Colorado could range from $459 million to $884 million, which is about $6.4 million to $6.5 million more than under Alternative 1. The Colorado severance tax revenue could range from $32.3 million to $62.2 million, which is almost $500,000 more than under Alternative 1. The oil and gas conservation fee could generate a range of $3.0 million to $5.8 million, slightly more than under Alternative 1. Additionally, oil and gas production could generate a range of $121 million to $232 million in county revenues from ad valorem taxes, which is about $1.7 million more than under Alternative 1). These revenues that are disbursed to counties would continue to support local public services, such as education.

The potential increase in oil and gas activity is not likely to result in large impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest.

Under Alternative 2, PHMAs in Colorado would be designated as NSO for fluid mineral development. Compared with Alternative 1, changing GHMA from closed to fluid mineral leasing within 1 mile of leks and NSO within 2 miles of leks under Alternative 1 to NSO within 1 mile of leks under this alternative would likely result in an increase in air emissions because the amount of federal mineral estate available for leasing and development would be greater under this alternative. This could lead to less access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in the *Nature and Types of Effects.*

Idaho

Under Alternative 2, on annual average, oil and gas production revenue and well development expenditures in the Idaho analysis area is expected to support about 5 total additional jobs (about 2 additional direct jobs), $253,000 in additional total labor income (about $120,000 in additional direct labor income), and about $1.1 million in additional economic output (about $625,000 in additional direct economic output), across the state, compared to development under Alternative 1.

The small increase in projected oil and gas activity In Idaho could result in a small increase in tax revenues compared with Alternative 1, which would be disbursed to counties and would continue to support local public services, such as education.

The potential increase in oil and gas activity is not likely to result in large impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest.

Nonenergy Leasable Minerals Management

Rangewide Environmental Consequences

Under Alternative 2, economic and social impacts from changes in nonenergy leasable minerals due to BLM-management decisions would be the same as under Alternative 1 for all states in the planning area, except Nevada.

Nevada

Nevada added exception criteria to the closure in PHMA, allowing leasing of non-energy leasable minerals under certain circumstances. This would improve the access of non-energy leasable minerals in the planning areas compared to Alternative 1, which could improve economic and social conditions associated with non-energy leasable minerals, such as lifestyle, culture, employment, and economic output, through greater extraction of these mineral resources. However, BLM-management decisions under Alternative 2 could also lead to less access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, as described in the *Nature and Types of Effects.*

Locatable Minerals Management

Rangewide Environmental Consequences

Except for Montana, where recommendation for withdrawal of SFAs language would be as described under Alternative 1, Alternative 2 does not include recommendations for the withdrawal of SFAs from locatable mineral entry. Recommendations for withdrawal have no impact on economic activity.

Under Alternative 2, removing the recommendation for withdrawal of locatable mineral entry in SFA in all states (except in Montana/Dakotas, which did not have a 2019 amendment) would not change impacts on nonmarket and social conditions from changes in air quality and GHG emissions because as discussed under Alternative 1, enacting the recommendation would be separate action and not occur under this RMPA.

Mineral Materials Management

Rangewide Environmental Consequences

Under Alternative 2, impacts on public access to mineral materials and social and nonmarket values associated with mineral material extraction would likely be similar to under Alternative 1, for all states except for Idaho and Nevada.

Under Alternative 2, impacts on nonmarket and social conditions due to changes in air quality and GHG emissions from proposed management of BLM-administered federal mineral estate as closed to or available for salable mineral sales or disposal in PHMA and GHMA would be the same as under Alternative 1, except in Idaho IHMA and Nevada PHMA as described in the state-specific sub-headings below.

Idaho

Under Alternative 2, PHMA and IHMA would be managed as closed to mineral material sales, however, Idaho would allow consideration of new free use permits. Compared to Alternative 1, this would reduce impacts on road conditions and high road maintenance costs on local governments which would no longer have to transport mineral materials required for road maintenance from outside these areas. Impacts would otherwise be the same as described under Alternative 1.

Under Alternative 2, allowing consideration of new free use permits for salable minerals in Idaho IHMA, would increase the potential for associated impacts on nonmarket and social conditions due to changes in air quality and GHG emissions compared with Alternative 1. This is because there would be a greater chance for more acres of salable mineral activities to occur in these areas.

Nevada

Under Alternative 2, Nevada would allow exception criteria to the mineral material disposal closure in PHMA. These criteria could increase the time to get approval for new mineral material sales but would also provide certainty about the conditions under which exemptions would be granted and would reduce social and economic impacts associated with sourcing mineral materials from alternative locations.

Under Alternative 2, adding an exception criterion to salable and nonenergy mineral closures for Nevada PHMA would increase the potential for associated impacts on nonmarket and social conditions due to changes in air quality and GHG emissions. This is because there would be a greater chance for more area of salable mineral activities to occur in these areas.

Renewable Energy (Geothermal, Wind, and Solar) Management

Rangewide Environmental Consequences

The number of geothermal plants developed, under Alternative 2, would be the same as those anticipated under Alternative 1 in all states (see **Appendix 12**, Reasonably Foreseeable Development Scenario, for more detail), so the impacts on economic activity in terms of jobs, labor, income, economic output from future geothermal development would also be the same as those described under Alternative 1 (see **Table 11** in **Appendix 18**).

Under Alternative 2, BLM-management decisions related to ROWs for wind and solar energy would be the same as Alternative 1 for all states, except for Nevada, Utah, and Wyoming (see **Appendix 12**, Reasonably Foreseeable Development Scenario, for more detail). While BLM-management decisions vary slightly in Nevada, Utah, and Wyoming, the impacts of these decisions on ROWs for wind and solar energy would be minimal due to the projected small change in restricted acres in Nevada and Wyoming and the greater flexibility for infrastructure projects in Utah compared to Alternative 1. This means that for all states, economic contributions from wind and solar energy development would be similar to those under Alternative 1.

Under Alternative 2, impacts on nonmarket and social conditions due to changes in air quality and GHG emissions from changes in GRSG habitat protected from major and minor ROWs and from solar and wind development would be the same as under Alternative 1, except in Nevada for solar energy development and major ROWs, and in Nevada and Utah for wind energy development, as described in the state-specific sub-headings below.

Nevada

Under Alternative 2, there would be an exception criterion avoidance for ROWs and to the closure to wind and solar development in Nevada PHMA and to wind development in Nevada GHMA. Compared with Alternative 1, this could increase the potential for impacts on nonmarket and social conditions due to changes in air quality and GHG emissions, as discussed in *Nature and Type of Effects*, because there would be a higher chance of development. However, the exception criteria would likely avoid impacts.

Utah

Under Alternative 2, areas outside PHMAs that are within 5 miles of leks in Utah would be avoidance for wind development. This could increase the potential for impacts on nonmarket and social conditions due to changes in air quality and GHG emissions compared with Alternative 1. This is because there would be a higher chance of development in an avoidance area as opposed to an exclusion area that includes an exception criterion to closure.

Livestock Grazing Management

Rangewide Environmental Consequences

Estimated billed AUMs, under Alternative 2, would be the same as under Alternative 1 for all states and analysis areas, so impacts on economic activity in terms of jobs and income from livestock grazing would also be the same as described under Alternative 1 (see **Table 17** in **Appendix 18**). In addition, social impacts in terms of way-of-life, culture, and social cohesion would be similar to those described under Alternative 1.

Impacts on livestock grazing operations and associated non-market values would be similar to those described for Alternative 1.

Greater Sage Grouse Conservation

Rangewide Environmental Consequences

Management under Alternative 2 to conserve, enhance, and restore sagebrush ecosystems would have similar impacts on nonmarket and social values of GRSG as those described in Alternative 1. Nonmarket impacts under Alternative 2 would be similar to those described in Alternative 1, with state analysis area specific differences. For GRSG conservation related values, removing SFAs in UT, WY, NV, and ID would reduce protections from development and provide fewer safeguards for nonmarket values associated with self-sustaining populations of GRSG, as discussed in *Nature and Type of Effect*.

Requirements for mitigation that achieves a net conservation gain in all HMA types in MT/DK, NV/CA, and OR, and impacts would be the same as described for Alternative 1. Enforcement of mitigation resulting in no net loss in HMA CO and ID would increase potential impacts to non-market values such as the nonuse values of preserving the species for future generations, as discussed in *Naure and Types of Effect,* compared to the net-conservation gain requirements under Alternative 1. Additionally, in UT and WY, the net conservation gain requirement would be removed, which would increase potential for impacts to conservation related values. Voluntary implementation of compensatory mitigation in CO, ID, NV/CA, OR, UT, and WY HMA, could also increase the potential for impacts on nonmarket values associated with GRSG preservation compared to Alternative 1.

Environmental Justice

Rangewide Environmental Consequences

Impacts on cultural resources under Alternative 2 would be similar to under Alternative 1, except as noted under the state-specific subheadings below for Colorado, Idaho, Nevada, Utah, and Wyoming. See **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Under Alternative 2, impacts on subsistence resources would be similar to those under Alternative 1, except for areas with fewer restrictions on fluid mineral development, and/or more allocable permits for salable minerals, where subsistence resources would likely be more at risk due to surface disturbance. Impacts on

subsistence resources could disproportionately impact environmental justice populations, as discussed in Nature and Type of Effects. However, the extent to which the impacts on subsistence affects environmental justice populations depends on site-specific factors and analysis. See **Section 4.5**, Fish and Wildlife, for more information on impacts to wildlife habitats and **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Under Alternative 2, impacts on air quality and GHG emissions would be the same as under Alternative 1, except as noted under the state-specific subheadings below for Colorado, Idaho, Nevada, and Utah. Impacts on air quality from risks of wildfire smoke and fugitive dust, under Alternative 2, would be the same as under Alternative 1. See **Section 4.13**, Air Resources and Climate for more information on air quality impacts.

Colorado

Impacts on environmental justice populations from potential impacts on cultural resources would be the same as described for Alternative 1, except in Colorado PHMAs, which would have no closed areas, and Colorado GHMAs, which would have NSO in place of closed areas. The exposure of areas in Colorado to fluid mineral leasing could increase the risk of potential impacts to cultural resources and decrease opportunities for American Indian and Alaska Native populations to maintain traditional cultural practices and values in areas where fluid mineral leasing occurs, although site specific NEPA analysis will be conducted to assess alternatives to avoid, minimize and/or compensate for identified impacts. This could have disproportionate and adverse impacts on environmental justice populations in the Colorado, especially on the American Indian and Alaska Native environmental justice populations located in Moffat County and Rio Blanco County (where American Indian and Alaska Native environmental justice populations were identified) as well as on American Indian and Alaska Native environmental justice populations that live outside of the analysis area that use the planning area for spiritual, cultural, and traditional uses. Future site-specific implementation analysis would be needed to determine the level and intensity of impacts.

Under Alternative 2, BLM-management decisions on fluid mineral development would increase potential impacts on nonmarket and social conditions due to changes in GHG emissions and air quality, compared with Alternative 1, which would disproportionately impact environmental justice populations throughout the Colorado analysis area, as described in Nature and Type of Effects. However, the extent to which environmental justice populations are impacted would depend on site-specific factors.

Idaho

In Idaho, removing SFAs and allowing consideration of new free use permits for salable minerals would reduce protections for GRSG and habitat, which could have negative impacts on cultural resources and decreased opportunities for American Indian and Alaska Native populations to maintain traditional cultural practices and values, such as observing lekking behavior. Additionally, this could have disproportionate and adverse impacts on environmental justice populations in the Idaho, especially on the American Indian and Alaska Native environmental justice populations located in Adams, Bingham, Cassia, Clark, Custer, Elmore, Jefferson, Lemhi, Lincoln, Minidoka, Owyhee, Payette, Power, and Washington counties (where American Indian and Alaska Native environmental justice populations were identified) as well as on American Indian and Alaska Native environmental justice populations that live outside of the analysis area that use the planning area for spiritual, cultural, and traditional uses. Future site-specific implementation analysis would be needed to determine the level and intensity of impacts.

Under Alternative 2, allowing consideration of new free use permits for salable minerals in Idaho IHMA, would increase the potential for associated impacts on nonmarket and social conditions due to changes in air quality and GHG emissions compared with Alternative 1. This is because there would be a greater chance for more acres of salable mineral activities to occur in these areas. However, the impacts might be small due to the small amount of extraction.

Nevada

In Nevada, removing SFAs would reduce protections for GRSG and habitat, which could have negative impacts on cultural resources and decreased opportunities for American Indian and Alaska Native populations to maintain traditional cultural practices and values, such as observing lekking behavior. This could have disproportionate and adverse impacts on environmental justice populations in all counties in the Nevada analysis area (where American Indian and Alaska Native environmental justice population were identified) as well as on American Indian and Alaska Native environmental justice populations that live outside of the analysis area that use the planning area for spiritual, cultural, and traditional uses. Future site-specific implementation analysis would be needed to determine the level and intensity of impacts.

Under Alternative 2, BLM-management decisions in Nevada would increase the potential for associated impacts on nonmarket and social conditions, as described in *Nature and Type of Effects*, due to changes in air quality and GHG emissions from the potential for more nonenergy leasable mineral and salable mineral activities to occur.

Utah

In Utah, removing SFAs would reduce protections for GRSG and habitat, which could have negative impacts on cultural resources and decreased opportunities for American Indian and Alaska Native populations to maintain traditional cultural practices and values, such as observing lekking behavior. This could have disproportionate and adverse impacts on environmental justice populations in the Utah, especially on the American Indian and Alaska Native environmental justice populations located in Daggett, Duchesne, Emery, Garfield, Grand, Iron, Juab, Kane, Rich, and Uintah counties (where American Indian and Alaska Native environmental justice populations were identified) as well as on American Indian and Alaska Native environmental justice populations that live outside of the analysis area that use the planning area for spiritual, cultural, and traditional uses. Future site-specific implementation analysis would be needed to determine the level and intensity of impacts.

Under Alternative 2, areas outside PHMAs that are within 5 miles of leks in Utah would be avoidance for wind development. This could increase the potential for impacts on nonmarket and social conditions due to changes in air quality and GHG emissions compared with Alternative 1. This is because there would be a higher chance of development in an avoidance area as opposed to an exclusion area that includes an exception criterion to closure. This could have a disproportionate impact on environmental justice populations in analysis area counties in Utah.

Wyoming

In Wyoming, removing SFAs would reduce protections for GRSG and habitat, which could have negative impacts on cultural resources and decreased opportunities for American Indian and Alaska Native populations to maintain traditional cultural practices and values, such as observing lekking behavior. This could have disproportionate and adverse impacts on environmental justice populations in the Wyoming, especially on the American Indian and Alaska Native environmental justice populations located in Fremont County and Weston County, (where American Indian and Alaska Native environmental justice populations

were identified) as well as on American Indian and Alaska Native environmental justice populations that live outside of the analysis area that use the planning area for spiritual, cultural, and traditional uses. However, there currently are protections in place for cultural resources within existing RMPs that would mitigate impacts on environmental justice populations. Future site-specific implementation analysis would be needed to determine the level and intensity of impacts.

4.12.4 Alternative 3

Fluid Minerals (Oil and Gas) Management

Rangewide Environmental Consequences

Table 6, in **Appendix 18**, shows the average annual number of jobs, labor income, and total economic output that could be supported by projected oil and gas development from 2023 to 2042, under Alternative 3, for the analysis area counties combined as well as each state combined. On annual average, oil and gas production revenue and well development expenditures in the analysis area for 8 states combined is expected to result in about 25,000 to 36,000 fewer total jobs (about 11,000 to 14,000 fewer direct jobs), about $2.0 million to $2.9 billion less in total labor income (about $1.2 million to $1.6 billion less in direct labor income), and about $9.2 billion to $12.8 billion less in economic output (about $6.5 billion to $8.5 billion less in direct economic output) than under Alternative 1. Below is a discussion on quantitative economic impacts as well as a qualitative discussion on the market and nonmarket impacts from potential changes in oil and gas operations in each state with reasonably foreseeable future development of oil and gas.[7]

Management actions that restrict oil and gas development in PHMA would likely adversely affect fiscal revenues and could contribute to future state and local government budget shortfalls, especially in jurisdictions that rely on the taxation of minerals in place of income taxes or where taxes on mineral production currently represent the single largest source of revenue. These budget shortfalls may affect the ability of states and local governments to maintain infrastructure and provide public services at current levels. Insufficient funding for infrastructure and public services would adversely affect quality of life in affected communities and could further limit rural residents' access to educational opportunities, health care, and social safety net programs. Below is a discussion on royalty and state tax revenues for each state.

Under Alternative 3, all PHMA would close all areas in PHMA to mineral and ROW development, and would make PHMA unavailable to livestock grazing, which would reduce potential impacts on nonmarket and social conditions due to changes in air quality and GHG emissions from actions such as surface disturbance from mineral development, as described under the *Nature and Types of Effects*. Due to closing PHMA, the effects on these nonmarket and social conditions would be the lowest out of the alternatives.

Colorado

Under Alternative 3, on annual average, oil and gas production revenue and well development expenditures in the Colorado analysis area is expected to result in about 1,000 to 13,000 fewer total jobs (about 300 to 3,600 fewer direct jobs), about $104 million to $1.1 billion less in total labor income (about $36 million to $439 million less in direct labor income), and about $390 million to $4.0 billion less in economic output (about $210 million to $2.3 billion less in direct economic output) across the state compared to development under Alternative 1.

[7] California and Oregon did not have reasonably foreseeable future oil and gas development, so they are not included in the discussion.

The decrease in projected oil and gas activity, under Alternative 3, would result in reductions in tax revenues, compared with Alternative 1. Under Alternative 3, the total royalty revenue generated from oil and gas production in Colorado could range from $312 million to $454 million, which is about $140 million to $424 million less than under Alternative 1. The Colorado severance tax revenue could range from $29.3 million to $42.6 million, which is about $2.5 million to $19.2 million less than under Alternative 1. The oil and gas conservation fee could generate a range of $2.7 million to $4.0 million, which is about $240,000 to $1.8 million less than under Alternative 1. Additionally, oil and gas production could generate a range of $109 million to $159 million in county revenues from ad valorem taxes, which is about $9.5 million to $71.5 million less than under Alternative 1). The reductions in tax revenues could put strain on local governments' budgets and could impact public services that are offered to the communities.

Additionally, there could be impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest, especially for those individuals who rely on oil and gas extraction for employment. These impacts would have a large effect on communities throughout the analysis area in Colorado, due to the reliance on the mineral industry and oil and gas development on federal estate for the local economies.

Idaho

Under Alternative 3, on annual average, oil and gas production revenue and well development expenditures in the Idaho analysis area is expected to result in about 2 fewer total jobs (about 1 fewer direct jobs), $101,000 less in total labor income (about $48,000 less in direct labor income), and about $432,000 less in economic output (about $250,000 less in direct economic output) across the state compared to development under Alternative 1.

The small decrease in projected oil and gas activity in Idaho could result in reductions in tax revenues compared with Alternative 1, which could impact public services that are offered to the communities.

The potential decrease in oil and gas activity could result in impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest.

Montana

Under Alternative 3, on annual average, oil and gas production revenue and well development expenditures in the Montana analysis area is expected to result in about 1,400 fewer total jobs (about 550 fewer direct jobs), $127 million less in total labor income (about $76 million less in direct labor income), and about $499 million less in economic output (about $337 million less in direct economic output) across the state compared to development under Alternative 1.

The decrease in projected oil and gas activity, under Alternative 3, would result in reductions in tax revenues, compared with Alternative 1. Under Alternative 3, the total royalty revenue generated from oil and gas production in Montana would be about $75.7 million, which is about $36.8 million less than under Alternative 1. The Montana severance tax revenue is expected to be about $56.0 million, which is about $6.6 million less than under Alternative 1. Additionally, oil and gas production could generate about $1.6 million in the privilege and license tax revenue, which is about $186,000 less than under Alternative 1. The reductions in tax revenues could put strain on local governments' budgets and could impact public services that are offered to the communities.

Additionally, there could be impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest, especially for those individuals who rely on oil and gas

extraction for employment. These impacts would have a larger effect on communities in southeastern and northeastern Montana, where the local economies have relied on mineral industry and oil and gas development on federal estate.

Nevada

Under Alternative 3, on annual average, oil and gas production revenue and well development expenditures in the Nevada analysis area is expected to result in about 29 fewer total jobs (about 13 fewer direct jobs), $1.5 million less in total labor income (about $173,000 less in direct labor income), and about $8.2 million less in economic output (about $4.5 million less in direct economic output) across the state compared to development under Alternative 1.

The decrease in projected oil and gas activity, under Alternative 3, could result in reductions in tax revenues, compared with Alternative 1. Under Alternative 3, the total royalty revenue generated from oil and gas production in Nevada would be about $111,000, which is about $409,000 less than under Alternative 1. The Nevada severance tax revenue is expected to be about $33,000, which is about $82,000 less than under Alternative 1. Additionally, oil and gas production could generate about $2,000 across the analysis area in administration fees, which is about $4,000 less than under Alternative 1. The reductions in tax revenues could put strain on local governments' budgets and could impact public services that are offered to the communities.

Additionally, there could be impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest, especially for those individuals who rely on oil and gas extraction for employment. These impacts would have a larger effect on communities in southern Nevada, where the local economies have relied on extractive minerals and oil and gas development on federal estate.

North Dakota

Under Alternative 3, on annual average, oil and gas production revenue and well development expenditures in the North Dakota analysis area is expected to result in about 88 fewer total jobs (about 42 fewer direct jobs), $7.4 million less in total labor income (about $4.9 million less in direct labor income), and about $72 million less in economic output (about $62 million less in direct economic output) across the state compared to development under Alternative 1.

The decrease in projected oil and gas activity, under Alternative 3, would result in reductions in tax revenues, compared to Alternative 1. Under Alternative 3, the total royalty revenue generated from oil and gas production in North Dakota would be about $32.7 million, which is about $18.8 million less than under Alternative 1. The North Dakota severance tax revenue is expected to be about $12.4 million, which is about $2.3 million less than under Alternative 1. Additionally, oil and gas production could generate about $13.1 million across the analysis area oil extraction tax revenues, which is about $2.4 million less than under Alternative 1. The reductions in tax revenues could put strain on local governments' budgets and could impact public services that are offered to the communities.

Additionally, there could be impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest, especially for those individuals who rely on oil and gas extraction for employment. These impacts would have a larger effect on communities in southwestern North Dakota, where the local economies have relied on extractive minerals and oil and gas development on federal estate.

South Dakota

Under Alternative 3, on annual average, oil and gas production revenue and well development expenditures in the South Dakota analysis area is expected to result in about 13 fewer total jobs (about 4 fewer direct jobs), $764,000 less in total labor income (about $318,000 less in direct labor income), and about $3.4 million less in economic output (about $1.7 million less in direct economic output) across the state compared to development under Alternative 1.

The decrease in projected oil and gas activity in South Dakota could result in reductions in tax revenues compared with Alternative 1. Under Alternative 3, the total royalty revenue generated from oil and gas production in South Dakota would be about $1.8 million, which is about $616,000 less than under Alternative 1. The South Dakota severance tax revenue is expected to be about $637,000, which is about $7,000 less than under Alternative 1. The reductions in tax revenues could impact public services that are offered to the communities.

The potential decrease in oil and gas activity could result in impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest.

Utah

Under Alternative 3, on annual average, oil and gas production revenue and well development expenditures in the Utah analysis area is expected to result in about 700 fewer total jobs (about 200 fewer direct jobs), $47 million less in total labor income (about $17 million less in direct labor income), and about $252 million less in economic output (about $167 million less in direct economic output) across the state compared to development under Alternative 1.

The decrease in projected oil and gas activity, under Alternative 3, would result in reductions in tax revenues, compared with Alternative 1. Under Alternative 3, the total royalty revenue generated from oil and gas production in Utah would be about $125 million, which is about $60.4 million less than under Alternative 1. The Utah severance tax revenue is expected to be about $50.0 million, which is about $5.6 million less than under Alternative 1. The conservation fee is expected to generate about $200,000, which is about $22,000 less than under Alternative 1. Additionally, oil and gas production could generate about $50.0 million across the analysis area in county revenues from ad valorem taxes, which is about $5.6 less than under Alternative 1. The reductions in tax revenues could put strain on local governments' budgets and could impact public services that are offered to the communities.

Additionally, there could be impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest, especially for those individuals who rely on oil and gas extraction for employment. These impacts would have a larger effect on communities in central and northeastern Utah, where the local economies have relied on mineral industry and oil and gas development on federal estate.

Wyoming

Under Alternative 3, on annual average, oil and gas production revenue and well development expenditures in the Wyoming analysis area is expected to result in about 22,000 fewer total jobs (about 10,000 fewer direct jobs), $1.7 billion less in total labor income (about $1.1 billion less in direct labor income), and about $8.0 billion less in economic output (about $5.7 billion less in direct economic output) across the state compared to development under Alternative 1.

The decrease in projected oil and gas activity, under Alternative 3, would result in reductions in tax revenues, compared with Alternative 1. Under Alternative 3, the total royalty revenue generated from oil and gas production in Wyoming would be about $523 million, which is about $449 million less than under Alternative 1. The Wyoming severance tax revenue is expected to be about $251 million, which is about $99 million less than under Alternative 1. The oil and gas conservation tax is expected to generate about $2.1 million, which is about $824,000 less than under Alternative 1. Additionally, oil and gas production could generate about $264 million across the analysis area in county revenues from ad valorem taxes, which is about $104 million less than under Alternative 1. The reductions in tax revenues could put strain on local governments' budgets and could impact public services that are offered to the communities.

Additionally, there could be impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest, especially for those individuals who rely on oil and gas extraction for employment. These impacts would have a large effect on communities throughout the analysis area in Wyoming, due to the reliance on extractive minerals and oil and gas development on federal estate for the local economies.

Nonenergy Leasable Minerals Management

Rangewide Environmental Consequences

Under Alternative 3, all PHMA would be closed to new nonenergy mineral leasing, which would result in the economic and social impacts as discussed in the *Nature and Type of Effects* section. For example, this closure would result in impacts on economic contributions associated with nonenergy mineral extraction, such as reductions in jobs, labor income, economic output, and tax revenue, compared with Alternative 1. The reductions in tax revenues could put strain on local governments' budgets and could impact public services that are offered to the communities. Additionally, there could be impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest, especially for those individuals who rely on mineral extraction for employment. These impacts would have a larger effect on communities in northwestern Colorado, in Caribou County, Idaho, central Utah, and southwestern Wyoming, where the local economies have relied on nonenergy leasable mineral extraction on federal estate.

Closures in land to new nonenergy mineral leasing could result in increases in prices in the short term of household products, such as products made from trona, as discussed in *Nature and Type of Effects*, due to an increase in cost that would likely occur to mining operators. Restrictions on mineral leasing will likely not result in immediate closures of mines; however, as restrictions on nonenergy leasing continue in the long term, there could be impacts on the availability of household products made from trona due to the potential continued constraints on nonenergy leasable mineral extractions. Increases in prices and decreases in availability of household products can put large strains on households, especially those with limited resources for alternative products or those with low income, where the products already make up a larger percentage of disposable income. Over the long term, if closures in mines continue to put pressure on prices and limit availability, it could cause even more stress on the surrounding communities, including increases in conflicts and decreases in social cohesion and health and safety. See **Section 4.10.2**, Nonenergy Leasable Minerals, for more information regarding impacts on trona and other nonenergy leasable minerals due to BLM-Management decisions.

Under Alternative 3, all PHMA would be closed to nonenergy mineral leasing, which would reduce potential impacts on nonmarket and social conditions due to changes in air quality and GHG emissions from actions such as surface disturbance from mineral development, as described under the *Nature and Types of Effects*.

Due to closing PHMA, the effects on these nonmarket and social conditions would be the lowest out of the alternatives.

Locatable Minerals Management

Rangewide Environmental Consequences

Under Alternative 3, all lands in PHMA would be recommended for withdrawal from locatable mineral entry. Recommending areas for closure to the mining laws for locatable exploration or development does not restrict any activities and therefore, such recommendation does not have any impacts. However, the BLM could ask the Secretary of the Interior to propose and make a withdrawal of the land from location and entry under the Mining Law of 1872 pursuant to Section 204(a) of FLMPA. Proposing and making a withdrawal is not a land use planning process. Should the Secretary propose a withdrawal, the proposal would require environmental and other analysis under NEPA and other applicable authorities before the land could be withdrawn. For purposes of this planning initiative, the alternatives analysis includes a description of the likely environmental effects should the Secretary propose and make a withdrawal in the future (e.g., reduced potential for behavioral disturbance and habitat loss/alterations). Here, if the Secretary ultimately decided to withdraw the land, such a withdrawal would likely result in a reduction of economic activity in mining sectors, compared with under Alternative 1, as described in the *Nature and Type of Effects*. The reduction in economic activity could result in impacts on market and nonmarket conditions, such as reductions in jobs, labor income, economic output, tax revenue, public services, access to lifestyles and culture associated with mining. Additionally, for those mining operators with existing mining claims that might survive a withdrawal, costs could increase due to the additional requirement to verify mining claim validity before BLM will approve a notice or plan of operations. These impacts could put a lot of strain on communities, especially those that are dependent on the mining industry. These impacts would likely be larger in areas with high potential for locatable mineral development, assuming that there are existing mining claims on those lands as of the date of withdrawal. Such a withdrawal, if made by the Secretary, would not impact nonmarket and social conditions associated with changes in air quality and GHG emissions.

Mineral Materials Management

Rangewide Environmental Consequences

Under Alternative 3, all areas managed for GRSG would be PHMA and would be closed to mineral materials disposal. This would reduce federal, state, territorial, municipality, and non-profit access to mineral materials through free use permits, and would increase costs for these users by relocating mineral materials operations to nonpublic lands or to public lands that are further away from where the minerals are going to be used, which would increase transportation costs. The increases in cost of mineral materials extraction could cause delays or cancelations of public projects that use mineral materials, such as road maintenance and construction of infrastructure by states and municipalities. Delays and cancelations in construction and maintenance projects would impact surrounding communities who rely on the roads and infrastructures and could increase public safety concerns and residents' frustration with road construction and repairs. These impacts would likely be larger in areas with high potential for mineral materials extraction. If historical extraction is an indication of potential, then the analysis areas in Colorado, Idaho, Montana, Nevada, and Wyoming would likely be impacted more by BLM-management decisions on lands closed to mineral materials disposal.

Under Alternative 3, closing PHMA to mineral materials disposal would reduce potential impacts on nonmarket and social conditions due to changes in air quality and GHG emissions from actions such as surface disturbance, associated with mineral development as described under the *Nature and Types of Effects*.

Due to closing PHMA, the effects on these nonmarket and social conditions would be the lowest out of the alternatives.

Renewable Energy (Geothermal, Wind, and Solar) Management

Rangewide Environmental Consequences

Impacts on economic activity from BLM-management decisions that could impact geothermal development, under Alternative 3, are discussed below for each state with reasonably foreseeable development. Montana, North Dakota, and South Dakota did not have any projected geothermal development in the analysis areas due to the limited geothermal potential. On annual average, across the 7 states with projected geothermal development, geothermal development is expected to result in about 76 fewer total jobs (about 43 fewer direct jobs), $4.3 million less in total labor income (about $2.4 million less in direct labor income), and about $11.5 million less in economic output (about $3.3 million less in direct economic output), compared with Alternative 1 (see **Table 12** in **Appendix 18**).

Under Alternative 3, there would be the most restrictions on ROWs for wind and solar development out of all alternatives (see **Appendix 12**, Reasonably Foreseeable Development Scenario, for more detail). These BLM-management decisions could result in operators relocating development of wind and solar facilities to other non-federal locations. However, relocating wind and solar operations might not be feasible in certain locations due to constraints on transmission line availability, and it could be very costly or not possible to develop transmission lines to the nearby area, because ROW avoidance and exclusion areas would apply to transmission lines as well. As noted in Alternative 1 discussion, if additional lines of transmission are needed, this could result in impacts on economic contributions of wind and solar. Under Alternative 3, impacts on economic conditions may be increased compared to Alternative 1 due to the highest level of restrictions on solar and wind site development, as discussed in **Section 4.12.1**, *Nature and Type of Effects*. However, there are many factors that operators consider when siting solar and wind development that are not influenced by BLM-management decisions, including resource potential, electricity prices, business decisions, among others. These factors can vary by site, operator, and technology, so a site-specific analysis would need to be conducted to further understand the economic impacts from changes in wind and solar development due to BLM-management decisions (see **Section 4.9**, Lands and Realty (Including Wind and Solar) for more information).

Under Alternative 3, all PHMAs would be managed as exclusion areas for major ROWs and wind or solar energy. Prohibiting development of wind, solar, and other major ROWs would eliminate the likelihood for impacts on nonmarket and social conditions from changes in air quality and GHG emissions from surface-disturbing activities in these areas.

California and Nevada

The number of geothermal plants developed in California and Nevada would be the same as under Alternative 1 because the amount of acreage under existing leases within GRSG HMAs is sufficient to meet the projected growth in geothermal production capacity (see **Appendix 12**, Reasonably Foreseeable Development Scenario, for more detail), so the impacts on jobs, labor, income, economic output from geothermal development would also be the same as described under Alternative 1 (see Table 12 in Appendix 18).

Colorado

Under Alternative 3, on annual average, geothermal development in the state is expected to result in about 16 fewer total jobs (about 8 fewer direct jobs), $1.1 million less in total labor income (about $537,000 less

in direct labor income), and about $2.7 million less in economic output (about $761,000 less in direct economic output), compared with Alternative 1.

Idaho

Under Alternative 3, on annual average, geothermal development in the state is expected to result in about 18 fewer total jobs (about 11 fewer direct jobs), $892,000 less in total labor income (about $506,000 less in direct labor income), and about $2.5 million less in economic output (about $702,000 less in direct economic output), compared with Alternative 1. The reduction in geothermal activities, under Alternative 3 would likely lead to a slight reduction in tax revenue collected by the state for geothermal production and disbursed to the counties. This reduction in tax revenue would reduce the quality and level of public services that are funded by the geothermal production tax.

If there is a reduction in wind and solar energy activities, under Alternative 3, due to BLM-management decision, such as a reduction in development and production, there would likely result in a decrease in tax revenue collected by the state and distributed to the counties, which could result in a decrease in quality and quantity of public services in the analysis area, as described in the *Nature and Type of Effects* section.

Oregon

Under Alternative 3, on annual average, geothermal development in the state is expected to result in about 11 fewer total jobs (about 6 fewer direct jobs), $577,000 less in total labor income (about $297,000 less in direct labor income), and about $1.5 million less in economic output (about $402,000 less in direct economic output), compared with Alternative 1. However, existing leases could still be used for geothermal development, so if any of these leases are developed, the impacts on economic contributions would change.

North Dakota

If there is a reduction in wind energy activities, under Alternative 3, due to BLM-management decision, such as a reduction in development and production, there would likely result in a decrease in tax revenue collected by the state and distributed to the counties, which could result in a decrease in quality and quantity of public services in the analysis area, as described in the *Nature and Type of Effects* section.

South Dakota

If there is a reduction in wind and solar energy activities, under Alternative 3, due to BLM-management decision, such as a reduction in development and production, there would likely result in a decrease in tax revenue collected by the state and distributed to the counties, which could result in a decrease in quality and quantity of public services in the analysis area, as described in the *Nature and Type of Effects* section.

Utah

Under Alternative 3, on annual average, geothermal development in the state is expected to result in about 22 fewer total jobs (about 12 fewer direct jobs), $1.3 million less in total labor income (about $743,000 less in direct labor income), and about $3.6 million less in economic output (about $1.1 million less in direct economic output), compared with Alternative 1. However, existing leases could still be used for geothermal development. If any of these leases are developed, the impacts on economic contributions would change, but development is less likely, under Alternative 3.

Wyoming

Under Alternative 3, on annual average, geothermal development in the state is expected to result in about 9 fewer total jobs (about 6 fewer direct jobs), $432,000 less in total labor income (about $288,000 less in

direct labor income), and about $1.3 million less in economic output (about $388,000 less in direct economic output), compared with Alternative 1.

If there is a reduction in wind energy activities, under Alternative 3, due to BLM-management decision, such as a reduction in development and production, there would likely result in a decrease in tax revenue collected by the state and distributed to the counties, which could result in a decrease in quality and quantity of public services in the analysis area, as described in the *Nature and Type of Effects* section.

Livestock Grazing Management

Rangewide Environmental Consequences

Under Alternative 3, all HMA (PHMA) would be unavailable for domestic livestock grazing, which would result in a substantial reduction in forage availability on federal lands. This reduction in forage availability would adversely affect ranching activity, including reducing billed AUMs, market, nonmarket, and social impacts associated with livestock grazing on public lands across communities. On annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the analysis areas for all 10 states combined is expected to result in about 2,000 fewer total jobs (about 841 fewer direct jobs), $120 million less in total labor income (about $67.6 million less in direct labor income), and about $380 million less in economic output (about $204 million less in direct economic output), compared with Alternative 1 (see **Table 18** in **Appendix 18**).

The restrictions on livestock grazing in large portions of federal allotments could impact the economic resilience of ranching and farming communities, as discussed in *Nature and Type of Effects,* especially in areas that are also reliant on mineral development due to the boom and bust economic cycle of the resources.

In many cases, BLM lands may have importance for a broader level of ranch operations, for example when providing important seasonal rotation pastures, and impacts limiting access to livestock grazing on BLM lands can result in large economic and social impacts for affected ranchers. Making PHMA unavailable to livestock grazing could result in increases in costs to ranchers and farmers who would have to find alternatives for federal forage for their livestock. The cost increases may lead to increases in meat prices if passed on to consumers and, in the long term, decreases in availability of meat and animal products, as discussed in *Nature and Type of Effects*. Increases in prices and decreases in availability of meat and animal products could put additional strain on households, especially those with lower incomes in rural areas, where food prices tend to be higher and a larger percentage of their disposable income goes towards food purchases.

Under Alternative 3, BLM-management decisions to restrict livestock grazing would likely have large market and nonmarket impacts on the local communities and economies across the analysis areas, as discussed in *Nature and Type of Effects.* There could be higher potential for closures of ranches or ranches selling lands to create ranchettes, which could have substantial impacts on social and economic conditions in some surrounding communities. These impacts include impacts on communities' well-being and social cohesion and impacts on access and quality of the ranching lifestyle, culture, and sense of place for those who rely on access to forage from federal land for their farming and ranching operations as well as for those who are part of the farming and ranching communities of interest and value livestock grazing on public lands. The regions that would be disproportionately affected include those communities and economies that rely on the agriculture industry and that have large quantities of small and midsize family farms and ranches where

the operators' primary occupation is farming or ranching.[8] These small and midsize ranches are located across most of the analysis area in each state of the planning area (see **Section 3.11**, Social and Economic Conditions (Including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report for more information on demographics and current economic and social conditions).

The impacts on economic activity from restricting livestock grazing in PHMA by state shown in Table 17, in Appendix 18, and are discussed below. See **Section 4.8**, Livestock Grazing, for more information regarding impacts on livestock grazing from BLM-management decisions.

California

Under Alternative 3, on annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the California analysis area is expected to result in about 22 fewer total jobs (about 7 fewer direct jobs), $3.4 million less in total labor income (about $2.1 million less in direct labor income), and about $8.4 million less in economic output (about $4.6 million less in direct economic output) across the state compared with Alternative 1. These impacts on economic conditions would likely disproportionately impact those communities in the analysis area with small family ranches that rely on federal lands for forage for their farming and ranching operations. Impacts on nonmarket and social conditions would likely be similar to those described in the *Rangewide Environmental Consequences* subsection under section 4.12.4, Alternative 3.

Colorado

Under Alternative 3, on annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Colorado analysis area is expected to result in about 82 fewer total jobs (about 50 fewer direct jobs), $3.2 million less in total labor income (about $1.8 million less in direct labor income), and about $9.8 million less in economic output (about $5.2 million less in direct economic output) across the state compared with Alternative 1. These impacts on economic conditions would likely disproportionately impact those communities in the analysis area with small family ranches that rely on federal lands for forage for their farming and ranching operations. Impacts on nonmarket and social conditions would likely be similar to those described in the *Rangewide Environmental Consequences* subsection under section 4.12.4, Alternative 3.

Idaho

Under Alternative 3, on annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Idaho analysis area is expected to result in about 221 fewer total jobs (about 77 fewer direct jobs), $22.8 million less in total labor income (about $13.3 million less in direct labor income), and about $57.3 million less in economic output (about $28.5 million less in direct economic output) across the state compared with Alternative 1. These impacts on economic conditions would likely be substantial, especially for those communities in the analysis area with small family ranches that rely on federal lands for forage for their farming and ranching operations. Impacts on nonmarket and social conditions would likely be similar to those described in the *Rangewide Environmental Consequences* subsection under section 4.12.4, Alternative 3.

[8] Small family ranches are those with annual gross cash farm income less than $350,000 and midsize family ranches are those with annual gross cash farm income of at least $350,000 but less than $1 million. See **Section 3.11**, Social and Economic Conditions (Including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report for more information on the types of ranches in the analysis area).

Montana

Under Alternative 3, on annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Montana analysis area is expected to result in about 381 fewer total jobs (about 186 fewer direct jobs), $21.0 million less in total labor income (about $10.5 million less in direct labor income), and about $67.3 million less in economic output (about $33.2 million less in direct economic output) across the state compared with Alternative 1. These impacts on economic conditions would likely be substantial, especially for those communities in the analysis area with small family ranches that rely on federal lands for forage for their farming and ranching operations. Impacts on nonmarket and social conditions would likely be similar to those described in the *Rangewide Environmental Consequences* subsection under section 4.12.4, Alternative 3.

Nevada

Under Alternative 3, on annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Nevada analysis area is expected to result in about 236 fewer total jobs (82 fewer direct jobs), $23.6 million less in total labor income (about $13.7 million less in direct labor income), and about $76.7 million less in economic output (about $42.1 million less in direct economic output) across the state compared with Alternative 1. These impacts on economic conditions would likely be substantial, especially for those communities in the analysis area with small family ranches that rely on federal lands for forage for their farming and ranching operations. Impacts on nonmarket and social conditions would likely be similar to those described in the *Rangewide Environmental Consequences* subsection under section 4.12.4, Alternative 3.

North Dakota

Under Alternative 3, on annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the North Dakota analysis area is expected to result in about 1 fewer total jobs (1 fewer direct jobs), $64,000 less in total labor income (about $39,000 less in direct labor income), and about $235,000 less in economic output (about $143,000 less in direct economic output) throughout the state, compared with Alternative 1. Impacts on nonmarket and social conditions would likely be similar to those described in the *Rangewide Environmental Consequences* subsection under section 4.12.4, Alternative 3, although to a lesser degree.

Oregon

Under Alternative 3, on annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Oregon analysis area is expected to result in about 206 fewer total jobs (78 fewer direct jobs), $14.1 million less in total labor income (about $6.5 million less in direct labor income), and about $50.0 million less in economic output (about $25.2 million less in direct economic output) across the state compared with Alternative 1. These impacts on economic conditions would likely be substantial, especially for those communities in the analysis area with small family ranches that rely on federal lands for forage for their farming and ranching operations. Impacts on nonmarket and social conditions would likely be similar to those described in the *Rangewide Environmental Consequences* subsection under section 4.12.4, Alternative 3.

South Dakota

Under Alternative 3, on annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the South Dakota analysis area is expected to result in about 10 fewer total jobs (about 5 fewer direct jobs), $402,000 less in total labor income (about $186,000 less in direct labor income), and about $2.5 million less in economic output (about $1.4 million less in direct economic output)

across the analysis area, compared with Alternative 1. These impacts on economic conditions would likely disproportionately impact those communities in the analysis area with small family ranches that rely on federal lands for forage for their farming and ranching operations. Impacts on nonmarket and social conditions would likely be similar to those described in the *Rangewide Environmental Consequences* subsection under section 4.12.4, Alternative 3.

Utah

Under Alternative 3, on annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Utah analysis area is expected to result in about 90 fewer total jobs (54 fewer direct jobs), $6.2 million less in total labor income (about $4.6 million less in direct labor income), and about $16.9 million less in economic output (about $10.8 million less in direct economic output) across the analysis area, compared with Alternative 1. These impacts on economic conditions would likely disproportionately impact those communities in the analysis area with small family ranches that rely on federal lands for forage for their farming and ranching operations. Impacts on nonmarket and social conditions would likely be similar to those described in the *Rangewide Environmental Consequences* subsection under section 4.12.4, Alternative 3.

Wyoming

Under Alternative 3, on annual average, livestock grazing on allotments where PHMA accounted for at least 15 percent of the acreage in the Wyoming analysis area is expected to result in about 552 fewer total jobs (about 301 fewer direct jobs), $25.1 million less in total labor income (about $14.7 million less in direct labor income), and about $91.3 million less in economic output (about $52.6 million less in direct economic output) across the analysis area, compared with Alternative 1. These impacts on economic conditions would likely be substantial, especially for those communities in the analysis area with small family ranches that rely on federal lands for forage for their farming and ranching operations. Impacts on nonmarket and social conditions would likely be similar to those described in the *Rangewide Environmental Consequences* subsection under section 4.12.4, Alternative 3.

Greater Sage Grouse Conservation

Rangewide Environmental Consequences

Alternative 3 would have the highest level of restrictions on development in all HMAs, including the fewest acres open and the most stringent restrictions for mineral extraction. Alternative 3 would also provide the most protection for wildlife and habitat within GRSG management areas because of increased restrictions, and in some cases the prohibition of surface disturbing activities (including mineral development, renewable energy development, and ROW development). As a result, Alternative 3 would provide the highest level of support for conservation related values.

BLM-management decisions, under Alternative 3, would support the protection of GRSG ecosystems, which would continue to provide value to the surrounding communities through impacts on tribal interests and cultural resources, especially subsistence, from changes in GRSG populations. Conversely, habitat conservation could negatively impact road realignment projects near tribal reservations and plans to expand reservation boundaries if the reservation is surrounded by PHMA.

Environmental Justice

Rangewide Environmental Consequences

Under Alternative 3, BLM-management decisions, such as those regarding mineral development and GRSG management, would offer the highest level of protection to cultural resources in GRSG habitat across all

alternatives. This would result in reduced impacts on environmental justice populations, as those described in Nature and Type of Effects. See **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Adverse impacts on subsistence resource availability, under Alternative 3, would be minimal due to the highest level of restrictions for mineral development and other surface-disturbing activities, compared with Alternative 1. See **Section 4.5**, Fish and Wildlife, for more information on impacts to wildlife habitats and **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Under Alternative 3, the impacts on nonmarket and social conditions due to changes in air quality from mineral exploration and development and surface disturbing activities would substantially reduce, compared with Alternative 1, due to the increase in restrictions on mineral development. This would reduce the impacts on environmental justice populations as discussed in Nature and Type of Effects. Due to restrictions in vegetation management, impacts on air quality from increased wildfire risk could increase, as described in Nature and Type of Effects. These impacts could disproportionately impact environmental justice populations, but the impacts would depend on site-specific factors such as location of changes in air quality compared with the locations of environmental justice populations that cannot be determined in this analysis. See **Section 4.13**, Air Resources and Climate for more information on air quality impacts.

Under Alternative 3, large swaths of public land would be unavailable for livestock grazing and closed to mineral leasing, which would likely increase production costs to ranchers and mining operators as they use alternative lands for forage and mining operations, if available. As described in *Nature and Type of Effects*, depending on the ability of the affected permittees and mining leases to adapt and mitigate to the loss of public land forage and public lands for mineral leasing, the increases in costs could lead to either higher prices of meat and household products (especially products made from trona) if the costs are passed on to consumers or closures in ranching and mining operations, which would lead to a decrease in availability of meat and household products, especially in the long term. These impacts would disproportionately affect low-income environmental justice populations, because marginal increases in prices of meat and household products make up a larger percentage of the disposable income from low-income households than the general public and low-income households tend to have fewer alternatives if meat and household products become unavailable. The restrictions in livestock grazing and mineral development that could lead to impacts on prices and availability are localized and vary across geographic regions; however, the impacts of meat and household product prices and availability would likely be observed regionally and nationally, especially in areas with higher low-income populations. See subsections in this section on *Nonenergy Leasable Minerals* and *Livestock Grazing* as well as **Section 4.10.2**, Nonenergy Leasable Minerals, and **Section 4.8**, Livestock Grazing, for more information on impacts on trona mining and livestock grazing.

Restrictions on mineral development in PHMA under Alternative 3 could contribute to budget shortfalls for state and local governments that are highly dependent on mineral revenues, like many counties in Wyoming, and may affect their ability to provide public services. Reductions in public services, like education, health care, and social safety net programs, could adversely affect the quality of life in affected communities. Since some public services are more heavily used by low-income individuals and families, insufficient funding for programs may disproportionately adversely impact low-income populations if access to those services was reduced.

As discussed in **Section 3.12**, Social and Economic Conditions (including Environmental Justice) and **Appendix 13**, Socioeconomic Baseline Report, economic impacts, such as impacts on jobs, labor income, and economic output, on environmental justice populations from greater restrictions in livestock grazing and mineral and oil and gas development are not included in the discussion on environmental justice due to the lack of evidence that individuals employed in the agriculture and mining sectors have a higher percentage of people who meet the criteria for environmental justice. However, a discussion on economic output, jobs, and labor income impacts on the general population due to BLM-management decisions is included in other subsections (see the *Fluid Minerals (Oil and Gas), Renewable Energy (Geothermal, Wind, and Solar),* and *Livestock Grazing* subsections). The loss of economic activity stemming from the closure of GRSG PHMA or making PHMA unavailable for authorized uses, as described in the subsections above in terms of affected jobs and labor income, may result in some additional communities meeting low-income criteria for consideration as potential environmental justice communities in the future. 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.

4.12.5 Alternative 4

Fluid Minerals (Oil and Gas) Management

Rangewide Environmental Consequences

The number of wells drilled and completed would be the same as under Alternative 1 in Montana, Nevada, North Dakota, South Dakota, Utah, and Wyoming, so the impacts on jobs, labor, income, economic output from oil and gas development and operations would also be the same as described under Alternative 1 for these states (see **Table 7** in **Appendix 18**). Under Alternative 4, oil and gas production revenue and well development expenditures are expected to increase in Colorado and Idaho due to more areas available for leasing and addition of more exceptions and waivers and oil and gas production revenue and well development expenditures are expected to decrease in Wyoming due to all land in PHMA managed as NSO (see **Section 4.10**, Mineral Resources, for more information). On annual average, this change is expected to result in about 9,000 to 10,000 fewer total jobs (about 4,000 to 5,000 fewer direct jobs), about $702 million to $762 million less in total labor income (about $482 million to $506 million less in direct labor income), and about $3.5 million to $3.7 million less in economic output (about $2.6 to $2.8 million less in direct economic output) than under Alternative 1, across these three states. Additional details on economic and social impacts specific to Colorado, Idaho, and Wyoming are discussed below.

Mineral development would continue to support federal, state, and local mineral revenues at levels similar to those estimated under Alternative 1 except for described below for impacts in Colorado, Idaho, and Wyoming. Changes in mineral revenues available to fund public services and infrastructure in Montana, Nevada, North Dakota, South Dakota, and Utah would be negligible relative to those under Alternative 1. Below is a discussion on royalty and state tax revenues for Colorado, Idaho, and Wyoming.

Under Alternative 4, impacts on nonmarket and social conditions associated with changes in air quality and GHG emissions from fluid mineral leasing would be similar to Alternative 1, except in some states as discussed under state-specific subheadings below for Colorado and Wyoming. Alternative 4 would minimize impacts on nonmarket and social conditions associated with air quality and GHG emissions, as describes under the *Nature and Type of Effects,* by promoting project designs that avoid, minimize, reduce, rectify, and compensate for direct and indirect impacts. Social impacts from way-of-life, culture, and social cohesion for the communities who value mineral extraction in Montana, Nevada, North Dakota, South Dakota, Utah, and Wyoming would be similar to those described under Alternative 1.

Colorado

Under Alternative 4, on annual average, oil and gas production revenue and well development expenditures in the Colorado analysis area is expected to result in 1,300 to 2,000 additional total jobs (about 374 to 574 additional direct jobs), about $111 million to $172 million in additional total labor income (about $45 million to $68 million in additional direct labor income), and about $414 million to $639 million in additional economic output, compared with Alternative 1 (about $232 million to $357 million in additional direct economic output) throughout the state.

Under Alternative 4, the total royalty revenue generated from oil and gas production in Colorado could range from $482 million to $924 million, which is about $29.3 million to $45.8 million more than under Alternative 1. The Colorado severance tax revenue could range from $33.9 million to $64.9 million, which is about $2.1 million to $3.2 million more than under Alternative 1. The oil and gas conservation fee could generate a range of $3.2 million to $6.1 million, which is about 193,000 to 302,000 more than under Alternative 1. Additionally, oil and gas production could generate a range of $126 million to $242 million in county revenues from ad valorem taxes, which is about $7.7 million to $12.0 million more than under Alternative 1. This increase in revenues that are disbursed to counties could bolster public finances which may be used to support additional public services, compared with Alternative 1. Additionally, there could be more support and preservation of nonmarket values associated lifestyles and culture for those in mineral development communities of interest and those who value preservation of historical mining communities.

In Colorado, under Alternative 4, more acreage would be available for fluid mineral leasing than under Alternative 1, since closures within one mile of leks in GHMA would no longer apply. This could allow for more development-related impacts on nonmarket and social conditions associated with changes in air quality and GHG emissions, compared with Alternative 1.

Idaho

Under Alternative 4, on annual average, oil and gas production revenue and well development expenditures in the Idaho analysis area is expected to result in about 9 total additional jobs (about 4 additional direct jobs), $506,000 in additional total labor income (about $240,000 in additional direct labor income), and about $2.2 million in additional economic output (about $1.2 million in additional direct economic output) throughout the state, compared with Alternative 1.

The small increase in projected oil and gas activity In Idaho could result in a small increase in tax revenues compared with Alternative 1, which would be disbursed to counties and would continue to support local public services, such as education.

The potential increase in oil and gas activity is not likely to result in large impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest.

Wyoming

In Wyoming, under Alternative 4, NSO stipulations would be applied to all land in PHMA and within 0.25 miles of leks in GHMA. This would reduce the acreage available for fluid mineral leasing, compared to Alternative 1. Under Alternative 4, on annual average, oil and gas production revenue and well development expenditures in the Wyoming analysis area are expected to result in about 11,000 fewer total jobs (about 5,000 fewer direct jobs), $874 million less in total labor income (about $551 million less in direct labor income), and about $4.2 billion less in economic output (about $3.0 billion less in direct economic output) across the state compared to development under Alternative 1.

The decrease in projected oil and gas activity, under Alternative 4, would result in reductions in tax revenues, compared with Alternative 1. Under Alternative 4, the total royalty revenue generated from oil and gas production in Wyoming would be about $829 million, which is about $143 million less than under Alternative 1. The Wyoming severance tax revenue is expected to be about $298 million, which is about $51.6 million less than under Alternative 1. The oil and gas conservation tax is expected to generate about $2.5 million, which is about $430,000 less than under Alternative 1. Additionally, oil and gas production could generate about $313 million across the analysis area in county revenues from ad valorem taxes, which is about $54.1 million less than under Alternative 1. The reductions in tax revenues could put strain on local governments' budgets and could impact public services that are offered to the communities, including education, as described in the *Nature and Type of Effects* section.

Additionally, there could be impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest, especially for those individuals who rely on oil and gas extraction for employment.

The reduction in the acreage available for fluid mineral leasing could reduce the development-related impacts on nonmarket and social conditions associate with changes in air quality and GHG emissions, compared with Alternative 1.

Nonenergy Leasable Minerals Management

Rangewide Environmental Consequences

Under Alternative 4, many of the economic and social impacts from changes in nonenergy leasable minerals due to BLM-management decisions would be the same as under Alternative 1 for all states in the planning area.

Under Alternative 4, the BLM would manage minerals to minimize land use conflict and associated impacts from subsequent development through project designs that avoid, minimize, reduce, rectify, and compensate for indirect impacts. Under this alternative, the BLM would take a more adaptive approach to management and consider existing data and best available science to determine if conservation measures are reasonable. Under this approach, while the impacts on nonmarket and social conditions related to air quality and GHG emissions would be reduced or removed in some cases, compared with Alternative 1, under the scenario which management would result in more development, impacts could increase due to an increase in development and surface disturbing activities, compared with Alternative 1.

Nevada/California

In Nevada and northeastern California, exceptions to the non-energy leasable mineral closure in PHMA under Alternative 1 may allow for increased development of non-energy leasable minerals, which could lead to impacts on nonmarket and social conditions such as access to clean air, health and safety from changes in air quality and GHG emissions, and reduced visitor and viewer enjoyment from changes in air quality, in some locations.

Locatable Minerals Management

Rangewide Environmental Consequences

Under Alternative 4, there would be no areas recommend for withdrawal from locatable mineral entry. As noted above, recommendations for withdrawal do not restrict any activities; therefore, they have no effects. Similarly, not recommending an area for withdrawal does not have any effects. There would be no impact to jobs, income, economic output and social conditions, as discussed in *Nature and Types of Effects*, under Alternative 4 different from those under Alternative 1.

Mineral Materials Management

Rangewide Environmental Consequences

Under Alternative 4, impacts on public access to mineral materials and social and nonmarket values of mineral material extraction would likely be similar to under Alternative 1, for all states, except for Idaho.

Idaho

In Idaho, under Alternative 4, economic and social impacts from proposed management and impacts on mineral material development would be the same as described under the Alternative 2 *Idaho* section.

Renewable Energy (Geothermal, Wind, and Solar) Management

Rangewide Environmental Consequences

The number of geothermal plants developed would be the same as under Alternative 1 in all states (see **Appendix 12**, Reasonably Foreseeable Development Scenario, for more detail), so the impacts on jobs, labor, income, economic output from geothermal development would also be the same as described under Alternative 1 (see **Table 13** in **Appendix 18**).

Utility scale wind and solar projects in PHMA would be managed as ROW exclusion areas, under Alternative 4 (see **Appendix 12**, Reasonably Foreseeable Development Scenario, for more detail). These BLM-management decisions could result in operators relocating development of wind and solar facilities to other locations that are not restricted. However, relocating wind and solar operations might not be possible or feasible, if access to transmission lines is limited, due to the high costs associated with building transmission lines and because ROW avoidance and exclusion areas would impact transmission lines as well. As noted in Alternative 1 discussion, if additional lines of transmission are needed, this could result in impacts on economic contributions of wind and solar. Under Alternative 4, impacts may be increased compared to the Alternative 1 due to increased restrictions on solar and wind site development due to ROW exclusion areas.

Livestock Grazing Management

Rangewide Environmental Consequences

Estimated billed AUMs, under Alternative 4, would be the same as under Alternative 1 for all states and analysis areas, so market impacts on jobs and income from livestock grazing would also be the same as described under Alternative 1 (see **Table 19** in **Appendix 18**). In addition, social impacts from way-of-life, culture, and social cohesion would be similar to those described under Alternative 1.

Impacts on livestock grazing operations and associated non-market values from designating GRSG habitat as HMAs would be similar to those described for Alternative 1.

Greater Sage Grouse Conservation

Rangewide Environmental Consequences

Impacts would be similar to that described in Alternative 1, with some additional state analysis area variation in level of protection for GRSG and associated impacts on those groups prioritizing development or conservation values. The level of impacts to non-market values associated with GRSG would therefore vary by area based on the determination of site-specific development restrictions determined by state.

Environmental Justice

Rangewide Environmental Consequences

Under Alternative 4, impacts from BLM-management decisions on environmental justice populations through cultural resource disturbance would be similar to Alternative 1. See **Section 4.17**, Tribal

Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Impacts on subsistence resource availability, under Alternative 4, could be reduced due to minerals management strategies that reduce possibilities of consequences from potential development in GRSG habitats or giving preference to lands that would not obstruct the suitability and proper operation of GRSG habitats. See **Section 4.5**, Fish and Wildlife, for more information on impacts to wildlife habitats and **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Under Alternative 4 impacts on nonmarket and social conditions from changes in air quality and GHG emissions from mineral development may increase compared with Alternative 1 due to the wavers, exceptions, and modifications that would be allowed under Alternative 4, which could increase mineral extraction. This would likely result in adverse and disproportionate impacts on environmental justice populations, as discussed in Nature and Type of Effects. See **Section 4.13**, Air Resources and Climate for more information on air quality impacts.

4.12.6 Alternative 5

Fluid Minerals (Oil and Gas) Management

Rangewide Environmental Consequences

The number of wells drilled and completed would be the same as under Alternative 1 in Montana, Nevada, North Dakota, South Dakota, and Utah, so the impacts on jobs, labor, income, economic output from oil and gas development and operations would also be the same as described under Alternative 1 for these states (see **Table 8** in **Appendix 18**). Under Alternative 5, oil and gas production revenue and well development expenditures are expected to increase in Colorado and Idaho due to more areas available for leasing and addition of more exceptions and waivers and oil and gas production revenue and well development expenditures are expected to decrease in Wyoming due to all land in PHMA managed as NSO, relative to Alternative 1 (see **Section 4.10**, Mineral Resources, for more information). On annual average, this change is expected to result in about 560 fewer total jobs to 150 more total jobs (about 460 to 260 fewer direct jobs), about $34 million less in total labor income to $26 million more in total labor income (about $47 million to $23 million less in direct labor income), and about $54 million to $279 million less in economic output (about $141 million to $266 million less in direct economic output) than under Alternative 1, across these three states. Additional details on economic and social impacts specific to Colorado, Idaho, and Wyoming are discussed below.

Mineral development would continue to support federal, state, and local mineral revenues at levels similar to those estimated under Alternative 1, except for described below for impacts in Colorado, Idaho, and Wyoming. Changes in mineral revenues available to fund public services and infrastructure in Montana, Nevada, North Dakota, South Dakota, and Utah would be negligible relative to those under Alternative 1. Below is a discussion on royalty and state tax revenues for Colorado, Idaho, and Wyoming.

Impacts on nonmarket and social conditions associated with air quality and climate change to the surrounding communities and regions would be similar as described under Alternative 1. Social impacts from way-of-life, culture, and social cohesion for the communities who value mineral extraction in Montana, Nevada, North Dakota, South Dakota, and Utah would be similar to those described under Alternative 1.

Colorado

Under Alternative 5, the economic and social impacts of changes in oil and gas development in the Colorado analysis area due to the BLM-management decisions would be the same as under Alternative 4.

Idaho

Under Alternative 5, on annual average, oil and gas production revenue and well development expenditures in the Idaho analysis area is expected to result in about 8 total additional jobs (about 4 additional direct jobs), $456,000 in additional total labor income (about $216,000 in additional direct labor income), and about $1.9 million in additional economic output (about $1.1 million in additional direct economic output) throughout the state, compared with Alternative 1.

The small increase in projected oil and gas activity In Idaho could result in a small increase in tax revenues compared with Alternative 1, which would be disbursed to counties and would continue to support local public services, such as education.

The potential increase in oil and gas activity is not likely to result in large impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest.

Wyoming

Under Alternative 5, on annual average, oil and gas production revenue and well development expenditures in the Wyoming analysis area is expected to result in about 2,000 fewer total jobs (about 836 fewer direct jobs), about $146 million less in total labor income (about $92 million less in direct labor income), and about $695 million less in economic output (about $498 million less in direct economic output), compared with Alternative 1 throughout the state.

The decrease in projected oil and gas activity, under Alternative 5, would result in reductions in tax revenues, compared with Alternative 1. Under Alternative 5, the total royalty revenue generated from oil and gas production in Wyoming would be about $948 million, which is about $23.9 million less than under Alternative 1. The Wyoming severance tax revenue is expected to be about $341 million, which is about $8.6 million less than under Alternative 1. The oil and gas conservation tax could generate about $2.8 million, which would be about $72,000 less than under Alternative 1. Additionally, oil and gas production could generate about $358 million across the analysis area in county revenues from ad valorem taxes, which is about $9.0 million less than under Alternative 1. The reductions in tax revenues could put strain on local governments' budgets and could impact public services that are offered to the communities, including education, as described in the *Nature and Type of Effects* section.

Additionally, there could be impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest, especially for those individuals who rely on oil and gas extraction for employment.

The reduction in the acreage available for fluid mineral leasing could reduce the development-related impacts on nonmarket and social conditions associate with changes in air and GHG emissions, compared with Alternative 1.

Nonenergy Leasable Minerals Management

Rangewide Environmental Consequences

Under Alternative 5, economic and social impacts from changes in nonenergy leasable minerals due to BLM-management decisions would be the same as under Alternative 1 for all states in the planning area.

Locatable Minerals Management

Rangewide Environmental Consequences

Under Alternative 5, the impacts on the economic activities and social conditions associated with locatable mineral resources would be the same as described under Alternative 4 above.

Mineral Materials Management

Rangewide Environmental Consequences

Under Alternative 5, impacts on public access to mineral materials and social and nonmarket values of mineral material extraction would likely be the same as under Alternative 4.

Renewable Energy (Geothermal, Wind, and Solar) Management

Rangewide Environmental Consequences

The number of geothermal plants developed would be the same as under Alternative 1 in all states (see **Appendix 12**, Reasonably Foreseeable Development Scenario, for more detail), so the impacts on jobs, labor, income, economic output from geothermal development would also be the same as described under Alternative 1 (see **Table 14** in **Appendix 18**).

Under Alternative 5, lands encompassing major ROWs and utility scale wind and solar in PHMA would be managed as ROW avoidance areas, while in GHMA they would be managed as open to ROWs. The impacts of BLM-management decisions on economic activity and market conditions from wind, solar, and transmission line development across all states would be the same as under Alternative 4 (see **Appendix 12**, Reasonably Foreseeable Development Scenario, for more detail).

Livestock Grazing Management

Rangewide Environmental Consequences

Estimated billed AUMs, under Alternative 5, would be the same as under Alternative 1 for all states and analysis areas, so impacts on jobs and income from livestock grazing would also be the same as described under Alternative 1 (see **Table 20** in **Appendix 18**). In addition, social impacts from way-of-life, culture, and social cohesion would be similar to those described under Alternative 1.

Impacts on livestock grazing operations and associated non-market values from designating GRSG habitat as HMAs would be similar to those described for Alternative 1.

Greater Sage Grouse Conservation

Rangewide Environmental Consequences

Impacts would be similar to that described in Alternative 1, with some additional state analysis area variation in level of protection for GRSG and associated impacts on those groups prioritizing development or conservation values. The level of impacts to non-market values associated with GRSG would therefore vary by area based on the determination of site-specific development restrictions determined by state.

Environmental Justice

Rangewide Environmental Consequences

Under Alternative 5, impacts from BLM-management decisions on environmental justice populations through cultural resource disturbance would be similar to Alternative 1. See **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Impacts on environmental justice populations from changes in subsistence resource availability, under Alternative 5, would be similar to Alternative 1. See **Section 4.5**, Fish and Wildlife, for more information

on impacts to wildlife habitats and **Section 4.17**, Tribal Interests and **Section 4.16**, Cultural Resources, for more discussions on impacts on tribal and cultural resources.

Under Alternative 5, impacts on nonmarket and social conditions due to changes in air quality and GHG emissions from mineral development would be minimized by promoting project designs that avoid, minimize, reduce, rectify, and compensate for indirect impacts. This would reduce the impacts on environmental justice populations as discussed in Nature and Type of Effects, compared with Alternative 1. See **Section 4.13**, Air Resources and Climate for more information on air quality impacts.

4.12.7 Alternative 6

All impacts would be the same as described for Alternative 5 except for the impacts described below.

Fluid Minerals (Oil and Gas) Management

Wyoming

Management of ACECs as open to leasing subject to NSO stipulations with an exception/modification to allow occupancy if there are drainage concerns from adjacent development and if it can be demonstrated that no direct or indirect impacts on GRSG will occur could lead to a reduction in the number of wells drilled and completed as well as oil and gas production from these wells in Wyoming, compared with Alternative 1.

Under Alternative 6, on annual average, oil and gas production revenue and well development expenditures in the Wyoming analysis area is expected to result in about 2,000 fewer total jobs (about 1,000 fewer direct jobs), about $175 million less in total labor income (about $110 million less in direct labor income), and about $835 million less in economic output (about $599 million less in direct economic output), than under Alternative 1, throughout the state (see **Table 9** in **Appendix 18**).

The decrease in projected oil and gas activity, under Alternative 6, would result in reductions in tax revenues, compared with Alternative 1. Under Alternative 6, the total royalty revenue generated from oil and gas production in Wyoming would be about $943 million, which is about $28.7 million less than under Alternative 1. The Wyoming severance tax revenue is expected to be about $339 million, which is about $10.3 million less than under Alternative 1. The oil and gas conservation tax is expected to generate about $2.8 million, which is about $86,000 less than under Alternative 1. Additionally, oil and gas production could generate about $356 million across the analysis area in county revenues from ad valorem taxes, which is about $10.8 million less than under Alternative 1. The reductions in tax revenues could put strain on local governments' budgets and could impact public services that are offered to the communities, including education, as described in the *Nature and Type of Effects* section.

Additionally, there could be impacts from BLM-management decisions on lifestyles and culture for those in mineral development communities of interest, especially for those individuals who rely on oil and gas extraction for employment.

The reduction in the acreage available for fluid mineral leasing could reduce the development-related impacts on nonmarket and social conditions associate with changes in air and GHG emissions, compared with Alternative 1.

Nonenergy Leasable Minerals Management

Under this alternative, impacts would be the same as described under Alternative 5 except that any existing non-energy leasable operations within ACECs would not be able to expand on federal mineral estate and

no new operations would be permitted in ACECs. This limitation on expansion and new operations would result in the economic and social impacts as discussed in the *Nature and Type of Effects* section. However, the impacts would be limited to areas within ACECs.

Locatable Minerals Management

Under Alternative 6, requiring a plan of operations for exploration operations disturbing five acres or less in ACECs would increase administrative process and cost for operators conducting exploration. This could result in a reduction in exploration in ACECs which could lead to a reduction in development and production in these areas as well. If this results in a reduction development, there could be impacts on economic and social conditions in the surrounding communities, as discussed in *Nature and Type of Effects.*

Mineral Materials Management

Restrictions on mineral material development in ACECs could result in impacts on economic and social conditions, as discussed in *Nature and Type of Effects*; however, due to mineral materials being available in other locations, the impacts are not anticipated to be large.

4.13 AIR RESOURCES AND CLIMATE

4.13.1 Air Quality

This section presents potential impacts on air quality implementing management actions presented in **Chapter 2**. Existing conditions concerning air quality are described in **Chapter 3**.

Nature and Type of Effects

Air quality is measured by the concentration of air pollutants and changes in air quality-related values, such as visibility and atmospheric deposition (e.g., nitrogen and sulfur deposition on soils and vegetation, and acidification of sensitive water bodies). Emissions of hazardous air pollutants could potentially result in localized increased risk of impacts on human health. Criteria and hazardous air pollutants can negatively impact human health in a variety of ways. Exposure to air pollution most often affects the respiratory system, and is often also associated with pulmonary, cardiovascular, and neurological impairments (EPA 2023f). Children and other high-risk groups, such as the elderly, pregnant women, and individuals with chronic heart and lung diseases, are especially susceptible to impacts from air pollution (EPA 2023f).

Actions that increase emissions of air pollutants can result in negative effects on air quality related values, including visibility and atmospheric deposition. An increase in SO_2, NO_2, PM_{10}, and $PM_{2.5}$ emissions can result in decreased visibility, increased atmospheric nitrogen and sulfur deposition on soils and vegetation, and acidification of sensitive water bodies. Fugitive dust could potentially result in increases in ambient concentrations of PM_{10} and $PM_{2.5}$ resulting in localized impacts on vegetation and increases in atmospheric deposition. Particulate matter also contributes to haze and limits visibility (EPA 2023g). Ground-level ozone, which is formed by a chemical reaction between volatile organic compounds and nitrogen oxides, contributes to smog, which limits visibility (EPA 2023h). Particulate matter emissions (fugitive dust) are primarily caused by earth-moving activities and vehicular traffic on unpaved roads and surfaces associated with development and operation. While PM10 emissions are largely caused by fugitive dust, and primary PM2.5 emissions can be partially attributed to fugitive dust, secondary PM2.5 primarily stems from chemical reactions with gaseous emissions.

Greater Sage-Grouse Management

Implementing management for the protection of GRSG generally involves reducing or otherwise restricting land use and activities that disturb GRSG habitat. These land uses and activities often also emit air pollutants. Wildland fires, particularly uncontrolled wildfires, can significantly affect air quality by introducing large

amounts of particulate matter, CO, atmospheric mercury, ozone precursors, and volatile organic compounds into the air, affecting both visibility and human health (British Columbia 2023). By improving landscape resiliency to wildfire and soil degradation, protection of the GRSG habitat would result in a general improvement in air quality. By restricting land uses that may emit air pollutants, protection of GRSG habitat would result in a general improvement in air quality.

Minerals Management

Activities related to fluid mineral leasing and development can result in emissions produced during all phases of mineral development—from exploration, construction, and operational phases of the project to well plugging, site closure, reclamation, and abandonment. Oil and gas development results in short-term and long-term emissions of criteria pollutants and hazardous air pollutants from vehicle use, drill rigs, construction equipment use, disturbance of soils, and leaks, flaring or venting of natural gas. Limiting oil and gas leasing and resultant development with the purpose of reducing disturbance to GRSG and their habitat could reduce air pollutant emissions or at a minimum, move sources to a different location.

Mining activities associated with the development of non-energy minerals and mineral materials (salable minerals), generate fugitive dust particles and gaseous tailpipe emissions from large mining equipment. Activities such as blasting, excavating, loading and hauling of overburden and mineral resources, and wind erosion of disturbed and un-reclaimed mine areas, produce fugitive dust. Crushing, storage, and handling facilities are common stationary point sources for particulate matter. Air pollutant emissions that could be expected to result from solid mineral development are CO, NOx, particulates (PM_{10} and $PM_{2.5}$), SO_2, ground level ozone, and some EPA listed hazardous air pollutants (e.g., Benzene, Formaldehyde, and Acetone). Actions that limit leasing or development of nonenergy leasable minerals and mineral materials within GRSG key habitat areas could reduce non-oil and gas emissions by limiting exploration, construction, and operations associated with mining. However, restrictions on travel associated with mining could result in creating longer trips by redirecting travel around sensitive areas, and thereby increasing travel-related emissions.

Lands and Realty Management

Activities related to surface disturbances (e.g., construction of facilities, roads, and transmission lines, wind and solar plants) can result in particulate emissions from fugitive dust, exhaust emissions, and other criteria pollutant emissions from soil disturbances, construction-related travel, use of heavy equipment, and long-term effects associated with road use and maintenance. A number of the management actions under the alternatives address surface disturbances pertaining to GRSG core and connectivity habitat areas, nesting/early brood-rearing habitats, winter habitats and winter concentration areas. In addition, some of the action alternatives restrict activities by date, density, and any reclamation activities proposed. All proposed actions associated with restricting or prohibiting surface disturbing activity for GRSG core and connectivity habitat areas, nesting/early brood-rearing habitats, and winter habitats and concentration areas specified could reduce air emissions by limiting travel and activity. However, the restrictions on travel could result in creating longer trips by redirecting travel around sensitive areas, and thereby increasing travel-related emissions. In addition, some of the actions that restrict activities in March through May could redirect emissions toward the other months (such as winter), thereby increasing ozone potential in areas subject to winter ozone formation.

Alternative 1

Rangewide Environmental Consequences

Under Alternative 1, in most of the planning area PHMA (IHMA in Idaho), except as noted under the state-specific sub-headings below, fluid mineral leasing would continue to be managed as NSO. While this would

continue to eliminate emission sources in PHMA (IHMA in Idaho), impacts could be relocated within the planning area, and continue to impact air quality as described in the *Nature and Types of Effects*. Fluid mineral development and production would continue to be the primary source of emissions from BLM-authorized activity in the planning area. BLM has conducted the 2032 Western US Photochemical Air Quality Modeling study to assess the impacts of fossil fuel development and production and other cumulative sources on air quality and air quality related values in BLM-administered lands in the seven US intermountain western states (Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming); modeling results represent emission sources in year 2032 anticipated future oil, gas, and coal development, other human-caused (anthropogenic) emissions, and natural sources on air quality and air quality related values (visibility and deposition) for the year 2032 (Ramboll 2023). Modeled emissions from new federal oil and gas development in circa 2032 for states that overlap with the planning area are shown in **Table 4-5**. Under Alternative 1, potential emissions from oil and gas development in the Greater Sage-Grouse planning area can be assumed to be a fraction of the modeled emissions (circa 2032) from new federal oil and gas development. That is because the GRSG planning area represents a portion of the area that was modeled in each state. Under Alternative 1, circa 2032 emissions in each of the modeled planning area states are used as proxy to represent an upper limit to potential new federal oil and gas emissions in the planning area.

Under Alternative 1, except as noted under the state-specific sub-headings below, potential impacts on air quality from proposed management of BLM-administered federal mineral estate as closed to or available for salable mineral sales or disposal within the planning area GHMA where there is no specific allocation, and within PHMA (IHMA in Idaho) from new free use permits and expansion of existing leases would continue.

Under Alternative I, potential for impacts on air quality from locatable mineral development would continue in all GHMA and PHMA (IHMA in Idaho).

Under Alternative 1, except as noted under the state specific sub-heading below, potential impacts on air quality from major and minor ROWs in PHMA/IHMA and GHMA, where it would continue to be managed as avoidance for major ROWs and open to minor ROWs, would continue. Under Alternative I, except as noted under the state-specific sub-headings below, wind and solar development would continue to be managed as avoidance in GHMA and as exclusion in PHMA (IHMA in Idaho). This would continue to reduce potential impacts on air quality associated with emissions and surface-disturbing activities in GHMA and eliminate sources of impacts on air quality in PHMA, as described in the *Nature and Types of Effects*.

Under Alternative 1, impacts on air quality from changes in livestock grazing would continue in PHMA (IHMA in Idaho) and GHMA across the planning area. Impacts would continue to largely be determined by variations in site-specific management actions that minimize surface-disturbing actions. These management actions would continue to indirectly reduce impacts on air quality from changes in livestock grazing described in the *Nature and Types of Effects*.

Colorado Environmental Consequences

Under Alternative 1, Colorado GHMA would continue to be managed as closed to fluid mineral leasing within 1 mile of leks, NSO within 2 miles of leks, and seasonal limitations elsewhere, while PHMA would continue to be closed to fluid mineral leasing within 1 mile of leks. While in areas that remain as closed or as open with NSO stipulations for fluid mineral leasing, sources of impacts on air quality would be removed, impacts may be relocated to elsewhere within the planning area where fewer restrictions on fluid mineral leasing exists.

Idaho Environmental Consequences

Under Alternative 1, fluid mineral leasing would continue to be managed as NSO in Idaho IHMA and as CSU in GHMA. Within GHMA, potential for impacts on air quality from fluid mineral leasing would continue to exist while in areas that remain designated NSO for fluid mineral leasing, emissions sources would be eliminated. However, the potential for displacement of impacts to elsewhere within the planning area where fewer restrictions on fluid mineral leasing exist would continue.

Under Alternative 1, potential impacts on air quality from proposed management of BLM-administered federal mineral estate as closed to or available for salable mineral sales or disposal would continue to exclude impacts from new free use permits and continue to be limited to impacts from expansion of existing permits.

Under Alternative 1, potential for impacts on air quality from wind, solar, and other major ROWs would continue within GHMA in Idaho where it would continue to be open to such use. Potential for impacts on air quality from solar and wind development in Idaho IHMA, where it would continue to be managed as avoidance for solar and wind development and only excluded for utility scale projects, would continue to be higher compared with PHMA in other planning area states.

Nevada/California Environmental Consequences

Under Alternative 1, potential for impacts on air quality from fluid mineral leasing would continue in Nevada and California GHMA where it would continue to be open to fluid mineral leasing, subject to CSU stipulations.

Under Alternative 1, potential for impacts on air quality from solar and wind projects would continue to exist in Nevada and California PHMA from non-utility-scale solar and wind, and from major ROWs or wind projects in GHMA, which would continue to be managed as avoidance. No air quality impacts from solar development within the Nevada and California PHMA would occur, where it would continue to be managed as exclusion for solar projects.

Oregon Environmental Consequences

Under Alternative 1, while potential for impacts on air quality from fluid mineral leasing within 1 mile of leks would continue to be eliminated, potential for impacts outside of the 1-mile radius, where it would continue to be open to fluid mineral leasing and subject to CSU stipulations, would continue to exit.

Under Alternative 1, potential for impacts on air quality from solar and wind projects would continue in Oregon PHMA, where it would continue to be managed as avoidance for solar and wind development and only excluded for utility scale projects (except in Lake, Harney, and Malheur Counties where it is avoidance and impacts could occur within PHMA).

Utah Environmental Consequences

Under Alternative 1, potential impacts on air quality from fluid mineral leasing in Utah GHMA would continue, where it would continue to be managed as NSO near leks or CSU based on allocations in plans that predated the 2015 amendment. While in areas that remain designated as NSO for fluid mineral leasing, sources of impacts on air quality would be removed, impacts may be relocated to elsewhere within the planning area, where fewer restrictions on fluid mineral leasing exists. In areas open to fluid mineral leasing with CSU stipulations, potential for impacts on air quality would continue to exist.

Under Alternative 1, GHMA in Utah would continue to be open to wind and other major ROWs (subject to minimization and mitigation), which would continue to result in air quality impacts that are associated

with emissions and surface-disturbing activities. Under Alternative 1, potential for impacts on air quality from wind projects would continue to exist in PHMA in Utah to within 5 miles of leks.

Wyoming Environmental Consequences

Under Alternative 1, in Wyoming, GHMA would be managed as NSO within 0.25 miles of leks, and seasonal limitations within 2 miles of leks, while PHMA would continue to be managed as NSO within 0.6 miles of leks and as CSU or with timing limitations outside. While in areas that remain designated as NSO for fluid mineral leasing, sources of impacts on air quality would be removed, impacts may be relocated to elsewhere within the planning area, where fewer restrictions on fluid mineral leasing exists. In areas open to fluid mineral leasing with CSU stipulations or timing limitations, potential for impacts on air quality would continue to exist.

Under Alternative 1, potential impacts on air quality from proposed management of BLM-administered federal mineral estate as closed to or available for salable sales or disposal would continue to exist within PHMA in Wyoming, where it would continue to be managed as open, subject to occupancy, seasonal limitations, disturbance, and density for such use.

Under Alternative 1, potential impacts on air quality would continue to exist from major and minor ROWs, and from solar and wind development, in Wyoming PHMA, where it would be open to such use.

Alternative 2

Rangewide Environmental Consequences

Under Alternative 2, impacts on air quality from closure to leasing or stipulations applied to fluid mineral leasing in PHMA and GHMA would be the same as under Alternative 1, except in Colorado as described under the state-specific sub-heading below.

Under Alternative 2, impacts on air quality from proposed management of BLM-administered federal mineral estate as closed to or available for salable mineral sales or disposal in PHMA and GHMA would be the same as under Alternative 1, except in Idaho IHMA and Nevada PHMA as described in the state-specific sub-headings below.

Under Alternative 2, removing the recommendation for withdrawal of locatable mineral entry in SFA in all states (except in Montana/Dakotas, which did not have a 2019 amendment) would not change impacts on air quality because as discussed under Alternative 1, recommending areas for closure to the mining laws for locatable exploration or development does not restrict any activities and therefore, such recommendation does not have any impacts. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

Under Alternative 2, impacts on air quality from changes in GRSG habitat protected from major and minor ROWs and from solar and wind development would be the same as under Alternative 1, except in Nevada for solar energy development and major ROWs, and in Nevada and Utah for wind energy development, as described in the state-specific sub-headings below.

Under Alternative 2, impacts on air quality from changes in livestock grazing would be similar to those described under Alternative 1. However, there would be more exceptions to restrictions on livestock grazing than under Alternative 1, which could result in increased potential localized impacts on air quality in PHMA or IHMA.

Colorado Environmental Consequences

Under Alternative 2, PHMAs in Colorado would be designated as NSO for fluid mineral development. Compared with Alternative 1, under which areas within 1 mile of leks would remain closed to fluid mineral leasing, this would increase potential impacts on air quality. Compared with Alternative 1, changing GHMA from closed to fluid mineral leasing within 1 mile of leks and NSO within 2 miles of leks under Alternative 1 to NSO within 1 mile of leks under this alternative would likely result in an increase in air emissions because the amount of federal mineral estate available for leasing and development would be greater under this alternative.

Idaho Environmental Consequences

Under Alternative 2, allowing consideration of new free use permits for salable minerals in Idaho IHMA, would increase the potential for associated impacts on air quality compared with Alternative 1. This is because there would be a greater chance for more acres of salable mineral activities to occur in these areas.

Nevada/California Environmental Consequences

Under Alternative 2, adding an exception criterion to salable and nonenergy mineral closures for Nevada PHMA would increase the potential for associated impacts on air quality. This is because there would be a greater chance for more area of salable mineral activities to occur in these areas.

Under Alternative 2, there would be an exception criterion avoidance for ROWs and to the closure to wind and solar development in Nevada PHMA and to wind development in Nevada/California GHMA. Compared with Alternative 1, this could increase the potential for impacts on air quality associated with changes in land protected from or open to renewable energy development because there would be a higher chance of development. However, the exception criteria would likely avoid impacts on air quality.

Utah Environmental Consequences

Under Alternative 2, areas outside PHMAs that are within 5 miles of leks in Utah would be avoidance for wind development. This could increase the potential for impacts on air quality associated with changes in land protected from wind development compared with Alternative 1. This is because there would be a higher chance of development in an avoidance area as opposed to an exclusion area that includes an exception criterion to closure.

Alternative 3

Under Alternative 3, closing PHMA to fluid mineral leasing, salable mineral sales and disposal, and nonenergy mineral leasing would reduce potential impacts on air quality from actions such as surface disturbance, associated with mineral development as described under the *Nature and Types of Effects*. Effects would be reduced compared with Alternative 1. The recommendation to withdraw all PHMA from location and entry under the United States mining laws would not impact air quality because considering whether to withdraw certain lands is a separate action with its own NEPA analysis.

New infrastructure development would be substantially limited compared with Alternative 1. Under Alternative 3, prohibiting development of wind, solar, and other major ROWs would eliminate the likelihood for impacts on air quality from changes in land protected from or open to such surface-disturbing activities in these areas.

Compared with Alternative 1, Alternative 3 contains greater restrictions on other resources and would most greatly reduce the potential for impacts on air quality from changes in land protected from or open to

livestock grazing as described under the *Nature and Type of Effects*. However, removing grazing may result in the accumulation of fine fuels, potentially leading to wildfires that could impact air quality.

Alternative 4

Under Alternative 4, impacts on air quality from fluid mineral leasing would be similar to Alternative 1. Under Alternative 4, impacts on air quality from management of BLM-administered federal mineral estate as closed to or available for salable mineral sales or disposal, would be the same as under Alternative 1, except in some states as discussed under state-specific subheadings below.

Under Alternative 4, PHMA in all states, and IHMA to within 3.1 miles from active leks, would be managed as exclusion for utility-scale wind and solar energy projects. Therefore, no air quality impacts from utility-scale wind or solar projects would be expected in those areas, similar to IHMA in Idaho, and PHMA in Nevada/California and Oregon (except in Lake, Harney, and Malheur Counites where potential for impacts remain, because it would be managed as avoidance under Alternative 1). Under Alternative 4, potential for impacts on air quality from utility-scale solar or wind development would be less than the potential for impacts from construction of such projects in Wyoming and Utah under Alternative 1, where the management action is either avoidance, or exclusion with exception criterion.

Under Alternative 4, site-specific management actions would continue to have impacts on air quality resulting from changes in livestock grazing as described under the *Nature and Type of Effects*. The emphasized flexibility under Alternative 4, compared to Alternative 1, would help ensure that grazing practices remain in compliance with established guidelines, reducing impacts on air quality compared with Alternative 1.

Alternative 5

Under Alternative 5, impacts on air quality from mineral development would be similar to Alternative 1. Under Alternative 5, PHMA would be designated as avoidance for utility-scale wind and solar projects, prioritizing the protection of GRSG habitat and, in turn, reducing the impacts on air quality as described under the *Nature and Type of Effects*. In contrast, GHMA would remain open for utility-scale wind and solar development, accompanied by specific minimization measures to mitigate potential impacts on air quality as described under the *Nature and Type of Effects*.

The measures under Alternative 5, compared with Alternative 1, would improve disturbance management and mitigate potential degradation, which could have long-term benefits on air quality conditions for GRSG's sagebrush habitat across different states and specific boundaries.

Under Alternative 5, like Alternative 1, livestock grazing would generally remain available in PHMA, IHMA, and GHMA for GRSG, except for certain RNAs in Oregon that may be partially or entirely unavailable for grazing. Changes in livestock grazing would be determined by site-specific management actions aiming to decrease surface disturbance activities which would have impacts on air quality as described under the *Nature and Types of Effects*.

Alternative 5 introduces a targeted approach for the inclusion of thresholds and responses. which, compared with Alternative 1, would focus efforts on the priority areas, promoting the establishment of suitable habitat and thus minimizing impacts on air quality by reducing land disturbance as described under the *Nature and Type of Effects*.

Alternative 6

Under Alternative 6, impacts on air quality would be similar to Alternative 5. ACECs under Alternative 6 would restrict some uses, in accordance with the ACEC boundaries and restrictions under Alternative 3, which could reduce potential sources of pollutants.

4.13.2 Climate Change and Greenhouse Gases

Nature and Type of Effects

Management actions that can affect climate change include actions that emit GHGs, and those that create, eliminate, or damage carbon sinks and sequestration on BLM-managed lands. These include mineral exploration, development, and production activities; livestock grazing, wild horses and burros, and wildlife; wildland fire; vegetation management; rangeland management; and infrastructure development. Protection of GRSG habitat may move sources of GHGs to different locations.

Greater Sage-Grouse Management

In general, management activities that plan to protect and enhance GRSG populations involve management that restrict or reduce land use and activities that can involve surface disturbance and/or GHG emissions. Conservation activities to this effect can be expected to increase vegetation cover (e.g., sagebrush habitat) and enhance the soil, thereby increasing the amount of carbon that can be sequestered from the atmosphere and stored in the landscape in plants and organic soil.

Minerals Management

Emission of GHGs occurs during all phases of mineral exploration, development, operation, and reclamation. Vehicles and construction equipment that are used in mineral development emit GHGs from combustion of fossil fuels. Restricting or closing areas to mineral exploration and development activities would reduce or eliminate GHG from such activities where such restrictions or closures occur. Surface disturbance from mineral development and exploration activities can also reduce the carbon sequestration potential of the land.

Lands and Realty Management

ROW projects that involve construction activities would continue to emit GHGs (e.g., from operation of heavy construction equipment and vehicles), and result in surface disturbance which can reduce carbon sequestration potential of the land (e.g., from damaged soils and vegetation). Impacts from solar and wind projects are typically on large areas (several thousand acres) and can require major land disturbance which can reduce carbon sequestration potential in the land. At the project construction stage, solar and wind projects emit GHGs from heavy equipment and vehicles which are used to transport workforce and building material. However, less available acreage for solar and wind energy projects could increase the use of fossil fuel for energy development, which emit higher levels of GHGs from operation and downstream emissions.

Livestock Grazing Management

Grazing, in addition to wild horses and burros and big game wildlife herds, can impact emission of GHGs and improper grazing can affect vegetation, soils, and water resources (Beschta 2012; Ripple et al. 2014; Gerber et al. 2013). GHG emissions of livestock grazing include methane emissions that can result from manure management and digestive process of most livestock and GHG emissions from vehicles and heavy equipment use (e.g., rangeland management or transporting livestock). Other potential impacts of livestock grazing on climate change involve spread of noxious weeds and plants and the reduction in soil nutrient contents, which exacerbate carbon storage and climate change impacts. Conversely, sustainable livestock grazing can have beneficial effects by reducing fuel loads, reduction in wildfire potential, and improving soil

conditions and biological diversity. Grazing, under improved management, can increase carbon sequestration potential of the soil and promote root production (Chen et al. 2015). Further, as described in **Section 2.9.7**, livestock grazing is managed to meet or make progress toward land health standards, thus reducing the likelihood of adverse effects.

Alternative 1

Rangewide Environmental Consequences

Under Alternative 1, except as noted under the state-specific subheading below, in most of the planning area PHMA (IHMA in Idaho), fluid mineral leasing would continue to be managed as NSO. While this would continue to eliminate emission sources and improve carbon sequestration in PHMA (IHMA in Idaho), development could be relocated within the planning area, and continue to result in increased GHG emissions and changes to carbon sequestration, as described in the *Nature and Types of Effects*.

Similar to the analysis of emissions for air quality (**Section 4.13.1**), GHG emissions under Alternative 1 were assumed to represent a fraction of the BLM's circa 2032 modeled emissions (**Table 4-6**) from oil and gas development from BLM-administered lands in the US intermountain western states that overlap with the planning area Ramboll (2023). Modeled emissions (circa 2032) from the states that overlap with the planning area are used as proxy to represent an upper limit to potential new federal oil and gas development emissions, under Alternative 1.

Under Alternative 1, except as noted under the state-specific sub-headings below, potential impacts on GHG emissions and carbon sequestration from management of BLM-administered federal mineral estate as closed to or available for salable mineral sales or disposal within the planning area GHMA where there is no specific allocation, and within PHMA (IHMA in Idaho) from new free use permits and expansion of existing leases would continue.

Under Alternative 1, potential for impacts on GHG emissions and carbon sequestration from locatable mineral development would continue in all GHMA and PHMA (IHMA in Idaho).

Under Alternative 1, most states would continue to manage PHMAs (or IHMA in Idaho) as avoidance areas for major ROWs, and exclusion for wind and solar ROWs (Idaho, Nevada/California, and Oregon have exclusion for utility scale solar and wind projects only). In most states, GHMAs would continue to be managed as either avoidance or open for major ROWS, wind, and solar projects. In exclusion areas which do not allow for ROWs, there would be no impacts on GHG emissions or changes to carbon sequestration. In avoidance areas, while the potential for impacts would remain, this would be less than the potential for impacts in areas that would remain open to ROWs or have fewer restrictions.

Impacts on GHG emissions and carbon sequestration from changes in livestock grazing would continue to largely be determined by variations in AUMs and site-specific management actions that involve surface-disturbing actions. Management actions that would continue to indirectly reduce impacts on climate change from changes in livestock grazing include managing for riparian vegetation, applying the principles of prescriptive livestock grazing to control time and timing of grazing during the hot season, and retiring grazing privileges on a voluntary basis.

Colorado Environmental Consequences

Under Alternative 1, Colorado GHMA would continue to be managed as closed to fluid mineral leasing within 1 mile of leks, NSO within 2 miles of leks, and seasonal limitations elsewhere, while PHMA would

continue to be closed to fluid mineral leasing within 1 mile of leks. Emission sources and impacts to carbon sequestration could be displaced and would continue to result in overall impacts on climate change.

Idaho Environmental Consequences

Under Alternative 1, fluid mineral leasing would continue to be managed as NSO in Idaho IHMA and as CSU in GHMA. Within GHMA. Emission sources and impacts to carbon sequestration could be displaced and would continue to result in overall impacts on climate change.

Under Alternative 1, potential impacts on GHG emissions and carbon sequestration from management of BLM-administered federal mineral estate as closed to or available for salable mineral sales or disposal would continue to exclude impacts from new free use permits and continue to be limited to impacts from expansion of existing permits.

Under Alternative 1, potential for impacts on GHG emission and carbon sequestration from wind, solar, and other major ROWs would continue within GHMA in Idaho where it would continue to be open to such use. Potential for impacts on GHG emissions and carbon sequestration from solar and wind development in Idaho IHMA, where it would continue to be managed as avoidance for solar and wind development and only excluded for utility scale projects, would continue to be higher compared with PHMA in other planning area states.

Nevada/California Environmental Consequences

Under Alternative 1, potential for impacts on GHG emissions and carbon sequestration from fluid mineral leasing would continue in Nevada and California GHMA where it would continue to be open to fluid mineral leasing, subject to CSU stipulations.

Under Alternative 1, potential for impacts on GHG emissions and carbon sequestration from solar and wind projects would continue to exist in Nevada and California PHMA from non-utility-scale solar and wind, and from major ROWs or wind projects in GHMA, which would continue to be managed as avoidance. No impacts from solar development within the Nevada and California PHMA would occur, where it would continue to be managed as exclusion for solar projects.

Oregon Environmental Consequences

Under Alternative 1, while potential for impacts on GHG emissions and carbon sequestration from fluid mineral leasing within 1 mile of leks would continue to be eliminated, potential for impacts outside of the 1-mile radius, where it would continue to be open to fluid mineral leasing and subject to CSU stipulations, would continue to exit.

Under Alternative 1, potential for impacts on GHG emissions and carbon sequestration from solar and wind projects would continue in Oregon PHMA, where it would continue to be managed as avoidance for solar and wind development and only excluded for utility scale projects (except in Lake, Harney, and Malheur Counties where it is avoidance and impacts could occur within PHMA).

Utah Environmental Consequences

Under Alternative 1, potential impacts on GHG emissions and carbon sequestration from fluid mineral leasing in Utah GHMA would continue, where it would continue to be managed as NSO near leks or CSU based on allocations in plans that predated the 2015 amendment. Emission sources and impacts to carbon sequestration would be displaced and would continue to result in overall impacts on climate change.

Under Alternative 1, GHMA in Utah would continue to be open to wind and other major ROWs (subject to minimization and mitigation), which would continue to result in GHG emissions and carbon sequestration impacts that are associated with emissions and surface-disturbing activities. Under Alternative 1, potential for impacts on climate change from development of wind projects would continue to exist in PHMA in Utah to within 5 miles of leks.

Wyoming Environmental Consequences

Under Alternative 1, in Wyoming, GHMA would be managed as NSO within 0.25 miles of leks, and seasonal limitations within 2 miles of leks, while PHMA would continue to be managed as NSO within 0.6 miles of leks and as CSU or with timing limitations outside. While in areas that remain designated as NSO for fluid mineral leasing, emission sources and impacts on carbon sequestration would be removed, impacts may be relocated to elsewhere within the planning area, where fewer restrictions on fluid mineral leasing exists. In areas open to fluid mineral leasing with CSU stipulations or timing limitations, potential for impacts on GHG emissions and carbon sequestration would continue to exist.

Under Alternative 1, potential impacts on GHG emissions and carbon sequestration from proposed management of BLM-administered federal mineral estate as closed to or available for salable sales or disposal would continue to exist within PHMA in Wyoming, where it would continue to be managed as open, subject to occupancy, seasonal limitations, disturbance, and density for such use.

Under Alternative 1, potential impacts on GHG emissions and carbon sequestration would continue to exist from major and minor ROWs, and from solar and wind development, in Wyoming PHMA, where it would be open to such use.

Alternative 2

Rangewide Environmental Consequences

Under Alternative 2, impacts on GHG emissions and carbon sequestration from changes in land protected from or open to fluid minerals in PHMA and GHMA would be the same as under Alternative 1, except in Colorado as described in the state-specific sub-headings below.

Under Alternative 2, impacts on GHG emissions and carbon sequestration from changes in land protected from or open to salable minerals in PHMA and GHMA would be same as under Alternative 1, except in Idaho IHMA and Nevada PHMA as described in the state-specific sub-headings below.

Under Alternative 2, impacts on GHG emissions and carbon sequestration from nonenergy mineral management in PHMA and GHMA would be the same as under Alternative 1, except in Nevada PHMA as described in the state-specific sub-headings below.

Under Alternative 2, removing the recommendation for withdrawal of locatable mineral entry in SFA in all states (except in Montana/Dakotas, which did not have a 2019 amendment) would not change impacts on GHG emissions and carbon sequestration compared with Alternative 1, because as discussed under Alternative 1, recommending areas for closure to the mining laws for locatable exploration or development does not restrict any activities and therefore, such recommendation does not have any impacts. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

Under Alternative 2, impacts on GHG emissions and carbon sequestration from changes in land protected from or open to renewable energy management would be the same as under Alternative 1, except in Nevada and Utah as described in the state-specific sub-headings below.

Impacts on GHG emissions and carbon sequestration from changes in livestock grazing would be similar to those described under Alternative 1. However, there would be more exceptions to restrictions on livestock grazing than under Alternative 1, which could have increased potential impacts on climate change in PHMA or IHMA.

Colorado Environmental Consequences

Under Alternative 2, PHMAs in Colorado would be designated as NSO for fluid mineral development. Compared with Alternative 1, under which areas within 1 mile of leks would remain closed to fluid mineral leasing. This would increase potential impacts on climate change from increased emissions and surface disturbance.

Idaho Environmental Consequences

Under Alternative 2, allowing consideration of new free use permits for salable minerals in Idaho IHMA, would increase the potential for associated impacts on GHG emissions and carbon sequestration. This is because there would be a greater chance for more area of salable and/or nonenergy mineral open to activities to occur, increasing potential GHG emissions and reducing carbon storage in the land from surface disturbance.

Nevada/California Environmental Consequences

Under Alternative 2, adding an exception criterion to salable and nonenergy mineral closures for Nevada PHMA would increase the potential for associated impacts on GHG emissions and carbon sequestration as described in the Nature and Types of Effects. This is because there would be a greater chance for more area of salable and/or nonenergy mineral open to activities to occur in these areas, increasing potential GHG emissions and reducing carbon storage in the landscape from surface disturbance.

Under Alternative 2, there would be additional exception criteria for areas open to wind/solar development in Nevada PHMA and for wind development in Nevada/California GHMA. Compared with Alternative 1, this could increase the potential for development, increasing impacts on GHG emissions and carbon sequestration associated with changes in land protected from or open to renewable energy development because there would be a higher chance of development.

Utah Environmental Consequences

Under Alternative 2, areas outside PHMAs in Utah would be avoidance for wind development. This could increase the potential for impacts on GHG emissions and carbon sequestration associated with changes in land protected from wind development compared with Alternative 1. This is because there would be a higher chance of development in avoidance areas as opposed to exclusion areas under Alternative 1, which would not allow any development.

Alternative 3

Under Alternative 3, all GRSG management areas would be managed as PHMAs which would be closed to fluid mineral leasing, salable minerals, and nonenergy minerals and would be recommended for withdrawal from locatable mineral entry. All PHMAs would be managed as exclusion areas for major ROWs and wind or solar energy and unavailable to livestock grazing. ROW exclusion would preclude development of Class VI projects. Due to a reduction in the level of use from added restriction under Alternative 3, fluid, salable,

and nonenergy mineral development, renewable energy development, livestock grazing, and most other major surface disturbing activities would result in the least amount of GHG emissions and surface disturbance, compared with all alternatives. Any reduction in development of minerals under the Mining Law of 1872 would only occur if the Secretary were to propose and make a withdrawal pursuant to section 204 of FLPMA.

Alternative 4

Under Alternative 4, the BLM would manage minerals to minimize land use conflict and associated impacts from subsequent development through project designs that avoid, minimize, reduce, rectify, and compensate for indirect impacts. PHMAs and IHMAs would be managed as avoidance for major ROWs within 0.5-mile buffer zone. GHMA would be managed as avoidance areas within breeding, nesting, and limited-seasonal habitats where mapped. Under this alternative, the BLM would take a more adaptive approach to management and consider existing data and best available science to determine if conservation measures are reasonable. Under this approach, while the impacts on climate change would be reduced or removed in some cases, compared with Alternative 1, under the scenario which management would result in more development, impacts would include an increase in GHG emissions and reduction of carbon sequestration would increase compared with Alternative 1.

Alternative 5

Under Alternative 5, similar to Alternative 4, the BLM would apply a balanced approach to development by managing to minimize potential for conflict in important habitat. This would result in an increase in GHG emissions and carbon sequestration in situations where more development would occur while can result in a reduction in impacts where less development would occur. Alternative 5 would be less restrictive than Alternative 4 in terms of allowing for mineral and renewable energy development. Consequently, any alterations in impacts, wherein a decrease in development is anticipated under Alternative 4 compared to Alternative 1, would likely result in a greater reduction of impacts under Alternative 5.

Alternative 6

Under Alternative 6, impacts on GHG emissions and carbon sequestration would be similar to Alternative 5. ACECs under Alternative 6 would restrict some uses, in accordance with the ACEC boundaries and restrictions under Alternative 3, which could reduce surface disturbance and potential sources of GHGs.

4.14 SOIL RESOURCES

4.14.1 Nature and Type of Effects

Activities that disturb, compact, contaminate, or remove vegetation from soils are generally considered to degrade soil productivity. In some cases, soil compaction aids in plant establishment and growth. However, too much compaction decreases water infiltration rates and gas exchange rates. Decreased gas exchange rates can cause aeration problems, induce nitrogen and potassium deficiency, and negatively impact root development, which is a key component of soil stabilization. As soil compaction increases, the soil's ability to support vegetation diminishes because the resulting increase in soil strength and change in soil structure (loss of porosity) inhibit root system growth and reduce water infiltration. Vegetation diminishment could lead to a shift of soil resources more dominated by trees to one more dominated by grasses and shrubs. As vegetative cover, water infiltration, and soil stabilizing crusts are diminished or disrupted, the surface water runoff rates increase, further accelerating rates of soil erosion (Weltz et al. 2017).

Impacts on soil productivity and erosion can result from a number of causes, including improper livestock grazing, wild horses and burros, surface-disturbing activities, vegetation treatment projects, prescribed burns,

and wildfires. The intensity and extent of impacts on soil productivity and erosion are determined in part by the type and location of the activities. Impacts on soil productivity and erosion can also be affected by any applicable stipulations and plans of operations that address site-specific environmental concerns and require mitigation to stabilize soil, to prevent unnecessary erosion, and to revegetate disturbed surfaces.

Impacts on soil productivity and erosion can be mitigated by avoiding or minimizing the impact. This can be done by managing certain lands as closed or unavailable for surface-disturbing activities, or by restricting the activity by managing certain lands as ROW avoidance areas or attaching such stipulations as NSO or CSU to fluid minerals leases. As described in **Section 2.9.7**, livestock grazing is managed to meet or make progress toward land health standards, thus reducing the likelihood of adverse effects. Impacts that cannot be avoided can be minimized through project design and the application of COAs and BMPs. In addition, to protect GRSG, disturbance cap requirements and the application of lek buffers can locally eliminate impacts from disturbance. However, there could be impacts elsewhere if the disturbance is pushed to another location to minimize impacts on GRSG.

4.14.2 Alternative 1

Livestock Grazing Management

Under Alternative 1, PHMA, IHMA (Idaho only), and GHMA would continue to be available for livestock grazing, except in Oregon where all or portions of 13 key RNAs would be unavailable. The BLM would continue to prioritize monitoring and permit renewal of grazing per IM 2018-024 or subsequent updated policy. SFAs and PHMA outside of SFAs should be considered high priority areas to assess. Impacts on soil productivity and erosion from changes in livestock grazing would be determined by variations in site-specific management actions that strive to minimize concentrated compaction and aim to maintain or improve soil conditions. Within the areas available for livestock grazing, the BLM Authorized Officer may include or adjust permit terms and conditions needed to meet land health standards and GRSG habitat objectives. In turn, these management actions would continue to help minimize local impacts on soil productivity and erosion from the changes in livestock grazing, which would continue to also help minimize rangewide impacts for long-term soil productivity as described in the *Nature and Types of Effects*.

Management of Surface-disturbing Activities

Management actions proposed in this alternative that minimize, preclude, or stipulate surface disturbance would help maintain or improve soil productivity, such as the 3 percent disturbance cap. Management of fluid minerals, salable minerals, and nonenergy mineral development in PHMA, GHMA, and IHMA varies by state and includes areas that are open, closed, and withdrawn (see **Chapter 2** alternatives for minerals management). These various restrictions on land protected from surface-disturbing activities and areas closed to surface-disturbing activities from mineral activities within PHMA, IHMA, and GHMA would continue to help minimize impacts on soil productivity and erosion as described under the *Nature and Types of Effects*.

PHMA and IHMA in all states would continue to be identified as ROW avoidance areas to allow for management flexibility, except for minor ROWs in Wyoming. PHMA would continue to be designated as ROW exclusion for wind and solar (utility scale solar only in Idaho, Nevada/California, and Oregon) development, with exceptions in Wyoming, Oregon, and Idaho. Classifying PHMA as exclusion or avoidance areas would decrease the potential for impacts on soil productivity and erosion associated with ROW development, such as the surface-disturbing activities described in the *Nature and Types of Effects*. This is because development of ROWs would be prohibited in exclusion areas and would be considered on a case-by-case basis in avoidance areas.

New ROWs in PHMA would continue to not be allowed except in accordance with the Anthropogenic Disturbance Screening Criteria outlined in the Proposed Plan. In IHMA, new ROWs could be considered if in accordance with the IHMA Anthropogenic Disturbance Development Criteria. The BLM would continue to collocate new ROWs with existing infrastructure when possible. BLM would retain management flexibility to route ROWs to minimize overall impacts on soil productivity and erosion. Existing ROW corridors are preferred for collocation of new ROWs but could not be widened more than 50 percent greater than the original footprint. These measures would continue to reduce negative impact to soil productivity from the surface-disturbing activities as described in *Nature and Types of Effects*. GHMA in all states would be open to minor ROWs with mitigation measures, except Wyoming would not require mitigation. Impacts on soil productivity and erosion associated with these surface-disturbing activities could occur in these areas if developed, but mitigation measures would help to lessen the impacts.

4.14.3 Alternative 2

Livestock Grazing Management

Under Alternative 2, impacts from changes in livestock grazing would be similar to those described above under Alternative 1.

Management of Surface-disturbing Activities

Changes to the disturbance cap would apply and include allowing the cap to be exceeded in all states except Oregon under certain circumstances. This action could impact soil productivity and erosion as described in the *Nature and Type of Effects*.

Under Alternative 2, impacts from changes in land open to fluid minerals in PHMA and GHMA would be similar to those described above under Alternative 1, except in Colorado PHMA and Colorado GHMA where fluid mineral development would be open and would increase potential for surface-disturbing impacts on soil productivity and erosion, as compared to Alternative 1. This is because mineral development activities could occur in previously closed areas and cause negative impacts as described under *Nature and Types of Effects*. Changing GHMA from closed to fluid mineral development to NSO would likely not change impacts on soil resources because the NSO stipulation would avoid potential for land available to surface-disturbing activities.

Impacts from changes in land open to salable mineral management in PHMA and GHMA would be similar to those described under Alternative 1, except in Idaho IHMA and Nevada PHMA. Impacts from changes in land open to nonenergy mineral management in PHMA and GHMA would be similar to those described under Alternative 1, except in Nevada PHMA. As compared with Alternative 1, the additional exception criterion to salable and nonenergy mineral closures for Nevada PHMA and allowing consideration of new free use permits for salable minerals in Idaho IHMA would increase the potential for associated impacts on soil productivity and erosion as described under the *Nature and Types of Effects*. This is because there would be a greater chance for salable and/or nonenergy mineral activities to occur in these areas.

Removing the recommendation for locatable mineral withdrawal in SFAs in all states (except in MT/DK, which did not have a 2019 amendment) has no impact. This is because a recommendation to withdraw lands under the Mining Law of 1872 has no impact. Withdrawals are considered through a separate process pursuant to section 204 of FLPMA.

Impacts from changes in land protected from or open to ROW and renewable energy management would be similar to those described under Alternative 1, with additional exception criteria in Nevada/California. Under Alternative 2, there would be an additional exception criterion for ROW and wind and solar

development in Nevada PHMA and for wind development in Nevada/California GHMA. As compared to Alternative 1, this could increase the potential for impacts on soil productivity and erosion associated with ROW and renewable energy development because there would be a higher chance of development. However, the exception criteria would likely avoid major impacts on soil productivity and erosion as described under the *Nature and Type of Effects*.

Under Alternative 2, removing the prioritization objective for PHMA and GHMA, which involves determining the order or preference for leasing decisions, would not directly impact soil productivity and erosion because prioritization does not permit or preclude leasing in PHMA.As compared with Alternative 1, the NSO stipulations and conservation measures in place for PHMA would protect soil resources; however, the prioritization objective could potentially result in temporarily deferring a parcel in PHMA from leasing to a later sale, but only in instances of large lease sales where staff capacity would be incapable to analyzing all the nominated parcels. In an area with high levels of disturbance, such a delay could provide time for vegetation conditions and soil productivity to improve before new developments are implemented. As the amount of development increases in former GHMA, the consecutive effects of mitigating disturbances in PHMA could mount and could possibly affect soil productivity and erosion as described in the *Nature and Type of Effects*. Site-specific planning and other management from local resource management plans, and adhering to the land health standards, would reduce impacts on soil productivity and erosion in former GHMA with the use of BMP and other project mitigation design features.

4.14.4 Alternative 3

Livestock Grazing Management

Management of PHMA as unavailable for livestock grazing would eliminate the possibility of the short-term, site-specific impacts from changes in livestock grazing and the associated impacts on soil productivity and erosion as described under the *Nature and Types of Effects*. Compared with Alternative 1, Alternative 3 contains greater restrictions on livestock grazing and would be more protective of soil productivity from impacts related to livestock grazing.

Management of Surface-disturbing Activities

Application of a 3% disturbance cap and calculating disturbance at the project scale and HAF fine scale habitat selection area may prevent some development, and therefore reduce impacts to soil productivity and erosion. Compared with Alternative 1, Alternative 3 would have greater restrictions on new areas of land protected from or open to ROWs, fluid mineral leasing, and other mineral development and thus on development in these areas that would otherwise have the potential to impact soil productivity and erosion. PHMA in all states would be closed to fluid mineral leasing, salable minerals, and nonenergy minerals would reduce potential impacts on soil productivity and erosion, such as areas available to surface-disturbance activities associated with mineral development as described under the *Nature and Types of Effects*. Effects would be reduced to a greater extent than under Alternative 1. This is because areas closed to leasing could not be developed at any point. Recommendation to withdraw PHMA from location and entry under the United States mining laws does not restrict any activities and therefore would not have any impact on soil productivity and erosion. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

New infrastructure development would be substantially limited as compared with Alternative 1. All PHMA would be excluded from new ROW authorizations. New linear ROWs would be allowed only in designated ROW corridors. The inability to site ROWs in PHMA would decrease the potential for impacts on soil productivity and erosion associated with ROW development and as described under the *Nature and Type of*

Effects. The inability to site ROWs in PHMA could lead to longer ROW routes to bypass closed areas. Longer routes would increase surface disturbance and other impacts of ROW sitting on soil productivity and erosion outside of PHMA and may result in increased impacts on soil productivity and erosion on adjacent private lands.

Under Alternative 3, PHMA would be ROW exclusion for wind and solar energy development. Prohibiting wind energy development would eliminate impacts on soil productivity and erosion from changes in land protected from or open to this type of surface-disturbing activity in these areas.

4.14.5 Alternative 4

Livestock Grazing Management

Under Alternative 4, same as Alternative 1, livestock grazing would remain available in PHMA, IHMA, and GHMA, with the exception of 13 key RNAs in Oregon that may be fully or partially unavailable for grazing. Site-specific management actions would play a crucial role in determining the impacts on soil productivity and erosion resulting from changes in livestock grazing as described under the *Nature and Type of Effects*. These actions would minimize concentrated compaction and aim to maintain or improve soil productivity and minimize erosion, thereby mitigating effects on soil productivity and erosion as described under the *Nature and Type of Effects*. The BLM Authorized Officer would retain the authority to include or adjust permit terms and conditions within the areas available for livestock grazing. As compared with Alternative 1, the emphasized flexibility under Alternative 4 would ensure that grazing practices comply with existing land health standards under 43 CFR Part 4180 (or subsequent changes to regulations or policy) and contributes to minimizing local and implementation level impacts on soil productivity and erosion resulting from changes in livestock grazing as described in the *Nature and Types of Effects*.

Management of Surface-disturbing Activities

Alternative 4 would include a 3 percent cap within the HAF fine scale habitat selection area in PHMA. Additionally, Alternative 4 would address habitat loss from wildfire and agriculture through existing sagebrush availability and habitat objectives. These measures under Alternative 4 would aim to manage and minimize disturbance, preserve vegetation communities, and mitigate the potential for further degradation while balancing impacts on soil productivity and erosion as described under the *Nature and Types of Effects*.

Under Alternative 4, additional management actions would be included compared with Alternative 1, specifically addressing fluid mineral leasing and development within GRSG PHMA, IHMA, and GHMA. Under Alternative 4, the proposed measures would include evaluating parcels identified in Expressions of Interest within GRSG habitat management areas giving preference to lands that would not result in impairing habitat suitability and proper function. Alternative 4 would consider the management of areas already leased for fluid minerals, emphasizing the application of lease stipulations, minimization measures, and compliance with NEPA. With that, under Alternative 4 and similar to Alternative 1, the BLM would aim to minimize impacts on soil productivity and erosion by promoting project designs that avoid, minimize, reduce, rectify, and compensate for direct and indirect impacts, while considering site-specific considerations and project specific COAs. However, a blanket NSO restriction on new leases in an area with existing leases complicates the effectiveness of the described efforts. Alternative 4 would also include enhanced collaboration with project proponents and state wildlife agencies to promote effective conservation and connectivity of habitats, while reducing impacts on soil productivity and erosion.

Alternative 4 would maintain the exclusion of PHMA for utility-scale wind and solar projects and would designate IHMA as exclusion within 3.1 miles from active leks, while the remaining IHMA areas are avoidance.

Avoidance areas would also be designated within 0.5 miles of PHMA/IHMA to address indirect impacts. GHMA would be avoidance for utility-scale wind/solar projects. PHMA/IHMA would be avoidance for major ROWs, and areas within 0.5 miles of PHMA/IHMA would also be avoidance. GHMA would be avoidance within breeding/nesting/limited-seasonal habitats or entirely if not mapped, and designated corridors remain open. These modifications in Alternative 4, compared with Alternative 1, would help reduce impacts on soil productivity and erosion, as described under the *Nature and Types of Effects*, while allowing for managed development in specific areas.

4.14.6 Alternatives 5 and 6

Livestock Grazing Management

Under Alternatives 5 and 6, similar to Alternative 1, livestock grazing would generally remain available in PHMA, IHMA, and GHMA, with the exception of certain RNAs in Oregon that may be partially or entirely unavailable for grazing (pending final determinations). The impacts on soil productivity and erosion resulting from changes in livestock grazing would be determined by variations in site-specific management actions. These actions would strive to minimize concentrated compaction and aim to maintain or improve soil productivity and erosion as described under the *Nature and Type of Effects*.

Under Alternatives 5 and 6, livestock grazing within GRSG PHMA, IHMA, and GHMA would be managed to meet land health standards, informed by the site-scale HAF suitability. The BLM Authorized Officer would have the flexibility to include or adjust permit terms and conditions within the available livestock grazing areas, ensuring compliance with land health standards and GRSG habitat objectives. Under Alternatives 5 and 6, construction of range infrastructure, such as water sources, structures, and fences, would be guided by guidelines that minimize impacts on GRSG and soil productivity and erosion as described under the *Nature and Type of Effects*, similar to the consolidation and simplification efforts of Alternative 1.

While Alternative 1 does not specify the areas where thresholds and responses would be required, Alternatives 5 and 6 would introduce a targeted approach. Under Alternatives 5 and 6, areas with the greatest potential to impact GRSG if suitable habitat conditions were not met would be prioritized for the inclusion of thresholds and responses. Accordingly, by focusing efforts on these priority areas, proactive conservation measures would be implemented, promoting the establishment of suitable habitat and minimizing impacts on soil productivity and erosion as described under the *Nature and Type of Effects*.

Management of Surface-disturbing Activities

Alternatives 5 and 6 include varying caps on disturbance at the project scale within PHMA, depending on the state. These measures under Alternatives 5 and 6 would aim to manage disturbance, protect vegetation communities, and mitigate potential degradation while reducing impacts on soil productivity and erosion, as described under the *Nature and Type of Effects*, across states and specific boundaries.

Alternatives 5 and 6 would include additional management actions compared to Alternative 1, specifically addressing fluid mineral leasing and development within GRSG PHMA, IHMA, and GHMA. The proposed measures under Alternatives 5 and 6 would include evaluating parcels identified in Expressions of Interest within GRSG habitat management areas giving preference to lands that would not result in impairing habitat suitability and proper function. Additionally, Alternatives 5 and 6 would consider the management of areas already leased for fluid minerals, emphasizing the application of lease stipulations, minimization measures, and compliance with NEPA. Under Alternatives 5 and 6, the BLM would aim to minimize impacts to soil productivity and erosion as described under the *Nature and Type of Effects* by promoting project designs that avoid, minimize, reduce, rectify, and compensate for direct and indirect impacts, while considering site-

specific considerations and project specific COAs. Collaboration with project proponents and state wildlife agencies would be encouraged to promote effective conservation and connectivity of habitats while reducing impacts to soil productivity and erosion.

Alternatives 5 and 6 would include notable changes compared to Alternative 1 for wind and solar development and major transmission ROW. Specifically, PHMA would be designated as avoidance for utility-scale wind and solar projects as well as major ROWs, prioritizing the protection of soil productivity. In contrast, GHMA would be open for utility-scale wind and solar development with the implementation of specific minimization measures to mitigate potential impacts on soil productivity and erosion. The designated corridors would remain open to accommodate transmission infrastructure. These modifications in Alternatives 5 and 6 would strike a balance between facilitating renewable energy development, ensuring transmission infrastructure access, and safeguarding the impacts on soil productivity and erosion as described under the *Nature and Type of Effects*.

4.15 WATER RESOURCES

4.15.1 Nature and Type of Effects

Surface water quality is influenced by both natural and human factors. Natural factors include weather-related erosion or sediment delivery into waterways as the result of wildfire removal of vegetation. Human related factors that can temporarily affect surface water quality includes additional transport of eroded soils into streams due to improper recreational activities or improper livestock grazing. Water quality can be affected by introduction of waste matter into streams from domestic livestock (Weltz et al. 2017).

Water quality can also be affected by the introduction of soil from low-water crossing points of roads, routes, and ways used by motorized vehicles. Activities that introduce chemicals into the natural environment also have the potential to degrade surface and water quality through chemical leaks, accidents, or broken well casings. All of these activities have appropriate regulation and mitigation measures in place to reduce and, in most cases, eliminate these risks. The specific regulation and mitigation measures may include strict guidelines for chemical handling, spill response protocols, and well casing integrity requirements. Continuous monitoring of water quality in areas where such activities occur allows for the prompt identification of any deviations from regulatory standards. Additionally, the observed reduction in incidents and the successful implementation of mitigation measures in response to past events contribute to the confidence that risks to water quality can be minimized and, in many cases, eliminated.

Surface-disturbing activities, particularly under specific soil types or weather conditions, can also lead to soil compaction, which decreases infiltration rates and elevates the potential for overland flow. Overland flow can increase erosion and sediment delivery potential to area surface water bodies, leading to surface water quality degradation (Belnap et al. 2001). This degradation occurs through mechanisms such as the introduction of excess sediments, which may carry pollutants, nutrients, and contaminants into the water, adversely impacting its quality.

Surface-disturbing activities within stream channels, floodplains, and riparian habitats are more likely to alter natural morphologic stability and floodplain function. Morphologic destabilization and loss of floodplain function accelerate stream channel and bank erosion, increase sediment supply, dewater near-stream alluvium, cause the loss of riparian and fish habitat, and deteriorate water quality (Rosgen 1996). The deterioration of water quality refers to the introduction of excessive sediments and pollutants into the water, disrupting its chemical composition and overall health. Altering or removing riparian habitats can diminish the hydraulic roughness of the bank, which refers to the resistance that natural features provide to

water flow. This reduction in hydraulic roughness, in turn, amplifies flow velocities near the bank. The term hydraulic roughness encompasses the natural irregularities, such as vegetation, rocks, and other features, that impede the smooth flow of water. Thus, when riparian habitats are altered or removed, the resulting decrease in hydraulic roughness allows for swifter flow velocities near the bank. This acceleration in flow can lead to accelerated erosion and potentially contribute to a decline in water quality (National Research Council 2002).

Removing riparian vegetation and the shade it provides contributes to elevated stream temperatures (Rishel et al. 1982; Beschta 1997). Increased solar radiation, resulting from the absence of riparian vegetation, can raise water temperatures. This is significant because elevated water temperatures impact the water's ability to hold dissolved oxygen. The relationship between increased water temperature and lower dissolved oxygen concentrations is crucial for understanding water quality issues affecting aquatic life, particularly in the context of GRSG habitat. Warmer water with lower oxygen levels can pose challenges for aquatic ecosystems, potentially influencing GRSG habitat conditions and overall ecosystem health. Channel widening or lowering overall flow can increase solar loading in stream channels through specific mechanisms. For instance, when a channel widens, it enlarges the surface area exposed to solar radiation, intensifying the heating of the channel. Additionally, a decrease in overall flow results in a reduction in water volume within the stream channel. With less water present, there is a greater concentration of solar energy absorbed per unit volume of water, as the lower flow means that the available solar radiation is distributed over a smaller volume. This contributes to an increase in solar loading and, consequently, elevated water temperatures. The principal source of heat energy delivered to the water column remains solar energy striking the stream surface directly (Brown 1969). The ability of riparian vegetation to shade the stream throughout the day depends on aspect and vegetation height, width, density, and positions relative to the stream, as well as the aspect in which the stream flows (streamside vegetation provides less shade on a north- or south-flowing stream than on an east- or west-flowing stream). In this context, aspect refers to the compass direction of the slope or landform where the vegetation is located, influencing the angle and duration of sunlight exposure.

The land uses most commonly associated with stream degradation in the planning area is improper livestock grazing and excessive use by wild horses and burros because it is most prevalent, compared with other land use disturbances. Livestock, wild horses, and burros often use the same riparian and wetland areas for water and shade and may congregate around water developments. This can result in compacted soil, decreased water quality due to fecal coliform introductions, trampled and consumed nearby vegetation, and reduced riparian community conditions and hydrologic functionality (Weltz et al. 2017). Other land uses linked to degraded streams and water quality issues include road location, which involves placing roads that disrupt drainage, increase sediment runoff, and fragment habitats. Construction and use refer to building structures like bridges or culverts, impacting stream channels and water flow. Trails, if not managed properly, contribute to soil erosion and disrupt stream health. Excessive water withdrawal for agriculture or industry reduces streamflow, affecting aquatic habitats. Mining introduces sediments and pollutants, harming water quality. Reservoir operations impact flow, sediment transport, and aquatic habitat. Altered stream characteristics, like channelization, disrupt ecological processes. Wetlands alteration, such as draining, affects natural filtration and nutrient cycling. These activities collectively contribute to degraded streams and compromised water quality.

Management to protect GRSG generally involves reducing or otherwise restricting land uses and activities that disturb the surface. Therefore, the greater the amount of acreage restricted from a land disturbing use, the greater the protection of impacts from surface disturbing activities afforded to water resources. Lands

and realty management decisions affect where surface-disturbing activities can and cannot occur. The use of ROW exclusion and NSO stipulations limit the opportunities for surface disturbances and runoff of soils and chemicals into waterways within those areas and are generally considered to be protective of water quality. ROW exclusion and NSO stipulations also reduce the likelihood of chemical spills onto the ground which may contaminate surface or groundwater. In areas managed as ROW avoidance, water quality would receive some protection since ground disturbance would often be limited. ROW avoidance areas would generally result in lower impacts on water quality, compared with areas not managed as ROW avoidance. Areas where ROWs are authorized are permitted with conditions of approval (COAs) which assure that the holder of the rights comply with the Water Quality Act and other federal and state laws, which would protect water resources from degradation.

The intention of BLM management is to ensure that water quality adheres to the Standards and Guidelines for Livestock Grazing Administration (43 CFR Part 4180.2 (b)). Improper livestock grazing and wild horses and burros above appropriate management levels (AMLs) can lead to loss of vegetation cover, reduced water infiltration rates and nutrient cycling, decreased plant litter and lower water quality, and increased bare ground and soil erosion (Manier et al. 2013). See **Section 4.2**, Greater Sage-Grouse and **Section 4.3**, Vegetation for a more detailed analysis regarding these effects. Livestock grazing can be a compatible use in riparian areas when managed consistent with land health standards and land management objectives.

Activities beneficial to water resources are primarily defined as improving conditions by enhancing or restoring degraded water quality or by reducing ongoing groundwater depletion. Changing grazing patterns and maintaining wild horses and burros at AMLs in riparian areas can mitigate negative impacts and further benefit the water quality by promoting vegetation health, stabilizing streambanks, and enhancing nutrient cycling, along with the geomorphic function of streams.

Water supply structures throughout the landscape that have been established for multi-purpose use may also provide drinking water sources for GRSG. GRSG will use available water although they do not require it because they obtain their water needs from the food they eat. Information on the extent of habitat influenced by developed water and the net effects on GRSG populations is unknown. Natural water bodies and reservoirs can provide mesic areas for succulent forb and insect production, thereby attracting GRSG hens with broods (Connelly et al. 2004). It is unknown whether wildlife guzzlers built to supply available water in normally arid habitats provide a net benefit to GRSG or if potential benefits are countered by potential negative consequences. These negative consequences may include increased competition from other species that benefit from guzzlers, such as domestic and wild ungulates, or predators and the associated increase in predation risk (Braun 1998). In addition, new water sources may become additional habitat for mosquitoes carrying West Nile virus (Naugle et al. 2004).

Diverting the water sources has the secondary effect of changing the habitat at the water source before diversion. This could result in the loss of either riparian or wet meadow habitat that is important to GRSG as sources of forbs or insects. Further study is needed to determine the effects of water management on the sagebrush biome.

Potential impacts from locatable mineral, mineral material disposal, nonenergy leasable, and fluid leasable mineral activity may result from mining accidents. The accidents can include the release of pollutants capable of contaminating surface water or aquifers during groundwater recharge as a result of use, storage, and transportation of hazardous fluids and compounds. Mining activities and developments could alter drainage patterns which would affect stream flow and water supplies, and unintended discharge of mine water could alter water chemistry and impair natural stream morphologic conditions. Effects or impacts from mineral

activity is regulated and mitigated through federal and state laws, as well as handbooks, stipulations, and conditions of approval which have effectively reduced the potential of surface or groundwater contamination. However, areas managed as closed to mineral entry would eliminate any potential for impacts on water resources, and therefore be more protective of water resources than areas open to mineral entry.

Effects of wildfire on water resource conditions are determined largely by the severity of the wildfire, suppression tactics used for wildfire management, and post-fire precipitation regimes (Neary et al. 2005). Higher-severity wildfires often result in near complete consumption of vegetation and litter cover and can cause changes to soil chemistry resulting in hydrophobic soil conditions. Wildfire can create hydrophobic soil conditions through a process known as fire-induced soil water repellency. During a wildfire, the intense heat can cause the combustion of organic matter in the soil, releasing hydrophobic substances. These substances then coat soil particles, forming a water-repellent layer. This layer disrupts the natural wettability of the soil, causing water to bead up on the surface rather than penetrating the soil profile. As a result, stream flow responses in severely burned watersheds are typically higher, in some cases orders of magnitude, than in unburned or lower severity burned watersheds. Additionally, increased flooding and debris flow risks can occur up to 5 years after a severe wildfire. (Neary et al. 2005).

Changes in vegetation communities due to wildfire can also affect water resources. Most wildfires in the planning area result in an increase to invasive vegetation communities, particularly cheatgrass. Cheatgrass communities often have shorter wildfire return intervals, altering the 32-70 year return interval (a range representing the typical frequency at which wildfire events naturally occurred in these ecosystems) for sagebrush communities to a 5-year wildfire return interval (Pellant 1996).

4.15.2 Alternative 1

Livestock Grazing Management

Under Alternative 1, PHMA, IHMA, and GHMA would continue to be available for livestock grazing. In Oregon all or portions of 13 key RNAs would be unavailable to livestock grazing. The BLM would continue to prioritize monitoring and renewal of grazing in SFAs and PHMA outside of SFAs. This prioritization includes permit renewals in SFAs and PHMA, with the exception of cases outlined in IM 2018-024. These exceptions may encompass areas that have never undergone assessment or that are in compliance with court orders. Impacts on water resource conditions from changes in livestock grazing would continue to largely be determined by variations in site-specific management actions. Some of the management actions could minimize surface-disturbing actions. In turn, these management actions would continue to help minimize local impacts on water resource conditions from changes in livestock grazing, which would also continue to help minimize rangewide impacts for long-term benefits to water resource conditions as described in the *Nature and Types of Effects*.

Management of Surface-disturbing Activities

Within the rangewide planning area, impacts on water resource conditions are largely a result of variations in management actions. Management actions proposed in this action that minimize, preclude, or stipulate surface disturbance would help maintain or improve water resource conditions. Management of fluid minerals, salable minerals, and nonenergy mineral development in PHMA, GHMA, and IHMA varies by state and includes areas that are open, closed, and withdrawn (see **Chapter 2** alternatives for minerals management). These various restrictions land protected from or open to surface disturbing activities within PHMA and GHMA would continue to help reduce impacts on water resource conditions as described under the *Nature and Types of Effects*.

PHMA and IHMA in all states would continue to be identified as ROW avoidance areas to allow for management flexibility, except for minor ROWs in Wyoming. PHMA would continue to be designated exclusion for wind and solar (utility scale solar only in Idaho, Nevada/California and Oregon) development, with exceptions in Wyoming, Oregon, and Idaho IHMA. Classifying PHMA as exclusion or avoidance areas would continue to decrease the potential for impacts on water resource conditions associated with changes in land open to ROW development, such as the surface-disturbing activities as described in the *Nature and Types of Effects*. This is because development of ROWs would continue to be prohibited in exclusion areas and would be considered on a case by-case basis in avoidance areas.

New ROWs in PHMA would continue to not be allowed except in accordance with the Anthropogenic Disturbance Screening Criteria outlined in the 2015 approved plan. In IHMA, new ROWs could be considered if in accordance with the IHMA Anthropogenic Disturbance Development Criteria. The BLM would continue to collocate new ROWs with existing infrastructure when possible. BLM would continue to retain management flexibility to route ROWs to minimize overall impacts on water resource conditions. Existing ROW corridors are preferred for collocation of new ROWs but could not be widened more than 50 percent greater than the original footprint. These measures would continue to reduce negative impact to water resource conditions from surface-disturbing impacts described in the *Nature and Types of Effects*. GHMA in all states would continue to be open to minor ROWs with mitigation measures, except Wyoming does not require mitigation. Impacts on water resource conditions associated with changes in land open to ROW development, such as surface disturbance could occur in these areas if developed, but mitigation measures, such as erosion control practices and revegetation, would help to lessen the impacts.

GRSG Management

Watershed health would continue to be affected by reducing water infiltration rates, increase overland flow and sediment loading, which could affect turbidity, temperature, and nutrient loading in water systems.

4.15.3 Alternative 2

Livestock Grazing Management

Under Alternative 2, impacts on water resource conditions from changes in livestock grazing would be similar to those described under Alternative 1. In Oregon, all or portions of the 13 key RNAs would be available to livestock grazing.

Management of Surface-disturbing Activities

Impacts on water resource conditions from changes in land protected from or open to fluid minerals in PHMA and GHMA would be the similar to those described under Alternative 1, except in Colorado PHMA and Colorado GHMA. Removing the closure of Colorado PHMA to fluid mineral development would increase potential for surface-disturbing impacts on water resource conditions. This is because mineral development activities could occur in previously closed areas and cause impacts on water resource conditions as described under the *Nature and Types of Effects*. Compared with Alternative 1, changing GHMA from closed to fluid mineral development to NSO would likely not change impacts on water resource conditions because the NSO stipulation would avoid potential for these surface-disturbing activities.

Impacts on water resource conditions from changes in land protected from or open to salable minerals in PHMA and GHMA would be similar to those described for Alternative 1, except in Idaho IHMA and Nevada PHMA. Impacts from nonenergy mineral management in PHMA and GHMA would be similar to those described under Alternative 1, except in Nevada PHMA. Under Alternative 2, adding an exception criterion to salable and nonenergy mineral closures for Nevada PHMA, and allowing consideration of new free use

permits for salable minerals in Idaho IHMA, would increase the potential for associated impacts on water resource conditions as described in the *Nature and Types of Effects*. This is because there would be a greater chance for more area of salable and/or nonenergy mineral open to activities to occur in these areas.

Under Alternative 2, removing the recommendation for locatable minerals in SFA in all states (except in Montana/Dakotas, which did not have a 2019 amendment, and Oregon, which retained SFA designation through a plan maintenance action and not an amendment.) would increase the potential for impacts on water resource conditions compared with Alternative 1. This is because locatable mineral activities could occur and cause impacts as described under the *Nature and Types of Effects*.

Impacts on water resource conditions from changes in land protected from or open to renewable energy management would be the similar to those described under Alternative 1, with additional exception criteria in Nevada/California. Under Alternative 2, there would be additional exception criteria for areas land open to wind/solar development in Nevada PHMA and for wind development in Nevada/California GHMA. Compared with Alternative 1, this could increase the potential for impacts on water resource conditions, as described under the *Nature and Type of Effects*, associated with changes in land protected from or open to renewable energy development because there would be a higher chance of development. However, the exception criteria would likely avoid impacts on water resource conditions.

Impacts on water resource conditions from changes in land protected from or open to ROW would be the similar to those described under Alternative 1, with additional exception criteria in Nevada/California. Under Alternative 2, there would be additional exception criteria for areas land open to ROW in Nevada PHMA and for wind development in Nevada/California GHMA. Compared with Alternative 1, this could increase the potential for impacts on water resource conditions, as described under the *Nature and Type of Effects*, associated with changes in land protected from or open to ROW development because there would be a higher chance of development. However, the exception criteria would likely avoid impacts on water resource conditions.

GRSG Management

Impacts on water resource conditions from changes in potential for wildfire would be the same as those described under Alternative 1 and as described under the *Nature and Type of Effects*.

4.15.4 Alternative 3

Livestock Grazing Management

All areas managed for GRSG would be PHMA. Compared with Alternative 1, Alternative 3 contains greater restrictions on other resources and would most greatly reduce the potential for impacts on water resource conditions as described under the *Nature and Type of Effects*.

Management of PHMA as unavailable for livestock grazing would eliminate the possibility of the short-term, site-specific impacts from changes in land protected from or open to livestock grazing and the associated impacts on water resource conditions as described under the *Nature and Type of Effects*. Alternative 3 would be more protective of water resource conditions from impacts related to changes in land protected from or open to livestock grazing compared with Alternative 1.

Management of Surface-disturbing Activities

Compared with Alternative 1, Alternative 3 would have greater restrictions on new ROWs, fluid mineral leasing, and other mineral development and thus on areas land open to development in these areas that would otherwise have the potential to impact water resource conditions. Under Alternative 3, closing PHMA

to fluid mineral leasing, salable minerals, and nonenergy minerals would reduce potential impacts on water resource conditions, such as surface disturbance, associated with mineral development as described under the *Nature and Types of Effects*. Effects would be reduced to a greater extent than those under Alternative 1. This is because areas closed to leasing could not be developed at any point. Recommendation to withdraw PHMA from location and entry under the United States mining laws would not restrict any activities and therefore would have no impact on water resource conditions. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

Under Alternative 3, PHMA would be designated ROW exclusion for wind and solar energy development. Prohibiting wind energy development would eliminate the likelihood for impacts on water resource conditions from changes in land protected from or open to these surface-disturbing activities in these areas.

Because many water-consuming activities would be restricted, Alternative 3 is also likely to result in increased storage of water in the landscape. Restrictions from Alternative 3 would improve the likelihood of more waters meeting fully supporting beneficial uses and increase or maintain the level of stream miles meeting state and federal water quality standards and designated beneficial uses.

New infrastructure development would be substantially limited compared with Alternative 1. All PHMA would be excluded from new ROW authorizations. New linear ROWs would be allowed only in designated ROW corridors. The inability to site ROWs in PHMA would decrease the potential for impacts on water resource conditions associated with changes in land open to ROW development as described under the *Nature and Type of Effects*. However, the inability to site ROWs in PHMAs could lead to longer ROW routes to bypass closed areas. Longer routes would increase surface disturbance and other impacts of ROW siting on water resource conditions outside of PHMA and may result in increased impacts on water resource conditions on adjacent private lands.

GRSG Management

Alternative 3 would have more restrictions and result in fewer areas treated when compared with Alternative 1. Under these restrictions, impacts on water resource conditions as described under the *Nature and Type of Effects* would be more prone to impacts from potential wildfires in those areas.

4.15.5 Alternative 4

Livestock Grazing Management

Under Alternative 4, same as Alternative 1, livestock grazing would generally remain available in PHMA, IHMA, and GHMA, except for all or portions of 13 key RNAs in Oregon that may be fully or partially unavailable for grazing. Under Alternative 4, same as Alternative 1, the BLM would maintain its focus on monitoring and renewing grazing activities in PHMA areas. Under Alternative 4, site-specific management actions would continue to play a crucial role in determining the impacts on water resource conditions resulting from changes in livestock grazing as described under the *Nature and Type of Effects*. These actions would strive to minimize concentrated compaction and aim to maintain or improve water resource conditions, thereby mitigating effects on water resource conditions as described under the *Nature and Type of Effects*. Under Alternative 4, to align with land health standards and GRSG habitat objectives, the BLM Authorized Officer would retain the authority to include or adjust permit terms and conditions within the areas available for livestock grazing. The emphasized flexibility under Alternative 4, compared with Alternative 1, would help ensure that grazing practices remain in compliance with established guidelines and

contribute to minimizing local impacts on water resource conditions resulting from changes in livestock grazing as described under the *Nature and Types of Effects*.

Management of Surface-disturbing Activities

Alternative 4, compared with Alternative 1, would introduce additional management actions specifically addressing fluid mineral leasing and development within GRSG Habitat Management Areas (PHMA, GHMA, IHMA). Under Alternative 4, BLM would evaluate parcels identified in Expressions of Interest within GRSG habitat management areas giving preference to lands that would not result in impairing habitat suitability and proper function. Furthermore, Alternative 4 emphasizes the management of already leased areas for fluid minerals, including the application of lease stipulations, minimization measures, and compliance with NEPA. Alternative 4 would minimize impacts on water resource conditions as describes under the *Nature and Type of Effects* by promoting project designs that avoid, minimize, reduce, rectify, and compensate for direct and indirect impacts.

Alternative 4 would direct the exclusion of PHMA for utility-scale wind and solar projects and designate IHMA as exclusion within 3.1 miles from active leks, with the remaining IHMA areas being avoidance. Avoidance areas would also be designated within 0.5 miles of PHMA/IHMA to address indirect impacts. GHMA would be avoidance for utility-scale wind/solar projects.

Under Alternative 4, PHMA/IHMA would be avoidance for major ROWs, and areas within 0.5 miles of PHMA/IHMA would also be avoidance. GHMA would be avoidance within breeding/nesting/limited-seasonal habitats, or entirely if not mapped, while designated corridors remain open. These modifications aim to protect water resource conditions and the GRSG habitat while allowing for managed development in specific areas, considering the impacts described under the *Nature and Types of Effects*.

GRSG Management

Alternative 4 would introduce specific provisions that differ from Alternative 1 regarding potential for wildfire, focusing on the impacts on water resource conditions for GRSG. That is, under Alternative 4, there would be a 3 percent cap within the HAF fine scale habitat selection area in PHMA. These measures under Alternative 4 aim to manage and minimize disturbance, preserve vegetation communities, and mitigate the potential for further degradation, while ensuring the conservation of water resource conditions and considering the impacts described under the *Nature and Types of Effects*.

4.15.6 Alternatives 5 and 6

Livestock Grazing Management

Under Alternatives 5 and 6, same as Alternative 1, livestock grazing would generally remain available in PHMA, IHMA, and GHMA for GRSG, except for certain RNAs in Oregon that may be partially or entirely unavailable for grazing pending final determinations. This precautionary measure aims to maintain critical GRSG habitat and associated water resource conditions in Oregon so that impacts described under the *Nature and Types of Effects* would be minimized.

In contrast to Alternative 1, Alternatives 5 and 6 introduce a targeted approach for the inclusion of thresholds and responses. Priority areas with the greatest potential to impact GRSG if suitable habitat conditions were not met would be identified for the implementation of thresholds and responses. This proactive conservation approach, compared with Alternative 1, would focus efforts on these priority areas, promoting the establishment of suitable habitat and thus minimizing impacts on water resource conditions as described under the *Nature and Type of Effects*.

Management of Surface-disturbing Activities

Alternatives 5 and 6 introduce additional management actions compared with Alternative 1, specifically focusing on fluid mineral leasing and development within GRSG HMAs. BLM would evaluate parcels identified in Expressions of Interest within GRSG habitat management areas giving preference to lands that would not result in impairing habitat suitability and proper function. Alternatives 5 and 6 would include management of areas already leased for fluid minerals, emphasizing the application of lease stipulations, minimization measures, and compliance with NEPA. Alternatives 5 and 6, compared with Alternative 1, would help minimize impacts on water resource conditions as described under the *Nature and Type of Effects* by promoting project designs that avoid, minimize, reduce, rectify, and compensate for direct and indirect impacts, while considering site-specific considerations and project specific COAs. Moreover, Alternative 5 would expand upon the management actions in Alternative 1 to strike a balance between resource development and the conservation of GRSG habitat, connectivity, and impacts on water resource conditions.

Regarding wind and solar development, Alternatives 5 and 6 would introduce notable changes compared with Alternative 1. PHMA would be designated as avoidance for utility-scale wind and solar projects, prioritizing the protection of GRSG habitat and, in turn, reducing the impacts on water resource conditions as described under the *Nature and Type of Effects*. In contrast, GHMA would remain open for utility-scale wind and solar development, accompanied by specific minimization measures to mitigate potential impacts on water resource conditions as described under the *Nature and Type of Effects*. The designated corridors would be retained to accommodate transmission infrastructure. These modifications in Alternative 5 aim to conserve the GRSG habitat and strike a balance between renewable energy development and the preservation of water resource conditions.

Regarding major transmission ROWs, Alternatives 5 and 6 would introduce notable changes compared with Alternative 1. PHMA would be designated as avoidance for major ROWs, prioritizing the protection of GRSG habitat and, in turn, reducing the impacts on water resource conditions as described under the *Nature and Type of Effects*. In contrast, GHMA would remain open for major ROW development, accompanied by specific minimization measures to mitigate potential impacts on water resource conditions as described under the *Nature and Type of Effects*. The designated corridors would be retained to accommodate transmission infrastructure. These modifications in Alternative 5 aim to conserve the GRSG habitat and strike a balance between ROW development and the preservation of water resource conditions.

GRSG Management

Alternatives 5 and 6 would introduce provisions that slightly deviate from Alternative 1 concerning the potential for wildfire in relation to impacts on water resource conditions as described under the *Nature and Type of Effects*. That is, Alternatives 5 and 6 would entail different disturbance caps within the project analysis area of PHMA, depending on the state. In Wyoming and Montana, the cap would be set at 5 percent, while in other states, the cap would be 3 percent, limited to infrastructure only. Furthermore, a 3 percent cap on infrastructure would be implemented within the HAF fine scale habitat selection area in PHMA. Moreover, there would be no additional disturbance cap, but there are two scales of analysis. These measures under Alternatives 5 and 6, compared with Alternative 1, would aim to improve disturbance management, preserve vegetation communities, and mitigate potential degradation, while ensuring the conservation of water resource conditions for the GRSG across different states and specific boundaries.

4.16 CULTURAL RESOURCES

4.16.1 Nature and Type of Effects

Effects on cultural resources can be direct, indirect, or cumulative. They can also be adverse or beneficial. Effects from management guidance under each alternative will be largely indirect and cumulative, influencing the effects (or lack of thereof) from future undertakings.

On a project-by-project basis, the spatial distribution (or range) of effects would be largely focused on the specific site or location of a development or action. However, over time and as more actions occur throughout the planning area, the extent of these effects on cultural resources would accumulate throughout the planning area.

The nature and type of effects to be expected from different management actions are explained in more detail below:

GRSG Management

GRSG management in the proposed alternatives includes designation of HMAs for the benefit of GRSG. Restrictions on land use and surface-disturbing activities would occur within the HMAs. These restrictions and corresponding management guidance, including required design features and habitat objectives seeking to stabilize or increase GRSG populations in HMAs, would reduce potential for ground disturbance, changes in setting such as visual or auditory disturbance, and access.

A cap for disturbance in GRSG habitat is present in some form under all alternatives, ranging from three to five percent. This cap varies by alternative and within alternatives by state and situation, limiting disturbance to some degree for the benefit of GRSG. This would offer protection to cultural resources in these habitat areas from impacts due to disturbance under all alternatives, including ground disturbing activities and alterations of setting. This is discussed in detail by alternative. While this will reduce potential for impacts on cultural resources in certain areas, it is likely at least some of the development related impacts will be displaced to locations outside of these protected areas, exposing cultural resources elsewhere to greater potential for impacts.

While intended to benefit the GRSG, reduced potential for ground disturbance, changes in setting, and increase in access would tend to be protective of cultural resources within these areas. Designations of HMA and management guidance by designation varies under each alternative and between states, and the differences will be discussed in more detail below.

Minerals Management

Surface disturbing activities associated with mineral exploration and development would have potential direct and indirect impacts on cultural resources, including damaging, destroying, and/or displacing artifacts and features, and construction of modern features out of character with a historic setting. Many cultural resources that occur on or just below the ground are susceptible to surface disturbance and erosion damage, including modifying spatial relationships of artifacts and destroying features and stratified deposits. The information loss may be relevant to the site function, dates of occupation, subsistence, and past environments; all of these are important to understanding past culture.

Depending on the extent and type of activity, the amount of physical disturbance could be from slight artifact shifts out of context in a small portion of the site to wholesale destruction of the entire site. Should a portion of a site be impacted, it is crucial to recognize that data recovery, while seeking to retrieve valuable information, inherently constitutes an adverse effect. Despite the intention to contribute to the historical or

prehistoric record of the region, the process of data recovery itself can have adverse implications. Furthermore, the historical record could be influenced by physical disturbance, encompassing both prehistoric and historic contexts. Adverse impacts that result in an irreversible and irretrievable loss of cultural resource value are of the highest severity. Mineral exploration and development could result in impacts to cultural resources due to surface disturbing or setting altering activities such as road development and use, facility construction and placement, and creation of well pads and pipelines.

Indirect impacts on cultural resources include changing the character of a property's use or physical features within a property's setting that contribute to its historic significance (e.g., isolating the property from its setting) and introducing visual, atmospheric, or sound elements that diminish the integrity of the property's historic features.

Areas closed to mineral leasing and development, or restrictions placed on these activities would reduce the total acreage of potential surface disturbance and associated impacts to cultural resources in those areas. While this would reduce potential for impacts on cultural resources in protected HMA, it is likely at least some of the development related impacts will be displaced to locations outside of HMA, exposing cultural resources in other areas to greater potential for impacts. Additionally, many cultural resources have been discovered because of field surveys associated with anticipated mineral development activities. Reducing mineral development could have the unintended effect of reducing surveys and discoveries.

Renewable Energy Management

The nature and type of effects on cultural resources from renewable energy development and associated infrastructure (including construction and operation of distribution and transmission lines, substations, and access roads) would largely be similar to the type of effects resulting from minerals management, including damaging, destroying, and/or displacing artifacts and features, and construction of modern features out of character with a historic setting.

Similar to minerals management, closing areas to renewable energy development or restricting surface-disturbing activities during development of renewable energy projects would reduce potential impacts to cultural resources in these areas. While this would reduce potential for impacts on cultural resources in protected HMA, it is likely at least some of the development related impacts will be displaced to locations outside of HMA, exposing cultural resources in other areas to greater potential for impacts.

Lands and Realty Management

The nature and type of effects on cultural resources from ROW development would be similar to the type of effects resulting from minerals management and renewable energy management.

Generally speaking, management actions such as establishing ROW exclusion and avoidance areas offer increased protection to cultural resources in these areas from surface disturbing activities or alterations in setting like construction of highly visible features, and from increased access that often accompanies construction in ROWs. While this would reduce potential for impacts on cultural resources in these areas, it is very likely with ROWs that the development related impacts will simply be displaced to other locations, exposing cultural resources in other areas to greater potential for impacts and potential increasing the potential for impacts by resulting in longer ROWs.

Livestock Grazing and Wild Horse and Burro Management

Cultural resources can be adversely impacted by livestock grazing and wild horses and burros through direct trampling of artifacts and features and from such activities as trailing, concentrating around water, under

shade, or along natural constraining features, such as rock cliffs. Experimental studies have shown that trampling significantly impacts both the physical artifacts and features of a site. It also distorts the most common analytical approaches to measuring sites, such as artifact abundance, raw material proportions, and average artifact dimensions (Osborn et al. 1987; Douglass and Wandsnider 2012). Trampling also causes the vertical displacement of artifacts, especially in wet ground (Eren et al. 2010). Making land unavailable for livestock grazing and removal of wild horses or burros would be protective of cultural resources.

The loss of vegetation, such as grass, forbs, and shrubs over-consumed by improperly managed livestock, wild horses, or burros can result in increased erosion (**Section 4.14.2**, Soil, Nature and Type of Effects), potentially impacting the integrity of cultural resources. Erosion and the loss of vegetation due to improper grazing could also result in impacts to the setting of cultural resources. However, as described in **Section 2.9.7**, livestock grazing is managed to meet or make progress toward land health standards, thus reducing the likelihood of these effects.

4.16.2 Impacts Common to All Alternatives

Under all alternatives, the BLM would continue to adhere to the existing laws, such as the National Historic Preservation Act, and cultural resource related policy like that found in BLM manuals and handbooks, such as Manual 8100 The Foundations For Managing Cultural Resources (BLM 2004a). This would generally act to protect culturally significant resources from impacts related to ground-disturbing activities, alterations to setting, and vandalism or unauthorized collection. It would also contribute to mitigating unavoidable impacts to cultural resources through various strategies. These might involve the collection of scientific data during cultural resource inventories or excavations, as well as in situ preservation to minimize physical disturbance and avoidance measures to guide activities away from sensitive areas. The BLM would continue to identify and manage cultural resources on a programmatic and project specific level. Additionally, continued consultation and cooperation with State Historic Preservation Offices and Native American Tribes would allow information on cultural properties and cultural landscapes to continue to be compiled and concerns regarding sensitive cultural resources such as TCPs to be addressed. This would enable better future management and protection of the integrity of these resources.

4.16.3 Alternative 1

GRSG Management

Under Alternative 1, habitat management areas (HMAs) and Sagebrush Focal Areas (SFAs) would be designated in GRSG habitat. In all states, a disturbance cap ranging from 3 to 5 percent would be implemented within PHMA. In Wyoming, a 5 percent cap is made at the project area scale and includes disturbance from wildfire and agriculture. In all other states (Colorado, Montana, Idaho, Nevada, California, Oregon, Utah, North Dakota, and South Dakota) a 3 percent cap would not include wildfire or agriculture and the cap would apply not only at the project area scale but also at the biologically significant unit scale within PHMA. In Idaho the cap could be exceeded in utility corridors if it is a benefit to GRSG.

Management related to HMAs and SFAs under Alternative 1, including disturbance caps, would protect cultural resources in these areas from disturbance related impacts to varying degrees depending on the activity and location. While this would continue to reduce potential for impacts on cultural resources in HMAs, it is likely at least some of the development related impacts would be displaced to locations outside of HMA, exposing cultural resources in other areas to greater potential for impacts.

Minerals Management

Under Alternative 1, leasing of fluid minerals would be permitted within PHMAs (and IHMAs in Idaho), with No Surface-Occupancy (NSO) stipulations. The NSO stipulations would reduce potential for ground disturbing activities, changes to site setting, and increases in access due to development activities within PHMAs and IHMAs.

Under Alternative 1, closure of PHMA and IHMA to salable and non-energy mineral development (with some limited exceptions) would reduce potential within PHMAs and IHMAs for ground disturbing activities, changes to site setting, and increases in access due to development activities.

Under Alternative 1, the BLM previously recommended that all SFAs be withdrawn from location and entry under US mining laws. Recommending areas for withdrawal from location and entry under the Mining Law of 1872 does not restrict any activities and therefore, such recommendation does not have any impacts. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

Under Alternative 1 fluid, salable, and non-energy mineral development in GHMAs would be subject to a mixture of management measures intended to minimize impacts on GRSG including designation as open, controlled surface use, closed, or NSO within varying distance of GRSG leks. These measures would reduce potential for ground disturbing activities, changes to site setting, and increases in access to impact cultural resources within GHMAs, though not to the degree that the management described above for PHMAs and IHMAs would.

While restrictions from minerals management under Alternative 1 would reduce potential for impacts on cultural resources within HMAs and SFAs, it would also likely result in a shift of some of these activities to suitable areas outside of them where possible, increasing potential for impacts on cultural resources outside of HMAs and SFAs. Overall, restrictions from minerals management under Alternative 1 could make development more costly and difficult, or prevent development that could not be relocated to a suitable area. This would continue to be generally protective of cultural resources across the planning area.

Renewable Energy Management

Under Alternative 1, PHMA would be excluded from wind energy development except in some Oregon counties where PHMA would be designated as avoidance and Wyoming, where all PHMA would be designated as avoidance or open if there would be no impact to GRSG. IHMA in Idaho would be designated as avoidance for wind energy development.

Under Alternative 1, PHMA would be excluded from solar energy development, except in Wyoming where solar energy development would not be addressed and in Oregon, where it would be designated as avoidance. IHMA would be designated as avoidance for solar energy development.

Under Alternative 1, GHMAs would be a mix of open, avoidance, and exclusion for wind and solar that would vary by state. Exclusion or avoidance of wind and solar energy development would reduce potential within these areas for ground disturbing activities, changes to site setting, and increases in access due to development.

Impacts on cultural resources from ground disturbance, alteration of setting, and increased access related to renewable energy development would be the same as those described under Nature and Type of effects. While excluding or avoiding renewable energy development within HMAs under Alternative 1 would reduce potential for impacts on cultural resources within these areas, it would likely result in a shift of these activities

to suitable areas outside of HMAs, negatively impacting cultural resources outside of them. Overall, the restrictions on renewable energy development under Alternative 1 could make development more costly and difficult or prevent any uses that could not be relocated to a suitable area. This would continue to be generally protective of cultural resources across the planning area.

Lands and Realty Management

Under Alternative 1, all states would designate PHMA/IHMAs as avoidance for major and minor ROWs, except for Wyoming which would be open to minor ROWs with buffers and mitigation. This would reduce potential within designated PHMAs and IHMAs for ground disturbing activities, changes to site setting, and increases in access due to ROW development.

Under Alternative 1, GHMAs would be designated as avoidance for major ROW development in Colorado, California, Nevada, and Oregon. In Idaho and Utah GHMAs would be open to major ROWs with minimization measures, and Wyoming is open to major ROWs. All states would be open to minor ROW development with mitigation, except for Wyoming which would not require mitigation. This would reduce potential within GHMAs for ground disturbing activities, changes to site setting, and increases in access due to ROW development, though to a much lesser degree than ROW related management for PHMAs and IHMAs.

While excluding or avoiding ROW development within HMAs under Alternative 1 would continue to reduce potential for impacts on cultural resources within these areas, it would likely result in a shift of these activities to suitable areas outside of HMAs, negatively impacting cultural resources outside of them.

Livestock Grazing Management

Under Alternative 1, all PHMAs, IHMAs, and GHMAs would be available for livestock grazing except for in Oregon where some or all of Research Natural Areas (RNAs) would be unavailable. Livestock grazing would continue to create potential for impacts on cultural resources within these areas from ground disturbance like trampling and changes to site setting through vegetation changes.

Wild Horse and Burro Management

Under Alternative 1, all states where wild horses and burros overlap with GRSG habitat would continue to manage wild horse and burro populations within established appropriate management levels (AMLs) and incorporate GRSG objectives into wild horse and burro management. Keeping wild horse and burro populations at established AMLs, and prioritized gathers to accommodate GRSG habitat objectives would keep wild horse and burro populations from increasing. Any reduction in AMLs from incorporation of GRSG objectives into wild horse and burro management could decrease wild horse and burro populations. Restrictions on wild horses and burros under Alternative 1 would maintain or decrease the current potential for surface disturbance and changes to site setting from wild horse and burro grazing, extending protection to cultural resources.

4.16.4 Alternative 2

GRSG Management

Under Alternative 2, the impacts on cultural resources from designating SFAs and HMAs within GRSG habitat would be similar to those described under Alternative 1, although SFAs in Utah, Wyoming, Nevada and Idaho would not be designated under Alternative 2. Under Alternative 2, the impacts on cultural resources from instituting a disturbance cap in GRSG habitat would be very similar to those described under Alternative 1, relevant differences being that in Utah the cap can be exceeded if it is a benefit to GRSG, and

in Idaho the cap only applies at the BSU-scale, both of which could result in additional impacts from development beyond what would be seen under Alternative 1.

Similar to Alternative 1, management related to HMAs and SFAs under Alternative 2 would protect cultural resources in these areas from disturbance related impacts to varying degrees depending on the activity and location. The differences in GRSG management under Alternative 2 would reduce GRSG related restrictions in these areas that are protective of cultural resources.

Minerals Management

Under Alternative 2, impacts from fluid mineral management in PHMAs and GHMAs would be similar to those described for Alternative 1, except in Colorado PHMAs would not be closed to fluid mineral leasing and GHMAs would have NSO stipulations instead of closure. The increased potential for fluid mineral leasing and associated activities in Colorado GRSG habitat from these changes would increase the potential for related impacts on cultural resources in these areas.

Under Alternative 2, impacts from salable and non-energy mineral management in PHMAs and GHMAs would be similar to those described for Alternative 1, except that in Idaho consideration of new free use permits would be allowed and in Nevada there would be exception criteria added to closure. The increased potential for salable and non-energy mineral development in Idaho and Nevada GRSG habitat would increase the potential for related impacts on cultural resources in these areas.

Under Alternative 2, the recommendation that all SFAs be withdrawn from mineral location and entry under US mining laws (except in Montana, North Dakota, and South Dakota) would be removed. This removal would have no impact because withdrawals are initiated and considered not through land use planning but through a separate process outlined in section 204 of FLPMA. Only the Secretary may withdraw lands through a Public Land Order.

Under Alternative 2, restrictions from minerals management would reduce potential for impacts on cultural resources within HMAs and SFAs and would also likely result in a shift of some of these activities to suitable areas outside of them where possible. This would increase potential for impacts on cultural resources outside of HMAs and SFAs. Overall, restrictions from minerals management under Alternative 2 could make development more costly and difficult or prevent uses that could not be relocated to a suitable area. This would be generally protective of cultural resources across the planning area.

Renewable Energy Management

Under Alternative 2, the impacts from solar and wind energy management in PHMAs and GHMAs would be the similar to those described for Alternative 1, with some additional exception criteria added to exclusion and avoidance of HMAs in Nevada and California. These exception criteria would increase potential for ground disturbing activities, changes to site setting, and increases in access related to renewable energy development in these areas.

Lands and Realty Management

Under Alternative 2, the impacts from ROW management would be similar to those described for Alternative 1, with the addition of exception criteria for ROWs in PHMAs in Nevada. These exception criteria would increase potential for ground disturbing activities, changes to site setting, and increases in access related to ROW development in these areas.

Livestock Grazing Management

Under Alternative 2, the impacts from livestock grazing management would be similar to those described for Alternative 1. In Utah, Wyoming, and Nevada, the prioritization for review and processing of grazing permits in SFAs and PHMAs was removed; however, the BLM would still have the authority to prioritize staff time and budget to identify areas that aren't meeting land health standards and implement corrective actions in areas with the greatest GRSG habitat value.

Wild Horse and Burro Management

Under Alternative 2, the impacts from wild horse and burro management would be the same as those described for Alternative 1.

4.16.5 Alternative 3

GRSG Management

Under Alternative 3, all areas managed for GRSG would be designated PHMAs, with some states considering expanding HMA boundaries to include areas of adjacent non-habitat, unoccupied historic GRSG habitat, or areas with potential to become GRSG habitat as PHMAs. Under Alternative 3, The disturbance cap is three percent, applies at the project scale, and in accordance with the HAF (Stiver et al. 2015) Fine Scale boundaries range wide. Of note, under Alternative 3, the disturbance cap would include wildfire and agriculture as well as infrastructure, greatly increasing the amount of potential disturbance included in the disturbance calculation for those states that do not do so under Alternative 1 (all but Montana and Wyoming)

Under Alternative 3, the HMA designation scheme would create the highest acreage of PHMA, and along with the most robust version of the disturbance cap, offers the highest level of protection to cultural resources in HMAs from GRSG related restrictions among the alternatives.

Minerals Management

Under Alternative 3, closure of PHMAs to fluid minerals, salable minerals, and non-energy minerals related development offers the highest level of related protections to cultural resources from GRSG related restrictions among the alternatives.

Under Alternative 3, the recommendation that all PHMAs be withdrawn from mineral location and entry under US mining laws would be made. This recommendation would have no impact on ground disturbing activities, changes to site setting, or access due to related locatable mineral development because withdrawals are initiated and considered not through land use planning but through a separate process outlined in section 204 of FLPMA. Only the Secretary may withdraw lands through a Public Land Order.

Renewable Energy Management

Under Alternative 3, impacts on cultural resources from ground disturbance, alteration of setting, and increased access related to renewable energy development would be the same as those described under Nature and Type of effects. Only PHMA would be designated under Alternative 3, and all designated PHMA would be excluded from solar and wind energy development without exceptions. These exclusions would decrease potential in designated HMAs for ground disturbing activities, changes to site setting, and increases in access due to solar and wind energy related development the most among alternatives.

Lands and Realty Management

Under Alternative 3, PHMA would be excluded from ROW development outside of designated corridors. These exclusions would decrease potential for ground disturbing activities, changes to site setting, and increases in access due to ROW related development inside PHMAs, and would designate the most acreage

of PHMA among alternatives. However, the exclusion of ROW development in PHMAs could lead to creation of longer ROW routes to get around closed areas. Longer ROW routes would increase potential for ground disturbing activities, changes to site setting, and increases in access outside of PHMAs.

Livestock Grazing Management

The management of PHMA as unavailable for livestock grazing would cause the greatest decrease in potential for related impacts on cultural resources among alternatives. However, removal of all grazing could reduce the removal of fine fuels across the landscape, making the decision area potentially at higher risk of a large-scale wildfire that could damage or destroy cultural resources located at or near the surface.

Wild Horse and Burro Management

The removal of wild horses and burros would decrease the potential for related impacts on cultural resources within PHMAs the most among alternatives.

4.16.6 Alternative 4

GRSG Management

Under Alternative 4, the BLM would consider adjustments to HMA boundaries from the 2015 and 2019 amendments based on new information such as updated science and mapping that could result in expansion of HMAs, removal of current HMA designation, or re-categorization of HMAs. Under Alternative 4, the impacts on cultural resources from designating HMAs within GRSG habitat would likely be similar to those described under Alternative 1, although SFAs would not be designated under Alternative 4.

Under Alternative 4, the disturbance cap in PHMA (and IHMA in Idaho) for all states would be 3 percent for new and pre-existing authorizations at the project scale and also within HAF fine scale habitat selection area, and would apply only to infrastructure (not to wildfire or agriculture). Impacts from the disturbance cap as instituted under Alternative 4 would be similar to those under Alternative 1.

Minerals Management

Similar to Alternative 1, under Alternative 4 fluid mineral leasing management would seek to minimize impacts on GRSG through reduction of habitat fragmentation and loss, which would be generally protective of cultural resources in GRSG habitat. Under Alternative 4 a greater number of waivers, exceptions, and modifications for fluid minerals leasing applied across a larger portion of the planning area could enable a greater degree of development in HMAs than would be seen under Alternative 1.

Renewable Energy Management

Under Alternative 4, PHMA would be managed as exclusion for utility scale wind and solar development while IHMA would be managed as exclusion for utility scale wind and solar development within 3.1 miles of active leks, with the rest of IHMA managed as avoidance. Unique to Alternative 4, all areas within 0.5 miles of PHMA or IHMA would be managed as avoidance for utility scale wind and solar development. Under Alternative 4, the overall impacts on cultural resources from managing HMAs as exclusion and avoidance areas for wind and solar energy development would be similar to those described for Alternative 3.

Lands and Realty Management

Under Alternative 4, PHMA and IHMA as well as a 0.5 mile buffer around them would be designated as avoidance for major transmission ROWs. GHMA would also contain at least some areas designated as ROW avoidance, depending on habitat mapping at the state level. Despite the addition of a 0.5 mile ROW avoidance buffer on PHMA and IHMA, the lack of major ROW exclusions under Alternative 4 could result in shorter

ROWs, reducing the overall acreage where cultural resources would potentially be impacted across the planning area compared to Alternative 1.

Livestock Grazing Management

Impacts from livestock grazing management would be the same as described under Alternative 1.

Wild Horse and Burro Management

Impacts from wild horse and burro management would be the same as described under Alternative 1.

4.16.7 Alternative 5

GRSG Management

Under Alternative 5, the BLM would consider adjustments to HMA boundaries from the 2015 and 2019 amendments based on new information such as updated science and mapping that could result in expansion of HMAs, removal of current HMA designation, or re-categorization of HMAs. Under Alternative 5, the impacts on cultural resources from designating HMAs within GRSG habitat would likely be similar to those described under Alternative 1, although SFAs would not be designated under Alternative 5.

Under Alternative 5, the disturbance cap in PHMA (and IHMA in Idaho) for all states would be 3 percent for new and pre-existing authorizations within HAF fine scale habitat selection area, and would apply only to infrastructure (not to wildfire or agriculture). In Wyoming and Montana, a 5 percent cap is made in PHMA at the project scale and includes disturbance from wildfire and agriculture. In all other states (Colorado, Montana, Idaho, Nevada, California, Oregon, Utah, North Dakota, and South Dakota) a 3 percent cap at the project scale would not include wildfire or agriculture related disturbance. Impacts on cultural resources from the disturbance cap as instituted under Alternative 4 would be similar to those under Alternative 1.

Minerals Management

Under Alternative 5, impacts on cultural resources from fluid mineral management would be similar to those described under Alternative 4. The management of fewer acres as NSO under Alternative 5 could make some cultural resources more susceptible to impacts from fluid mineral exploration and development as described in the *Nature and Type of Effects*.

Renewable Energy Management

Under Alternative 5, Impacts on cultural resources from ground disturbance, alteration of setting, and increased access related to renewable energy development would be the same as those described under Nature and Type of Effects. Under Alternative 5, PHMA and IHMA would be managed as avoidance for utility scale wind and solar development while GHMA would be open to it. Impacts on cultural resources within HMAs would be greater than under Alternative 1 due to the lack of HMA designated as solar and wind energy exclusion areas, however overall likelihood of these impacts within the planning area are likely to be the similar to that under Alternative 1, since impacts on cultural resources due to renewable energy development may only be displaced instead of avoided entirely.

Lands and Realty Management

Under Alternative 5, impacts on cultural resources related to ROW avoidance would be the same as those described under Nature and Type of effects. The designation of GHMA as open to major ROWs and lack of major ROW exclusions under Alternative 5 could result in shorter ROWs compared to management under all the other alternatives, since all other alternatives include greater ROW avoidance or exclusion designations. Potentially shorter ROWS would reduce the overall area where cultural resources could potentially be impacted by ROWs across the planning area compared to all other alternatives.

Livestock Grazing Management

Under Alternative 5, the impacts from livestock grazing management would be the same as those described for Alternative 4.

Wild Horse and Burro Management

Impacts from wild horse and burro management under Alternative 5 would be similar to those described for Alternative 1. Management to the low end of the AMLs could reduce impacts from wild horses and burros on cultural resources in some areas.

4.16.8 Alternative 6

Impacts on cultural resources under Alternative 6 would be similar to impacts under Alternative 5 except for the designation of ACECs. ACECs designated for the benefit of GRSG under Alternative 6 would have greater restrictions on mineral exploration, including fluid minerals, non-energy minerals, saleable minerals and mineral materials as well as development of major ROWs, wind and solar within the ACECs, which would be protective of cultural resources inside these areas. The overall likelihood of impacts on cultural resources from various types of development within the planning area would be similar to that under Alternative 5 since impacts on cultural resources may only be displaced outside of ACECs instead of avoided entirely.

4.17 TRIBAL INTERESTS

4.17.1 Nature and Types of Effects

The nature and type of most effects on tribal interests are general and non-quantifiable in nature. In general, activities that result in ground disturbance to lands currently or historically occupied by GRSG could decrease opportunities for tribes to maintain traditional cultural practices and values if these activities result in decreases in GRSG populations. These include, but are not necessarily limited to, granting ROWs for road and highway construction, wind energy development, vegetation treatments in sagebrush communities, development of leasable, locatable, salable, and fluid minerals, OHV use, and SRPs. Livestock grazing and wild horse and burros may also alter the landscape in ways that decrease tribal opportunities to maintain specific traditional practices and values. In addition, natural processes that are impossible to control likely add to the human-caused impacts on GRSG listed above, including climate change, drought, and lightning-caused wildfires. The general impacts on tribal interests that would result through the implementation of each alternative analyzed in this EIS are described below.

Types of impacts that could occur from management actions or their implementation under all alternatives including the following:

- Direct disturbance of locations or landscapes associated with trust or treaty assets, traditional beliefs, sacred sites, resource gathering areas, hunting and fishing areas, water sources, ancestral sites, human remains, and trails (similar to those described in **Section 4.16,** Cultural Resources)
- Alterations of visual and aural aspects of the cultural landscape's setting that would create changes to the landscape that make it no long useable by tribal members
- Increased access and human presence, which could lead to increased vandalism and unauthorized collection of ancestral sites or trespass on treaty areas
- Decreased tribal member access or interference with the exercise of treaty rights or cultural uses and practices, such as resource gathering or hunting
- The potential for erosion, pollution, habitat loss, and less-tangible changes to natural features and resources that tribal members may consider sacred

Any action that would impact the integrity of an Indian Trust Asset or treaty-based right of a tribe or tribal resource in the planning area would be considered an adverse effect on that resource, asset, or interest. Impacts can be caused by development (e.g., road construction) or conservation (e.g., habitat improvement or landscape reclamation) actions or future implementation actions. The BLM would continue to maintain government-to-government consultation with federally recognized Native American tribes and would consult with tribes during future implementation actions to assess case-by-case or project-by-project impacts.

Depending on the extent and type of activity the amount of physical disturbance could be from slight visual or other intrusions on a landscape to wholesale destruction of an entire location or site. Whether impacts would affect a small portion of an area or affect a larger stretch of landscape would need to be evaluated by tribal representatives before making a determination on said impact's severity. However, it is usual to assume that impacts resulting in an irreversible and irretrievable loss of tribal value are of the highest severity. On a project-by-project basis, the spatial distribution (or range) of the disturbance would be largely focused on a site-specific basis. However, over time and as more actions occur throughout the planning area, the extent would be throughout sagebrush habitat.

4.17.2 Impacts Common to All Alternatives

Under all alternatives the BLM would continue to manage BLM-administered lands in a manner that accommodates Native American religious traditions, practices, and beliefs as guided by directives contained in BLM Manual 1780, BLM Handbook 1780-1, American Indian Religious Freedom Act (42 USC 1996), Native American Graves Protection and Repatriation Act (25 USC 3001), Executive Order 13007 (Indian Sacred Sites), and Executive Order 13084 (Tribal Consultation), Secretarial Order 3317, DOI Policy on Consultation with Indian Tribes (December 1, 2011), and Joint Secretarial Order 3403, on Fulfilling the Trust Responsibility to Indian Tribes in the Stewardship of Federal Lands and Waters (November 21, 2022). All alternatives allow for the appropriate tribal governments to consult on a case-by-case basis on undertakings on BLM-administered that could affect Native American concerns. The BLM would continue to identify, protect, and preserve tribal assets, treaty rights, sacred/religious sites, or special use areas through site- and project-specific modification or mitigation on a case-by-case or project-by-project consultation basis that could affect Native American concerns.

Under all alternatives, actions that provide protections for GRSG or its habitat by limiting access into areas or excluding surface-disturbing activities, such as NSO and restrictions on surface and vehicle use would protect cultural resources from effects due to surface disturbance, erosion, effects on setting and access leading to vandalism, inadvertent damage, and unauthorized collection of cultural resources. These actions could also increase tribal opportunities to maintain specific traditional practices and values such as traditional plant gathering, hunting animals including GRSG, and the role played by GRSG in oral traditions and cultural practices such as observing lekking behavior as described in the Nevada and Northeastern California Greater Sage-Grouse Proposed Land Use Plan Amendment and Final Environmental Impact Statement (BLM 2015) if the current leasing of nonenergy minerals has led to decreases in GRSG populations.

4.17.3 Alternative 1

GRSG Management

Under Alternative 1, GRSG habitat would be separated into SFAs, PHMAs, IHMAs, and GHMAs. Restrictions to land use and surface-disturbing activities would occur within each HMA and SFA, depending on the classification. Corresponding management actions, including lek buffers, required design features, fluid mineral leasing prioritization, and habitat objectives, would provide a hierarchy of potential conditions to

minimize effects in HMAs which could stabilize or increase GRSG populations in the future. These management goals and objectives could lead to increased opportunities for tribes to maintain traditional cultural practices and values, such as observing lekking behavior. However, use of Sagebrush Focal Areas (SFAs) and sagebrush-dominated vegetation areas in HMAs to the restrict development has the potential to push development into other vegetation regimes where cultural resources and areas of tribal interest may also exist. For example, in northwest Colorado, there are known concentrations of archaeological resources in pinyon-juniper vegetation areas that could face increased potential for impacts if ground-disturbing activities are directed into those areas when sagebrush-dominated areas are more restrictive. In Nevada and California, tribes have expressed concern for access to traditional pine nutting areas that could be similarly impacted if development is pushed to other vegetative areas in preference for SFA conservation. However, project-specific Section 106 compliance and tribal consultation should mitigate the effects of development on BLM-administered lands outside of sagebrush-dominated areas.

Lands and Realty Management

Under Alternative 1, the BLM would manage and minimize effects of land use actions on PHMA and GHMA; however, it would allow for corridors and ROWs that result in a net conservation gain for GRSG. Tribes would be able to maintain traditional practices by accessing pine nutting areas and observing lekking behavior. Restricting new development and land use authorizations near leks would likely maintain traditional tribal cultural practices and values. Cultural resources important to tribes could be impacted by the development of transmission lines within new and existing utility corridors, specifically surface disturbances from construction of poles, roads, and ancillary features, and visual impacts to the setting.

All states would have a 3% disturbance cap applied to land use activities other than wildfire and agriculture, except MT and WY, which would have a 5% cap that would include wildfire and agriculture. The 3% cap would be calculated at both the BSU-scale and at proposed project analysis area within PHMA, though in ID, the cap could be exceeded in utility corridors. Including caps at both project and BSU scales in the 3% states would reduce disturbance on both the local and landscape scales, therefore, provide protection for resources of tribal interest. A higher disturbance cap in MT and WY calculated at only the project-scale could lead to greater levels of disturbance within a project area, and therefore greater potential direct disturbances to tribally-important resources and the potential for greater cumulative disturbances across multiple projects.

Renewable Energy development is excluded in PHMAs in all states except WY where PHMAs are avoidance or open if there is no impact to GRSG. IHMAs and certain areas in OR would use GRSG avoidance rather than exclusion. GHMAs would be a mix of open, avoidance, and exclusion for wind and solar by state. Allowing renewable energy development within certain GRSG core habitat areas could adversely impact cultural resources and access for tribal cultural practices in those areas.

Minerals Management

Leasing of fluid minerals would be allowed in PHMAs and ID IHMAs, subject to NSO stipulations and/or seasonal restrictions. Allowing fluid mineral leasing would create surface disturbance that could impact cultural resources important to tribes in those areas. However, NSO stipulations on new leases would protect PHMAs from surface-disturbing activities, which could protect cultural resources and increase the opportunities for tribes to participate in traditional cultural practices, if the NSO stipulations were to increase or stabilize GRSG populations.

Closing PHMA to salable and non-energy minerals would protect cultural resources important to tribes and increase the opportunities for tribes to participate in traditional cultural practices if the closures were to increase or stabilize GRSG populations.

Livestock Grazing and Wild Horse and Burro Management

Management of livestock grazing and wild horses and burros in PHMA and GHMA could decrease tribal opportunities to maintain specific traditional practices and values such as observing lekking behavior if those current management practices have led to decreases in GRSG populations.

4.17.4 Alternative 2

GRSG Management

Impacts from designating GRSG habitat as SFAs, PHMAs, IHMAs, and GHMAs would be similar as to those described for Alternative 1. However, some SFAs would be removed in UT, WY, NV, and ID. Removing SFAs in UT, WY, NV, and ID would reduce protections to GRSG and habitat, which could lead to decreased opportunities for tribes to maintain traditional cultural practices and values, such as observing lekking behavior.

Lands and Realty Management

Impacts from ROW management would be the same as described for Alternative 1 (with additional exception criteria in NV/CA). The additional exception criteria for ROW and renewable energy in NV/CA could increase the potential for impacts cultural resources and traditional uses from surface-disturbing activities, though the criteria would likely avoid impacts to GRSG. Impacts from disturbance caps at 3%, and 5% in MT and WY, would be similar to Alternative, though the caps could be exceeded in both ID and UT under certain conditions which could pose a higher risk of potential impacts to resources of tribal interest in those states.

Minerals Management

Impacts from fluid mineral management in PHMAs and GHMAs would be the same as described for Alternative 1, except in CO PHMAs would have no closed areas and CO GHMAs would have NSO in place of closed areas. The exposure of areas in CO to fluid mineral leasing could increase the risk of potential impacts to cultural resources and decrease opportunities for tribes to maintain traditional cultural practices and values in areas where fluid mineral leasing occurs.

Impacts from salable and non-energy mineral management in PHMAs and GHMAs would be the same as described for Alternative 1, except in ID IHMAs where new free use permits for salable minerals would be considered and NV PHMAs would include exception criteria to closure for both salable and non-energy minerals. These actions could expose cultural resources to increased risk of potential impacts from surface-disturbing activities and decrease opportunities for tribes to maintain traditional cultural practices and values.

Removing the recommendation for withdrawal of the SFAs from location and entry under the Mining Law of 1872 in all states (except in MT/DK, which did not have a 2019 amendment) would have no impact on how surface-disturbing activities would impact cultural resources and would not impact GRSG disturbance and habitat alterations/degradation, nor would it impact opportunities for tribes to maintain traditional cultural practices and values. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

Livestock Grazing Management

Impacts from domestic livestock grazing management would be the same as described for Alternative 1. In UT, WY, and NV, the prioritization for review and processing of grazing permits was removed; however, the BLM would still have the authority to prioritize staff time and budget to identify areas that aren't meeting land health standards and implement corrective actions in areas with the greatest GRSG habitat value.

Wild Horse and Burro Management

Impacts from wild horse and burro management would be the same as described for Alternative 1.

4.17.5 Alternative 3

GRSG Management

Under Alternative 3, the highest level of conservation for GRSG would be adopted with all areas managed for GRSG as PHMAs and establish management goals and objectives for specific resources in PHMA that could stabilize or increase GRSG populations in the future. If successful, these management goals and objectives could lead to increased opportunities for tribes to maintain traditional cultural practices and values such as observing lekking behavior.

Lands and Realty Management

New development would be substantially limited compared with Alternatives 1 and 2. All PHMAs would be excluded from new ROW authorizations. New linear ROWs would be allowed only in designated corridors. The potential for habitat degradation and fragmentation within the PHMAs would be reduced and this would result in increased opportunities for tribes to maintain traditional practices as well as increase protection of cultural resources important to tribes in those areas from surface-disturbing activities by reducing travel and access, which in, turn could reduce vandalism and collection. However, the inability to site ROWs in PHMAs could lead to longer ROW routes in order to bypass closed areas. Longer routes would increase surface disturbance and other impacts of ROW siting, resulting in more areas that would be exposed to ground disturbance, erosion, and impacts from increased access outside of PHMAs. A 3% disturbance cap would be applied to pre-existing land-use authorization including wildfire and agriculture at multiple scales and with now exceptions, offering a higher level of protection to resources of tribal interest than alternatives 1 and 2.

Under Alternative 3, PHMAs in all states would be ROW exclusion areas for wind and solar energy development. Alternative 3 would offer more protection from renewable energy development than under Alternatives 1 and 2 because more areas would be excluded from renewable energy development with no exceptions. Excluding wind energy development in GRSG priority and general habitat areas would reduce surface disturbance and visual impacts to cultural resources important to tribes in those areas as well as preserving opportunities for tribes to maintain traditional cultural practices.

Minerals Management

Closing PHMAs in all states to fluid mineral leasing, salable minerals, and non-energy minerals would reduce potential for impacts to GRSG and habitat to a greater extent than Alternatives 1 and 2. This is because areas closed to leasing could not be developed at any point. Closing PHMAs to mineral leasing and development would protect cultural resources important to tribes from surface-disturbing activities as well as subsurface activities (e.g., directional drilling). GRSG would not be exposed to disruption that is often associated with the noise and human activity that accompanies construction, development, or production activities, preserving opportunities for tribes to maintain traditional cultural practices.

Recommending PHMAs for withdrawal from location and entry under the United States mining laws would have no impact on tribal opportunities to practice traditional cultural behavior and values such as observing lekking behavior if this management strategy stabilizes or increases GRSG populations. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

Livestock Grazing Management

Under Alternative 3, all PHMA would be unavailable for domestic livestock grazing that would increase opportunities for tribes to maintain traditional practices, such as observing lekking behavior, if this grazing strategy stabilizes or increases future GRSG populations. Prohibiting livestock grazing within GRSG priority habitat could also protect cultural resources important to tribes in these areas from damage by livestock trampling. However, removal of all grazing could reduce the removal of fine fuels across the landscape, making the decision area potentially at higher risk of a large-scale wildfire that could damage or destroy tribal interests. Additionally, this alternative may decrease economic revenue to tribes holding grazing permits if their current AUMs are reduced.

Wild Horse and Burro Management

Removing wild horses and burros in those PHMAs with existing herd management areas in all states would increase habitat quality for wildlife, including GRSG, as described in **Section 4.2**. This increase in GRSG habitat quality would increase opportunities for tribes to maintain traditional practices.

4.17.6 Alternative 4

GRSG Management

Under Alternative 4, the BLM would consider adjustments to HMA boundaries from the 2015 and 2019 amendments based on new information such as updated science and mapping that could result in expansion of HMAs, removal of areas currently in HMA, or re-categorization of HMA prioritization. Impacts to resources of tribal interest from HMA designations under Alternative 4 are expected to be similar to alternatives 1 and 2.

Lands and Realty Management

Under Alternative 4, impacts from managing PHMAs in all states and ID IHMAs as ROW avoidance areas would be similar to those described for Alternative 1.

Impacts from applying a 3% disturbance cap under Alternative 4 would be similar as to those described for Alternative 3, however, the cap would apply to both existing and proposed infrastructure authorizations and wildfire and agriculture would not be included in the disturbance calculation. As a result, the level of possible disturbance to resources of tribal interest from other sources (energy development, roads, RPWs, etc.) would be relatively higher than if wildfire and agriculture were included in the disturbance calculation.

Impacts from managing PHMAs in all states as ROW exclusion areas for utility-scale wind and solar energy development would be similar to those described for Alternative 3. Unique to Alternative 4, all areas within 0.5 miles of PHMA or IHMA would be managed as avoidance for utility scale wind and solar development. However, since PHMAs would apply to a smaller area under this alternative, the extent of protection from disturbance associated with from renewable energy development would be less.

Minerals Management

Under Alternative 4, fluid mineral leasing management would seek to minimize impacts on GRSG through reduction of habitat fragmentation and loss, which would be generally protective of cultural resources and

other tribal interests in GRSG habitat. Under Alternative 4 a greater number of waivers, exceptions, and modifications for fluid minerals leasing applied across a larger portion of the planning area could enable a greater degree of development in HMAs than would be seen under Alternative 1.

Livestock Grazing Management

Impacts under Alternative 4 would be the same as those described under Alternative 1.

Wild Horse and Burro Management

Impacts under Alternative 4 would be the same as those described under Alternative 1.

4.17.7 Alternative 5

GRSG Management

Under Alternative 5, impacts to tribal interests would be similar to Alternative 4 with the additional consideration of adjustments to HMAs to balance multi-use opportunities, which has the potential produce impacts on tribal interests since HMAs would cover a smaller area under Alternative 5.

Lands and Realty Management

Under Alternative 5, impacts from managing PHMAs in all states and ID IHMAs as ROW avoidance areas and applying minimization measures where major ROWs cannot be avoided would be similar to those described for Alternative 4. GHMA would be open to major ROW development with minimization measures of managing the severity of a project impact at a specific location. Potential impacts on areas of tribal interest would be similar to those as described under Alternative 4, but greater in magnitude due to GHMA being managed as open to major ROW development.

Impacts from applying a 3% disturbance cap under Alternative 5 would be the same as described for Alternative 4, except in WY and MT that would have a 5% disturbance cap at the project scale. Impacts from exceeding the 3% disturbance cap under certain conditions would be similar to those described for Alternative 4, but more exceptions would be allowed, which may result in increased development and potential disturbance to resources of tribal interest.

Minerals Management

Under Alternative 5, impacts on areas of tribal interest from fluid mineral management would be identical to those described under Alternative 4.

Livestock Grazing Management

Impacts under Alternative 5 would be the same as those described under Alternative 1.

Wild Horse and Burro Management

Impacts from wild horse and burro management under Alternative 5 would be similar to those described for Alternative 1. Management to the low end of the AMLs could increase in GRSG habitat quality, which could increase opportunities for tribes to maintain traditional practices in some areas.

4.17.8 Alternative 6

Impacts on areas of tribal interest under Alternative 6 would be similar to impacts under Alternative 5 except for the designation of ACECs. ACECs designated for the benefit of GRSG under Alternative 6 would have greater restrictions on mineral exploration, including fluid minerals, non-energy minerals, saleable minerals and mineral materials as well as development of major ROWs, wind and solar within the ACECs, which would lessen the potential for impacts to areas of cultural interests in these areas.

4.18 LANDS WITH WILDERNESS CHARACTERISTICS

4.18.1 Nature and Type of Effects

Wilderness characteristics are primarily influenced by actions that impact the undeveloped nature of the area or by activities that increase the sights and sounds of other visitors. Linear developments also impact the sizes of lands with wilderness characteristics units, which can also impact a unit's eligible acreage. These actions and activities could change the wilderness qualities listed in BLM Manual 6310 that make up the criteria for lands with wilderness characteristics. Generally, actions that create surface disturbance degrade the naturalness of wilderness characteristics, as well as the setting for experiences of solitude and primitive recreation.

Allowing any type of energy or mineral development, such as fluid, nonenergy leasable, and salable minerals, as well as renewable energy (e.g., wind and solar), would result in surface disturbance that would diminish the area's natural characteristics. Any new roads authorized for access to the development area could eliminate wilderness characteristics of the entire unit. This would be the case if the road were to bisect the unit so that it would no longer be considered a roadless area of adequate size. In addition, allowing developers regular access to the lease area or mine site would reduce opportunities for solitude.

ROW exclusion areas provide direct and indirect protection of wilderness characteristics by preserving naturalness and opportunities for solitude and primitive recreation by prohibiting disturbance and fragmentation from transmission lines, roads, and other utility developments. ROW avoidance areas also provide protection of wilderness characteristics by encouraging ROW development outside of the avoidance area when feasible.

Impacts on wilderness characteristics are possible from changes in livestock grazing and wild horses and burro management, particularly from new developments (e.g., water developments and range facilities) in lands with wilderness characteristics. This could lessen the naturalness of appearance or could limit unconfined recreation. Existing range facilities used for livestock grazing and wild horses and burro management, such as stock trails and spring developments, would result in no changes to current wilderness characteristics. Installing and maintaining range improvements could result in short-term impacts on solitude and naturalness due to human presence, noise, and disturbance. In addition, range improvements reduce the overall appearance of naturalness over the long term could result in short-term impacts on solitude and naturalness due to human presence, noise, and disturbance during installation. Where areas are unavailable for livestock grazing, lands with wilderness characteristics that overlap with these areas would experience a reduction of these impacts. Gathering operations to manage wild horse and burro populations would temporarily reduce opportunities for solitude due to the increase in human presence and noise during these efforts.

4.18.2 Alternative 1

Under Alternative 1, fluid minerals would be managed within PHMA and IHMA as open with an NSO stipulation in most states with the exception that PHMA in Colorado would be closed to fluid mineral leasing within 1 mile of leks. Fluid mineral leasing in PHMA within Wyoming and Montana would also be subject to density and disturbance limits. Fluid mineral leasing within GHMA would be managed as closed within one mile of leks in Colorado and Oregon. Fluid minerals would be managed with an NSO stipulation in GHMA with varying distances from leks depending on the state. Fluid minerals would also be managed within GHMA as controlled surface use in California, Idaho, Nevada, Oregon, and Wyoming. Areas open to fluid minerals leasing and development would not provide protection to wilderness characteristics because development

and infrastructure related to those actions would impact wilderness characteristics as discussed above under *Nature and Type of Effects*.

PHMA and IHMA would be managed as closed to salable minerals in most states and closed to new development of non-energy leasable minerals. These closures would protect the naturalness of the lands with wilderness characteristics. Lands in GHMA would have minimization measures for salable mineral and non-energy leasable mineral development, which would minimize impacts, but would not prevent impacts from salable mineral development on lands with wilderness characteristics.

SFAs were recommended for withdrawal from mineral location and entry within PHMA. Recommending areas for closure to the mining laws for locatable exploration or development does not restrict any activities and therefore, such recommendation does not have any impacts. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA. Where lands with wilderness characteristics intersect with the areas open for mineral development, there is no certainty for protection of these wilderness characteristics.

PHMA and IHMA would be managed as ROW avoidance areas for major and minor ROWs. However, Wyoming would be open to ROWs with buffers and mitigation. Major ROW development within GHMA would vary by state. For minor ROWs, GHMA would remain open to ROW development with mitigation for all states, except for Wyoming, which does not require mitigation. ROW activities and associated development can reduce the size of lands with wilderness characteristics and can impair the apparent naturalness of the area and the experience of solitude, as described above under *Nature and Type of Effects*. Due to screening criteria, conditions for development, and required mitigation, applicants may find it easier to cite their development outside of GRSG habitat, thereby leading to some additional protection of lands with wilderness characteristics within GRSG habitat.

Livestock grazing would be available in GRSG HMAs, except in Oregon where all or portions of 13 key RNAs would be unavailable. Impacts to wilderness characteristics would be the same as those described under *Nature and Type of Effects*.

4.18.3 Alternative 2

Under Alternative 2, impacts from management of fluid minerals on lands with wilderness characteristics would be similar as those described under Alternative 1. However, under Alternative 2, PHMA and GHMA within Colorado would not be managed as closed to fluid minerals, rather these areas would be managed as NSO within 1 mile of leks which would effectively provide the same protection to wilderness characteristics due to the lack of surface disturbance with this type of development.

Impacts from salable minerals on lands with wilderness characteristics within PHMA and IHMA would be similar as those described under Alternative 1. However, under Alternative 2, Idaho would allow for consideration of new free use permits and Nevada would have exception criteria to the closed areas. Compared with Alternative 1, the free use permits, and exception criteria would allow for more impacts on lands with wilderness characteristics within PHMA and IHMA due to more areas allowing this surface disturbing activity. Impacts from salable minerals and non-energy minerals on lands with wilderness characteristics within GHMA would be the same as those described under Alternative 1.

The BLM would not recommend lands for withdrawal from locatable mineral entry within GHMA or PHMA. Recommending areas for closure to the mining laws for locatable exploration or development does not restrict any activities and therefore, such recommendation does not have any impacts. The Secretary

proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA. Where lands with wilderness characteristics intersect with the areas open for mineral development, impacts in these areas would be greater under this alternative compared with Alternative 1 due to no certainty for protection of wilderness characteristics.

PHMA would be managed similar to Alternative 1 for ROWs, except Nevada would have added exception criteria added which could allow for more impacts to wilderness characteristics under this alternative as described under *Nature and Type of Effects*. Impacts from ROWs on lands with wilderness characteristics would be the same as those described under Alternative 1 for GHMA.

Impacts from livestock grazing on lands with wilderness characteristics would be the same as those described under Alternative 1. In Oregon, livestock grazing would be available in all or portions of 13 key RNAs.

4.18.4 Alternative 3

Under Alternative 3, PHMA would be closed to fluid mineral leasing, salable minerals, non-energy leasable minerals, and recommended for withdrawal from locatable mineral entry providing the most protection from impacts described under *Nature and Type of Effects* to lands with wilderness characteristics than under any other alternative. However, a recommendation for withdrawal provides no protection to habitat. Withdrawals are initiated and considered not through land use planning but through a separate process outlined in section 204 of FLPMA.

PHMA would be managed as ROW exclusion areas which would result in the most protection of lands with wilderness characteristics compared to all other alternatives. ROW activities and associated development can reduce the size of lands with wilderness characteristics and can impair the apparent naturalness of the area and the experience of solitude, as described under *Nature and Type of Effects*. Precluding these types of activities would help protect wilderness characteristics.

Livestock grazing would be unavailable in PHMA which would result in the most indirect protection of lands with wilderness characteristics of all the other alternatives because lands with wilderness characteristics would not be subject to the types of impacts from livestock grazing that could reduce naturalness. In Oregon, key RNAs within PHMA would be unavailable for grazing with the same direct and indirect impacts as described under *Nature and Type of Effects*. However, removal of all grazing could reduce the removal of fine fuels across the landscape, making the decision area potentially at higher risk of a large-scale wildfire that could damage wilderness characteristics.

Management actions under Alternative 3 would have the overall greatest potential to maintain wilderness characteristics on lands with wilderness characteristics within PHMA when compared to all other alternatives.

4.18.5 Alternative 4

Under Alternative 4, no changes to mineral resource use allocations would be made, but fluid mineral leasing would be managed to minimize potential for conflict and associated impacts from subsequent development in important habitats or connectivity areas. The evaluation of parcels and the consideration of development proximity, habitat significance, and potential would contribute to the preservation of naturalness in lands with wilderness characteristics as described under *Nature and Types of Effects.*

PHMA and IHMA would be managed as avoidance areas for major ROWs under this alternative. All areas within 0.5 miles of PHMA and IHMA would be managed as avoidance areas for ROWs to address indirect impacts to adjacent PHMA and IHMA. GHMA would be managed as avoidance areas within breeding, nesting,

and limited-seasonal habitats where mapped. Impacts on lands with wilderness characteristics would be similar to those as described under Alternative 1, but lesser in magnitude due to the additional areas adjacent to HMAs being managed as avoidance areas for ROWs.

All GRSG HMAs would be available for livestock grazing, except in Oregon, where all or portions of 13 key RNAs would be unavailable. Livestock grazing would be managed toward meeting land health standards to meet or make progress toward meeting the GRSG habitat objectives in HMAs. This alternative would provide additional protections to lands with wilderness characteristics because the BLM would design new range improvement projects to enhance livestock distribution and new structural range improvements would be placed along existing disturbance corridors where possible to not increase impacts on GRSG and their habitat. This would limit the impacts on lands with wilderness characteristics from new range improvement projects as described under *Nature and Type of Effects*.

4.18.6 Alternative 5

Under Alternative 5, impacts from mineral resource use allocations on lands with wilderness characteristics would be the same as those described under Alternative 4.

PHMA and IHMA would be managed as avoidance areas for major ROWs under this alternative, but GHMA would be open to major ROW development with minimization measures of managing the severity of a project impact at a specific location. Impacts on lands with wilderness characteristics would be similar to those as described under Alternative 4, but greater in magnitude due to GHMA being managed as open to major ROW development.

Impacts from livestock grazing on lands with wilderness characteristics would be the same as those described under Alternative 4.

4.18.7 Alternative 6

Where lands maintained for wilderness characteristics overlap ACECs, management of these other areas could also indirectly protect wilderness characteristics due to the protective measures proposed for the other areas. These protective measures would include complementary management objectives, where lands with wilderness characteristics would be managed to protect them. This could offer some indirect protection of wilderness characteristics for units managed primarily for other resource considerations.

Under Alternative 6, ACECs would be open to fluid mineral leasing subject to NSO stipulations. Where ACECs overlap inventoried areas found to possess wilderness characteristics, impacts to the indicators of lands with wilderness characteristics would occur due to the surface disturbance and facility development associated with locatable and fluid mineral development. Closure of ACECs to new non-energy minerals and saleable minerals operations would protect overlapping lands with wilderness characteristics from this type of surface disturbing development.

Management of ACECs as ROW exclusion areas would result in the protection of overlapping lands with wilderness characteristics. ROW activities and associated development can reduce the size of lands with wilderness characteristics and can impair the apparent naturalness of the area and the experience of solitude, as described under *Nature and Type of Effects*. Precluding these types of activities would help protect wilderness characteristics.

4.19 RECREATION AND VISITOR SERVICES

4.19.1 Nature and Type of Effects

Impacts on recreation can be direct and indirect. Management actions that alter or prohibit users' opportunities to access recreation areas or participate in recreation activities would result in a direct impact. Management actions that change the physical, social, or administrative setting within which recreation activities take place would result in indirect impacts. Impacts on recreation settings can be the achievement of or movement toward a desired setting or an unwanted shift in setting, such as to either a more or less developed environment. Management actions which change when or where SRPs are issued would affect recreation users by changing the types of organized recreation activities permitted via SRPs in the planning area over the long term. This would potentially add costs to recreational users of BLM-administered lands having to circumvent some areas or adopting less preferred options in certain activities. Dispersed recreational activity does not require a permit and would not be affected. There may also be areas closed for restoration, changing the experiences of or opportunities for users. Physical, social, and administrative settings are not specifically managed for in areas not designated as Recreation Management Areas, although these areas do still provide intrinsic recreation values and opportunities.

4.19.2 Impacts Common to All Alternatives

Under all alternatives, the BLM would continue to review and approve SRPs on a case-by-case basis within the planning area and there would be no direct impacts on recreation through changes to the number and types of SRPs issued on an annual basis within the decision area. Any indirect impacts on SRPs would be related to the impacts on the change in the types of recreation activities, experiences, and benefits in the decision area.

Under all alternatives, disturbance caps which restrict the construction of recreation infrastructure would decrease access for recreation experiences that depend on road and trail development and could inhibit management objectives where developments are part of the desired conditions. If future recreation projects would exceed the disturbance cap in a particular area, the disturbance cap would prohibit construction of new recreation facilities such as campground, day-use areas, and trailheads in PHMA and GHMA. However, these disturbance caps would also limit development in some areas, thereby increasing remoteness and naturalness in areas managed for those objectives and enhancing the recreational user experience of primitive backcountry recreation activities and experiences over the long-term (BLM 2014).

4.19.3 Alternative 1

Under Alternative 1, existing restrictions on other resource uses, such as seasonal restrictions on fluid mineral development and disturbance caps, would indirectly affect recreation by reducing resource conflicts in PHMA, IHMA, or GHMA (**Table 2-3**) as described in **Chapter 2**. Reducing resource conflicts with recreation enhances and preserves the recreational experiences in those areas. These restrictions would reduce the impacts on recreation from the general trend of resource conflict with increasing energy development on BLM-administered lands in those management areas over the long-term.

Management of major ROW avoidance areas including those for power lines, pipelines, access roads, and communication sites in PHMA and IHMA and in GHMA in some states (CO, NV/CA, OR), would continue to improve recreation experiences over the long-term as these diminish the naturalness of the physical setting and the opportunities for recreation activities, experiences, and outcomes that require more remote and natural settings. These avoidance areas would not apply to existing roads and facilities.

4.19.4 Alternative 2

Under Alternative 2, there would be more exceptions to restrictions on other resource uses than Alternative 1 such as no closed areas for fluid mineral development in Colorado, and additional exceptions to the disturbance cap compared to Alternative 1. These exceptions would indirectly increase recreation conflicts with other resources in PHMA, IHMA, and GHMA more than Alternative 1. Increasing resource conflicts with recreation diminishes the recreational experiences in those areas. These exceptions would potentially add to the impacts on recreation associated with the trend of increasing energy development on BLM-administered lands over the long-term.

Management of ROW avoidance areas under Alternative 2 would be similar to Alternative 1, except in Nevada where additional exception criteria would allow for more ROWs to be constructed. This would diminish the naturalness of the physical setting and opportunities for recreation experiences in those areas over time for recreation activities that require more remote and natural settings; however, this exception criteria would only occur in Nevada. Some ROWs, such as for road maintenance and trail development, would enhance other recreational activities by providing better access to recreational activities.

Under Alternative 2, there would be fewer acres of PHMA and GHMA when compared to Alternative 1 (**Table 2-3**). This would restrict fewer acres of land subject to disturbance caps when compared to Alternative 1. Therefore, if future recreation projects would exceed the disturbance cap in a particular area, the disturbance cap would have the potential to restrict fewer acres than Alternative 1.

4.19.5 Alternative 3

Alternative 3 would impose the greatest restrictions on other resources, including closing fluid mineral leasing in PHMA, and would most greatly reduce the potential for resource conflict with recreation. Reducing resource conflicts with recreation would enhance and preserve recreation which requires specific physical setting characteristics, such as remoteness. This would counter the trend of increased energy development on BLM-administered lands and its impact on recreation resources in PHMA to a greater extent than Alternative 1. These restrictions would also reduce the degradation of physical setting characteristics within the planning area, which would enhance the recreational user experience more than Alternative 1.

By managing more acres of ROW exclusion compared to Alternative 1, Alternative 3 would prohibit such developments over a greater area and would thus maintain the naturalness and remoteness for recreation experiences in these areas (BLM 2014).

Alternative 3 has the greatest acreage of PHMA, which would be subject the greatest acreage to disturbance caps. Therefore, if future recreation would have the potential exceed the disturbance cap in a particular area, the disturbance cap would have the potential to prohibit the construction of new recreation facilities over the largest area when compared with the other alternatives. There would be over double the acres of PHMA when compared to Alternative 1 (**Table 2-3**).

4.19.6 Alternative 4

Similar to Alternative 1, under Alternative 4, existing restrictions on other resource uses such as fluid mineral leasing, would have an indirect effect on recreation by reducing resource conflicts in PHMA, IHMA, or GHMA. Reducing resource conflicts with recreation enhances and preserves the recreational experiences in those areas.

Under Alternative 4, ROWs would have additional criteria for avoidance of GRSG when compared to Alternative 1, which would limit such developments over a greater area and would thus indirectly affect

recreation by maintaining the naturalness and remoteness for recreation experiences in these areas (BLM 2014).

Under Alternative 4, there would be more acres of PHMA and fewer acres of GHMA when compared to Alternative 1 (**Table 2-3**), which would subject fewer acres of land to disturbance caps. Therefore, if future recreation projects would exceed the disturbance cap in a particular area, the disturbance cap would have the potential to restrict fewer acres of land against the construction of new recreation facilities when compared to Alternative 1.

4.19.7 Alternative 5

Similar to Alternative 1, existing restrictions on other resource uses such as fluid mineral leasing, would have an indirect effect on recreation by reducing resource conflicts in PHMA, IHMA, or GHMA. Under Alternative 5, all states would be avoidance for utility scale wind and solar energy development. This would be less restrictive on energy development than Alternative 1, which could indirectly affect recreation by leading to the potential for great resource conflicts with energy development. Increasing resource conflicts with recreation diminishes the recreational experiences in those areas.

Under Alternative 5, ROWs would have less restrictive criteria for avoidance of GRSG when compared to Alternative 1. This would indirectly affect recreation when compared to Alternative 1 by decreasing the naturalness and remoteness for recreation experiences in these areas (BLM 2014).

Under Alternative 5, there would be more acres of PHMA when compared to Alternative 1 (**Table 2-3**). This would restrict more acres of land to disturbance caps when compared to Alternative 1. Therefore, if future recreation projects would exceed the disturbance cap in a particular area, this would have the potential to restrict more acres against the construction of new recreation facilities when compared to Alternative 1.

4.19.8 Alternative 6

Impacts to recreation under Alternative 6 would be similar to impacts under Alternative 5 except in ACECs. Alternative 6 would have greater restrictions on mineral exploration, including fluid minerals, non-energy minerals, and mineral materials as well as major ROWs, wind and solar. These would indirectly decrease the resource conflicts that also affect recreation resources when compared to Alternative 1.

4.20 TRANSPORTATION AND TRAVEL MANAGEMENT

The BLM has designated lands within the planning area in one of three OHV designation categories, open, limited or closed. Per Alternative 1, PHMA and GHMA that do not have designated routes in a Travel Management Plan will be managed as limited to existing routes until a Travel Management Plan designates routes (unless they are already designated as limited to designated routes or closed to OHV use). This decision will not change by alternative, but since HMAs change by alternative, areas where this management action would be applied would also change by alternative (**Table 4-7**). Alternative 3 would manage the greatest acreage of PHMA and thus the greatest acreage would be limited to existing routes of all alternatives. The second greatest acreage of PHMA would be managed under Alternative 4, followed by Alternatives 5 and 6, 1, and 2, with decreasing acreage that would be limited to existing routes across these alternatives.

4.21 CUMULATIVE EFFECTS

The following two cumulative effects would apply for all resources and resource uses discussed below. First, GRSG state plans can cumulatively affect most resources and resource uses. While 10 of the 11 States in the GRSG range have updated their State plans to conserve the species by incorporating new information,

not all of these plans have been implemented or are regulatory in scope. Specifically, the regulatory conservation actions mandated by the State plans in WY, MT, and OR, and through mitigation required by the NV plan provide the greatest degree of regulatory certainty in addressing potential threats to GRSG. Required mitigation in NV is through the Conservation Credit System (CCS) managed by the State of Nevada Sagebrush Ecosystem Program. The goal of the CCS is to generate a net benefit of greater sage-grouse habitat on public lands, but it may be adapted to support the ongoing preservation, enhancement, and restoration of NV sagebrush ecosystem. The regulatory plans may reduce or increase restrictions on resource uses in planning areas that would protect or limit impacts on natural and cultural resources and Tribal interests. For instance, regulatory plans could add to the potential complications and costs of large projects that span multiple states, such as transmission lines, pipelines, and fiber optics or in areas where the federal plan is inconsistent with the state plan.

The remaining State plans are voluntary in nature and do not meet a level of certainty for implementation and effectiveness; they may result in more compensatory mitigation relative to if no State plan existed, which could still provide long-term benefits to natural and cultural resources and tribal interests. However, these voluntary state plans do have measurable goals and objectives for habitat and population management across the state.

Secondly, as described further in **Section 4.21.8** and **Appendix 12**, the BLM's ongoing Solar PEIS revision may change the availability of lands for solar energy development outside of GRSG habitat. Within the cumulative impacts study area but outside of GRSG habitat, natural and cultural resources, Tribal interests, and resource uses could be impacted by solar development, though the extent of such impacts could be limited by other exclusion criteria or design features imposed by the Solar PEIS.

4.21.1 Greater Sage-Grouse

This cumulative impacts analysis discloses the short- and long-term effects on GRSG and its habitat from implementing each RMPA/EIS alternative, in conjunction with other past, present, and reasonably foreseeable future actions. The cumulative effects analysis area for GRSG is the same as the planning area, which encompasses the entirety of the GRSG current range. The temporal scale of the analysis is the anticipated lifetime of RMPA/EIS, i.e., 20 years.

The past, present, and reasonably foreseeable future actions that contribute to cumulative impacts on GRSG are summarized in **Appendix 14, Table 14-1**. These include the ongoing and reasonably foreseeable actions across the entire range for GRSG, which are separated by state. However, the cumulative impacts analysis considers multiple geographic scales, including the appropriate HAF groupings, which have biological significance to GRSG—fine scale HAFs represent an individual's home range and are determined in part by the quality and juxtaposition of resources within and between seasonal habitats (Stiver et al. 2015).

Where these actions occur within GRSG habitat, they would cumulatively add to the impacts of BLM-authorized activities set forth in the EIS alternatives. The actions in **Appendix 14, Table 14-1** can broadly be characterized as regional and state land use and conservation plans; resource uses and projects such as energy development and grazing; wildfire, fuels, and vegetation/habitat management. The types of cumulative impacts that can occur from these activities are discussed in the sections below.

Regional and State Land Use and Conservation Plans

Regional efforts to manage threats to GRSG include land use/resource management plans and amendments conducted by the BLM, Forest Service, and by other federal and/or in cooperation with non-federal agencies, organizations, landowners, or other groups. The National Resources Conservation Service partners with

private agricultural lands for the Working Lands for Wildlife to conserve habitat while keeping working lands. The Sage-Grouse Initiative is a part of the and targets conservation efforts where the returns are highest by targeting threats to the bird. At the state level, each state considered in the GRSG range has developed a GRSG conservation plan with a suite of management actions that aim to conserve GRSG habitat and populations across all land ownerships. In their 2015 determination not to list the GRSG as threatened under the ESA, the USFWS cited regulatory mechanisms provided by federal and the three existing state plans at that time, as having substantially reduced threats to the species in approximately 90 percent of the breeding habitat through avoidance and minimization measures (USFWS 2015).

Plans developed by States for GRSG vary widely in the nature of the protective measures, but generally establish goals and objectives to maintain and increase GRSG populations statewide, and maintain, protect and increase GRSG seasonal habitats. They also generally include stipulations and guidelines, for leases, permits, and easements on state lands and conservation measures for activities such as oil and gas development, mining, and wildfire prevention or suppression.

Mineral Development

Mining and mineral leasing, exploration, and development continue to occur throughout the planning area. These include activities associated with fluid minerals (oil, gas and geothermal), locatable minerals, leasable minerals, and mineral materials. The types of impacts on GRSG that could occur from mineral development are described in **Section 4.2**, and generally relate to surface and subsurface disturbance from exploration and development actions and infrastructure. These activities may contribute to fragmentation, removal or alteration of habitat, changes in GRSG use patterns, changes in GRSG demographics (e.g., nest survival, recruitment, and population growth), and an increase in invasive plant introduction and spread. Past, present, and reasonably foreseeable development related to fluid minerals in the planning area are included in the RFDs for those resources (see **Appendix 12**). In addition, the process to consider the proposed withdrawal of SFAs is underway; if approved by the Secretary, the effects described under Alternative 1 for locatable minerals would be realized. The acres of HMAs subject to energy and mineral decisions within each HAF group are presented in **Appendix 14**.

Lands and Realty, including Renewable Energy Development

Effects on GRSG and its habitat from roads and ROWs (including pipelines, electrical transmission lines, infrastructure ROWs, and large renewable energy projects, such as solar and wind development projects) have occurred throughout the planning area and are expected to continue to occur (**Table 14-1**). The likelihood for development would increase following the development of large-scale utility corridors. The types of impacts on GRSG that could occur from lands and realty and solar and other renewable energy development are described in **Chapter 4**. Increasing development and population growth have increased demand and construction of transmission lines and roads within the planning area which fragments habitat and increases the risk of collision, predation, and mortality of GRSG. Road use is also a source of spread for invasive annual grasses which degrade GRSG habitats and increase wildfire frequency. This trend is expected to continue. The acres of HMAs subject to lands and realty decisions within each HAF group are presented in **Appendix 14**.

Livestock Grazing

The BLM and other land management agencies authorize livestock grazing in accordance with their regulations (43 CFR Part 4100 for the BLM) and agency policies and guidance. Where lands are available for livestock grazing, BLM field offices will continue to administer grazing authorizations (permits and leases) in conformance with the NEPA and other applicable laws. Land management agencies will authorize structural

and nonstructural range improvements, and agencies like the NRCS and state agricultural departments will continue to work with private landowners to conduct projects on private rangelands. As a result, several GRSG Candidate Conservation Agreements with Assurances (CCAA) have been initiated. These are voluntary agreements between the USFWS and landowners whereby landowners agree to manage their lands to remove or reduce threats to GRSG will help contribute to the long-term persistence of GRSG by helping to maintain intact habitats and implement conservation measures to reduce threats. Impacts to GRSG from grazing on public and private lands would continue to occur as described in **Chapter 4**. The acres of HMAs available and unavailable for livestock grazing within each HAF group are presented in **Appendix 14**.

Wild Horses and Burros

Wild horse and burro grazing has similar types of effects as livestock grazing in their effect on soils, vegetation health, species composition, water, and nutrient availability by consuming vegetation, redistributing nutrients and seeds, trampling soils and vegetation, and disrupting microbial systems (Connelly et al. 2004). These effects impact GRSG by causing habitat alteration, such as loss of cover and forage (Coates et al. 2021). There are approximately 168 wild horse and burro herd management areas across the planning area (15 million acres), and populations are continuing to grow, often exceeding AMLs. As such, impacts to GRSG, such as habitat degradation, will likely increase. Removal, adoption, and fertility control of animals from the range each year will help control herd sizes and lessen impacts to GRSG.

Wildfire, Fuels, and Vegetation/Habitat Management

Wildfires result in the greatest direct loss of GRSG habitat and have been widely distributed in terms of frequency and severity. The spread and prevalence of invasive plant species contributes to increasing wildfire frequency and size. Increasing recurrence and severity of drought conditions have been predicted for much of the planning area as a result of climate change. These trends can contribute to increasing the occurrence, size, and severity of wildfires throughout the planning area.

Fuels management and fuel reduction projects have been and continue to be implemented throughout the planning area by the BLM, other federal agencies such as the Forest Service, states, local or regional partnerships, and other groups to assist in wildfire management. These cooperative treatments seek to support and, where possible, improve natural resilience and resistance of sagebrush habitats to invasive plant species and wildfire. Treatments also seek to improve the ability of cooperative firefighting agencies to better suppress wildfires, minimizing the potential size of wildfires and the related acres of habitat burned. Where fuels projects reduce the potential for catastrophic wildfire, they would also reduce potential for GRSG habitat loss and fragmentation. They would also contribute to short-term impacts such a disturbance from use of equipment and habitat alterations.

Likewise, vegetation and habitat management projects for GRSG have occurred throughout the planning area and projects such as hazardous fuels reduction, pinyon-juniper removal, emergency stabilization and rehabilitation, and invasive species control have impacted vegetative cover and structure, which in turn influence wildfire risk and GRSG habitat conditions and availability. These projects have been and continue to be implemented by the BLM and other federal and state land management agencies and private landowners. Vegetation projects will continue throughout the planning area and new projects will be proposed, regardless of decisions made in this RMPA. Where vegetation and habitat management projects for GRSG occur, they would improve habitat for GRSG by improving native plant composition and structure and decrease the risk of habitat avoidance resulting from conifer invasion because trees displace species that are important to GRSG habitat (Manier et al. 2013). They would also reduce the potential for/mitigate the risks of catastrophic wildfire that creates stand replacing impacts or major changes to vegetation seral stages

affecting habitat availability and suitability on a long-term basis. Vegetation treatments would contribute to short-term impacts such a disturbance from use of equipment and temporary habitat alterations until desired conditions are achieved.

Travel Management and Recreation

Travel management planning on BLM-administered lands continues throughout the planning area. Travel management planning has been completed or is underway on certain BLM-administered lands to develop travel networks and manage access for all types of resources and resource uses (e.g., mineral extraction, range access, realty, recreation). As demand for each resource use continues to grow, the use of existing routes, demand for new routes, and upgrading of existing routes would be considered in travel management planning. In general, use of existing roads and development of new roads in GRSG habitat contributes to GRSG habitat loss, alteration, and fragmentation. Travel management plans typically include seasonal and permanent closures of roads and other mitigation measures reduce impacts to other resources, such as vegetation and wildlife, including GRSG.

Dispersed, organized, and concentrated recreation would continue throughout the planning area with specific management for certain activities per the recreation management allocations and management actions in individual BLM resource management plans. Overall visitation to the BLM-administered lands in the planning area is expected to continue to increase; however, the number of visitors would vary by season, year, location, and type of activity. Where roads, trails, and recreation occur in GRSG habitat it would contribute to disturbance, habitat alterations and fragmentation, and potential for injury or mortality from vehicle collisions.

Contribution of Alternatives

Consistent with multiple use management, each alternative would allow for some land use activities, including energy and mining, lands and realty, renewable energy development, grazing, recreation activities, and travel and trails. These land uses will have varying cumulative impacts of habitat loss and degradation and behavioral disturbance of individuals. The cumulative contribution of each alternative would vary due to differences in habitat designations, stipulations, management actions, and protections that would influence the type, extent, and magnitude of allowable activities within GRSG habitats.

Under Alternative 1, GRSG habitat would be separated into SFAs, PHMA, IHMAs, and GHMA (**Table 2-3**). Restrictions to land use and surface-disturbing activities would occur within each HMA and SFA, depending on the classification. Restrictions on development, such as stipulations and avoidance/exclusion areas would be applied within HMAs and would limit impacts to GRSG. Under Alternative 1, the BLM would manage lands to conserve, enhance and restore GRSG habitat and the sagebrush ecosystem upon which GRSG populations depend. The BLM would incorporate adaptive management, mitigation, disturbance caps, buffers, habitat objectives, and monitoring. Including 3 percent disturbance caps at both project and BSU scales for most states would reduce disturbance on both the local and landscape scales, therefore, provide protection for both the larger population and individual leks and their surrounding habitat. In MT and WY, a 5 percent disturbance cap would apply to land use activities; this would increase potential for habitat loss and alterations as well as direct disturbance to GRSG above those of 3%. Because the 5% cap would include wildfire and agricultural conversion in the calculation, there would be potential for added protection from impacts to habitats other than anthropogenic development (in contrast to considering only anthropogenic disturbance in the calculation).

Under Alternative 2, the contribution to cumulative impacts from designating HMAs and incorporating adaptive management, mitigation, disturbance caps, buffers, habitat objectives, and monitoring would be similar to Alternative 1 (**Table 2-3**). Alternative 2 would remove SFAs in some states, which would reduce protections to GRSG and habitat. It would also include more areas open to mineral development and exploration. Fewer restrictions may result in greater impacts to GRSG habitats. Alternative 2 would remove the recommendation for locatable mineral withdrawals in SFAs, which has no impact. Recommending areas for closure to the mining laws for locatable exploration or development does not restrict any activities and therefore, such recommendation does not have any impacts. The Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA.

Under Alternative 3, the BLM would manage the largest acreage of HMAs, all as PHMA (**Table 2-3**). Management actions for PHMA, such as lek buffers and required design features would be more restrictive and designed to promote GRSG conservation to a greater extent than in previously designated GHMA. Therefore, managing previously designated GHMA as PHMA would minimize potential impacts to GRSG to a greater extent than if they remained managed as GHMA. Expanding PHMA in some states to include areas of adjacent non-habitat, unoccupied historic habitat, or areas with potential to become habitat as PHMA would also decrease potential for disturbance to birds and habitat alterations because management restrictions associated with PHMA would occur over a larger area. Applying a 3 percent disturbance cap at the project scale and within HAF fine scale habitat selection area would include protection for both the larger population and individual leks and their surrounding habitat. Including no disturbance cap exceptions and wildfire and agriculture as part of the overall disturbance cap would also result in a lower level of disturbance overall, particularly since wildfire was the cause of the majority of habitat loss between 2012 and 2018 (Herren et al. 2021). Closing PHMA in all states to fluid mineral leasing, salable minerals, and non-energy minerals would protect GRSG habitat from surface-disturbing activities as well as subsurface activities (e.g., directional drilling), maintain connectivity between leks, and not contribute to fragmentation. These restrictions would decrease the acres available for development and the potential for impacts to GRSG associated with surface disturbing activities (including mineral development, renewable energy development, ROW development, and travel and recreation development) in PHMA to a greater extent than under Alternatives 1 and 2. Additionally, this alternative would require all states that have PHMA to restrict livestock grazing and place developments outside of the PHMA boundaries. This would increase the potential for GRSG habitat alterations from fencing and collision rates from fencing that would be needed to separate public from private lands. As described above, fencing is a potential cause of direct mortality to GRSG by acting as potential movement barriers, predator perches, or travel corridors (Manier et al. 2013). GRSG collision rates with fencing generally increases with low visibility fencing and decreases in areas of greater topographic relief (Manier et al. 2013). However, exclusion of grazing on BLM-administered lands may intensify grazing use on private lands, which could degrade GRSG habitat in those areas. Alternately, managing PHMA as unavailable for grazing could promote rural subdivisions and thus habitat loss in areas where livestock operators are not able to continue their operations solely on private lands.

Under Alternative 4, leasing would be permitted in HMAs, which would increase the HMA acres affected and potential for cumulative impacts to GRSG, including disturbance and habitat loss and alterations. Applying a 3% disturbance cap at the project scale and within HAF fine scale habitat selection area would limit potential for overall disturbance and habitat alterations, including fragmentation, and would provide protection for both the larger population and individual leks and their surrounding habitat. Including exceptions to the cap and excluding wildfire and agriculture from the calculation would result in an overall greater contribution to cumulative impacts to GRSG compared with Alternative 3. The potential for developments in PHMA and GHMA is underdetermined at the time of this analysis and would likely vary by state. Therefore, cumulative

impacts on GRSG from mineral development, renewable energy development, ROW development, and travel development is unknown in this analysis, but the 3% would limit the overall disturbance level as described above. Both Alternatives 4 and 5 would include compensatory mitigation that would meet the requirements set by the state wildlife agency or appropriate authority. This would reduce impacts on GRSG but to a lesser degree than Alternative 3. Impacts associated with certain uses, such as livestock grazing or wild horses and burros, would not be subject to compensatory mitigation requirements but would be addressed through other processes. Further, adaptive management under Alternatives 4 and 5 may result in more favorable outcomes for GRSG because the approach would be coordinated at ecological rather than geopolitical boundaries.

Under Alternative 5, cumulative impacts from permitting leasing in HMAs and applying a 3 percent disturbance cap (including exceptions to the cap and excluding wildfire and agriculture from the calculation) at the project scale and within HAF fine scale habitat selection area in most states would be similar as to those described for Alternative 4 but would occur over a smaller area given the lower acreage of PHMA under Alternative 5. Cumulative impacts from applying a 5 percent disturbance cap at the project scale in WY and MT would be similar to those described for Alternative 1. Impacts from development in PHMA and GHMA as well as from compensatory mitigation would be the same as described for Alternative 4.

4.21.2 Vegetation

Land management by BLM, Forest Service, and other federal agencies with adjacent state, tribal, county, and privately owned lands within the planning area are considered to be the cumulative effects analysis area for vegetation. Ongoing and planned actions in and near GRSG habitat that are considered PHMA or GHMA (including IHMA in ID) would influence vegetation conditions and management effectiveness across the different state plans over a 20-year period. The cumulative effects assessment for this project would consider previous efforts in combination with the current planning efforts to establish best management decisions for current conditions within the project's boundaries.

Vegetation management, including fire and fuels management, is becoming more broadly consistent across federal landownerships, due to updated adherence with current federal law, regulation, and policy. The cumulative effects of historical activities have directly or indirectly contributed to increased shift of native plant community size, distribution, and risk of invasion or expansion of invasive species. BLM has completed a programmatic environmental impact statement (PEIS) that evaluates creating and maintaining a system of fuel breaks, fuels reduction and rangeland restoration in the Great Basin region. This landscape scale PEIS analyzes potential effects of reducing fuel loading and restoring rangeland productivity within the Great Basin Region (Idaho, Oregon, Nevada, northern California, Utah, and eastern Washington) to protect and conserve the sagebrush-steppe ecosystem from loss or fragmentation as a result of wildfires.

Reasonably foreseeable future actions in the planning area have the potential to impact vegetation. Generally, these are projects that would substantially alter vegetation conditions, including projects which disturb the land's surface, increase the potential for invasive weed spread, or increase the risk of human-caused wildfire. Anticipated projects that could impact vegetation include energy (with the exclusion of Solar in PHMA) and mineral exploration and development, lands and realty decisions, livestock grazing, wild horses and burros, timber removal, and travel and transportation decisions that create new routes or roads.

The cumulative impacts of past and present action on vegetation in the planning area have had differing effects, as described under *Nature and Types of Effects*, based on type of disturbances. Impacting factors include wild horses and burros, big game wildlife herds, mineral development, wind and solar implementations, and ROW development in addition to historical and ongoing livestock grazing and wildfire

suppression in land management plans. These impacts vary in degree of disturbance based on state and local regulations throughout the multi-state HMA boundaries, which have contributed to the introduction of invasive annual grasses, wild horses, and ranching and the change in the wildfire regime that are departed from historical conditions in current conditions. These disturbances have resulted in a landscape with increased pinyon-juniper densities and invasive annual grasses and a greater potential for uncharacteristically large, severe wildfires compared with historical conditions. Ongoing climate trends, including more frequent extreme fire weather, combine with and exacerbate these conditions.

The importance of vegetation management including fuels treatments, wildland fire management, and managing wildlife habitat is widely recognized by state and Federal agencies and private landowners. Vegetation and habitat management projects for GRSG have occurred throughout the planning area and projects such as hazardous fuels reduction, pinyon-juniper removal, emergency stabilization and rehabilitation (ESR), and invasive species control have impacted vegetative cover and structure, which in turn influence wildfire risk. These projects have been and continue to be implemented not only by the BLM but also by other federal and state land management agencies and private landowners. Coordination of these activities during implementation across ownership/jurisdictions boundaries improves their effectiveness for providing habitat benefits. Vegetation management will continue throughout the planning area and new projects will be proposed, regardless of decisions made in this RMPA. Implementation of these projects will include completion of the appropriate level of NEPA.

Contribution of Alternatives

Under all alternatives, best management practices would be followed and would provide guidance on which treatments and chemicals can be used. Avoiding or limiting surface disturbance on steeper slopes or highly erodible soils would maintain native vegetation stability and resiliency to invasive species spread or invasion. There would be no impacts common to all alternatives from mineral resource management, renewable energy development, infrastructure development, livestock grazing management, or ACEC management.

Alternative 1 management actions is the 2015 plan amendments. This includes restrictions on development, such as land use and surface-disturbing activities, that would occur within HMAs and would limit impacts to vegetation. All states would include language to maintain and enhance sagebrush habitats with the intent of conserving GRSG populations. In summary, there would not be any significant changes to management that would cause an impact on vegetation beyond current conditions and management practices.

By contrast, under Alternative 2, there would be more areas open to oil and gas development and exploration. The consequence of fewer restrictions would likely result in greater impacts to vegetation habitats. Alternative 2 would remove the GHMAs in Utah for wild horse and burro management that would increase the potential for vegetation loss.

Alternative 3 would include the fewest acres open and the most stringent restrictions for fluid mineral leasing. More restrictions on PHMA would result in fewer open acres that can be used for development. These restrictions would decrease the potential for impacts to vegetation associated with surface disturbing activities (including mineral development, renewable energy development, ROW development, and travel development) in PHMA to a greater extent than under Alternatives 1 and 2. Additionally, this alternative would require all states that have PHMA unavailable to livestock grazing and place developments outside of the HMA boundaries that would result in less disturbances occurring within the planning area. Mitigation approaches for direct and indirect impacts would utilize avoid, minimize, and compensate, with emphasis on avoidance, precluding new developments when possible. In summary, Alternative 3 would have the most protections for vegetation and habitat within GRSG management areas.

Alternatives 4 would be similar to Alternatives 1 but would emphasis more avoidance. Mineral development would be allowed in HMA boundaries, which would increase potential impacts to vegetation in these areas as described in the *Nature and Types of Effects*. The potential for developments in PHMA and GHMA is still under review and will likely vary by state. Therefore, impacts on vegetation communities from mineral development, renewable energy development, ROW development, and travel development will vary by magnitude using the best available science. Like Alternative 3, Alternatives 4 would add to the discussion for compensatory mitigation that would meet the requirements set by the state wildlife agency or appropriate authority. This would reduce impacts on vegetation but to a lesser degree than Alternative 3.

Alternative 5 would be similar to Alternative 4 but would allow more development to occur. This alternative would emphasis more compensatory mitigation when development is allowed in HMA boundaries and would potentially impact vegetation communities.

4.21.3 Wildland Fire Ecology and Management

The cumulative impact area for wildland fire ecology and management includes lands managed by the BLM, Forest Service, and other federal agencies with adjacent state, tribal, county, and privately owned lands in the planning area. The time frame for cumulative environmental consequences for future actions is 20 years.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect fuels and wildfires include vegetation treatments, livestock grazing, increases in population and recreation, and development in the wildland-urban interface. Alternatives 1, 2, 4, 5, and 6 would have similar contributions to cumulative effects on wildland fires since they would carry forward the vegetation and wildland fire ecology and management decisions from the 2015 GRSG plans. By making all PHMA unavailable for grazing, Alternative 3 would have the greatest contribution to cumulative effects through a potential increase in fine fuels that could influence a large-scale wildfire.

4.21.4 Fish and Wildlife and Special Status Species

The cumulative impact analysis area includes all BLM-administered lands within the range of GRSG as well as other federally managed lands, and adjacent state, tribal, county, and privately owned lands. The larger analysis area is necessary because some wildlife and special status species, including migratory birds, and big game move across this larger landscape and animals and plants depend on ecosystems that extend over larger areas. Ongoing and planned actions in and near the cumulative impact analysis area would influence conditions and habitat requirements for fish, wildlife, and special status species, and management effectiveness across the planning area. The time frame for cumulative environmental consequences for future actions is 20 years.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect fish, wildlife, and special status species, include mining and mineral exploration and development such as fluid minerals (oil, gas and geothermal), locatable minerals, leasable minerals, and mineral materials. Other development like residential and industrial development, associated roads and ROWs (including pipelines, electrical transmission lines, infrastructure ROWs, and large renewable energy projects, such as solar and wind development projects), vegetation treatments, fire and fuels management, livestock grazing, wild horse and burro management (which includes gathers, fertility treatments, and removal of excess wild horses and burros from designated herd management areas), recreation, travel management, and GRSG goals, objectives, and planning efforts that are also likely to continue to affect fish, wildlife, and special status species.

Many of the actions described above have and will likely continue to alter habitat conditions, which then cause or favor other habitat changes. For example, wildland fire removes wildlife and special status species habitat features, and affected areas are more susceptible to weed invasion, soil erosion, and sedimentation of waterways, all of which further degrade habitats. In general, resource use activities, such as energy, mineral, and other developments have cumulatively impacted fish, wildlife, and special status species by causing habitat removal, fragmentation, weed spread, and disturbance from noise and increased human presence. Dispersed, organized, and concentrated recreation also promotes the spread of invasives and pollutants into the environment, habitat degradation from OHV use, and associated noise from an increase in visitors to BLM-administered lands. Land planning efforts and vegetation, habitat, and fuels treatments have offset some of these impacts by improving habitat connectivity, resistance, and resilience. Planning efforts for GRSG would also constrain certain uses such as mineral development, ROW authorizations, and grazing, and contribute to restoration of shrubland habitats. Additionally, planning efforts to protect aquatic species exist that constrain certain uses within 100 meters of riparian areas, fens, wetlands, and water impoundments. As such, these planning efforts would reduce cumulative impacts on wildlife species associated with these habitat types.

Federal Plans typically exclude new utility-scale solar and wind developments from PHMAs, with limited exceptions based on the rationale that biological impacts on GRSG will be avoided. This includes ROWs for wind testing, development structures, and solar energy projects on public lands. The Renewable Energy RFD includes the planning area's past, present, and reasonably foreseeable renewable energy activities associated with the proper level of NEPA.

Climate change could cause an increase or decrease in temperatures and precipitation, as described further in **Section 3.2.12**, which would affect soil conditions, vegetative health, and water flows and temperature. Such changes would alter habitat conditions, potentially creating conditions that could favor certain species or communities, weeds, or pests. Future climate conditions will likely impact GRSG planning efforts to restore habitat by reducing sagebrush ecosystem resistance and resiliency in some areas of PHMA.

Under all the alternatives, there is at least one goal or objective in place that includes language to improve GRSG habitat and populations, this would reduce the incremental contribution to cumulative impacts on fish, wildlife, and special status species by helping to offset effects from activities which degrade habitat.

Contribution of Alternatives

Management under Alternative 1 includes restrictions on development, such as NSO and CSU stipulations on fluid minerals, mining, and other surface disturbing activities would be focused outside of PHMA, exclusion areas for some renewable energy development, and mitigation to reduce the total net impact on fish, wildlife, and special status species (3 or 5 percent disturbance cap, depending on the state). In summary, there would not be any significant changes to management that would cause an impact on fish and wildlife beyond current conditions and management practices. Therefore, this alternative would have some incremental contribution to cumulative impacts on wildlife species. This is because impacts, such as habitat alterations and disturbance, would not necessarily be dispersed, and concentrated areas of development could reduce habitat connectivity and functionality.

Conversely, under Alternative 2, there would be more areas open to mineral development and explorations, thus posing greater impacts on fish, wildlife, and special status species. This is because Alternative 2 allows for more flexibility in the management of activities that can impact wildlife and their habitat.

Alternative 3 would include the fewest acres open and the most stringent restrictions for fluid mineral leasing. Alternative 3 would also provide the most protection for wildlife and special status species habitats within GRSG management areas because of increased restrictions, and in some cases the prohibition of surface disturbing activities (including mineral development, renewable energy development, ROW development, and travel development). In summary, Alternative 3 would provide the most protection and reduce the contribution of surface disturbances, but the lack of active vegetation management would have long-term detrimental to cumulative impacts to wildlife and special status species to the greatest extent of all the alternatives. These protections would result in increased wildlife habitat connectivity and functionality.

Under Alternatives 4 and 5, mineral development would be allowed in HMA boundaries, which would increase potential impacts to fish, wildlife, and special status species in these areas as described in the *Nature and Types of Effects*. Like Alternative 3, both Alternatives 4, and 5 would require compensatory mitigation that would meet the requirements set by BLM but may also be affected by state wildlife agencies or appropriate authority mitigation programs. This would offset impacts on fish, wildlife, and special status species but to a lesser degree than Alternative 3.

Vegetation treatments would improve habitat conditions for some wildlife and special status species such as small mammals, big game, birds, and invertebrates, such as insects and pollinators. These projects include hazardous fuels reduction, pinyon-juniper removal, emergency stabilization and rehabilitation, and invasive species control. Removing encroaching conifers would help maintain the extent of sagebrush habitat by reducing the potential for conversion to pinyon-juniper woodlands. These activities would improve the habitats' resistance to potential future disturbances, assisting in long-term habitat maintenance. Vegetation treatments would cause short-term impacts, such as noise disturbance, displacement of individuals, surface disturbance, erosion, and sedimentation. Mitigation measures such as the timing of treatments would be implemented to minimize the impacts on migratory birds. For other wildlife and special status species, short-term displacement could occur during vegetation treatments; however, these effects would be temporary and minor. Long-term impacts would potentially be enhanced habitat conditions and a reduced risk of catastrophic wildfire. Restoration activities would improve habitat conditions for sagebrush-dependent wildlife by increasing the availability of features used for nesting and shelter. Pinyon and juniper removal could reduce nesting and roosting opportunities for raptors, migratory birds, and other arboreal species, however, the removal could have beneficial components for small mammal and bird species that occupy sagebrush habitats Removing predator perches and nesting sites would benefit species that are vulnerable to avian predation (for example, raptors). Opening the understory would allow sagebrush and perennial grasses to grow.

4.21.5 Wild Horses and Burros

The cumulative impacts analysis area for wild horses and burros and herd management areas includes lands administered by BLM, Forest Service, and other federal agencies, as well as adjacent state, tribal, county, and privately owned lands surrounding the planning area. This includes all herd management areas that overlap with the planning area. The temporal limit of this analysis would be the life of this plan, or approximately 20 years.

Impacts to wild horses and burros managed for AML inside herd management areas are typically caused by the same activities which impact vegetation and water resources. Current and reasonably foreseeable future actions in and near GRSG habitat that are considered PHMA (and IHMA in ID) or GHMA would influence the availability of resources for wild horses and burros across the different states analyzed in this EIS. Past, present, and reasonably foreseeable future actions which limit the creation or maintenance of range

improvements or remove or modify forage would combine cumulatively with the actions outlined in this plan to impact wild horses and burros over the short and long term. Generally, cumulative impacts on wild horses and burros from current and reasonably foreseeable future actions are similar to those described under **Section 4.6.1**, Wild Horses and Burros.

Past, present, and reasonably foreseeable future actions within the cumulative impact analysis area that have affected and will continue to affect wild horses and burros include mining and mineral exploration and development of fluid minerals, locatable minerals, leasable minerals, and mineral materials. Additionally, ground disturbing development like residential and industrial construction (including renewable energy development), associated roads and ROWs, vegetation treatments, fire and fuels management, recreation, travel management, and GRSG goals, objectives, and planning efforts are also likely to continue to affect wild horses and burros.

Contribution of Alternatives

Management under Alternative 1 would rely heavily on the management actions from the 2015 Plan amendments. Restrictions on development, including fluid minerals development, mining, and other surface disturbing activities would be focused outside of PHMA and other exclusion areas. Under Alternative 1, there would not be any significant changes that would lead to additional impacts on wild horses and burros and herd management areas beyond current conditions and management practices. This alternative would have some incremental contribution to cumulative impacts on wild horses and burros where herd management area do not overlap with PHMA.

Under Alternative 2, there would be more areas open to mineral development and other ground disturbing activities, leading to a greater contribution to the cumulative impacts described above when compared with Alternative 1.

Alternative 3 would make the fewest acres available for fluid mineral leasing and other ground disturbing activities, therefore protecting vegetation where those restrictions are implemented. However, Alternative 3 would also make the greatest number of acres of livestock grazing unavailable, in some cases, this may contribute to the cumulative impacts on wild horses and burros when combined with other actions, as limitations on livestock grazing could limit the availability of watering sources used by wild horse and burros.

Under Alternatives 4 and 5, mineral development would be allowed in HMA boundaries, which would increase potential impacts to forage and other resources used by wild horses and burros as described in **Section 4.7.1**, Wild Horses and Burros. The potential for development in PHMA and GHMA are still under review, and will likely vary by state. Therefore, impacts on forage and habitat conditions inside of herd management areas from mineral development, renewable energy development, ROW development, and travel development will vary by magnitude using the best available science.

4.21.6 Livestock Grazing

The cumulative impacts analysis area for livestock grazing includes the BLM, Forest Service, and other federal agencies as well as adjacent state, tribal, county, and privately owned lands surrounding the planning area. Impacts to permittee's base property and changes to surface owned by other agencies but administered by BLM could impact livestock grazing across a larger landscape than the planning area. Ongoing and future activities in and near the cumulative impacts analysis area could influence livestock grazing and forage conditions within the planning area.

Current and reasonably foreseeable future actions in and near GRSG habitat that are considered PHMA (and IHMA in ID) or GHMA would influence grazing operations and livestock grazing permitting across the different states analyzed in this EIS. The temporal limit of this analysis would be the life of this plan, and the life of grazing decisions made as a result of the actions made through the record of decision.

Past, present, and reasonably foreseeable future actions which modify or prohibit livestock use, limit the creation or maintenance of range improvements, or remove or modify forage would combine cumulatively with the actions outlined in this plan to impact livestock over the short and long term. Generally, cumulative impacts on livestock grazing from current and reasonably foreseeable future actions are similar to those described under **Section 4.7.1**, Livestock Grazing.

Past, present, and reasonably foreseeable future actions within the cumulative impact analysis area that have affected and will continue to affect livestock grazing operations and livestock forage include mining and mineral exploration and development of fluid minerals, locatable minerals, leasable minerals, and mineral materials. Additionally, ground disturbing development like residential and industrial construction (including renewable energy development), associated roads and ROWS, vegetation treatments, fire and fuels management, wild horse and burro management, recreation, travel management, and GRSG goals, objectives, and planning efforts are also likely to continue to affect livestock grazing.

Vegetation management, including fire and fuels management, is becoming more broadly consistent across federal landownerships. The cumulative effects of historical activities have directly or indirectly contributed impacts on livestock forage, such as increased shift of native plant community size, distribution, and risk of invasion or expansion of invasive species. As a response to these shifts in vegetation communities, BLM has completed a PEIS that evaluates creating and maintaining a system of fuel breaks, as well as conducting fuels reduction and rangeland restoration activities in the Great Basin region. This landscape scale PEIS analyzes potential effects of reducing fuel loading and restoring rangeland productivity within Idaho, Oregon, Nevada, northern California, and Utah In order to protect and conserve the sagebrush-steppe ecosystem from loss or fragmentation as a result of wildfires. Similar vegetation management projects may be implemented by other federal and state land management agencies, as well as private landowners, including hazardous fuels reduction, pinyon-juniper removal, emergency stabilization and rehabilitation (ESR), and invasive species control, all of which could impact the availability of forage for livestock.

Contribution of Alternatives

Alternative 1 management actions would be based on the 2015 plan amendments. This includes restrictions on development, such as land use and surface-disturbing activities, that would occur within HMAs and would limit impacts to livestock grazing and forage. All states would include language to maintain and enhance sagebrush habitats with the intent of conserving GRSG populations. In summary, there would not be any significant changes to management that would cause an impact on livestock grazing operations beyond current conditions and management practices.

Under Alternative 2, there would be more areas open to oil and gas development and exploration and thus more potential for surface disturbance and removal of forage for livestock. Alternative 2 would remove GHMAs in Utah for wild horse and burro management, which would increase the potential for reductions in forage quality and quantity. Additionally, development could lead to exclusion of livestock from the development footprint, reducing the available area for livestock grazing.

Alternative 3 would make all PHMA unavailable to livestock grazing. The BLM would have to construct and maintain a large amount of fencing, particularly in areas with mixed surface ownership, to effectively make

grazing unavailable. Exclusion of grazing on BLM-administered lands may intensity grazing use on private lands or cause operators to reduce the scale of their operations on private lands. This alternative would have the greatest cumulative adverse effects on livestock grazing than any of the other action alternatives.

Under Alternatives 4 and 5, mineral development would be allowed in HMA boundaries, which would increase potential impacts to forage in these areas as described in **Section 4.8.1**, Livestock Grazing. The potential for developments in PHMA and GHMA are still under review and will likely vary by state. Therefore, impacts on forage conditions and livestock grazing operations from mineral development, renewable energy development, ROW development, and travel development will vary by magnitude using the best available science.

4.21.7 Lands and Realty (Including Wind and Solar)

Cumulative impacts on lands and realty would be the result of past, present, and reasonably foreseeable future actions that restrict ROW authorizations within the planning area. The spatial scale of the project for lands and realty is the planning area and the temporal scale is 20 years. Many of the states in the planning area are heavily dependent on extractive industries that require ROWs to operate and provide end users with products. These industries include oil and gas development, renewable energy generation, power transmission, and fiber optics. Any criteria that cause a change in ROW management action may have a direct effect on proposed projects in the planning area.

As populations continue to grow and shift geographically, there will be an increased demand for ROW authorizations that would occur under all of the alternatives. Each of the Alternatives contains restrictions, stipulations, and limitations; when coupled with present and reasonably foreseeable future actions longer planning and approval processes could result. This could lead to delays for future projects including transmission lines, mining operations, and telecommunication sites that occupy HMAs across the planning area.

Under Alternatives 1 and 2, project planning would be the most complex as a variety of land management actions, stipulations, and restrictions for ROWs are present. This could lead to increased project costs, longer timelines, or abandonment of proposed projects. Abandonment and delays of existing and planned projects could lead to increased costs and lower levels of service for consumers due to supply constraints and increased project costs. Alternative 3 would make all PHMA ROW exclusion, which may prevent development of adjacent private lands where a ROW would need to cross public lands. Alternatives 4 and 5 apply to entire planning area which could provide for a consistent project planning approach that is not dependent on individual state plan restrictions found in Alternatives 1, 2, and 3. This could streamline the planning process for projects, including those that span large areas and differing land ownership types by reducing state-by-state restrictions on ROWs. This may allow for a less time-consuming planning, permitting, and approval process. This alternative would have the greatest cumulative adverse effects on lands and realty authorizations than any of the other action alternatives.

A planning process to update the Solar Energy Development Programmatic EIS (BLM 2012) is currently underway to identify areas of BLM-administered lands available for, or excluded from, solar energy development. That planning process would defer to the allocation decision for solar energy decisions regarding GRSG to those in this GRSG RMPA/EIS. The ongoing Solar PEIS revision may change the availability of lands for solar energy development outside of GRSG habitat. However, given the ample lands available for solar energy development in each state, none of the management actions in the GRSG EIS alternatives would constrain the availability of lands estimated to be needed to meet the demand for solar energy development on public lands through 2045 (see **Appendix 12** for further discussion).

Additionally, each state in the planning area has developed conservation plans for state and private lands not under the jurisdiction of Federal plans. Of these plans, only the Wyoming, Montana, and Oregon plans are regulatory in nature, with the state of Nevada also requiring mitigation.

4.21.8 Mineral Resources

The cumulative impact analysis area used to analyze cumulative impacts on mineral resources is the planning area, regardless of mineral ownership. The cumulative impact analysis area includes all lands and mineral estate within the range of GRSG including other federally managed lands, and adjacent state, Tribal, county, and privately owned lands. The time frame for cumulative environmental consequences for future actions is 20 years. Ongoing, planned and expected future actions in and near the cumulative impact analysis area would influence conditions surrounding mineral development and the development of supporting infrastructure in the cumulative impacts analysis area. The closures, restrictions, and stipulations considered in the alternatives and discussed in the context of the decision area for analyzing direct and indirect impacts, are analyzed here in the context of the entire planning area to assess their contribution to cumulative impacts on mineral resources.

Mining and mineral leasing, exploration, and development are occurring and will continue to occur throughout the planning area. These include activities associated with fluid minerals (oil, gas and geothermal), locatable minerals, leasable minerals, and mineral materials. Impacts associated with mining and mineral exploration and development in GRSG habitat relate to surface and subsurface disturbance from exploration and development actions and infrastructure constructed to support these activities. The surface and subsurface disturbance from these activities contribute to habitat removal, alteration, and fragmentation, changes in GRSG use patterns, and the potential for invasive plant introduction.

Past, present, and reasonably foreseeable development trends for fluid minerals and locatable minerals in the planning area are included in the RFD updates for those resources, **Table 14-1** lists many projects, plans and actions that could or are likely to impact mineral exploration, leasing, and development. Past, present, and reasonably foreseeable future actions and conditions in the cumulative impact analysis area that have affected and will likely continue to affect fluid mineral leasing and development include, past, present, and continued mineral exploration, development, leasing, and management decisions on BLM-administered lands as well as on other federal and Tribal lands.

State laws, regulations, and permitting for mineral development activities intended to prevent or reduce environmental or public health impacts would likely confer incidental protection to GRSG and could reduce levels of mineral development. Similarly, policy and land use plan decisions by BLM, other federal agencies, and state agencies, that would apply closures, restrictions, or stipulations on mineral leasing and development intended to protect other resources, could result in reductions in the availability of minerals for development.

Fluid Minerals (Including Geothermal)

The level of development of oil and gas resources is in large part dependent on global resource prices which can be impacted by a variety of factors such as the cost of development, changes in demand, geopolitical instability, new technology, and the availability of alternative energy sources including geothermal development. The cumulative impact analysis area for fluid minerals includes all lands within the range of GRSG including other federally managed lands, and adjacent state, tribal, county, and privately owned lands, however due to the global nature of the oil and gas markets certain actions, projects or trends that are further removed can also contribute to cumulative impacts on oil and gas. Areas with a high potential rating,

and areas with existing and historical developments are more likely to be the focus of future development interest. Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect fluid minerals are existing and planned fluid mineral development projects outside the decision area, changes to BLM policy or requirements; changes to land use plan allocations; GRSG plans developed by individual states, especially state plans that have regulatory authority (Wyoming, Montana, Nevada, and Oregon); other multi-state plans and actions conducted by the BLM or other federal agencies, such as the west-wide energy corridors plan, and the designations of special management areas such as wilderness areas or national monuments. Reductions in fluid mineral development in the planning area may occur because of restrictions applied by any of these plans or actions, or by plans and actions not known at this time. These reductions would not vary by alternative and would have cumulative impacts on fluid minerals similar to those of the management actions being considered in this RMPA/EIS.

Under all alternatives, the current trends for oil and gas development activities in the planning area are expected to continue, however the locations and intensity of development would likely experience changes in some areas due to the impacts of the alternatives. The management actions proposed under this RMPA/EIS would cumulatively impact fluid mineral development through surface use restrictions (e.g., closures, and NSO, CSU, and TL stipulations) that ultimately would decrease the amount of oil and gas development in the planning area during the planning period. Closures and surface use restrictions, such as NSO stipulations, could also cause an operator to move to nearby private or state land if similar resources are available and recoverable with no such restrictions. However, many state plans or state fluid mineral regulations require actions to avoid, minimize, or mitigate impacts from land uses on GRSG, which would likely result in some restrictions on fluid mineral development within GRSG habitat. Surface use restrictions could also prevent or restrict the development of some infrastructure necessary for fluid mineral development. The application of disturbance caps or limitations proposed under this RMPA/EIS could cumulatively impact fluid mineral development through limitations on additional development in some areas.

Alternative 1 reflects the HMA boundaries from the 2015 amendments. Most states are NSO (in PHMA and IHMA) and/or have seasonal restrictions. PHMA is also subject to density and disturbance limits. Colorado closes PHMA within 1 mile of leks to fluid mineral leasing.

In Alternative 2, PHMA management would be the same as Alternative 1, except Colorado changed the area within 1 mile of an active lek from closed to NSO for both PHMA and GHMA. In GHMA, management would be the same as Alternative 1, except Colorado changed the closure areas to NSO.

Under Alternative 3, management would focus on maximum protection of GRSG. Alternative 3 would conserve and manage GRSG habitats to support persistent, healthy populations, consistent with BLM's sensitive species policy and in coordination with state wildlife agencies. In areas with large, contiguous areas of BLM-administered lands, conservation and management should maintain existing connectivity between GRSG populations. This effect would be limited in areas with BLM-adminsitered lands interspersed with lands managed by other agencies or individuals. With all of PHMA closed to new fluid mineral leasing, this alternative would be the most restrictive and limit development of fluid mineral resources more than other alternatives.

Cumulative impacts would be greater under Alternative 4 compared with Alternatives 1 and 2 but less than Alternative 3 due to the acreage that would be managed as PHMA. For those HMAs open to leasing under Alternative 4, BLM would evaluate parcels identified in EOIs and determine which to analyze for potential inclusion in a lease sale. This evaluation process will follow BLM's policies for lease sales. The amount of fluid

mineral acreage available for leasing under this alternative is similar to Alternative 1. However, areas that would be leased under Alternative 4 would depend on received EOIs and evaluated based on fluid mineral and GRSG habitat criteria. Areas in proximity to existing production and areas where mitigation efforts could minimize impacts will have higher priority review and therefore will be more likely to be leased.

Alternative 5 would have similar cumulative impacts as Alternative 4, though impacts would be less due to less acreage being managed as PHMA under Alternative 5. Under Alternative 6, ACECs would be added to the proposed managment. ACECs would be managed as open to leasing subject to NSO stipulations with an exception/modification to allow occupancy if there are drainage concerns from adjacent development and if it can be demonstrated that no direct or indirect impacts on GRSG will occur. Compared to Alternative 5, Alternative 6 would apply NSO on additional acres, resulting in a decrease in fluid mineral leasing and development.

Nonenergy Leasable Minerals

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect nonenergy leasables are existing and planned nonenergy leasable development projects outside the decision area. Cumulative impacts on nonenergy leasable mineral development focuses on the impacts of conservation measures to protect GRSG. Management actions in the form of surface use restrictions such as closing areas to new nonenergy leasable mineral, prohibitions on surface mining, or creating ROW exclusion or avoidance areas, would impact nonenergy solid leasable mineral extraction by limiting the available means for accessing mineral resources and transporting nonenergy solid leasable minerals to processing facilities and markets. Additional management actions that would cause impacts on nonenergy leasable minerals are defined by results from Application of RDFs, including such standards as noise restrictions, height limitations on structures, design requirements, water development standards, remote monitoring requirements, reclamation standards, and additional requirements on exploration and development. Closures and surface use restrictions could also cause an operator to move to nearby private or state land if similar resources are available with fewer such restrictions, however many states apply management actions to protect GRSG.

Under Alternative 1 most of the PHMA and IHMA in the planning area is closed to new leasing of nonenergy leasable minerals but states can consider expansion of existing leases. Idaho keeps known phosphate leasing areas open to leasing, and Wyoming keeps the Known Sodium Leasing Area open to exploration and consideration for leasing and development but closes it to prospecting permits. In some Wyoming field offices sodium leasing will be considered on a case-by-case basis and would be subject to conditional requirements. Wyoming and Montana have restrictions based on density and disturbance limits. Applying lek buffer distances when approving actions could also restrict development of infrastructure related to nonenergy solid leasable mineral development, as could application of RDFs.

Under Alternative 2, PHMA all states would apply the same management and expect the same resulting impacts on non-energy leasable minerals as described under Alternative 1. The only change is that Nevada would add exception criteria to the closure in PHMA, described under the Nevada Environmental Consequences section. Individual states would have different mitigation measures that could influence the cumulative impacts under Alternative 2 but impacts on nonenergy leasable minerals would be similar to Alternative 1.

Under Alternative 3, more acres would be affected by closures, all PHMA would be closed to leasing, and fringe leases to expand existing mines would not be permitted in areas managed as closed. This would increase the level of cumulative impacts on nonenergy leasable minerals by reducing the amount of the

planning area available for leasing and development of these resources, thus preventing development of known reserves and undiscovered deposits in PHMA which would reduce the availability of important minerals such as phosphate and sodium for use.

Under Alternative 4 nonenergy leasable minerals would be managed the same as under Alternative 1, all states are closed to leasing non-energy Leasable Minerals but can consider expansion of existing leases. Wyoming has seasonal restrictions, and Wyoming and Montana are subject to density and disturbance limits. IHMA (Idaho) is open in known phosphate lease areas, and Wyoming keeps the Known Sodium Leasing Area open to exploration and consideration for leasing and development but closes it to prospecting permits. In some Wyoming field offices sodium leasing will be considered on a case-by-case basis and would be subject to conditional requirements. The impacts would be the same as described under Alternative 1, above.

Alternative 5 would have the management and same impacts as Alternative 4. Alternative 6 would have the same as Alternative 5 except the ACECs would be closed to new leasing and to fringe leasing expansion associated with existing operations. Impacts would be the same as described under Alternative 1 except that any existing operations within ACECs could not expand on federal mineral estate and no new operations would be possible in ACECs, which could reduce the availability of some nonenergy leasable minerals.

Coal

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect coal are existing and planned coal development projects outside the decision area and federal coal policy decisions.

Closing an area to new coal leasing would directly impact coal production. This would be the result of removing the possibility of coal resources in that area from being accessed and extracted. Under Alternative 1, Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming manage PHMA as "essential habitat" for unsuitability evaluation. This would contribute to cumulative impacts on coal resouces by preventing the development of federal coal resources in PHMA outside of existing leases.

Under Alterntive 2 all states would apply the same management as under Alternative 1, except Utah which would be identify essential habitat as part of future unsuitability efforts in coordination with the State. Management and impacts on coal resources would be approximatly the same as described under Alternative 1. Idaho, Nevada California, and Oregon did not address coal due to absence of coal mineral in deposits with a reasonably foreseeable possibility of development and no change in cumlative impcts is expected in these states.

Under Alternitve 3, all areas managed for GRSG would be PHMA. All essential habitat would be identified as part of future unsuitability criteria. Compared to Alternative 1 where all PHMA would be considered as "essential habitat" for unsuitability evaluation, this change in management might give flexibility to consider leasing in small areas that were included in PHMA but do not meet the criteria for essential habitat, such as important connectivity areas. Impacts of this management change would likely be minimal because the amount of PHMA that does not meet essential habitat criteria is small. Impacts of this alternative would otherwise be the same as described under Alternative 1.

Under Alternative 4 the consideration of PHMA as essential habitat for unsuitability evaluation in CO, MT/DK, UT, and WY would be removed as some areas of PHMA may not meet essential habitat criteria. However almost all essential habitat is likely to overlap with PHMA so the impacts would be approximately the same as described under Alternative 1.

The proposed management and impacts under Alternatives 5 and 6 would be the same as under Alternative 4.

Locatable Minerals

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect locatable minerals are existing and planned locatable mineral operations and withdrawal decisions, both of which occur outside of the RMP process. That is, the Secretary proposes and makes withdrawals not through BLM land use planning but according to a separate process pursuant to section 204 of FLPMA. In areas withdrawn from location and entry under the Mining Law, production of mineral resources is generally lower compared with similarly mineralized areas that are not withdrawn; thus a withdrawal potentially decreases production of locatable mineral resources on federal mineral estate. Locatable mineral resources are associated with the geological formations or units they are found within, which are typically localized and do not encompass large areas. As a result, withdrawals may impact the availability of certain mineral resources over a large area or they may, in fact, not impact any minerals of interest. Consequently, an assessment of locatable mineral occurrence potential is important to provide context associated with the impacts of any particular withdrawal.

BLM authorization of locatable mineral resources within areas withdrawn from location and entry under the Mining Law is also subject to additional processing and cost considerations as compared to mining operations on lands that are not withdrawn. Specifically, BLM will not approve a plan of operations or allow notice-level operations to proceed on withdrawn lands until a mineral validity examination report has been completed that confirms that every mining claim on which operations are proposed was existing and valid at the date of withdrawal and remains valid. If BLM determines that some or all of the mining claims on which operations are proposed are invalid, it would disapprove the proposed operations and the mineral resources would not be developed. Mineral validity examination reports can take several years to complete and can cost hundreds of thousands of dollars. Withdrawals and other actions that increase the costs of locatable mineral development would cumulatively impact locatable mineral development as these actions ultimately could decrease the amount of locatable mineral resources produced in the planning area during the planning period.

Alternative 1 recommended the withdrawal of all SFAs, from location and entry under the United States mining laws. This recommendation already occurred in the 2015 Plans and had no impact.

No recommendations for the withdrawal of SFAs from location and entry under the United States mining laws are made under this alternative, except in Montana which did not remove the recommendation for withdrawal of SFAs language as described in Alternative 1.

Under Alternative 3, the PHMA would be recommended for withdrawal from location and entry under the United States mining laws. Recommending areas for withdrawal from location and entry under the U.S. mining laws does not restrict any activities and therefore, such recommendation does not have any impacts. A withdrawal is initiated and considered not through land use planning but through a separate process outlined in section 204 of FLPMA. Only the Secretary may withdraw lands through a Public Land Order. If the Secretary were to withdraw the lands as recommended in Alternative 3, there would be limited opportunities for locatable mineral development in the decision area.

Alternative 4 would recommend any areas for withdrawal from locatable mineral entry. This alternative would not contribute to cumulative impacts on locatable minerals because recommendations for withdrawal have no impact.

Under Alternative 5, the proposed management of locatable mineral resources would be the same as described under Alternative 4 above. Neither Alternative 5 nor Alternative 6 would recommend any areas for withdrawal from location and entry under the Mining Law. Alternative 6 would designate parts of the planning area as ACECs. Pursuant to 43 CFR Part 3809.11(c)(3), in ACECs operators must file a plan of operations for all operations causing surface disturbance greater than casual use. Processing plans of operations is more time-consuming than processing an exploration notice. Additionally, designation of an ACEC would increase costs to those operators who would otherwise conduct exploration under a notice, and potentially reduce development of locatable mineral resources on BLM-administered mineral estate in the planning area that would have resulted from exploration that could have been done under a notice. The requirement for a plan of operations for all locatable mineral activities causing surface disturbance greater than casual use would likely result in less impact on locatable minerals than a withdrawal.

Mineral Materials

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect mineral materials are existing and planned mineral material development projects outside the decision area. The predominant mining method for mineral materials is surface mining; therefore, restrictions on surface-disturbing activities would effectively close or limit mineral material mining in the subject areas to unless an exception is provided. Demand for mineral materials is generated primarily from road maintenance needs, commercial projects, and public use. Closing areas to mineral material disposal would directly impact mineral materials by removing the possibility of mineral resources in that area from being accessed and extracted for use under new contracts. Where areas are closed to mineral material disposal, new mines could relocate to nearby areas open to disposal if feasible. If demand for mineral materials could not be met by pits operated on federal lands, pits could be moved onto private or state lands where resources exist, this would generally increase costs associated with road construction and maintenance conducted by state, county and local governments which are able to develop federal mineral materials free of charge under free use permits. Closing an area to mineral material sales but not to new free use permits would remove this impact on road maintenance and other uses by state, county, and local governments, but would still result in impacts on commercial and private users.

Under Alternative 1, mineral material development would be restricted in PHMA and IHMA (variable by state). Mineral material disposal from the 47 existing community pits in GRSG habitat would be subject to timing restrictions. These timing restrictions could impact some operations by preventing use of the pit at certain times of the year which would result in additional costs due to transporting materials from further away or stockpiling material in advance, and therefore reduce overall development of federal mineral materials in the planning area.

Under Alternative 2 proposed management and impacts would be similar to those described under Alternative 1, except in Idaho which would manage PHMA and IHMA as closed to new mineral material sales, but open for new free use permits and expansion of existing pits, and Nevada which would allow certain exceptions to the closures. Compared to Alternative 1 these changes would allow more material use which would reduce the contribution to cumulative impacts on mineral materials.

Under Alternative 3, all areas managed for GRSG would be PHMA and mineral minerals would be closed to disposal in all PHMA. This would result in the termination and closure of all existing BLM mineral material sales, free use permits and community pits; and prevent the development and use of mineral material resources across the entire decision area. Compared to Alternative 1 this would result in a greater contribution to cumulative impacts on mineral materials in the cumulative impacts area.

Under Alternative 4, proposed management and impacts on mineral material development would be the same as described under Alternative 1, except in Idaho which would implement the same management as other states and manage PHMA and IHMA as closed to new mineral material sales, but open for new free use permits and expansion of existing pits. Compared to Alternative 1 these changes would allow more material use which would reduce the contribution to cumulative impacts on mineral materials.

Under Alternative 5, proposed management and cumulative impacts on mineral material development would be the same as described under Alternative 4. Under Alternative 6, proposed management and impacts on mineral material development would be the same as described under Alternative 4, except that ACECs would also be considered under this alternative. Under Alternative 6, ACECs would be closed to new all new mineral material sales and operations, except for free-use permits issued in order to support maintenance needs for existing local roads to ensure public safety.

Oil Shale and Tar Sands

Analysis of the cumulative impacts on oil shale and tar sands focuses on the impacts of conservation measures to protect GRSG. These impacts could result from closure of an area to oil shale and tar sand development. In Utah, the ROD for the Oil Shale and Tar Sands Programmatic EIS (BLM 2013) closed all of the federal mineral estate in mapped occupied GRSG habitat in Utah to oil shale and tar sands leasing except for the portion of the White River Oil Shale Research, Development, and Demonstration Preference Right Leasing Area overlapping habitat and the tar sands lease in the Asphalt Ridge Special Tar Sands Area. Management placing limitations on surface disturbing activities including the application of a disturbance cap would limit surface activities in these areas which could result in a reduction of production from oil shale and tar sands in these areas, contributing to cumulative impacts on these resources.

Under all alternatives, oil shale and tar sands development could continue to occur on federal mineral estate in Utah outside of HMAs in areas designated as open by the Oil Shale and Tar Sands Programmatic EIS. Oil shale and tar sands development could also continue to occur on state, private, and tribal mineral estate.

Colorado, Idaho, Utah, and Wyoming contain significant oil shale resources overlapping the planning area. Colorado, Idaho, and Wyoming manage these resources as fluid leasable minerals so management and impacts would be same as described under the Fluid Minerals section above.

4.21.9 ACECs

This section presents an assessment of the cumulative effects on the relevant and important values with respect to ACECs. This analysis considers the past, present, and reasonably foreseeable future actions that may impact these designated ACECs and their relevant and important values. The cumulative effects analysis covers a 20-year timeframe, corresponding to the duration of the GRSG RMPA. The spatial scope encompasses the rangewide planning area including the ACEC relevant and important values and their immediate surroundings, as these areas hold significant historical, cultural, and scenic values, and support important fish and wildlife and other natural resources.

Surface-disturbing activities, improper grazing, wild horses and burros, wildlife use, wildfires, and fuels management activities are examples of past, present, and reasonably foreseeable future actions and conditions that have affected and will likely continue to affect ACEC-relevant and important values in the cumulative effects analysis area. Impacts from surface-disturbing activities, improper grazing, wild horses and burros, wildlife use would be as described above in **Section 4.11**. Additionally, wildfires can impact relevant and important values like significant historical, cultural, and scenic values, as well as support for important fish and wildlife and other natural resources, due to the removal of vegetation, which can increase the risk

of erosion. This erosion can transport soil particles into water bodies, potentially affecting water quality and aquatic habitats. On the other hand, fuels management projects, while aiming to reduce wildfire risk, can also help maintain soil stability by preventing large-scale vegetation removal that might lead to soil erosion. These projects can also contribute to preserving habitats for fish, wildlife, and other natural resources. Projects focused on managing vegetation and GRSG habitat can impact relevant and important values. Strategies like prescribed burns can help restore ecosystems, but they might also impact wildlife habitat temporarily. Recreation can also impact relevant and important values. Activities like off-road vehicle use can lead to soil compaction, vegetation damage, and habitat disturbance. Trails and paths can alter natural drainage patterns, potentially contributing to erosion and sedimentation of water bodies.

Federal resource management and land use plans will continue to be updated to reflect best management decisions for current conditions. These plans can influence the physical environment and potentially impact significant historical, cultural, and scenic values in the area. Decisions to allow certain activities, such as mining or energy development, could potentially lead to changes in the landscape and affect the visual aesthetics of the area. Inadequate planning or infrastructure development might disturb soil and result in erosion, impacting both natural and cultural resources. Comprehensive plans that prioritize sustainable practices and consider the preservation of values can contribute to maintaining the ACEC relevant and important values integrity and supporting its fish, wildlife, and natural resources.

The presence and extent of threats would be addressed in ACEC Activity Plans, as outlined in MS 1613. Strategies like ACEC Management of Land Boundary (MLB) Plans can help to identify areas of high-risk boundaries adjoining high value resources.

Potential Impacts of Climate Change

The cumulative impacts of climate change can impact relevant and important values. Climate change is expected to impact temperatures and precipitation, which will have a number of cascading impacts on ACEC relevant and important values. These impacts could include the loss of important plant and animal species, the degradation of ecosystems, and damage to important historical and cultural values.

Contribution of Alternatives to ACEC Cumulative Effects

The analysis evaluates the cumulative effects of each alternative proposed. Specifically, the potential impacts of each alternative on the ACECs' relevant and important values, such as historical, cultural, scenic values, fish and wildlife, and other natural resources, is assessed.

Alternative 1 would permit continued impacts on relevant and important values in some areas, since although there would be protective measures for GRSG applied, no additional ACECs would be designated. In areas where GRSG management would not apply, there could be effects on historical, cultural, and scenic values, as well as fish and wildlife and other natural resources within these areas.

Alternative 2 would contribute to cumulative effects to a greater extent than Alternative 1 since protective measures for GRSG would be applied over a smaller area and ACECs would still not be designated. Conversely, Alternative 4 would apply protective measures for GRSG over a larger area than Alternative 1 and ACECs would not be designated.

Alternative 3 would have the lowest contribution to cumulative effects of all alternatives owing to increased protections from prohibiting or limiting surface-disturbing activities throughout the rangewide planning area and designation of ACECs. This alternative could result in a more secure status for historical, cultural, and scenic relevant and important values, while also enhancing habitat conditions for fish, wildlife, and natural

resources. Alternative 5 would have similar, though slightly greater contribution to cumulative effects than Alternative 3 because ACECs would be designated but protective measures for GRSG would be less stringent, which could allow for some degradation of relevant and important values in some areas.

4.21.10 Social and Economic Conditions

This section presents the anticipated cumulative impacts on the environment that could occur from implementing the alternatives presented in **Chapter 2**. A cumulative impact is the impact on the environment that results from the incremental impact of the action, when added to other past, present, and reasonably foreseeable actions, regardless of what agency (federal or nonfederal) or person undertakes such actions. Additional details regarding the methodology for the cumulative impacts analysis, including the table of past, present, and reasonably foreseeable future actions, is presented in **Appendix 14**.

Cumulative impacts can result from individually minor, but collectively significant actions taking place over time. The cumulative impacts resulting from the implementation of the alternatives in this RMPA/EIS may be influenced by other actions, as well as activities and conditions on other public and private lands, including those beyond the planning area boundary. These include state GRSG conservation plans (see **Appendix 14**). As a result, the sum of the effects of these incremental impacts involves determinations that often are complex, limited by the availability of information, and, to some degree, subjective.

Because of the programmatic nature of an RMPA/EIS and cumulative impacts assessment, the analysis tends to be broad and generalized. This allows BLM to examine the impacts that could occur from a reasonably foreseeable management scenario, combined with other reasonably foreseeable activities or projects; consequently, this assessment is primarily qualitative for most resources because of a lack of detailed project-scaled information at the planning stage. A quantitative analysis is presented for GRSG; details regarding this methodology and supporting data are included in **Appendix 14**.

The analysis assesses the magnitude of cumulative impacts by comparing the environment in its baseline condition with the expected impacts of the alternatives and other actions in the same geographic area. The magnitude of an impact is determined through a comparison of anticipated conditions against the baseline, as depicted in the affected environment, or the long-term resilience of a resource or social system.

The following factors were considered in this cumulative impact assessment:

- Federal, Tribal, nonfederal, and private actions
- Potential for combined impacts or combined interaction between impacts
- Potential for impacts across political and administrative boundaries
- Other spatial and temporal characteristics of each affected resource
- Comparative scale of cumulative impacts across alternatives

Temporal and spatial boundaries used in the cumulative analysis are developed on the basis of resources of concern and actions anticipated to contribute to an impact. These boundaries vary by resource or resource use and are presented for each resource individually below.

4.21.11 Social and Economic Conditions

The following discussion analyzes the cumulative impacts on social and economic conditions as well as impacts on environmental justice concerns. This analysis considers the past, present, and reasonably foreseeable future actions that may impact these conditions. The cumulative effects analysis covers a 20-year

timeframe, corresponding to the duration of the Greater Sage-Grouse Resource Management Plan. The spatial scope encompasses the rangewide planning area.

Economic Interest and Conditions

Planning and implementation decisions within planning areas that overlap the analysis area in this current effort could also affect future development. The BLM-management decisions in the federal resource management and land use plans throughout the planning area could contribute to cumulative impacts on the local and regional economies and the social conditions of local communities. These management decisions could lead to changes in employment, income, tax revenue, and economic output on top of the impacts discussed in **Section 4.11**, Social and Economic Conditions (Including Environmental Justice), as well as impacts on nonmarket and social conditions, as discussed below. The combined impact from these efforts could cause strain on the local economies, especially those that are reliant on industries that would be more likely impacted such as mining and agriculture industries as well as industries related to renewable energy development.

The state GRSG conservation plans and efforts could lead to cumulative impacts on economic contributions. The requirements in the state GRSG conservation plans would likely vary from state to state, which would increase costs for operators as they navigate the differing restrictions and requirements. Additionally, the type of state GRSG conservation plan could lead to cumulative impacts. Some conservation plans are regulatory in nature, such as the plans in Wyoming, Montana, and Oregon as well as Nevada's mitigation requirement, while the other plans are voluntary compliance. This difference could cause some confusion and conflict or create barriers to entry of markets in different areas for operators.

Past, present, and reasonably foreseeable mineral leasing, exploration, and development will likely contribute to cumulative, impacts on employment opportunities and fiscal revenues in local and regional economies that have historically been reliant on mineral extraction. Even in areas with a small percentage of employment in the mining sector, there could be impacts to the local economy, because mining often provides high-wage employment opportunities that are not easy to replace or find alternatives (see **Section 3.11**, Social and Economic Conditions (Including Environmental Justice) and the Socioeconomic Baseline report for more information on employment and labor income per industry). Updates to the Federal oil and gas regulatory framework, including changes in minimum bid requirements and royalty and rental rates included in the Inflation Reduction Act, could affect future levels oil of gas activity on federal lands. Although, these higher rates will increase the cost to develop Federal oil and gas resources leased on or after August 16, 2022, there is insufficient information to determine how these changes will impact federal oil and gas development given how dynamic and complex the global oil market is. Competitive federal leases are anticipated to remain competitive with leases on private and State lands which already impose higher rental and royalty rates, and operators' decisions related to exploration and extraction will continue to be based on global market conditions and trends, and individual firms' strategic goals and profit margins (US Department of Interior 2021).

In areas that have historically relied on fossil fuels as an economic driver for employment, income, economic output, and fiscal revenue streams, as demand continues to shift to lower carbon energy sources, the continued decline in production of higher carbon energy sources such as coal could have compounding, cumulative impacts in communities that could also be impacted by GRSG BLM-management decisions that would restrict mineral development, including oil and gas, nonenergy leasable minerals, locatable minerals, and mineral materials. Since 2012, coal mining jobs across the US have decreased by over 48,000 (Sachs 2023). Counties in the analysis areas that have oil and gas production on federal lands and have seen a decline

in coal extraction over the last five years include Moffat and Rio Blanco counties in Colorado; Rosebud County in Montana, Carbon, and Sevier counties in Utah; and Campbell, Converse, Lincoln, and Sweetwater counties in Wyoming. These regions are more likely to see compounding cumulative impacts from the transition away from coal combined with impacts due to BLM-management decisions on oil and gas leasing. For BLM-management decisions on nonenergy leasable minerals, the counties that are likely to face cumulative impacts combined with the decline in coal due to their reliance on nonenergy leasable minerals are Rio Blanco County in Colorado, Carbon Counties in Utah, and Lincoln and Sweetwater counties Wyoming. Lastly, regions in Colorado, Montana, Utah, and Wyoming could also face cumulative impacts due to the decline in coal extraction. For locatable minerals, the level of cumulative impacts and locations of impacts depend on whether the Secretary actually withdraws the recommended areas from location and entry under the Mining Law of 1872 pursuant to the separate process outlined in section 204 of FLPMA (see the Socioeconomic Baseline Report and **Section 3.11**, Social and Economic Conditions (including Environmental Justice) for more information on current oil and gas, nonenergy leasable mineral, coal, and locatable mineral resource use in the analysis areas). The decrease in economic conditions from the decline in the coal industry would put additional strain on these regions and make it more difficult for local governments to support and sustain the public services that are important to the communities (see the Socioeconomic Baseline Report and **Section 3.11**, Social and Economic Conditions (including Environmental Justice) for more information on current conditions of public services that are supported by taxes on mineral activities). (CDLE, 2020).

Past, present, and reasonably foreseeable nonenergy mineral leasing, exploration, and development will likely contribute to the impacts on local and regional economies. Management actions in other planning efforts in the form of surface use restrictions such as closing areas to new nonenergy leasable mineral, prohibitions on surface mining, or creating ROW exclusion or avoidance areas, could impact local economics due to potential changes in nonenergy solid leasable mineral extraction by limiting the available means for accessing mineral resources and transporting nonenergy solid leasable minerals to processing facilities and markets.

Past, present, and reasonably foreseeable locatable mineral extraction will likely contribute to the impacts on local and regional economies. Any actions (including any future withdrawals) that increase the costs of locatable mineral development would cumulatively impact locatable mineral development and the local economies, through changes in employment, labor income, output, and tax revenue, as these actions ultimately could decrease the amount of locatable mineral availability and development in the planning area during the planning period.

Past, present, and reasonably foreseeable mineral materials extraction will likely contribute to the impacts on local and regional economies. The predominant mining method for mineral materials is surface mining; therefore, restrictions on surface-disturbing activities would effectively close or limit mineral material mining in the subject areas to unless an exception is provided. If feasible mineral materials extraction could relocate to nearby areas; however, this would likely result in increased costs associated with transportation or fees, if operations is moved to private or state lands. This increase in cost could result in cumulative impacts on the local economies.

Past, present, and reasonably foreseeable ROWs will likely contribute to the impacts on local and regional economies. These projects include development of pipelines and electricity transmission and distribution infrastructure as well as development of wind and solar. The BLM is working on a Solar Programmatic EIS to take steps to update its 2012 Western Solar Plan, which could have cumulative impacts on economic contributions. The on-going revisions on the Solar Programmatic EIS consider removing the slope

requirement which may allow for more land available to ROW authorization. As there continues to be a transition away from fossil fuel use, there will likely be an increase in demand for renewable development on public lands. Based on resource potential, this increase is likely to be more pronounced in certain areas and states, such as California, Nevada, Utah, and Wyoming, where there has historically been interest in renewable energy development and there will likely continue to be development. However, labor income for employment in industries associated with renewable energy development and operations tends to be lower than labor income for employment mining industries. This means that as economies transition to renewable energy, there could continue to be cumulative impacts from lower wages (see **Section 4.8**, Lands and Realty (Including Wind and Solar) for more information).

The BLM will continue to issue livestock permits on land that is available to livestock grazing. These permits could contribute to the impacts on local and regional economies. Additionally, livestock grazing and operations can be affected by BLM-management decisions on vegetation management and surface disturbing activities such as mining and mineral exploration and ROW development as well as changing environmental conditions. These cumulative impacts on livestock grazing can affect costs incurred by ranchers and farmers, which would have cumulative impacts on the regional economies through changes in jobs, income, and economic output.

In many regions, such as in Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, and Wyoming, farming and ranching can provide economic stability for communities that are susceptible to boom and bust cycles due to historical dependence on mining industries that have fluctuated over time. In these regions, there could be cumulative impacts on the change in economic resilience and stability from BLM-management decisions that impact both grazing and mineral development, which are important sectors for these communities.

Nonmarket and Social Conditions

The BLM-management decisions in the federal resource management and land use plans throughout the planning area could contribute to cumulative impacts on the local and regional economies and the social conditions of local communities. These management decisions could lead to changes in social conditions and access to nonmarket values on top of the impacts discussed in **Section 4.11**, Social and Economic Conditions (Including Environmental Justice). These impacts include changes in access to products and resources, values from open spaces, values from wildlife species including GRSG. Potential impacts also could include changes in way of life and culture, social cohesion, and preservation of ecosystem services, such as services provided from GRSG and GRSG habitats.

Past, present, and reasonably foreseeable vegetation and wildfire fuels management that impact GRSG habitat will likely contribute to the impacts on communities through changes in access to nonmarket values. Potential for severe wildfire could result in damage to GRSG habitat, which could result in cumulative impacts on access to nonmarket values associated with GRSG and GRSG habitat, such as values from cultural and subsistence resources and nonuse values.

Environmental Justice

The BLM-management decisions in the federal resource management and land use plans throughout the planning area could contribute to impacts on environmental justice communities, if the BLM-management decisions lead to changes in water or air quality of the surrounding communities, access to subsistence resources or use, access to cultural resources, among others; however, these impacts would depend on site-specific conditions and analysis.

Execution of state GRSG conservation plans, which could impact access to resources or subsistence activities on nonfederal lands, could lead to cumulative impacts on environmental justice communities.

GRSG planning efforts could contribute to cumulative impacts by placing more constraints on mineral development in areas where sage-grouse habitats overlap with big game high priority habitats, which could reduce health impacts from oil and gas production and development. These could lead to disproportionate impacts on environmental justice communities, because environmental justice communities, such as low-income households, tend to live closer to mineral developments (Proville et al. 2022).

Climate change could lead to impacts on many resources and could contribute to adverse and disproportionate impacts on environmental justice populations. These impacts from climate change include increases risk and severity of wildfires, which can lead to damage and destruction of property, cultural resources, and impact public health and safety, increases in drought and reductions in forage for livestock, increases in risk of flooding, changes in subsistence resource access due to changes in climate and invasive species, and reductions in water supply. These impacts would likely have adverse and disproportionate impacts on environmental justice populations due to the limited resources available to mitigate impacts and because environmental justice populations are often located in areas that are vulnerable to impacts from climate change, such as areas that are prone to drought or flooding (Cho 2020).

Contribution of Alternatives

Contributions to cumulative impacts from BLM-management decisions are discussed below for each alternative.

Alternative 1 management actions would be based on the 2015 plan amendments. This includes restrictions on development that would occur within HMAs. All states would include language to maintain and enhance sagebrush habitats with the intent of conserving GRSG populations. Anticipated levels of economic activities associated with mineral exploration and development, renewable energy development, and livestock grazing on BLM-administered lands would continue from current conditions, and they would continue to support jobs, labor income, economic output, and tax revenue, which would continue to support public services. In areas where mineral development is open subject to stipulations, there would continue to be impacts on air quality and GHG emissions, which could disproportionately and adversely impact environmental justice populations. Additionally, there would continue to be impacts on GRSG and subsistence resources, which could impact access to nonmarket use and non-use values and could adversely and disproportionately impact environmental justice populations, especially those who value subsistence resources.

Under Alternative 2, there would be more areas open to mineral development and exploration, which could result in an increase in supported jobs, labor income, and economic output, compared to Alternative 1. However, due to the increase in areas open to mineral development there would be the potential for more surface disturbance, which could reduce access to values associated with GRSG and GRSG habitat. In areas that are open to mineral development, there could be greater impacts on air and water quality, than under Alternative 1, and these impacts could disproportionately and adversely impact environmental justice populations.

Alternative 3 would close all areas in PHMA to mineral development, ROW development, and livestock grazing. Alternative 3 would be the most restrictive on economic activities across all alternatives. The restrictions could lead to large cumulative, combined impacts on local economies and communities, especially those areas that rely on mining and agriculture for employment such as Caribou County in Idaho; Big Horn and Fallon counties in Montana; Pershing County in Nevada; and Big Horn, Converse, Crook, and

Sublette counties in Wyoming. These impacts could include cumulative impacts on jobs, labor income, economic output, tax revenue, public services, and economic stability. Additionally, the impacts could include social cohesion, and access to nonmarket values associated with historical mining and agricultural communities as detailed in the direct and indirect impacts discussion.

Under Alternatives 4 and 5, mineral development would be allowed in HMA boundaries, which is expected to increase the supported jobs, labor income, and economic output compared to Alternative 1. However, due to the increase in areas open to mineral development there would be the potential for more surface disturbance, which could reduce access to values associated with GRSG and GRSG habitat. In areas that are open to mineral development, there could be greater impacts on air and water quality, than under Alternative 1, and these impacts could disproportionately and adversely impact environmental justice populations. The potential for developments in PHMA and GHMA is still under review and will likely vary by state. Therefore, impacts on forage conditions and livestock grazing operations from mineral development, renewable energy development, ROW development, and travel development will vary by magnitude using the best available science.

Reasonably Foreseeable Scenarios	Examples from Appendix 14 (Reasonably Foreseeable Future Actions)	SE Indicator Discussion
Transition from fossil fuel development	Closure of coal powered power plants and coal mines	Loss of jobs and revenue
	Implementation of Inflation Reduction Act	Unclear impact on jobs and revenue – could push development to state and private lands; Increased royalty and rents could offset less quantity of federal development.
	BLM CO GJFO and CRVFO RMPA	Preferred alternative would lead to cumulative impacts that would reduce jobs and revenues from oil and gas. There would be compounding impacts and stress put on the local communities
	BLM CO Big Game and Gunnison Sage Grouse RMPA	Restrictions for oil and gas development in Moffat, Routt, Mesa, and Jackson are applicable for all three wildlife RMPAs. Hence, the predicted job and revenue loss in **Chapter 4** is the same as the cumulative job effort of these BLM CO planning efforts.

4.21.12 Air Quality

The cumulative impact analysis area for air quality includes the airsheds that encompass the lands within the range of GRSG habitat, regardless of land ownership. The larger cumulative analysis area is chosen because air pollutants can be transported into and/or out of the planning area and affect pollutant concentrations in the ambient air. The cumulative impact analysis timeframe for air quality is chosen based on the expected duration of the GRSG RMPA, which is approximately 20 years. The BLM's regional air quality model (Ramboll 2023) is incorporated by reference as a representation of future cumulative air quality.

In general, air pollution is cumulative in the way that exceedances of ambient air quality standards are based on existing conditions which depend on past and present development. Any change in the level of emission generating activities would affect existing pollutant concentrations in the cumulative impact analysis area. Past, present, and reasonably foreseeable future actions that contribute to the cumulative impacts on air quality include mining and mineral exploration and development such as fluid minerals (oil, gas and geothermal), locatable minerals, leasable minerals, and mineral materials; urban and industrial development including major and minor ROWS (e.g., for roads, pipelines, electrical transmission lines, infrastructure, and large renewable energy projects, such as solar and wind development projects); vegetation treatments; fire and fuels management; livestock grazing; and recreation and travel management. The nature and type of impacts from actions considered for the cumulative impact analysis are as described under the *Nature and Type of Effects.*

The cumulative impacts on air quality from all sources within the cumulative impact analysis area include direct emission of air pollutants from burning fossil fuels (e.g., vehicles and heavy equipment) and from wildland fire. Closing areas to mineral material development could increase impacts to air resources if additional transportation is needed to carry mineral materials to centrally-located facilities, rather than being developed and processed in close proximity. Indirect cumulative impacts on air quality arise from the generation of secondary pollutants, such as ozone, stemming from other compounds in the atmosphere. Additionally, surface disturbance can generate dust, contributing to regional visibility degradation. This clarification underscores that ground-level ozone is a result of these secondary pollutants, not a precursor. Cumulative air quality impacts can also indirectly affect vegetations and aquatic ecosystems through pollutant depositions (e.g., acid rain). Impacts to air quality from past, present, and reasonably foreseeable future actions, when added to the impacts under each alternative can either offset impacts from emissions (e.g., by limiting development and/or improving vegetation conditions) or contribute to pollutant concentrations in ambient air. These impacts would be similar to those described under *Nature and Type of Effects.*

Climate change trends which include an increasing trend in occurrence and severity of drought conditions, extreme weather, and more uncontrolled extreme wildfires can exacerbate the cumulative impacts on air quality. Extreme weather conditions and severe drought conditions can increase erosion potential and acres of disturbance, resulting in higher potential for fugitive dust formation. Furthermore, extreme temperatures particularly during a period of drought increase the potential for uncontrolled severe wildfires which further contribute to the cumulative air quality impacts from increased emissions.

Impacts to air quality from solar development include increased pollutant concentrations near the solar project development site during construction and reclamation activities (e.g., activities that involve burning fuel and surface disturbance, as described under *Nature and Types of Effects).* Maintenance and operation of solar project would result in significantly smaller emissions from vehicle and equipment operation. An increase in solar development is expected to reduce the dependence on fossil-fuel-based energy productions and indirectly reduce associated emissions, which continue to be a primary source of emissions.

Alternative I, which is primarily based on management actions from the 2015 plan amendments, would continue to contribute to the cumulative impacts from past, present, and reasonably foreseeable future actions. This would result in air quality that resembles current local and regional conditions and follows known air quality trends. According to the modeled ambient air pollutant concentrations from BLM's 2032 Western US Photochemical Air Quality Modeling Study (Ramboll 2023), with the exception of particulate matter, circa 2032 cumulative emissions are not expected to result in exceedances of NAAQS for the portions of the planning area the overlap with the model's study area (Colorado, Montana, North Dakota,

South Dakota, Utah, and Wyoming only). Exceedances of $PM_{2.5}$ and PM_{10} in parts of the planning area in Colorado, Montana, South Dakota, Utah, and Wyoming were estimated, primarily due to modeled emission from wildfires.

An increase in air quality impacts from development of mineral and renewable energy projects under Alternative 2 would add to impacts from past, present, and reasonably foreseeable future actions that also result in emissions, to increase cumulative impacts compared with Alternative 1, while the countervailing impacts of vegetation treatments and fire and fuels as well as any potential for replacement of emissions from fossil fuels through use of renewable sources for energy production would be the same as those under Alternative 1. Therefore overall, Alternative 2, would result in an increase in cumulative impacts, compared with Alternative 1.

Alternative 3, which has the most restrictions and resource protection measures among the alternatives, would offset the air quality impacts from past, present, and reasonably foreseeable future actions to the greatest degree compared with cumulative impacts under Alternative 1. Therefore, Alternative 3 would result in the lowest cumulative air quality impacts among the alternatives.

Under Alternative 4, since mineral and renewable energy development can occur in HMAs, there may be an increase in impacts to air quality from development-related emissions and surface disturbing activity, compared with Alternative 1. However, cumulative impacts on air quality would depend on site- and/or state-specific adjustments.

Similar to Alternative 4, development can occur in HMAs under Alternative 5. This would increase the potential for added contribution to cumulative air quality impacts in the form of increased pollutant concentrations, which when added to impacts from past, present, and reasonably foreseeable future actions would result in increased cumulative air quality impacts compared with Alternative 1. However, compared with Alternative 4, fewer restrictions on development under this alternative would result in a greater contribution to cumulative air quality impacts.

4.21.13 Climate Change and Greenhouse Gases

Climate change is a global issue, therefore the cumulative impact analysis area for climate change includes lands within the range of GRSG habitat regardless of land ownership, the nation, and the globe. The time frame for cumulative impacts on climate change depends primarily on the cumulative effects of GHGs and the cumulative change in carbon sequestration in the landscape. Due to the different atmospheric lifetime of various GHGs (e.g., methane lasts 12 years in the atmosphere while carbon dioxide can last much longer) the climate change cumulative impact analysis considers both a 20-year and a 100-year timeframe.

Climate change is cumulative by nature. Over time, GHGs accumulate in the atmosphere and contribute to an overall greenhouse gas effect which is a primary driver of cumulative global climate change that can be attributed to human-related activity. Past, present, and reasonably foreseeable future actions that contribute to the cumulative impacts on climate change include mining and mineral exploration and development such as fluid minerals (oil, gas and geothermal), locatable minerals, leasable minerals, and mineral materials; urban and industrial development including major and minor ROWS (e.g., for roads, pipelines, electrical transmission lines, infrastructure, and large renewable energy projects, such as solar and wind development projects); vegetation treatments; fire and fuels management; livestock grazing; and recreation and travel management. The impacts from actions considered for the cumulative impact analysis are as described under the *Nature and Type of Effects.*

The cumulative impacts from all sources within the cumulative impact analysis area include direct emissions from burning fossil fuel and wildland fire as well as methane emissions from livestock grazing. The total amount of carbon dioxide removed from the atmosphere though carbon sequestration and storage in soils and vegetation would contribute to the cumulative climate change impacts through a reduction in the total GHG concentrations in the atmosphere. These impacts would be similar to those described under *Nature and Type of Effects.*

Climate change trends, particularly the increasing trend in occurrence and severity of drought conditions affecting carbon sequestration, and the increasing trend uncontrolled large wildfires affecting GHG emissions can further exacerbate impacts to climate change.

Impacts to climate change from solar development include increased emissions near solar project development sites and reduced carbon sequestration and storage in land at the project location. An increase in solar development is expected to reduce the dependence on fossil-fuel-based energy productions and indirectly reduce associated emissions, which continue to be a primary source of emissions.

Alternative 1, which is based on management actions from the 2015 plan amendments, would continue to contribute to the cumulative impacts from past, present, and reasonably foreseeable future actions. This would result in conditions that resemble current local and regional conditions and follows known climate change trends.

Alternative 2, would result in an increase in cumulative impacts, due to fewer restrictions (e.g., fluid mineral development) which would result in an increase in emission of GHGs and fewer countervailing impacts climate change from carbon storage, compared with Alternative 1.

Alternative 3, which has the most restrictions and resource protection measures among the alternatives, would offset the climate change impacts from past, present, and reasonably foreseeable future actions to the greatest degree compared with cumulative impacts under Alternative 1. Therefore, Alternative 3 would result in the lowest cumulative climate change impacts among the alternatives. However, potential increases of acres burned by wildfire and increased fine fuels may result in increased GHG emissions from the burning of vegetation, reducing or negating offsets from other actions.

Under Alternative 4, since mineral and renewable energy development can occur in HMAs, there may be an increase in impacts to climate change from development-related GHG emissions and changes to carbon storage levels of the land, compared with Alternative 1. However, these impacts would depend on site- and/or state-specific adjustments.

Similar to Alternative 4, development can occur in HMAs under Alternative 5. This would increase the potential for added contribution to the cumulative climate change impacts in the form of increased GHGs and changes to carbon sequestration, which when added to impacts from past, present, and reasonably foreseeable future actions would result in increased cumulative climate change impacts compared with Alternative 1. However, compared with Alternative 4, fewer restrictions on development under this alternative would result in a greater contribution to cumulative climate change impacts compared with Alternative 4.

4.21.14 Soil Resources

The cumulative effects analysis area for soil resources includes the entire rangewide planning area. The time frame for the analysis is 20 years. Soil productivity is the ability of soil to support plant growth, and erosion is the removal of soil from the land surface. Soil productivity and erosion are affected by several factors,

including soil type, climate, vegetation, and land use (See **Chapter 4**, Soil Resources, *Nature and Type of Effects* for a more detailed description).

Surface-disturbing activities, improper grazing, wild horses and burros, wildlife use, wildfires, and fuels management activities are examples of past, present, and reasonably foreseeable future actions and conditions that have affected and will likely continue to affect soil resources in the cumulative effects analysis area. Impacts from these activities would be as described above in **Section 4.14**. ROW MLB Plans can help assure surface disturbance activities are within or outside of the planning area. Additionally, wildfires can have impacts on soil productivity and erosion, such as vegetation removal which can lead to erosion. Fuels management projects can also help to reduce the risk of wildfires by preventing the large-scale removal of vegetation which can lead to soil erosion. Vegetation and habitat management projects can help to improve the condition of soil productivity and erosion. For example, restoring sagebrush can help to stabilize the soil and reduce erosion. However, some of these projects, such as prescribed burning, can also have some impacts on soil productivity and erosion. In addition, recreation can have impacts on soil resources, including soil compaction and erosion. For example, OHVs can compact the soil, making it less able to absorb water and support plant growth. This can lead to erosion, as water and wind can more easily remove the compacted soil. OHVs can also damage vegetation, which can further increase the risk of erosion.

Federal resource management and land use plans can have impacts on soil productivity and erosion, as they can determine how land is used and how vegetation is managed. For example, a plan that allows for more development could lead to increased soil erosion.

Potential Impacts of Climate Change

Climate change is expected to have impacts on soil productivity and erosion in the GRSG range. Increased temperatures and decreased precipitation could lead to increased soil evaporation, decreased water availability, and more intense rainfall events. These changes could all contribute to increased soil erosion, which could lead to decreased soil productivity and the loss of important habitat for the GRSG. The impacts of climate change on soil productivity and erosion are cumulative, meaning that they will likely increase over time.

Cumulative Effects on Soil Resources by Alternative

Alternative 1 would continue the current trend of impacts on soil productivity and erosion. This is because the alternative does not make any significant changes to the management of activities that can impact soil, such as changes in livestock grazing, changes in surface-disturbing activities (including minerals development, renewable energy development, travel, and ROW development), and changes in vegetation treatments, prescribed burns, and potential for wildfire.

Cumulative effects on soil productivity and erosion would be greater under Alternative 2 compared with Alternative 1 because development activities are anticipated to be greater under this alternative. This is because it would provide more flexibility in the management of activities that can impact soil resources conditions. This could lead to increased soil compaction and erosion, which could reduce soil productivity. For example, if more development is allowed, this could lead to more roads, pipelines, and other infrastructure being built. This could, in turn, reduce soil productivity and make it more difficult for plants to grow.

Cumulative effects would be less intensive under Alternative 3, compared with Alternative 1. This is because it would prohibit or limit the number of surface-disturbing activities. This would help to protect soil productivity and prevent erosion. For example, this alternative would prohibit the construction of new roads

or pipelines in sensitive areas. It would also require that development activities be carefully managed to minimize soil disturbance. This would help to protect soil productivity and prevent erosion. However, the lack of vegetation management practices can effectively reduce fuels, thereby diminishing the potential for increased wildfires that might otherwise contribute to decreased soil productivity and increased erosion.

Alternative 4 would depend on the specific adjustments that are made. This is because it would be based on Alternatives 1 and 2, with adjustments based on HMA review, or other state-specific considerations. The potential impacts of this alternative on soil productivity and erosion will depend on the specific adjustments that are made. For example, if HMA review identifies areas that are particularly sensitive to soil erosion, then these areas could be protected from development.

Alternative 5 would involve an increase in areas designated as PHMA compared to Alternatives 1 and 2. The potential impacts on soil productivity and erosion in this alternative will depend on the specific adjustments made. For instance, if HMA review identifies areas particularly sensitive to soil erosion, protective measures could be implemented to limit development. Similarly, should an ACEC be identified, stricter regulations might safeguard soil resources within that area. However, the reduced protection of Alternative 5 could result in noteworthy cumulative effects on soil productivity and erosion, lacking the additional safeguards present in Alternative 1.

4.21.15 Water Resources

The cumulative impact analysis for water resources conditions will assess the potential impacts of past, present, and reasonably foreseeable future actions on water quality and quantity in the entire rangewide planning area over a 20-year time frame. Water quality is the physical, chemical, and biological characteristics of water that determine its suitability for a variety of uses. Water quantity is the amount of water available in a given area. Water resource conditions are affected by several factors, including geology, soil type, climate, vegetation, and land use (See **Chapter 4**, Water Resources, *Nature and Type of Effects* for a more detailed description).

Surface-disturbing activities, improper grazing, wild horses and burros, wildlife use, wildfires, and fuels management activities are examples of past, present, and reasonably foreseeable future actions and conditions that have affected and will likely continue to affect water resources conditions in the cumulative impact analysis area. Impacts from these activities would be as described above in **Section 4.12**. Additionally, wildfires can also have impacts on water resources conditions through soil erosion, sedimentation, and water quality degradation. Wildfires can remove vegetation, which can increase the risk of erosion. They can also deposit ash and debris into streams and rivers, which can pollute water supplies. Vegetation and habitat management projects can help to improve the condition of water resources conditions by improving soil productivity and plant growth and decreasing erosion which can lead to sedimentation and contamination. However, some of these projects, such as prescribed burning, can also have some impacts on water resources. For example, prescribed burning can release pollutants, which can then be deposited into water supplies. Furthermore, vegetation management and restoration methods to keep water on the landscape longer within riverscapes will help improve function of these areas. In addition, recreation can have impacts on water resources conditions, including soil compaction, erosion, and water quality degradation. For example, off-highway vehicles can compact the soil, making it less able to absorb water and support plant growth. This can lead to erosion, as water and wind can more easily remove the compacted soil.

Federal resource management and land use plans will continue to be updated to reflect best management decisions for current conditions. These plans determine what activities are allowed on federal lands, like mining, livestock grazing, and recreation. Decisions enabling various projects in land use can cause soil to

erode, leading to more sediment in water bodies. Sediment inputs to surface water can lead to increased turbidity and decreased water quality and aquatic habitat. Pollutants such as metals and bacteria can attach to soil particles. Turbidity in streams can also increase the solar energy that is absorbed by the water, thereby increasing the water temperature and impacting aquatic species' habitat. Higher turbidity levels can also reduce the amount of light the water receives and could impact ecological productivity.

Potential Impacts of Climate Change

Climate change is expected to have impacts on water resource conditions in the rangewide planning area. Increased temperatures and decreased precipitation could lead to changes in the timing and amount of water availability, as well as changes in water quality. These changes could have several downstream impacts, including decreased water supplies, increased risk of flooding and water contamination, growth of harmful algae blooms, and increased salinity among others.

Cumulative Effects on Water Resources by Alternative

Alternative 1 would result in a continuation of current trend of impacts on water resources conditions. This is because the alternative does not make any significant changes to the management of activities that can impact water resources conditions, such as changes in livestock grazing, changes in surface-disturbing activities (including minerals development, renewable energy development, travel, and ROW development), and changes in vegetation treatments, prescribed burns, and potential for wildfire.

Cumulative effects on water resource conditions would be greater under Alternative 2 compared with Alternative 1. This alternative would allow for more development and could lead to greater water degradation. This is because it would provide more flexibility in the management of activities that can impact water resources conditions. This could lead to increased soil compaction, erosion, and sedimentation, which could degrade water quality. For example, if more development is allowed, this could lead to more roads, pipelines, and other infrastructure being built. This could increase the risk of soil compaction and erosion, which could lead to sedimentation in streams and rivers. This could, in turn, degrade water quality and otherwise impact water resources conditions.

Cumulative effects would be less intensive under Alternative 3, compared with Alternative 1, because of increased protections from prohibiting or limiting the number of surface-disturbing activities including changes in livestock grazing, changes in surface-disturbing activities (including minerals development, renewable energy development, travel, and ROW development), and changes in potential for wildfire. This would result in the greatest protections of any alternative for water resources conditions in the planning area. For example, this alternative could prohibit the construction of new roads or pipelines in sensitive areas. It could also require that development activities be carefully managed to minimize soil disturbance. This would help to protect water resources conditions.

Alternative 4 would be based on Alternatives 1 and 2, with adjustments based on HMA review, presence of a potential ACEC, or other state-specific considerations. The potential impacts of this alternative on water resources conditions will depend on the specific adjustments that are made. For example, if HMA review identifies areas that are particularly sensitive to soil erosion, then these areas could be protected from development. Similarly, if an ACEC is identified, then this area could be subject to stricter regulations to protect water resources.

Alternative 5 would involve an increase in areas designated as PHMA compared to Alternatives 1 and 2. The potential impacts on water resources conditions in this alternative will depend on the specific adjustments made. For instance, if HMA review identifies areas particularly sensitive to water resources degradation,

protective measures could be implemented to limit development. Similarly, should an ACEC be identified, stricter regulations might safeguard water resources within that area. However, the reduced protection of Alternative 5 could result in noteworthy cumulative effects on water resources conditions, lacking the additional safeguards present in Alternative 1.

4.21.16 Cultural Resources

The effects of past, present, and reasonably foreseeable future actions would, when combined with impacts from the decisions made in this planning effort, produce cumulative impacts on cultural resources that differ by alternative. Every impact to cultural resources is cumulative and adverse impacts are permanent; beneficial impacts cannot reverse these impacts. The cumulative effects study area for cultural resources is the planning area and the time frame is 20 years, or the anticipated lifetime of the GRSG RMPA.

Surface-disturbing activities associated with development are the greatest contributor to cumulative impacts to cultural resources. Past and present actions contributing to cumulative impacts on cultural resources in the planning area include mineral exploration, development, and production (including oil and gas); increased recreation and tourism; urban and rural community development; livestock grazing; wild horse and burro management; land use authorizations for ROWs; road construction associated with a variety of uses; renewable energy development, fuels and vegetation treatments, and wildfire. The effects of climate change also present an ongoing threat to cultural resources. Increasing soil erosion, wildfire occurrence and severity, and events such as severe storms that increase weathering and erosion all impact cultural resources and are influenced by a changing climate. Land planning efforts such as this resource management plan tend to offer increased protections to cultural resources, even if incidental to their purposes. Future actions with the potential to affect cultural resources are expected to be very similar to the described past and present actions, influenced by the future social, economic, and regulatory landscape.

Contribution of Each Alternative

Under all the alternatives, the over-arching goal or objective of preserving and reducing impacts to GRSG habitat and populations will likely lead to reductions in cumulative impacts on cultural resources by reducing activities like surface-disturbance in GRSG habitat. However, the likely contribution to cumulative effects on cultural resources in the planning area varies by alternative.

Alternative 1 would result in a continuation of current impacts on cultural resources from GRSG management decisions regarding activities such as mineral development, renewable energy development, livestock grazing, and ROW location.

Under Alternative 2, potential for impacts on cultural resources is similar in magnitude, but likely greater than under Alternative 1 due to increased potential for mineral and renewable energy development, as well as increased potential for ROW location in PHMA. This alternative would result in the highest level of cumulative impacts on cultural resources in the planning area.

Due to the most robust disturbance cap and highest acreage of designated PHMA, Alternative 3 would offer the greatest restrictions on surface disturbing activities such as minerals development, renewable energy development, and ROW location. This alternative would result in the lowest level of cumulative impacts on cultural resources in the planning area.

Alternative 4 would be based on Alternatives 1 and 2, with adjustments based on HMA review and other state-specific considerations. While it is anticipated that impacts under Alternative 4 will be similar in

magnitude to those under Alternatives 1 and 2, the potential impacts on cultural resources from selection of this alternative will depend on the specific adjustments that are made.

Alternative 5 would also be based on Alternatives 1 and 2, with adjustments based on HMA review and other state-specific considerations. While it is anticipated that impacts under Alternative 5 will be similar in magnitude to those under Alternatives 1, 2, and 4, the potential impacts on cultural resources from selection of this alternative will depend on the specific adjustments that are made.

4.21.17 Tribal Interests

The effects of past, present, and reasonably foreseeable future actions would, when combined with impacts from the decisions made in this planning effort, produce cumulative impacts on resources and areas of tribal interest that differ by alternative. The cumulative effects study area for cultural resources is the planning area and the time frame is 20 years, or the anticipated lifetime of the GRSG RMPA.

Increasing development pressure including increased oil and gas and renewable energy development; recreation uses; construction of pipelines, transmission lines, and roads; urban expansion within the planning area; and livestock grazing would likely continue on a regional scale. Resource management activities within the planning area and surrounding areas would likely result in a trend toward increased adverse impacts and ultimately the destruction of many cultural resources and other areas of tribal interest through time and across political boundaries. If this trend continues as expected, the preservation of cultural resources, research, public education, and consultation with Native American Tribes will become even more critical.

Surface-disturbing activities are the greatest contributor to cumulative impacts to resources and areas of tribal interest. Residential development and associated recreation opportunities and access on adjacent public lands, both within and near the planning area, will continue to be a likely avenue for adverse effects on resources and areas of tribal interest. Other past and present actions that have affected and would continue to adversely affect resources and areas of tribal interest include energy and mineral exploration and development; range improvements; lands and realty ROWs; OHV travel and recreation use; wildland fires, and vegetation treatments for fire management and forest health. These actions have cumulative impacts on resources through surface disturbance that contributes to erosion and subsequent sedimentation; exposure of contributing cultural features and artifacts from removal of vegetative cover; and better vehicular access to resources and areas that could lead to relic hunting, and/or disturbance to contributing features and artifacts by vandals.

Contribution of Alternatives

Under all the alternatives, the over-arching goal or objective of preserving and reducing impacts to GRSG habitat and populations will likely lead to reductions in cumulative impacts on cultural resources by reducing activities like surface-disturbance in GRSG habitat. However, the likely contribution to cumulative effects on cultural resources in the planning area varies by alternative.

Alternative 1 would result in a continuation of current impacts on resources and areas of tribal interest from GRSG management decisions regarding activities such as mineral development, renewable energy development, livestock grazing, and ROW location. However, cumulative adverse impacts to resources and areas of tribal importance under alternative 1 are anticipated to be minor to moderate based on Section 106 compliance procedures, in addition to authorities mentioned in **Section 3.16**, which include appropriate tribal consultation on a case-by-case basis on undertakings on BLM-administered land that could affect Native American concerns.

Under Alternative 2, potential for impacts on resources and areas of tribal interest is similar in magnitude, but likely greater than under Alternative 1 due to increased potential for mineral and renewable energy development, as well as increased potential for ROW location in PHMA. This alternative would result in the highest level of cumulative impacts on resources and areas of tribal interest in the planning area.

Under Alternative 3, the level of surface-disturbing activities on BLM-administered public lands would greatly reduce impacts and improve protection to resources and areas of tribal interest over the other alternatives. Alternative 3 would provide the best protection and would result in the least cumulative impacts when compared to the other alternatives. Cumulative adverse impacts to resources and areas of tribal importance under Alternative 3 are anticipated to be minor based on Section 106 compliance procedures which include appropriate tribal consultation on a case-by-case basis on undertakings on BLM-administered land that could affect Native American concerns.

Cumulative impacts to resources and areas of tribal interest under Alternative 4 would be similar to those of Alternatives 1 and 2, with state-specific considerations and adjustments to HMA allocations based on data review. While impacts under Alternative 4 would be similar in type to those under Alternatives 1 and 2, the degree of the potential impacts on resources and areas of tribal interests from selection of this alternative will vary based on the specific adjustments that are made.

Alternative 5 would also be based on Alternatives 1 and 2, with adjustments based on HMA review and other state-specific considerations. While it is anticipated that impacts under Alternative 5 will be similar in magnitude to those under Alternatives 1, 2, and 4, the potential impacts on resources and areas of tribal interest from selection of this alternative will depend on the specific adjustments that are made.

4.21.18 Lands with Wilderness Characteristics

The cumulative effects study area for lands with wilderness characteristics includes BLM-administered lands in the planning area where completed inventories have identified wilderness characteristics to be present. The period of potential cumulative impacts is the approximately 20-year timeline of the plan.

Past and present actions in the cumulative effects study area that affected lands with wilderness characteristics include resource uses, such as, mineral extraction, utility and infrastructure development, recreation and travel management, and livestock grazing and range improvements as these activities affect the naturalness and outstanding opportunities for solitude and primitive recreation. Reasonably foreseeable future actions would have similar effects to the extent that they occurred within lands with wilderness characteristics units.

Alternative 1 would result in a continuation of existing trends of current impacts on lands with wilderness characteristics because there would be no changes to the existing management of GRSG habitats where they occur within lands with wilderness characteristics units.

Mining and mineral leasing, exploration, and development have and continue to occur throughout the planning area. Areas under this alternative that are managed as open to fluid, salable, and locatable mineral entry would impact lands with wilderness characteristics through surface disturbances associated with these types of projects which reduce the opportunities for solitude and primitive and unconfined recreation in lands with wilderness characteristics.

Proposed utility and infrastructure development projects for major ROW projects, such as, the Solar Programmatic EIS and the West-wide energy corridors would reduce the size of lands with wilderness characteristics units and impair the apparent naturalness of the area and the experience of solitude. There

could be additional impacts to lands with wilderness characteristics within PHMAs that are managed as avoidance areas which would encourage ROW development outside of PHMAs, but not prevent ROW developments from these areas.

Recreation has increased on public lands in general and if this continues, it would affect lands with wilderness characteristics. Recreational use would create alterations to the landscape over time through an increase in human presence, vehicle use, and road use in certain areas. Although the effects from these uses may be substantially unnoticeable, they may cumulatively affect the area's solitude with increased use. PHMAs and GHMAs would be limited to existing roads and trails with cross-country use allowed where suitable which would preserve the size of lands with wilderness characteristics in these areas.

Existing livestock grazing management would not directly impact lands with wilderness characteristics, but the addition of any reasonably foreseeable developments that increase the number of rangeland improvements (such as fencing and stock ponds) could lessen the apparent naturalness and limit unconfined recreation found within lands with wilderness characteristics.

Compared to Alternative 1, Alternative 2 would include more areas open to mineral development and exploration. Fewer restrictions to mineral development under this alternative would create more opportunities for wilderness characteristics to be impacted by increasing surface disturbing activities. For example, if more development is allowed, this could lead to more mines, roads, pipelines, and other infrastructure being built which would directly impact the size of lands with wilderness characteristics units and opportunities for solitude and primitive recreation. Cumulative impacts from ROWs, recreation, and livestock grazing under Alternative 2 would be the same as those described under Alternative 1, with no additional additive effects due to similar management actions being proposed for these resource uses in the range of alternatives.

Management actions under Alternative 3 would provide the overall greatest potential to maintain wilderness characteristics on lands with wilderness characteristics units within PHMAs when compared to all other alternatives due to the closure of fluid, salable, and non-energy mineral leasing, ROWs being managed as exclusion, and PHMAs being unavailable for livestock grazing.

Management actions under Alternative 4 and 5 would not offer as many protections to wilderness characteristics as those under Alternative 3, but would reduce impacts when compared to Alternatives 1 and 2. For example, under Alternatives 4 and 5 fluid mineral leasing would be managed to minimize the potential for conflict and associated impacts from subsequent development in important GRSG habitats or connectivity areas which would indirectly protect overlapping lands with wilderness characteristics units.

4.21.19 Recreation and Visitor Services

The cumulative effects study area for recreation and visitor services is the BLM-administered lands in the planning area over a 20-year time frame.

Dispersed, organized, and concentrated recreation would continue throughout the planning area and overall visitation would be expected to continue to increase but vary by season, year, location, and type of activity. Present, past, and reasonably foreseeable future actions, such as mineral development and livestock grazing and agriculture, would continue to affect recreation throughout the cumulative effects analysis area. These actions as well as management actions related to Big Game RMPA and Gunnison Sage-Grouse RMPA that alter the landscape and affect naturalness or remoteness would lead to conflict with these other resources,

while reducing or affecting recreation opportunities and experiences. All alternatives would lead to a continuation of reviewing and approving SRPs on a case-by-case basis within the planning area.

Alternative 1 would result in a continuation of existing trend of current impacts on recreation because there would be no changes to the existing management.

Compared to Alternative 1, Alternative 2 would have greater cumulative impacts on recreation since there would be more exceptions to restrictions on other resources uses than under Alternative 1. This would reduce impacts on recreation that would otherwise continue to occur and maintain the naturalness and remoteness for recreation in those locations. Compared to Alternative 1, Alternative 2 would also have fewer acres of PHMA and IHMA. This would restrict fewer acres of land to disturbance caps when compared to Alternative 1. Therefore, if future recreation projects would exceed the disturbance cap in a particular area, this would have the potential to restrict fewer acres against the construction of new recreation facilities when compared to Alternative 1.

Alternative 3 would reduce the cumulative impacts in the planning area on recreation since Alternative 3 has the greatest restrictions on other resource uses, such as season restrictions on fluid mineral development. This would reduce the resource conflicts with recreation in PHMA, IHMA, and GHMA that occur as resources that could lead to resource conflict with recreation would otherwise continue in the project area. These restrictions would reduce the degradation of physical setting characteristics in the planning area, which would enhance the recreational user experience more than Alternative 1 Compared to Alternative 1, Alternative 3 would also have the greatest acres PHMA. Which would subject the greatest acreage to disturbance caps. Therefore, if future recreation would have the potential exceed the disturbance cap in a particular area, the disturbance cap would have the potential to prohibit the construction of new recreation facilities over the largest area when compared with the other alternatives.

Compared to Alternative 1, Alternative 4 would have additional criteria for avoidance of GRSG, which would limit developments over a greater area, which would maintain naturalness and remoteness for recreation experiences where activities, such as mineral exploration, would have been pursued. Compared to Alternative 1, Alternative 4 would also have fewer acres of PHMA and IHMA. This would restrict fewer acres of land to disturbance caps when compared to Alternative 1. Therefore, if future recreation projects would exceed the disturbance cap in a particular area, this would have the potential to restrict fewer acres against the construction of new recreation facilities when compared to Alternative 1.

Compared to Alternative 1, Alternative 5, would have less restrictive avoidance of GRSG which would decrease the naturalness and remoteness for recreation experiences where activities such as mineral exploration, would have been pursued. Compared to Alternative 1, Alternative 5 would also have fewer acres of PHMA and IHMA. This would restrict fewer acres of land to disturbance caps when compared to Alternative 1. Therefore, if future recreation projects would exceed the disturbance cap in a particular area, this would have the potential to restrict fewer acres against the construction of new recreation facilities when compared to Alternative 1.

4.21.20 Transportation and Travel Management

The cumulative impact analysis area includes all BLM-administered lands within the range of GRSG as well as other federally managed lands, and adjacent state, tribal, county, and privately owned lands within the planning area. The larger analysis area is necessary because transportation and travel management has consequential effects on ecosystems that extend over larger areas. Ongoing and planned actions in and near the cumulative impact analysis area would influence conditions for transportation and travel management to

be effective across the planning area. The time frame for cumulative environmental consequences for future actions is 20 years.

Cumulative impacts on travel and transportation management would occur primarily from actions that facilitate, restrict, or preclude motorized and mechanized access. Management actions that restrict motorized and mechanized use would limit the degree of travel opportunities and the ability to access certain portions of the planning area for the public. Such past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect transportation and travel include restrictions in GRSG HMAs on mining and mineral exploration and development, other planning efforts, such as those for Gunnison sage-grouse and big game in Colorado, and continued maintenance of federal and state highways which provide arterial connections to BLM system roads. Project-specific travel management plans would be encouraged where high levels of new traffic on existing roads (e.g., resource transportation) will occur near occupied GRSG leks, which would improve travel management in these areas. Increasing development and population growth have increased demand and construction of roads.

The management actions considered in the alternatives, including land use restrictions, such as management of ROW avoidance or exclusion areas and NSO stipulations on fluid mineral development, would not result in the inability of the BLM to provide public access. The degree of impact would be lowest under Alternative 2 because of fewer land use restrictions. Conversely, increasing the restrictions to protect GRSG under Alternative 3 would result in the greatest level of impact on transportation and access. Alternatives 1, 4, 5, and 6 would have more restriction, and therefore more impact, than Alternative 2.

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