

# **Chapter 5. Cumulative Impacts**

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This section presents the likely cumulative impacts on the human and natural environment that could occur from implementing the alternatives presented in **Chapter 2**, Alternatives. This section is organized by topic, similar to **Chapter 3**, Affected Environment.

The CEQ defines a cumulative impact as *the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.* Cumulative impacts in this context are effects on the environment that could result from implementing any individual actions associated with one of the Nevada and Northeastern California Greater Sage-Grouse LUPA/EIS alternatives, when combined with other individual actions not part of this plan, either within the planning area or outside of it. Cumulative impact analysis is required by CEQ regulations because environmental conditions result from many different factors that act together.

## 5.1. Cumulative Analysis Methodology

The cumulative impacts discussion that follows considers the alternatives in the context of the broader human environment – specifically, actions that occur outside the scope and geographic area covered by the planning area. Cumulative impact analysis is limited to important issues of national, regional, or local significance.

Because of the programmatic nature of the LUP Amendment and cumulative assessment, the analysis tends to be broad and generalized to address potential effects 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 lack of detailed information that would result from project-level decisions and other activities or projects. Quantitative information is used whenever available and as appropriate to portray the magnitude of an impact. 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 naturally occurring baseline as depicted in the affected environment (see **Chapter 3**) or the long-term sustainability of a resource or social system.

The following factors were considered in this cumulative impact assessment:

- Federal, nonfederal, and private actions.
- Potential for synergistic effects or synergistic interaction among or between effects.
- Potential for effects 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 that might contribute to an impact. The baseline date for the cumulative impacts analysis is 2012. The temporal scope of this analysis is a 20-year planning horizon. Land use planning documents are generally evaluated on a 5-year cycle.

Spatial boundaries vary and are larger for resources that are mobile or migrate (e.g., migratory birds) compared with stationary resources. Occasionally, spatial boundaries could be contained within the planning area boundaries or an area within the planning area. Spatial boundaries were developed to facilitate the analysis and are included under the appropriate resource section heading. The cumulative effects analysis for all topics included an analysis of cumulative effects at the planning area level. For GRSG, cumulative effects analysis included an analysis at the WAFWA Management Zones 3, 4, and 5, in addition to the planning level analysis. WAFWA Management Zones are biologically based delineations that were determined by GRSG populations and sub-populations identified within seven floristic provinces. Analysis at this level enables the decision maker to understand the impacts on GRSG at a biologically meaningful scale.

## **5.2. Past, Present, and Reasonably Foreseeable Future Actions**

Past, present, and reasonably foreseeable future actions are considered in the analysis to identify whether and to what extent the environment has been degraded or enhanced, whether ongoing activities are causing impacts, and trends for activities in and impacts on the area. Projects and activities are evaluated on the basis of proximity, connection to the same environmental systems, potential for subsequent impacts or activity, similar impacts, the likelihood a project will occur, and whether the project is reasonably foreseeable.

Projects and activities considered in the cumulative analysis were identified through meetings held with cooperators and BLM employees with local knowledge of the area. Each was asked to provide information on the most influential past, present, or reasonably foreseeable future actions. Additional information was obtained through discussions with agency officials and review of publicly available materials and websites.

Effects of past and present actions and activities are manifested in the current condition of the resources, as described in the affected environment (see **Chapter 3**). Reasonably foreseeable future actions are actions that have been committed to or known proposals that would take place within a 20-year planning period and would be typically reviewed during the 5-year evaluation.

Reasonably foreseeable future action scenarios are projections made to predict future impacts – they are not actual planning decisions or resource commitments. Projections, which have been developed for analytical purposes only, are based on current conditions and trends and represent a best professional estimate. Unforeseen changes in factors such as economics, demand, and federal, state, and local laws and policies could result in different outcomes than those projected in this analysis.

Other potential future actions have been considered and eliminated from further analysis because there is a small likelihood these actions would be pursued and implemented within the life of the plan or because so little is known about the potential action that formulating an analysis of impacts is premature. In addition, potential future actions protective of the environment (such as new regulations related to fugitive dust emissions) have less likelihood of creating major environmental consequences alone, or in combination with this planning effort. Federal actions such as species listing would require the BLM to reconsider decisions created from this action because the consultations and relative impacts might no longer be appropriate. These potential future actions may have greater capacity to affect resource uses within the planning area; however, until more information is developed, no reasonable estimation of impacts could be developed.

Data on the precise locations and overall extent of resources within the planning area are considerable, although the information varies according to resource type and locale. Furthermore, understanding of the impacts on and the interplay among these resources is evolving. As knowledge improves, management measures (adaptive or otherwise) would be considered to reduce potential cumulative impacts in accordance with law, regulations, and applicable LUPs.

Reasonably foreseeable future actions are human-generated actions that are considered against a backdrop of ongoing resource and habitat trends. Three trends that are dominant in the planning area are the ongoing effects of an altered fire regime and the feedback loop within an expanding footprint of invasive grasses, the invasion of conifer into sagebrush habitats, and the effects of climate change. While the discrete impacts of localized human-generated actions are important to maintaining and restoring GRSG habitats and can cause the introduction or spread of environmental degradation, the impacts generated by the dominant trends relegate cumulative human impacts to incidental influence in any broad-scale assessment within this sub-region. Management for fire, invasive plant species, and climate are the major ecological dynamics affecting the persistence of GRSG in the western half of the range.

Projects and activities identified as having the greatest likelihood to generate potential cumulative impacts when added to the Nevada and Northeastern California GRSG LUPA/EIS alternatives are displayed in **Table 5-1**, Reasonably Foreseeable Future Actions by Greater Sage-Grouse Sub-Population.

In addition, there are on-going planning efforts both within (e.g., Carson City RMP) and adjacent to the sub-region (e.g., Idaho/ Montana Sub-Region Sage-Grouse LUPA/EIS) with which this planning effort has been coordinated and aligns. The collective actions proposed in these ongoing efforts could result in cumulative effects throughout the Great Basin Region, including on this Nevada and Northeastern California Sub-Region Sage-Grouse LUPA/EIS.

**Table 5.1. Reasonably Foreseeable Future Actions by Greater Sage-Grouse Subpopulation**

Name of Action	Description of Action	Location/Population Area	Status of Action
<b>Central Nevada Sage-Grouse Subpopulation Area — Management Zone III</b>			
Long Canyon Mine	Open-pit gold mining operation located on the east side of the Pequop Mountains. Operations would include one open pit, a heap leach pad, waste rock dump, tailing storage facility, and other ancillary facilities. The operator, Newmont Mining, is also proposing a natural gas pipeline for self-power generation on site. The pipeline would run from the Ruby pipeline south on existing ROWs to the project site, approximately 40 miles. The proposed disturbance acreage for operations is 2,116 acres, including public, private, and split estate lands. The projected life of mine is 14 years, including construction, operations, and closure and post-closure monitoring.	Central Nevada Subpopulation  30 miles east of Wells, Nevada, and 32 miles west of West Wendover, Nevada, on Interstate 80.	Currently writing the Draft EIS. Public scoping and the NOI have been completed. Alternatives to the proposed action have been developed. Anticipated Decision date of August 2014.
Oil and Gas – Noble Energy	60 Proposed Wells over 3 Project Areas	Located within both the North Eastern and Central Nevada Population. Includes portion of Management Zone IV	NEPA not complete
McGinness Hills Geothermal Expansion (Phase II)	40 MW Power Plant	Located within the Central Nevada Population	Construction Not Initiated
Salt Wells Geothermal Utilization Project – Gradient Resources	120 MW Power Plant	Located within the Central Nevada Population	Construction Not Initiated
3 Bars Restoration Project	EIS	Battle Mountain District/Central Nevada Population	Ongoing planning area estimated at 800,000 acres
Battle Mountain WUI EA	EA	Battle Mountain District/Central Nevada Population	Planning
Heath Canyon Ponderosa Hazardous Fuels EA	EA	Battle Mountain District/Central Nevada Population	Planning
Earthquake Fuels Project	Ongoing	Carson City District/Central Nevada Population	Mastication, thinning, reduce fire threat and improve wildlife habitat prescribed fire
Antelope Unit N Monitor EA (NFRR17 - Antelope Planning)	Ongoing, implementation to begin in FY14 (1,500 acres in FY14)	Austin-Tonopah Ranger District	Planning

Name of Action	Description of Action	Location/Population Area	Status of Action
Antelope Unit N Monitor (SRS2-Antelope Implementation-Cut & Leave)	800 acres to be treated in FY13	Austin-Tonopah Ranger District	Implementation
Big Ten/Hat Peak Steves Unit (SRS2 - Big Ten Implementation)	100 acres to be treated in FY13	Austin-Tonopah Ranger District	Implementation
Cloverdale within Priority Watershed (SRS2 - Indian Valley-Cloverdale Unit)	1,000 acres to be treated in FY13	Austin-Tonopah Ranger District	Implementation
Horse Heaven/Dobbin Unit N Monitors	Ongoing, implementation to begin in FY16 (200 acres in FY16)	Austin-Tonopah Ranger District	Planning
Kingston	Ongoing, implementation to begin in FY15 (200 acres in FY15)	Austin-Tonopah Ranger District	Planning
Overland Pass (NFRR17 - Overland Fuels)	Ongoing, 1,000 acres to be completed in FY14	Ruby Mountains Ranger District	Planning
Harrison Watershed	Ongoing, 1,500 acres to be completed in FY14	Ruby Mountains Ranger District	Inventory
Lamoille Canyon WUI	Ongoing, 150 acres to be completed in FY14	Ruby Mountains Ranger District	Planning
<b>Southeast Nevada Sub-Population Area — Management Zone III</b>			
Kinsley Exploration Plan	Expansion of mining exploration activities, including construction of drill pads and access roads, from a 4.79 acre Notice to 60 acres. The operator is also proposing the construction of 2 water wells, existing road maintenance to the project area, and gravel removal from an existing pit located near the project area, totaling an additional 40 acres of disturbance. The total disturbance for the Plan is 100 acres.	Southeast Nevada Subpopulation 40 miles south of West Wendover, Nevada in the Kinsley Mountain range on the Elko/Ely District boundary border	Draft EA is out for public review until May 30th. Anticipated Decision in mid-June 2013
Spruce Mountain Restoration Project	Restoration of up to 10,000 acres to improve wildlife habitat, reduce hazardous fuels, improve forest health, and protect cultural resources	Southeast Nevada Subpopulation Wells Field Office/Elko District	Treatments beginning; Mastication/seeding/ prescribed fire/herbicide reduce fire threat and improve wildlife habitat
Transwest Express	Transwest Express is a 725 mile 600 kV transmission line	Begins in south central Wyoming, crosses Utah diagonally from northeast to southwest, and crosses into Nevada and ends south of Las Vegas	Project under NEPA review, estimated ROD in 2014

Name of Action	Description of Action	Location/Population Area	Status of Action
Zephyr Transmission line	500 kV line	Begins in south central Wyoming, crosses Utah diagonally from northeast to southwest, and ends south of Las Vegas	Application received
Southwest Intertie Transmission Line	500 kV AC	Transmission line stretching between Idaho and southern Nevada. Covering the eastern portion of Nevada. Includes portion of Management Zone IV.	Application received
Southern Nevada Water Authority ROW	241 miles of 230 kV, 69 kV, and 25 kV power lines; 258 miles of pipeline; ancillary facilities include pump stations, water treatment facility within corridor	Begins near Ely, Nevada and ends northeast of Las Vegas, Nevada  K Valley corridor authorized under the Lincoln County Conservation, Recreation and Development Act of 2004	Decision signed; ROW issued
Pioche/Caselton WUI Project  Identified as an extreme hazard in Lincoln County Community Risk Assessment	11,300 acre project area  3,246 to 4,711 acres identified for treatment. Reduce fire threat and improve wildlife habitat by thinning pinyon/juniper	Ely District/Quinn Canyon Range and Southeast Nevada Populations	Ongoing treatments 3,157 acres completed, mastication, mowing/seeding, chaining, cut/pile/burn
Stonehouse WUI/Non-WUI Project	23,676 acres project area. Reduce fire threat and improve wildlife habitat by thinning pinyon/juniper in PPH adjacent to low value habitat, affects three major GRSG leks	Ely District/Southeast Nevada Population	Ongoing treatments 16,660 to 19,000 identified for mechanical treatments. 12,359 acres treated were in 2010-2012. Approved treatments double chaining/seeding, lop/scatter, cut/pile, mow/drill seed
Pleasant Valley (WUI)	15,725 acres project area  11,008 to 12,580 acres identified for treatment.	Ely District/Southeast Nevada Population	Ongoing 1,840 acres treated in 2010-2012. Mastication, chaining, broadcast burn, biomass utilization, hand cut, aspen restoration
Lincoln County Chain Maintenance Project	Burnt Canyon, Woods McCullough, Reeds Cabin in GRSG habitat	Ely District/Quinn Canyon Range and Southeast Nevada Populations	Ongoing- 2,607 acres completed as of June 2013
Cold Springs Project	Stewardship Contract, thinning densities showcase demonstration site	Ely District/Southeast Nevada Population	Ongoing- 521 acres of cut/pile/burn slash and 18 acres cut/piled as of June 2013
South Steptoe Watershed Plan	49,000 acres of treatments identified	Ely District/Southeast Nevada Population	BLM Decision Affirmed On Appeal, has interdisciplinary objectives
Ward Mtn. Watershed	Ongoing joint project/funding	Ely District/Southeast Nevada Population	Planning
Lein Draw	Ongoing joint project/funding	Ely District	Planning
Overland Pass	Ongoing joint project/funding	Ely District/Southeast Nevada Population	Planning
Combs Creek	Ongoing joint project/funding	Ely District/Southeast Nevada Population	Ongoing implementation

<b>Name of Action</b>	<b>Description of Action</b>	<b>Location/Population Area</b>	<b>Status of Action</b>
Kious Basin/Snake Range Aspen	Ongoing joint project/funding	Ely District/Southeast Nevada Population	Planning
Smith Valley	Stewardship Contract	Ely District/Southeast Nevada Population	Ongoing implementation
North Antelope	Stewardship Contract	Ely District/Southeast Nevada Population	Ongoing implementation
Kern Mountain Stewardship Agreement	Stewardship Agreement	Ely District/Southeast Nevada Population	Identifying areas for potential 10 year stewardship contracting, NEPA in progress
Hwy 6 PJ cutting (CE) (NFRR17 - Currant-Ellison Restoration Planning and Implementation project)	300 acres to be treated in FY13	Ely Ranger District	Planning
Currant/Ellison Mt EA (NFRR17 - Currant-Ellison Restoration Planning and Implementation project)	Ongoing, 500 acres to be completed in FY14	Ely Ranger District	Planning
White Pine (Currant/Ellison) (NFRR17 - Currant-Ellison Restoration Planning and Implementation project)	700 acres to be treated in FY13	Ely Ranger District	Implementation
Worthington (RAC) (CE) (S2F4R1 - SRS2 Worthington Canyon Sage Steppe Restoration Project and NFRR17 - Worthington Canyon NEPA and Implementation of RAC Proposals by ENLC and UNR)	650 acres to be treated in FY13	Ely Ranger District	Planning
Adaven (WFHF17 Adaven)	200 acres to be treated in FY13	Ely Ranger District	Implementation
SNPLMA North Schell (SNPLMA ) (SNJR04 North Schell Restoration (F006/9-4) C. Carlock (ES) [Exp. Date 1-31-15])	2,500 acres to be treated in FY13	Ely Ranger District	Implementation
SNPLMA Ward Mt (WFHF17 Ward Mountain WUI implementation )	800 acres to be treated in FY13	Ely Ranger District	Implementation
SNPLMA Central White Pine (SNLR03 Central White Pine Sage-Grouse Restoration 11-3/F012 (K. Woodtle-Johnson) Exp. 9/30/2013)	3,000 acres to be treated in FY13	Ely Ranger District	Implementation
Duck Ck PJ cutting (NDOW) (SRSA17 - SRSA - Duck Creek Pinyon-Juniper Treatment Project )	Ongoing	Ely Ranger District	Implementation
S. Schell (RMEF) (NFXN - Ely South Schell PJ thinning RMEF)	400 acres to be treated in FY13	Ely Ranger District	Implementation

Name of Action	Description of Action	Location/Population Area	Status of Action
SNPLMA North Schell (SNJR04 North Schell Restoration (F006/9-4) C. Carlock (ES) [Exp. Date 1-31-15])	Ongoing, 500 acres to be completed in FY14	Ely Ranger District	Monitoring
Duck Creek Basin	Joint project/funding	Ely District	Planning
<b>Northwest Interior Sub-Population Area — Management Zone III</b>			
Montana Mountain Fuels Project	346,000 acre planning area to reduce fire threat and improve wildlife habitat	Winnemucca District/North Central Nevada/Northwestern Interior Population	Treatments on going reduce fire threat and improve wildlife habitat
Double H/Bilk Creek	390,856 acre planning area to reduce fire threat and improve wildlife habitat	Winnemucca District/North Central Nevada/Northwestern Interior Population	Planning reduce fire threat and improve wildlife habitat
<b>Quinn Range Sub-Population Area — Management Zone III</b>			
Cave/Lake Valley Watershed Plan	121,600 acres of treatments identified	Ely District/Quinn Canyon Range Population	Planning, has interdisciplinary objectives
<b>North Central Nevada/Southeast Oregon Sub-Population Area — Management Zone IV</b>			
Santa Rosa Fuels Project	Ongoing 355,699 acre planning area to reduce fire threat and improve wildlife habitat	Winnemucca District/North Central Nevada Population	Treatments ongoing. Reduce fire threat and improve wildlife habitat
<b>Northeast Nevada Sub-Population Area — Management Zone IV</b>			
Round Mountain Gold Mine Expansion	Expansion of existing facilities at the Round Mountain Mine and development of new mining and leaching facilities at the adjacent Gold Hill ore deposit.	Nye County, Nevada	ROD signed, responding to protests.
Northeast Nevada Wild Horse Eco-Sanctuary	Development of a wild horse Eco-Sanctuary that would be managed through a joint BLM-private partnership.	Wells, Nevada	Draft Environmental Review
Angel Wing Exploration Plan	Expansion of mining exploration activities, including construction of drill pads and access roads and existing road maintenance, from a 3.3 acre Notice to 60 acres. Access to the proposed Plan is through Utah near the town of Grouse Creek	Northeast Nevada Subpopulation  60 miles northwest of West Wendover, Nevada, on the Utah/Nevada State Line.	Currently waiting for updated Plan of Operations from the operator. Biological baseline and cultural inventories have been completed and waiting for report review

<b>Name of Action</b>	<b>Description of Action</b>	<b>Location/Population Area</b>	<b>Status of Action</b>
Murdock Mountain Phosphate Prospecting Permit	Phosphate exploration drilling and trenching in the Murdock Mountain area. The operator is proposing to construct 31 drill pads with 2 drill holes per pad and 29 exploration trenches measuring 100 feet long by 5 feet wide by 5 feet deep. Exploration roads will also be constructed and existing roads will be utilized. Exploration operations are anticipated to take 200 days to complete	Northeast Nevada Subpopulation  35 miles northwest of West Wendover, Nevada, and 10 miles southwest of Montello, Nevada	Waiting for the operator to submit the required cost recovery money in order to continue with the project. NEVAGRO would also like submit an updated project proposal in order to update their trenching methods
North Tuscarora Sage-Grouse Habitat Restoration Project	Restoration of up to 10,000 acres of GRSG habitat. Treatments would improve, protect GRSG habitat, protect PPH, protect Lahontan Cutthroat Trout Streams, improve wildlife habitat, reduce invasive weeds, and reduce hazardous fuels	Northeast Nevada Subpopulation  Tuscarora Field Office/Elko District	Planning Process, Internal and External Scoping
China Mountain Wind Project	Utility-scale wind facility	Northeastern Nevada	Temporarily deferred pending NVCA GRSG EIS
White Rock Mountain Aspen Exclosures	Place up to nine exclosures around aspen stands to protect from overgrazing by livestock	Northeastern Nevada	Undergoing NEPA/archaeological review
Hollister Mine	Underground mine and power lines	Northeast Nevada	FEIS completed in June of 2013
Arturo Mine	Open pit expansion	Northeast Nevada	FEIS completed June 2013
Midas vest raises	Ventilation for underground mine & power lines	Northeast Nevada	DR and Plan approval signed May 2013
Eureka Pipeline Project	Natural gas pipeline from Goldstrike to Gold Quarry	Northeast Nevada	SF 299 received. Initiating work on project. (company wants to have line in operation by winter of 2013)
Rossi Mine expansion	Mine expansion	Northeast Nevada	Working on baseline data, expect Plan amendment by July 2013
Green Lantern	Mine expansion	Northeast Nevada	Working on baseline data, expect Plan amendment Fall 2013
Gold Quarry Mine expansion	Mine expansion	Northeast Nevada	Working on baseline date, expect Plan amendment Winter 2014
Spruce Mountain Project	Spruce Mountain Seeding Maintenance 700 acres	Elko District/Northeastern Nevada Population	Mastication/seeding reduce fire threat and improve wildlife habitat
<b>Northeast California/Northwest Nevada Sub-Population Area — Management Zone V</b>			

Name of Action	Description of Action	Location/Population Area	Status of Action
Vya Population Management Unit Programmatic Habitat Restoration and Fuels Reduction Project	Up to a total of 100,000 acre of treatment over a 10-year period. A combination of juniper thinning or removal and prescribed burning. 16,274 acres identified for prescribed fires and up to 83,726 acres of juniper treatment	Northeast California/Northwest Nevada Population	NEPA in process. Funded to implement 10,000 acres of juniper removal. Planning reduce fire threat and improve wildlife habitat
NE California Juniper Treatments	Multiple juniper removal treatments throughout the Alturas, Surprise and Eagle Lake Field Offices. Total 32,099 acres.	Northeast California/Northwest Nevada Population	NEPA finished and partially funded Reduce fire threat and improve wildlife habitat.
Northeast California Prescribed Fires	Multiple prescribed fire treatments throughout the Alturas, Surprise and Eagle Lake Field Offices. Burns include broadcast timber understory burns, Aspen regeneration, pile burns and small meadow broadcast burns. A total of 3,015 acres	Northeast California/Northwest Nevada Population	NEPA finished and partially funded. Reduce fire threat and improve wildlife habitat.
<b>Lands and Realty Cases within the BLM LR2000 System — All Management Zones</b>			
Other Linear ROWs	351 pending ROW cases - Roads, pipelines, transmission, fiber optics, telephone, etc.	Within the sub-region	Applications pending and Under NEPA review
ROW- Wind Testing	12 pending ROW cases for testing	Within the sub-region	Applications pending and under NEPA review
ROW- Wind Development	5 pending ROW cases for development	Within the sub-region	Applications pending and under NEPA review
ROW- Solar Development	0 pending ROW cases for development	Within the sub-region	4 Applications pending and under NEPA review in Southern Nevada.
Land Tenure actions - disposals	3,435,300 acres are identified for disposal.	Within the sub-region	Some Applications pending, other lands are just identified
Locatable Plans of Operation	95 Pending Plans of Operation	Within the sub-region	Applications pending
Locatable Notices of Exploration	100 Pending Notices of Exploration	Within the sub-region	Applications pending
Mineral Material sites	108 Pending cases	Within the sub-region	Applications pending
<b>Other Sub-Regional Actions</b>			
Carson Lake Geothermal Utilization Project – Ormat	40 MW Power Plant	Outside all Populations	Construction not initiated

<b>Name of Action</b>	<b>Description of Action</b>	<b>Location/Population Area</b>	<b>Status of Action</b>
New York Canyon Geothermal	62 MW Power Plant	Outside all Populations	NEPA finalized; construction not initiated
Ongoing vegetation management actions	Noxious and invasive weed control, post fire rehabilitation seedings, and range improvement seedings	Across entire sub-region and all Populations	Ongoing

### 5.3. Greater Sage-Grouse and Greater Sage-Grouse Habitat

The cumulative effects analysis study area extends beyond the planning area boundary and consists of WAFWA Management Zones III, IV, and V (See **Figure 1-1**). This Draft EIS contains a quantitative cumulative effects analysis for GRSG habitat within the planning area boundary. At the larger WAFWA Management Zone level, the analysis is primarily qualitative in nature. Data and information to enable a more comprehensive quantitative analysis that becomes available between the Draft EIS and the Final EIS may include the following: ongoing land use plan amendments and revisions, state plans that may not yet be completed, coordination with states and agencies during consistency reviews, and data from non-BLM-administered lands. Those data that become available will be compiled and included in the quantitative cumulative effects analysis for GRSG in the Final EIS.

Relevant cumulative actions are demonstrated in the current condition of the resources, as described in the Affected Environment (see **Chapter 3**). An action is reasonably foreseeable if: 1) there is an existing proposal, such as the submission of an application; 2) there has been a commitment of resources, such as funding; or 3) if it is a Federal action, the NEPA process has begun or has been completed but the project has not been implemented. A 20-year planning period was used for this analysis.

Data on the precise locations and overall extent of resources within the planning area are considerable (**Table 5-1**) although the information varies according to resource type and locale. The assumptions and indicators follow those established for the analysis of direct and indirect effects in **Chapter 4**.

#### 5.3.1. Other Regional Efforts

State of Nevada (includes California): In August 2000, then Nevada Governor Kenny Guinn appointed a Sage-Grouse Conservation Team that developed a conservation strategy for GRSG (State of Nevada 2004). Through collaboration with the CDFW, the strategy was later expanded to include Eastern California and local working groups in each state were identified and tasked with designing practical solutions for their respective region. The seven local working groups (including a Bi-State Planning Group) developed local conservation plans, which were submitted to the Governor's Team for synthesis into a conservation plan for Nevada and Eastern California (State of Nevada 2004).

The Greater Sage-Grouse Conservation Plan for Nevada and Eastern California prioritizes conservation efforts within both states. Immediate priorities identified include a comprehensive spatial analysis to determine those areas which support large populations of GRSG and are at high risk for wildfire or invasion of cheatgrass (State of Nevada 2004). In 2012, the NDOW published its GRSG habitat categorization analysis, which delineated five classes of GRSG habitat, ranging from essential/irreplaceable habitat to unsuitable habitat, to direct mitigation and conservation efforts within Nevada and California (NDOW 2012b).

Other top priorities identified by the Governor's Team include wildfire pre-suppression treatments/fire control and vegetation management. The average fire size in the Southern Great Basin (Management Zone III) increased from 1980 to 2007 (USFWS 2010a). As much as 80 percent of the land within the Great Basin ecoregion (Management Zones III, IV, and V) is at risk of being displaced by cheatgrass in the next 30 years, and an estimated 35 percent of sagebrush

in the region is at high risk of displacement by pinyon-juniper in the same time (Connelly et al. 2004).

The Nevada Department of Wildlife, in cooperation with various federal agencies, has implemented numerous conservation projects to confront these threats, dedicating over \$2 million and totaling nearly 69,000 treated acres (280 square kilometers) on private lands and lands administered by federal agencies from 2001 to 2009. These projects include pinyon-juniper removal, weed treatments, and fire rehabilitation (NDOW 2012a). More recently, Governor Brian Sandoval issued an Executive Order forming the Governor's Greater Sage-Grouse Advisory Committee to recommend policies for the protection of GRSG. The recommendations, released in July 2012, provide management strategies to achieve "no net loss" for controllable activities and aggressive pre-suppression, initial attack and restoration for uncontrollable events (State of Nevada 2012).

**WAFWA Strategy:** WAFWA is implementing its Greater Sage-Grouse Strategy across management zones. The WAFWA Greater Sage-Grouse Strategy includes monitoring, research and funding of conservation projects for GRSG. A basic premise of the WAFWA Greater Sage-Grouse Strategy is that additional conservation capacity must be developed. This is compatible with the COT Report (USFWS 2013a) statement that GRSG habitats outside of priority areas for conservation may also be essential to maintaining the redundancy, resilience and representation of the population.

**NRCS Strategy:** The USDA NRCS Greater Sage-Grouse Initiative is working with private landowners in 11 western states to improve habitat for GRSG while simultaneously improving working ranches (NRCS 2012). With the checkerboard pattern of ownership (where each alternating township is either under public or private ownership) in Management Zone III the opportunity for the Greater Sage-Grouse Initiative to accomplish the COT's General Conservation Objective 3 (Develop and implement state and federal GRSG conservation strategies and associated incentive-based conservation actions and regulatory mechanisms) is potentially very high if a critical mass of willing participants develops and Congress continues to authorize the program.

The State of Nevada is working on developing a mitigation bank for GRSG. This would presumably mitigate for residual impacts from mining and other surface disturbing activities.

In addition to these projects, noxious weed control, vegetation restoration, conifer removal and fuels treatment projects are ongoing and would presumably have a net positive impact on GRSG habitat in both the short and long term.

### **5.3.2. Management Zone III**

The cumulative effects analysis focuses on the three most substantial threats to GRSG habitats and populations in Management Zone III which include the spread of weeds, fire, and conifer encroachment. Infrastructure, mining, and energy are present but of lesser magnitude (USFWS 2013a). The analysis presents an overview of populations within the management zone and which are susceptible to the threats listed above. The analysis also characterizes the cause-and-effect relationship between GRSG, their habitat, and the three major threats. Each alternative is examined within the framework of each major threat to determine whether the major threat would be reduced through implementation of that alternative in conjunction with trends and past, present, and reasonably foreseeable future actions in Management Zone III.

Management Zone III consists of 12 GRSG populations, mainly in the Southern Great Basin in Nevada and Utah. The populations in Nevada within this management zone are the Southern Great Basin (Southeast Nevada and Central Nevada subpopulations), the Quinn Canyon Range, and the Northwest Interior. Land ownership in this management zone is 82 percent federal (71 percent BLM), indicating that actions on federal lands may have measurable population effects, and measures on private lands may be less influential. However, large areas of influence exist from some threats, therefore cooperation and prioritization of habitats across jurisdictions is still important in this management zone (Manier et al. 2013). This management zone, along with Management Zones IV and V, is a stronghold for GRSG (Wisdom et al. 2011) and predicted population trends indicate that populations are stable; however these scenarios are limited in their ability to predict the future, especially stochastic events and novel environmental conditions (Manier et al. 2013).

Sagebrush cover is naturally limited and patchy across much of this management zone, due to geologic substrates and topographic formations creating micro-climates and local environmental conditions that enable sagebrush dominance; these conditions result in a lack of connectivity among subpopulations in this management zone (Knick and Hanser 2011). The management zone also faces substantial risk from wildfire (USFWS 2013a).

This management zone is dominated by the large Southern Great Basin population which occupies much of central and eastern Nevada; however several smaller but significant populations are included in this management zone, and priority management issues and challenges associated with these small subpopulations may be distinctive from other populations in the Great Basin region (USFWS 2013a). The GRSG population areas within Management Zone III in Nevada include:

- The Northwest Interior population of Pershing and South Humboldt counties is relatively small in area, (1.9 million acres) the population contains all or portions of 16 small and isolated PMUs. The population area is dominated by lower elevation Wyoming sagebrush habitats which have burned extensively and repeatedly for the last two decades due to the domination of invasive grasses and altered fire return intervals. 561,000 acres have burned since 1984. Post-fire sagebrush restoration success is limited due to environmental factors. Sagebrush canopy is absent over vast areas marginalizing habitat value to GRSG. The entire population indicates invasive grass potential above 45 percent with fire regime departures the highest in Nevada (Comer et al. 2012a).
- The Central Nevada subpopulation includes 13.8 million surface acres and 6.7 million acres of GRSG habitat. The subpopulation contains 16 PMUs and is considered one of the four stronghold GRSG habitats within Nevada but considered in long-range population decline (Connelly et al. 2004; Garton et al. 2011). The subpopulation area supports 134 active and 51 currently inactive leks. Wildfire activity has been concentrated in the northern end of the subpopulation adjacent to the Northeast subpopulation area where wildfire has exerted the highest impacts within the state. The southern two-thirds of the Central Nevada subpopulation remains relatively insulated from the occurrence and effects of wildfire. Conifer encroachment plays a larger role affecting connectivity between breeding and summer ranges. Annual grasses model at or below 45 percent probability of occurrence throughout the entire subpopulation giving it a lower but still moderate ranking of fire regime departure (projected increase in frequency and extent) but reflective of the current level of annual grass invasion which has already occurred (Comer et al. 2012a). Ownership includes a high percentage of higher elevation lands managed by the Humboldt-Toiyabe National Forest.

The BLM manages 9.6 million surface acres (69 percent) and Forest Service manages 2.5 million acres (18 percent).

- The Southeastern Nevada subpopulation includes 9 million surface acres and 3.6 million acres of GRS habitat. It contains all or portions of 6 PMUs. GRS habitats here are considered important as a stronghold within the state, but are recognized as having generally smaller population size (lek size) on average compared to other stronghold areas. The subpopulation area supports 105 active and 42 currently inactive leks (NDOW 2012b). Topography in this subpopulation is a north-south basin and range configuration with invasive conifer occupying an elevation zone between breeding and summer brood-rearing habitats. GRS complete one- and two-stage migrations in this subpopulation between these seasonal ranges. The COT report (USFWS 2013a) characterizes the seasonal ranges as “disjunct, but connected”. As with populations throughout Nevada, the population is considered to be in long-term decline (Connelly et al. 2004; Garton et al. 2011). Annual grasses have potential abundance at or above 45 percent throughout the basins with low to no risk on mountain topography. Post-fire habitat restoration success is high due to monsoonal rains in late summer.
- The Quinn Canyon population contains one PMU and is the southernmost extent of GRS range in Nevada, located in east Nye and northwest Lincoln Counties. The Quinn PMU encompasses 2 million surface acres (1.7 BLM, 222,000 Forest Service). NDOW maps estimate total habitat at 258,557 acres with no habitat in Categories 1 and 2 (Essential/Irreplaceable and Important). The COT report (USFWS 2013a) characterizes the population status as “high risk”, because of extremely limited and/or rapidly declining numbers, range, and/or habitat, making GRS in this area highly vulnerable to extirpation. The 2012 NDOW lek database indicates no active leks. Moderate and imminent threats to the population are myriad including weeds/annual grasses, conifers, infrastructure, livestock, and wild horses. Climate change modeling indicates the near elimination of sagebrush habitat for this population by 2060 (Comer et al. 2012a).

Primary threats to GRS habitats and populations occurring across populations in Management Zone III include habitat loss and fragmentation as a result of weeds, wildfire and conifer encroachment (USFWS 2013a). Since 2000, 404,000 acres (1,635 square kilometers; 2.8 percent) of GRS habitats (PPH and PGH combined) have burned in this Management Zone (Manier et al. 2013).

Current energy developments in Nevada portions of Management Zone III are not widespread; however, more than 1.8 million acres (13 percent) of the GRS habitats in Management Zone III (including Utah) are currently leased for federal fluid mineral development, suggesting increased pressure from energy development in the future (Manier et al. 2013). The highest oil producing region in Nevada is Railroad Valley, much of which is located in and adjacent to the Southeast Nevada subpopulation. In addition to the high potential area of Railroad Valley, much of the Ely District Office is identified as moderate potential and low potential for petroleum. Drilling on federal mineral estate in the Central Nevada subpopulation is expected to increase. Much of the moderate to high potential areas identified for petroleum in the Ely District Office are identified as GRS habitat.

The second highest oil-producing region in Nevada is Pine Valley, which is located in the northern end of the Central Nevada subpopulation. Production of oil in Pine Valley has been declining over recent years. Oil and gas operators have not indicated an interest in drilling new wells in Pine Valley. Areas to the east and northeast of Pine Valley and within the Central Nevada

subpopulation are identified as moderate potential for the presence of petroleum. Developers have plans to explore for oil to the west of the City of Wells and in the valleys west of the Ruby Mountains, targeting the Elko formation. As a result, drilling on federal mineral estate in the northern end of the Central Nevada subpopulation is expected to increase. Many of these moderate-to-high-potential areas identified for petroleum are identified as GRSG habitat.

Mining claims for gold, silver, and copper are found throughout the planning area but are virtually ubiquitous throughout the Southern Great Basin. Prices have risen over the last few years, and there is increased interest in developing ore deposits for these minerals leading to increased demand for associated infrastructure.

High potential for geothermal energy development also occurs in GRSG habitats in central and western portions of Management Zone III, and solar energy potential is high in southern portions of the Great Basin region. These alternate energy sources could have impacts on GRSG habitats in southern Nevada and Utah in the future (depending on technology, financial markets and public policies; Manier et al. 2013).

Cheatgrass invasion has been widespread in this region for decades, and some former habitats are likely unrecoverable; many of these areas are already excluded from current habitat distributions (Manier et al. 2013). Conifer encroachment potentially affects over 1.8 million acres (13 percent) of PPH and PGH in Management Zone III.

In addition to cheatgrass, widespread, intense land-use coupled with natural variability and limitations of climate, has resulted in measurable effects on rangeland conditions. In 2006, 1.6 million acres of the BLM-administered GRSG habitats in Management Zone III (17 percent) did not meet wildlife standards due to grazing impacts. Further, over 4.1 million acres (29 percent) of this area is designated wild horse and burro range, mostly in central Nevada; horse and burro herbivory have been connected to intense resource use and measureable effects on range conditions and habitat quality (Beever and Aldridge 2011).

**Table 5-2**, Relevant Cumulative Actions – Management Zone III, summarizes the cumulative actions in Management Zone III by category.

**Table 5.2. Relevant Cumulative Actions – Management Zone III**

Actions by Category	Quinn Population	Southeast Nevada Subpopulation	Central Nevada Subpopulation	Northwest Interior Population
Mining	0	1	1	0
Infrastructure (ROW)	0	3	0	0
Fluid Minerals	0	0	3	0
Renewable energy	0	0	0	0
Fuels/Vegetation treatments	3	22	9	2
Other	0	0	0	0

## ***Major Threats***

### *Fire*

Fire has largely negative effects on GRSG by directly affecting the distribution and condition of available sagebrush habitats (Nelle et al. 2000; Beck et al. 2009; Rhodes et al. 2010; Baker

2011). Wildfire and prescribed fires typically kill sagebrush thereby reducing cover and forage in the short-term. However, fire is also associated with natural dynamics and spatial heterogeneity of many sagebrush ecosystems, suggesting that not all fires in sagebrush communities have net-negative effects on GRSG populations and habitats. In some higher elevation habitats, where mountain big-sagebrush is the canopy dominant, rapid regeneration due to site potential, seed production and layering can produce 25 percent cover within 20 years (Winward 2004). There is little evidence that fire will enhance GRSG habitat in Wyoming big sagebrush communities (Crawford et al. 2004). In low elevation Wyoming big sagebrush, due to increased fuel potentials caused by annual grasses and landscape-scale decrease in intact sagebrush habitats, wildfire represents an important threat to habitat conservation and population stability (USFWS 2010). Within Management Zone III in Nevada, effects and extent of habitat conversion from wildfire are variable with a nearly complete type conversion of the Northwest Interior population, severe effects in the northern third of the Central Nevada subpopulation, and lesser effects to the Southeast Nevada subpopulation (see **Table 3-9**, Fire Starts and Acres Burned by Decade by Population/Subpopulation).

Current wildfire suppression operations and fuels management activities would continue under Alternative A. The limitation or prohibition of the use of prescribed fire in sagebrush habitats and emphasis on sagebrush during wildland fire operations would not be instituted as they would be in Alternatives B, C, D, E, and F. GRSG populations in Management Zone III are considered stable in the Central and Southeastern populations and at high risk for extirpation in the Northwest Interior and Quinn Canyon populations. Selection of the No Action, Alternative A and the associated direct and indirect effects described in Chapter 4, in conjunction with the listed past, present and reasonably foreseeable future actions are not expected to cumulatively affect the remaining stable GRSG populations in Management Zone III over a critical threshold. However, two significant concerns with regard to fire are the trend of increasing exotic annual grass/weed infestations and subsequent wildfires, and predicted climate change and increasing fire activity. Due to these trends, portions of Management Zone III, including the Northwest Interior and Quinn Canyon Range in Nevada and isolated populations in Utah, may have, or are at risk of, exceeding a critical threshold for GRSG persistence. Stronghold populations, such as the Central Nevada and Southeastern Nevada populations are significantly less threatened by the altered fire regimes induced by invasive grasses and are likely to persist. Potentially, the direct and indirect effects from the existing LUPs, in conjunction with the past, present, and reasonably foreseeable future actions indicate a strong focus on restoration and vegetation management with the intent of reducing the cumulative impacts from fire and invasive species while new significant infrastructure development is not anticipated. . Some of the ongoing activities that may help alleviate impacts from fire include ongoing vegetation management actions that control noxious weeds and post-fire rehabilitation include the Pioche/Casleton Wildland Urban Interface (WUI) project (3,200 to 4,700 acres) of fuels reduction and pinyon-juniper thinning, the Stonehouse WUI and non-WUI project (24,700 acres) of fuels reduction and pinyon-juniper thinning, the Pleasant Valley (11,000 to 12,500 acres) fuels thinning and removal, Lincoln County Chain Maintenance project, and others as listed in **Table 5-1**.

Management actions under Alternative B with regard to fire are all focused on increased protection of GRSG habitat, primarily within PPMA, thereby benefitting GRSG rather than removing or fragmenting habitat. Under Alternative B, current wildfire suppression operations would continue, however, additional emphasis on protecting existing sagebrush habitat during suppression activities and pre-suppression planning and staging for maximum protection of GRSG habitat would be included. Fuels treatment activities would focus on protecting GRSG habitat, primarily within PPMA. Therefore, the direct and indirect effects of fire to GRSG from the

management actions under Alternative B, which are largely beneficial for GRSG, when combined with the past, present and reasonably foreseeable future actions do not substantially increase impacts on GRSG. While the management actions under Alternative B with regard to fire seek to minimize the impacts from wildfire on GRSG habitat, the trends described for Alternative A, No Action, are expected to continue. Additional reasonably foreseeable future actions do not add significantly to the risk of these ongoing environmental factors driving the current wildfire regime in Management Zone III. Stable populations have a higher probability of persistence, as noted under Alternative A, based on increased emphasis on fire pre-suppression activities, sagebrush retention prioritization during fire suppression, and increased emphasis on restoration activities.

The cumulative effect with respect to fire, of the direct and indirect effects of management actions under Alternative C, D, E, or F, as described in **Chapter 4**, when combined with the past, present and reasonably foreseeable future actions are similar to the cumulative effects described in Alternative B, and are not expected to be substantial and are not expected to change the existing population trend or remove and fragment sagebrush habitat beyond that which is induced as a result of the interaction of fire and invasive species.

### *Invasive Species*

Invasive weeds alter plant community structure and composition, productivity, nutrient cycling, and hydrology and may cause declines in native plant populations, including sagebrush habitat, through competitive exclusion and niche displacement, among other mechanisms. Invasive plants reduce and, in cases where monocultures occur, eliminate vegetation that GRSG use for food and cover. Invasive species do not provide suitable GRSG habitat, since the species depends on a variety of native forbs and the insects associated with them for chick survival. GRSG also depend on sagebrush, which is eaten year-round and used exclusively throughout the winter for food and cover. Along with competitively excluding vegetation essential to GRSG, invasive species fragment existing GRSG habitat or reduce habitat quality. Invasive species can also create long-term changes in ecosystem processes, such as fire-cycles and other disturbance regimes that persist even after an invasive plant is removed (Connelly et al. 2004, pp. 5-9). All the subpopulations in Nevada are threatened to some extent by spread of invasive weeds, especially cheatgrass.

Many areas in Management Zone III are threatened to some extent by the spread of invasive species (Manier et al. 2013, Table 20), especially cheatgrass which has been widespread for decades in this management zone. In Management Zone III, 31.3 percent of PPH and 43.2 percent of PGH is at moderate to high probability of cheatgrass occurrence (Manier et al. 2013, Table 20). Weeds and annual grasses are considered widespread in all but one of the 12 population areas making up this management zone (USFWS 2013a, Table 2). Although only 0.8 percent of PPH and PGH have burned over the last decade in this management zone, cheatgrass invasion is generally high especially at lower elevations. In southern habitats (Management Zones III, IV, and V), cheatgrass is found primarily at elevations between 5,249 to 6,562 feet (1,600 to 2,000 meters) but has been expanding in habitats down to 3,937 feet (1,200 meters; Connelly et al. 2004).

Much of the Great Basin is at risk for invasion by cheatgrass or pinyon-juniper encroachment within the next 30 years (Wisdom et al. 2005; Leu et al. 2008; Doherty et al. 2008), and where cheatgrass has invaded, there has typically been an increase in fire frequency resulting in further degradation of GRSG habitats by removing, and excluding sagebrush (Knapp 1996; Epanchin-Niell et al. 2009; Rowland et al. 2010; Baker 2011; Condon et al. 2011).

Large-scale restoration is needed in many areas, making minimally invaded areas highly valuable for habitat conservation. In the sagebrush steppe of northern habitats (all or parts of Management Zones I, II, IV, V, and VI), cheatgrass is less ubiquitous but demonstrates increased dominance, productivity, and elevation range on south-facing slopes (Connelly et al. 2004) which indicates the need for careful local considerations and best-practices that minimize disturbance in areas with a threat (presence) of cheatgrass expansion.

Under Alternative A, treatment of noxious weeds would continue under current policy with impacts the same as described under current LUPs. Policies would be expected to improve habitats; however under this alternative, more acres of PPH and PGH would have the potential to burn during wildfires, requiring additional post fire management. The action alternatives address the spread of invasive grasses by managing disturbance levels. Under Alternative B, no large scale disturbances would be allowed in PPH and small-scale disturbances would be limited to 3 percent surface disturbance. This would reduce the risk of invasive establish over more area compared to Alternative A. Alternative C emphasizes passive restoration of disturbed sites. This would include sites which may have passed a threshold or transition state. This alternative would not be expected to provide as much benefit as Alternative A since active management, such as seeding, is often needed for restoration (Manier et al. 2013). Alternative D focuses vegetation activities in PPMA and PGMA including prioritizing fire suppression, landscape restoration activities, and mandatory two years of rest from livestock use on burned acres. Alternative D provides a policy of no unmitigated loss of habitat, which equates to a disturbance threshold of zero percent. Alternative E focuses on avoidance and minimization of impacts and then mitigation, placing priority on vegetation treatment of disturbed areas and limiting disturbance to 5 percent in occupied and suitable habitats. Management under Alternative E would be expected to treat more acres of GRSG habitat than Alternative A, but may lead to more acres being impacted overall than Alternative A. Alternative F limits disturbance to 3 percent and focuses on passive restoration in unoccupied habitat. Alternative F has similar impacts on vegetation and therefore invasive species potential as Alternative B.

Fuels and vegetation treatments continue to be important factors in this management zone with the combined percent federal ownership in Management Zone III being approximately 82 percent. Higher levels of federal ownership would be expected to provide better opportunities for funding and larger landscapes to implement restoration on degraded lands.

The cumulative effect of management actions under Alternatives B, E, and F on invasive species in Management Zone III (described in **Chapter 4**), when combined with the past, present, and reasonably foreseeable future actions, are similar and do not result in significant cumulative impacts on GRSG habitats. While Alternatives B, E, and F contain direction that caps disturbance, Alternative D contains more stringent direction intended to significantly reduce the impacts of a potentially expanding human footprint. Alternative C reduces disturbance levels similar to the other action alternatives, but relies on natural processes to restore habitats and ultimately reduce the impacts of invasive species. Invasive species are likely to contribute further to cumulative impacts on GRSG and their habitats under this alternative.

### *Conifer*

Expansion of conifer woodlands, especially juniper (*Juniperus* spp.) present a threat to GRSG because they do not provide suitable habitat, and further, mature trees displace shrubs, grasses and forbs through direct competition for resources which are important components of GRSG habitat; juniper expansion is associated with increased bare ground and an increased potential for erosion

(Petersen et al. 2009). Mature trees may offer perch sites for raptors, thereby, woodland expansion may also represent expansion of raptor predation threat, similarly to perches on power lines, poles and other structures. In some areas (best documented in Management Zones III, IV, V, and VI) conifer encroachment is connected to reduced habitat quality in important seasonal ranges when woodland development is sufficient to restrict shrub and herbaceous production (Connelly et al. 2004). While widespread, this problem affects specific sagebrush habitats and GRSG populations because of local juniper and/or pinyon-juniper expansions; notably, Forest Service research indicated more than 55 percent of Great Basin sagebrush ecosystems (Management Zones III and V) are at risk of cheatgrass invasion, whereas approximately 40 percent of this same landscape was at risk of displacement by juniper expansion. Within Management Zone III in Nevada, the Central and Southeast subpopulation areas exhibit basin and range topography with higher elevation lands in the mountain big sagebrush/Wyoming sagebrush interface experiencing very high levels of conifer expansion. This in turn affects connectivity between nesting and summer seasonal ranges.

Conifer removal (vegetation treatments) would be implemented under all alternative scenarios and continue to improve GRSG habitat. Alternatives B and F emphasize conifer removal in riparian sites. Alternatives D and E emphasize a more broadly applied approach to encroaching conifer in all habitat types. Alternative D provides specific conifer objectives by habitat type to guide restoration. Alternative C de-emphasizes conifer removal in favor of natural restoration processes resulting from the removal of livestock grazing.

Cumulatively, Alternatives D and E provide the greatest reduction of the impacts from conifer expansion on GRSG habitats and may reverse habitat declines and result in the elimination of conifer encroachment as a contributor to cumulative effects. Alternatives B and F improve site-specific habitats, such as late-summer brood-rearing, but would not appreciably reduce the impacts of conifer encroachment over broader landscapes. Alternative C does not include actions that indicate a broad-scale approach to conifer encroachment into GRSG habitats.

Management under Alternative A would continue to use GRSG habitat standards defined by Connelly et al. 2000a and Hagen et al. 2007, which are based on research conducted outside of the Nevada and Northeast California Sub-region. Vegetation treatments for GRSG would continue to be prioritized in PMUs and follow the associated conservation strategy. Treatments would also be prioritized within close proximity to active lek sites and within Phase I and II juniper stands. The BLM and Forest Service would continue to coordinate vegetation treatments with other federal and state agencies, private landowners and tribes.

Alternative B, D, and E would prioritize vegetation treatments within PPMA and PGMA. For Alternative B and E vegetation treatments would incorporate the same GRSG habitat parameters as Alternative A. Management under Alternative D would provide for specific on the ground management objectives for vegetation treatments which are categorized by locally derived GRSG seasonal habitat requirements, allowing for attainment of the appropriate treatments to be applied on the ground and a set of common goals and objectives being met throughout the sub-region. Management under Alternative B would require the establishment of designated seed harvest areas for sagebrush seed collection in fire prone areas. All three alternatives consider climate change. In addition, post-restoration management plans would be implemented to ensure long-term persistence of vegetation treatments. The BLM and Forest Service would continue to coordinate vegetation treatments with other federal and state agencies, private landowners and tribes under these alternatives.

Management under Alternative C would focus vegetation treatments in unoccupied GRSG habitats (e.g., crested wheat grass seedings, urban interface, and areas of significant disturbances). This alternative does not specify GRSG habitat standards to be implemented but discusses the use of “Risk Assessments” and establishment of monitoring sites. Because this alternative does not prioritize vegetation treatments within intact sagebrush communities or existing GRSG habitats it does not provide for increasing the amount and quality of GRSG habitat (Manier et al. 2013, p. 108).

### *Climate Change*

The effects of changing climate are pervasive throughout all Management Zones, particularly in Management Zone III in the southern portion of the GRSG range. Changing climate conditions may render some locations less suitable for sagebrush than for other species, creating potential shifts in ecosystem distributions (Bradley 2010). Dramatic climate envelope shifts are forecasted for GRSG, with only a relatively small proportion of the current distribution forecasted to retain the climate regime close to that currently supporting this species. More generally, species that rely on sagebrush habitat have higher loss in climate envelope compared with other species (Comer et al. 2012a). Summer precipitation and temperature are the best predictors of regional distribution of sagebrush, suggesting that changing summer conditions may have the most impact on long-term viability of sagebrush habitats (Bradley 2010). Forecasts predict substantial increases in maximum temperatures for all months, with the greatest increases concentrated during the summer. By 2060, 90 percent and 85 percent of the Central Basin and Range (Management Zone III) is forecast to experience monthly maximum temperatures two standard deviations beyond the values of the 20th century baseline for July and August, respectively (Comer et al. 2012a). These climatic changes manifest as conversion of low-elevation sagebrush communities to salt desert scrub, the proliferation of invasive annual grasses, and substantial fire regime departure (Comer et al. 2012a). Landscape pattern effects, in most cases, indicate a clear shift to higher elevation, and to the north. Farther upslope, the climate envelope for Great Basin pinyon-juniper woodlands is forecasted to retreat northward to some degree.

### ***Lesser Threats***

#### *Mining*

Mining is ubiquitous across Management Zones III and IV in Nevada and occurs at a variety of scales. Surface and subsurface mining for mineral resources (coal, uranium, copper, phosphate, and others) results in direct loss of habitat if they occur in sagebrush habitats. GRSG and nests could be directly affected by trampling or vehicle collision. GRSG also could be impacted indirectly from an increase in human disturbance, ground shock, noise, dust, reduced air and water quality, and changes in vegetation and topography (Brown and Clayton 2004). Industrial activity associated with the development of surface mines and infrastructure could result in noise and human activity that disrupt the habitat and life-cycle of GRSG. All studies which assessed impacts of energy development on GRSG found negative effects; no studies reported a positive influence of development on populations or habitats (Naugle et al. 2011). Declines in GRSG population growth (21 percent) between pre- and post-mine development were attributable to decreased nest success and adult female survival; the treatment effect was more noticeable closer to gas field infrastructure. Annual survival of GRSG individuals reared near gas field infrastructure (yearling females and males) was significantly lower than control individuals not reared near infrastructure (Holloran 2005).

Management under Alternative A would maintain the current acreage open to locatable mineral development. WSAs and some ACECs are proposed for withdrawal from mineral entry. Alternative B and F would propose all priority habitats for withdrawal and would subject existing claims within priority habitats to validity examinations. Management under Alternative C would propose all occupied habitats (PPMA) for mineral withdrawal. Management under Alternatives D and E would maintain current acreage open to mineral development but add the application of best management practices and off-site mitigation.

### *Infrastructure*

Human developments, such as power lines, pipelines, communication towers, fences, roads, and railroads, contribute to habitat loss and fragmentation, with power lines and roads having the largest effects (Connelly et al. 2004; Naugle et al. 2011). Human disturbance is increased over the short term during infrastructure construction. In the long term, increased threats from predators perching on infrastructure may cause declines in lek attendance or nest success. GRSG population declines have resulted from avoidance of infrastructure, reduced productivity, and/or reduced survival in the vicinity of infrastructure (Naugle et al. 2011). Pipelines have similar short-term effects but impacts may be ameliorated in the long-term as vegetation re-establishes.

Power lines can directly affect GRSG by posing a collision and electrocution hazard, and can have indirect effects by decreasing lek attendance and recruitment, increasing predation, reducing connectivity, and facilitating the invasion of invasive plants (Braun 1998, pp. 145-146; Connelly et al. 2004, pp. 12, 25). In particular, power poles and crossarms provide perches and nesting habitat for potential avian predators, such as golden eagles and ravens (Ellis 1984). GRSG have been observed to avoid brood-rearing habitats within three miles of transmission lines (LeBeau 2012). Higher densities of power lines within four miles of a lek negatively influence lek attendance (Walker et al. 2007). In addition, power lines are linear and often extend for many miles. Thus, ground disturbance associated with power line construction, as well as vehicle and human presence during maintenance activities, may introduce or spread invasive weeds over large areas, thereby degrading habitat.

Impacts from roads may include direct habitat loss from road construction and direct mortality from collisions with vehicles. Roads may also present barriers to migration corridors or seasonal habitats. Other impacts include facilitation of predator movements, spread of invasive plants, and human disturbance from noise and traffic (Formann and Alexander 1998, pp. 207-231). Research suggests that road traffic within 4.7 miles of leks negatively influence male lek attendance (Connelly et al. 2004). Fences also may cause direct mortality through collisions, as the birds fly fast and low across the landscape, particularly during the breeding season. In addition, fence poles create predator perch sites and potential predator corridors along fences (particularly if a road is adjacent). Furthermore, fences may effectively cause habitat fragmentation, as GRSG may avoid habitat around the fences to escape predation (Braun 1998, p.145). The NRCS Greater Sage-Grouse Initiative includes incentives for private landowners to mark or remove fences that have been deemed high-risk for GRSG injury or mortality.

Alternative A includes ROW exclusion for existing congressionally designated lands such as Forest Service wilderness areas and National Historic Trails. LUPs in California identify avoidance areas and apply seasonal buffers and timing restrictions on ROWs. Most BLM districts consider ROW exclusion on a case-by-case basis. Management under Alternative B would identify all PPMA as ROW exclusion and all PGMA as ROW avoidance. Alternatives C and F

would identify all PPMA and PGMA as ROW exclusion. Alternative E carries forward existing exclusion and avoidance areas per Alternative A, but adds priority habitats for avoidance.

### *Energy*

Energy development is currently a minor threat present only in Management Zone III and affecting the Southeast Nevada and Central Nevada subpopulations. Potential expansion of oil and gas development is indicated in the northern Central Nevada subpopulation. Nonrenewable (oil and gas) energy development impacts GRSG and sagebrush habitats through direct disturbance and habitat loss from well pads, access construction, seismic surveys, roads, power lines, and pipeline corridors; indirectly from noise, gaseous emissions, changes in water availability and quality, and human presence. The interaction and intensity of effects could cumulatively or individually lead to habitat fragmentation in the long term (Connelly et al. 2004, p. 41; Holloran 2005, pp. 57-60). Geothermal energy development potential is widespread throughout Management Zone III. The direct footprint of existing development is relatively small and cumulatively affects a small percentage of GRSG habitats (0.73 percent of PPH and 1.33 percent of PGH) in the Management Zone. Impacts from geothermal development are similar to fossil-fuel-fired power plants in that resources are exploited in a highly centralized fashion. Related infrastructure increases the direct footprint and includes roads and transmission lines. Existing geothermal development is widespread, and geothermal potential is distributed across a majority of priority and general habitats throughout the range of GRSG habitat. Cumulatively, impacts from future development will be localized and of small scale with a high potential for siting outside of PPMA and PGMA (Manier et al. 2013).

Management under Alternative A would maintain the current acreage open to leasing of fluid minerals, without stipulations. Areas closed under Alternative A include some existing ACEC designations, designated wilderness, and wilderness study areas. Alternatives B and F would increase protection by adding all PPMA to existing closures. Alternative C closes all ACECs as delineated in that alternative. These ACEC designations include all occupied and unoccupied habitat within all PMUs in the sub-region precluding fluid mineral development within the range of GRSG. Alternative D is the same as Alternative A with respect to areas closed to entry, but adds NSO restrictions to all PPMA without waiver, exception, or modification. NSO restrictions would apply to PGH with allowance for waivers, exceptions and modifications. Alternative E would apply NSO restrictions to all occupied and suitable habitat within SGMAs allowing for waivers, exceptions, and modifications.

Under all alternatives, the impacts of both renewable and non-renewable energy development would be highly regulated within GRSG habitats and would not add significant impacts on GRSG and their habitats when considered within the context of other factors affecting GRSG persistence.

### **5.3.3. Management Zone IV**

Management Zone IV consists of nine GRSG populations in the Snake River Plains: east-central Idaho, southwest Montana, Snake-Salmon-Beaverhead, Belt Mountains, Weiser, northern Great Basin, Box Elder and Sawtooth (Garton et al. 2011). The three most substantial threats to GRSG habitats and populations occurring across populations in Management Zone IV are spread of weeds, fire, and isolation/small size. Infrastructure and mining are present but of lesser magnitude (USFWS 2013a). The Northeastern and Southeast Oregon/North Central Nevada subpopulations in Nevada are located in this management zone. These populations are part of the northern Great Basin population which is large and considered stable, though threatened by fragmentation,

invasive species, wildfire and agricultural conversion (USFWS 2013a). As a result, many populations in the region are small or isolated, with the exception of central Idaho (watershed of the Snake-Salmon-Beaverhead Rivers) and the northern Great Basin population (USFWS 2013a). The primary limiting factor for the northern Great Basin population in this region is surface disturbance, especially from fire (Manier et al. 2013, p. 133).

The majority of the sagebrush in this management zone is federally managed (Knick 2011), but local projects may be more important than range-wide effects because of habitat quality and connectivity at the local scale. The GRSG population areas within Management Zone IV include:

- Management Zone IV consists of two subpopulations (Northeastern, North Central) and all or portions of nine PMUs in north-central and northeastern Nevada. Surface acreage and occupied habitat for the northeastern subpopulation is 6 million acres and 5.1 million acres. Surface acreage and occupied habitat for the North Central subpopulation is 2.1 million acres and 1.5 million acres. Of the seven management zones, Management Zone IV is characterized as one of those supporting the highest densities of GRSG but also considered in long-range population decline (Connelly et al. 2004; Garton et al. 2011). The Northeastern subpopulation supports 157 active and 93 currently inactive leks. The North Central subpopulation supports 44 active and 29 currently inactive leks. The critical factor affecting GRSG and their habitats in Management Zone IV is the effect of wildfires. Combined, these subpopulations have had 555 fire starts burning 3.5 million acres since 1984. The combined footprint of wildfires in these subpopulations is 2.3 million acres. Thirty-seven (18 percent) of 201 active and 51 (42 percent) of 122 inactive leks have burned. 82 percent of active and 91 percent of inactive leks have suffered nesting habitat losses within a 4-mile buffer of leks. Wildfires have increased dramatically in both frequency and extent leaving large areas devoid of sagebrush canopy and dominated by grasses in general but particularly invasive species. Restoration efforts are moderately successful in some areas demonstrating some resiliency for this portion of the population (USFWS 2012). The COT report (USFWS 2013a) highlights fire, weeds/annual grasses, conifer encroachment, and infrastructure development as threats. The potential abundance of invasive annual grasses is consistently above 45 percent over the majority of the management zone, with the remainder in the 25-45 percent range, second only to the Northwest Interior subpopulation area in invasive grass abundance. However, climate change modeling shows expansion of habitat types supportive of GRSG through time with an accompanying increase in invasive juniper. Considering the intermediate scores for landscape condition and invasive annual grasses, low likelihood of future development, and low climate change stress, habitat restoration opportunities are very high in this management zone supporting the potential for management as a stronghold in this zone (Comer et al. 2012a).

Geothermal energy development potential is widespread throughout Management Zone IV. The direct footprint of existing development is relatively small and cumulatively affects a small percentage of GRSG habitats, impacting 0.26 percent of PPH and 0.16 percent of PGH in the management zone. Impacts from geothermal development are similar to fossil-fuel-fired power plants in that resources are exploited in a highly centralized fashion. Related infrastructure increases the direct footprint and includes roads and transmission lines. Existing geothermal development is widespread, and geothermal potential is distributed across a majority of priority and general habitats throughout the range of GRSG. Cumulatively, impacts of future development will be localized and of small scale with a high potential for siting outside of PPMA and PGMA. Few oil and gas wells exist in Management Zone IV and none within the Nevada and Northeastern California Sub-Region, though there is potential for exploration and development in the vicinity of Wells, Nevada, in the southeast corner of the subpopulation. Less than 350,000

acres (1 percent) of GRSG habitats are currently leased for federal fluid mineral exploration. Coal and solar potential are also low throughout the management zone. Agricultural development influences 1 percent of the management zone and 85 percent of PPH and PGH are within 4.3 miles (6.9 kilometers) of cropland (Manier et al. 2013). Agricultural influence is variable within Management Zone IV and not as prevalent within the sub-region as in Idaho and Montana.

Mining claims for gold, silver, and copper are found throughout the planning area. Within Nevada, the largest concentration of mining claims for gold, silver, and copper are located in Management Zone IV. Prices have risen over the last few years, and there is increased interest in developing ore deposits for these minerals leading to increased demand for associated infrastructure.

**Table 5.3. Relevant Cumulative Actions – Management Zone IV**

Actions by Category	Northeast Nevada Subpopulation	Northcentral Nevada Subpopulation
Mining	9	0
Infrastructure (ROW)	1	0
Fluid Minerals	0	0
Renewable energy	1	0
Fuels/Vegetation treatments	3	0
Other	1	0

### ***Major Threats***

#### *Fire*

Fire has largely negative effects on GRSG by directly affecting the distribution and condition of available sagebrush habitats (Nelle et al. 2000; Beck et al. 2009; Rhodes et al. 2010; Baker 2011). Wildfire and prescribed fires typically kill sagebrush thereby reducing cover and forage in the short-term. However, fire is also associated with natural dynamics and spatial heterogeneity of many sagebrush ecosystems, suggesting that not all fires in sagebrush communities have net-negative effects on GRSG populations and habitats. In some higher elevation habitats, where mountain big-sagebrush is the dominant canopy, rapid regeneration due to site potential, seed production and layering can produce 25 percent cover within 20 years (Winward 2004). There is little evidence that fire will enhance GRSG habitat in Wyoming big sagebrush communities (Crawford et al. 2004). In low elevation Wyoming big sagebrush, due to increased fuel potentials caused by annual grasses and landscape-scale decrease in intact sagebrush habitats, wildfire represents an important threat to habitat conservation and population stability (USFWS 2010). Within Management Zone IV in Nevada, effects and extent of habitat conversion from wildfire are high in both the Northeastern and Southeast Oregon/North Central Nevada subpopulations (see **Table 3-9**, Fire Starts and Acres Burned by Decade by Population/Subpopulation).

Current wildfire suppression operations and fuels management activities would continue under Alternative A. The limitation or prohibition of the use of prescribed fire in sagebrush habitats and emphasis on sagebrush during wildland fire operations would not be instituted as they would be in Alternatives B, C, D, E, and F. GRSG populations within Management Zone IV have some of the highest densities of all of the seven management zones; however, they have undergone long-range population declines. Under Alternative A, the direct and indirect effects described in Chapter 4, in conjunction with the listed past, present and reasonably foreseeable future actions and the likelihood of increasing future fires from annual weed invasions and predicted climate

change may result in the increased loss and fragmentation of the existing sagebrush habitat from wildfire in this management zone.

Some of the ongoing activities that may help alleviate impacts from fire include ongoing vegetation management actions that control noxious weeds and post-fire rehabilitation, the North Tuscarora Sage-Grouse Habitat Restoration Project (10,000 acres) and the Spruce Mountain Project (700 acres) seeding maintenance to reduce fuels and improve wildlife habitat.

Management actions under Alternative B with regard to fire are all focused on increased protection of GRSG habitat, primarily within PPMA, thereby benefitting GRSG rather than removing or fragmenting habitat. Cumulative effects under Alternative B in Management Zone IV, with regard to fire, are similar to the effects described for fire in Management Zone III. Namely, the direct and indirect effects of fire on GRSG from the management actions under Alternative B, when combined with the past, present and reasonably foreseeable future actions do not substantially increase impacts on GRSG.

The cumulative effect with respect to fire, of the direct and indirect effects of management actions under Alternative C, D, E or F, as described in Chapter 4, when combined with the past, present and reasonably foreseeable future actions are similar to the cumulative effects described in Alternative B, and are not expected to be substantial and are not expected to change the existing population trend or remove and fragment sagebrush habitat past a critical threshold.

### *Invasive Species*

Invasive weeds alter plant community structure and composition, productivity, nutrient cycling, and hydrology and may cause declines in native plant populations, including sagebrush habitat, through competitive exclusion and niche displacement, among other mechanisms. Invasive plants reduce and, in cases where monocultures occur, eliminate vegetation that GRSG use for food and cover. Invasive species do not provide suitable GRSG habitat, since the species depends on a variety of native forbs and the insects associated with them for chick survival. GRSG also depend on sagebrush, which is eaten year-round and used exclusively throughout the winter for food and cover. Along with competitively excluding vegetation essential to GRSG, invasive species fragment existing GRSG habitat or reduce habitat quality. Invasive species can also create long-term changes in ecosystem processes, such as fire-cycles and other disturbance regimes that persist even after an invasive plant is removed (Connelly et al. 2004, pp. 5-9). All the subpopulations in Nevada are threatened to some extent by the spread of invasive weeds, especially cheatgrass.

Although Management Zone IV has one of the largest areas of connected habitat, all but two of the nine populations found in this management zone are considered to have widespread populations of weeds or annual grasses (USFWS 2013a, Table 2) with approximately 53 percent of PPH and 58 percent of PGH being at risk of cheatgrass (Manier et al. 2013, Table 20). This management zone has a long history of agricultural land uses, and effects from wildfire. Since 1984, GRSG populations have been affected by more than 2.3 million acres of wildfire in this management zone and about 19 to 20 percent of PPH and PGH, combined, do not meet BLM land health standards in this management zone (Manier et al. 2013, Table 22). Infrastructure (ROW), mining, and fuels/vegetation treatments continue to be important factors in this management zone.

Impacts would be similar to those which would occur in Management Zone III with greater amounts of PPH and PGH acres and a majority of the landscape in federal ownership. This

would be expected to increase the potential for restoration actions and reduce the potential for invasive species.

### *Conifer*

Conifer encroachment is not considered a major threat in Management Zone IV. Spatial modeling of the potential for conifer encroachment risk on BLM-administered lands depicts a relative influence of 55 percent in PPH and 34 percent in PGH. Spatial modeling on Forest Service-administered lands depicts a potential of 15 percent in PPH and 25 percent in PGH (Manier et al. 2013, Table 21).

## ***Lesser Threats***

### *Mining*

Mining is ubiquitous across Management Zones III and IV in Nevada and occurs at a variety of scales. Surface and subsurface mining for mineral resources (gold, silver, and others) results in direct loss of habitat if they occur in sagebrush habitats. GRSG and nests could be directly affected by trampling or vehicle collision. GRSG also could be impacted indirectly from an increase in human disturbance, ground shock, noise, dust, reduced air and water quality, and changes in vegetation and topography (Brown and Clayton 2004). Industrial activity associated with the development of surface mines and infrastructure could result in noise and human activity that disrupt the habitat and life-cycle of GRSG. All studies which assessed impacts of energy development on GRSG found negative effects; no studies reported a positive influence of development on populations or habitats (Naugle et al. 2011). Declines in GRSG population growth (21 percent) between pre- and post-mine development were attributable to decreased nest success and adult female survival; the treatment effect was more noticeable closer to gas field infrastructure. Annual survival of GRSG individuals reared near gas field infrastructure (yearling females and males) was significantly lower than control individuals not reared near infrastructure (Holloran 2005).

See discussion in *Mining* under Management Zone III, above.

### *Infrastructure*

Human developments, such as power lines, communication towers, fences, roads, and railroads, contribute to habitat loss and fragmentation, with power lines and roads having the largest effects (Connelly et al. 2004; Naugle et al. 2011). Human disturbance is increased over the short term during infrastructure construction. In the long term, increased threats from predators perching on infrastructure may cause declines in lek attendance or nest success. GRSG population declines have resulted from avoidance of infrastructure, reduced productivity, and/or reduced survival in the vicinity of infrastructure (Naugle et al. 2011).

Power lines can directly affect GRSG by posing a collision and electrocution hazard, and can have indirect effects by decreasing lek attendance and recruitment, increasing predation, reducing connectivity, and facilitating the invasion of invasive plants (Braun 1998, pp. 145-146; Connelly et al. 2004, pp. 12, 25). In particular, power poles and crossarms provide perches and nesting habitat for potential avian predators, such as golden eagles and ravens (Ellis 1985). GRSG have been observed to avoid brood-rearing habitats within three miles of transmission lines (LeBeau 2012). Higher densities of power lines within four miles of a lek negatively influence lek attendance (Walker et al. 2007). In addition, power lines are linear and often extend for many

miles. Thus, ground disturbance associated with power line construction, as well as vehicle and human presence during maintenance activities, may introduce or spread invasive weeds over large areas, thereby degrading habitat.

Impacts from roads may include direct habitat loss from road construction and direct mortality from collisions with vehicles. Roads may also present barriers to migration corridors or seasonal habitats. Other impacts include facilitation of predator movements, spread of invasive plants, and human disturbance from noise and traffic (Formann and Alexander 1998, pp. 207-231). Research suggests that road traffic within 4.7 miles of leks negatively influence male lek attendance (Connelly et al. 2004). Fences also may cause direct mortality through collisions, as the birds fly fast and low across the landscape, particularly during the breeding season. In addition, fence poles create predator perch sites and potential predator corridors along fences (particularly if a road is adjacent). Furthermore, fences may effectively cause habitat fragmentation, as GRSG may avoid habitat around the fences to escape predation (Braun 1998, p.145). The NRCS Greater Sage-Grouse Initiative includes incentives for private landowners to mark or remove fences that have been deemed high-risk for GRSG injury or mortality.

See discussion in *Infrastructure* under Management Zone III, above.

### 5.3.4. Management Zone V

This management zone consists of five populations/subpopulations in three states (Connelly et al. 2004) and all or portions of ten PMUs in northwestern Nevada and northeastern California. It represents the westernmost extent of the GRSG range and contains a mix of habitat issues which have had long-term effects on GRSG populations. A majority of the sagebrush landscape (77 percent) is federally managed (Knick 2011), suggesting that federal habitat management may be expected to have a strong influence on these populations. GRSG leks in Management Zone V are relatively well-connected (second to the Wyoming Basin; Knick and Hanser 2011); however, the COT Report identifies habitat loss and fragmentation due to wildfire and conifer encroachment as primary threats to GRSG (USFWS 2013a). The range of GRSG in the sub-region has continued to shrink in extent over the last three decades, while some populations within Management Zone V are relatively stable. When considered in its entirety, including south-central Oregon, population change from 1965-2004 was statistically undetectable (Connelly et al. 2004), declining by 3.3 percent (WAFWA 2008), and by 2 percent (Garton et al. 2011). Of the seven management zones, Management Zone V is characterized as one of those supporting the highest densities of GRSG.

The Northern Great Basin region contains less ‘moderately’ and ‘highly’ affected GRSG habitat than the west-wide average. But it also contains the most extensive ‘low’ land-use intensity distribution of all management zones. Similarly, areas with intensive use that overlap PPH and PGH may be readily prioritized for habitat improvements as these areas are less extensive than in adjacent regions. However, since 2000, more than 1.5 million acres (6,400 square kilometers; 12.2 percent) of PPH (17.5 percent) and PGH (5.8 percent) burned with an average size of more than 95,000 acres (385 square kilometers) in PPH and 26,000 acres (105 square kilometers) in PGH per year during this time span (Manier 2013, Table 18; Figure 25). Additionally, 68.5 percent of PPH and 64.2 percent of PGH in the region is considered at high risk for large fires (Manier 2013, Table 19; Figure 26). Land at risk of conifer encroachment includes approximately 1.4 million acres of all ownerships (5,670 square kilometers; 11 percent) influencing 73 percent of PPH and 65 percent of PGH in Management Zone V (Manier 2013, Table 21), indicating that the spatial heterogeneity in habitat threats and conditions require local interpretation and adaptation to differentiate threats and develop specific management solutions.

Over 5.6 million acres (22,735 square kilometers; 43.5 percent) of Management Zone V are considered moderate to high risk for cheatgrass; a large block of high risk PPH is located in northwestern Nevada (Manier 2013, Table 20; Figure 27). Over 3.6 million acres (14,570 square kilometers; 28 percent) of GRSG habitats distributed throughout Management Zone V are federally managed wild horse and burro range (Manier et al. 2013, Table 23; Figure 29). Approximately 6 percent of BLM managed GRSG habitats in Management Zone V do not meet wildlife standards (Manier 2013, Table 22; Figure 28), with again a relatively large block of PPH not meeting standards in northwestern Nevada. The GRSG population areas within Management Zone V include:

- The Northeast California/Northwest Nevada subpopulation includes portions of west Humboldt and north Washoe counties in Nevada, and east Lassen and southeast Modoc counties in California. Total surface acreage is 4.3 million with 3.5 million acres of mapped habitat. The subpopulation includes a mix of extirpated, highly threatened, and relatively stable PMUs. In the COT Report, USFWS generalizes threats to this subpopulation as isolation/small size, conifers, fire, weeds/annual grasses, livestock, and feral horses.
- The California portion includes the Likely-Tables PMU in western Modoc County which is likely to become extirpated within the next decade. The population consists of only one lek which contained two strutting males in 2012. Up to 8 leks were present on the tablelands in the 1980s and were connected to other populations/PMUs on the Devil's Garden and further west onto Rocky Prairie and into the next valleys to the west, including Round Valley and Big Valley in far northwestern Lassen County, all of which are extirpated. The Likely-Tablelands PMU is the site of an extensive invasion of non-native grasses including cheatgrass, but specifically medusahead grass. Repeated fires and the resulting continuous mat of medusahead have precluded all but a few localized areas of sagebrush from this landscape. The PMU is disconnected from the Buffalo-Skedaddle PMU to the south by a 20-mile-wide band of invasive conifer.
- The Buffalo-Skedaddle PMU is one of mixed habitat quality and is discussed as a stronghold in many references. Of 1.4 million acres in the PMU, restoration mapping indicates 46 percent of potential habitat (mature sagebrush) understory is dominated by annual grass, annual forbs, bare ground, or zero to 9 percent juniper cover (invasive phase 1). An additional 19 percent of potential sagebrush habitat has crossed the threshold from sagebrush-dominated to juniper or annual grass-dominated communities (Armentrout and Hall 2006). The PMU has been subject to a highly altered fire regime which has systematically reduced sagebrush cover. In 2012, the Rush Fire burned 315,000 acres of this habitat (23 percent of the PMU). The Rush Fire burned nearly the entire length of the PMU and severed the remnant western half of the PMU from the stronghold populations to the east, creating another isolated GRSG population along the western edge of the range. Restoration of previous burns in the PMU has not proven successful due to the presence of invasive grasses, low-elevation Wyoming sage sites, and low precipitation. Similar results are expected from this most recent extensive wildfire. Long-term population declines leading to extirpation of GRSG in this PMU are likely over the next several decades due to isolation and habitat loss, thus greatly shrinking the GRSG range on the western edge and potentially eliminating GRSG from northeastern California. Subsequent to the Rush fire, no modeling has been completed to support this hypothesis. As of 2012, 21 leks were active in the PMU. Eleven of these leks were burned in the Rush fire of 2012. Livestock grazing, both historic and present, and wild horse overpopulation are additional threats affecting both nesting cover and availability of late-summer brood-rearing habitats within the PMU.

- The remaining PMUs within the Northeast California/Northwest Nevada sub-population include stronghold populations within northwestern Nevada and the far northeastern corner of California. The Massacre PMU has experienced much less wildfire than is the norm for the remainder of northern Nevada. Invasive grasses, though present, are a threat which have not manifested extensively in the PMU. GRSG populations remain high and stable and are connected with stronghold PMUs at the Sheldon Antelope Refuge and into Oregon. As of 2012, 28 leks were active in the PMU including two leks with over 100 males. Though the high level of fire activity since the 1980s characterizing much of northern Nevada has spared this PMU, recent wildfire activity has affected up to 100,000 acres. This potentially reflects a further heightening of wildfire activity overall due to the effects of climate change and resultant lowering of fuel moisture levels in larger fuel types such as sagebrush. Habitat quality is further threatened by both livestock grazing and wild horse overpopulation affecting both nesting cover and availability of late-summer brood-rearing habitats.
- Adjacent to the Massacre PMU, the Vya PMU is the northwestern-most Nevada PMU and includes a sliver of northeastern California. Similar to the Massacre, wildfire and invasive grasses are less manifested than in north-central and northeastern Nevada with overall habitat quality relatively high. However, GRSG habitat is affected by the encroachment of invasive juniper. The agencies continue to conduct large-scale juniper control in the PMU. Livestock grazing and wild horse overpopulation are additional threats. The PMU supports 16 active leks with population declines apparent as the conifer encroachment increases fragmentation.
- The Warm Springs Population (Pahrah and Virginia PMUs) encompass 402,748 surface acres and 156,111 acres of mapped habitat in southern Washoe County. Wildfires have burned approximately 35 percent of these PMUs converting sagebrush dominated shrub lands to annual grasses and weeds. Wildfires, which occurred during the years of 1999 through 2001, were particularly devastating, burning some of the last strongholds of GRSG habitats left in both the Pahrah and Virginia Mountain Ranges. GRSG in these two mountain ranges occur in small isolated pockets of suitable habitat in the northern Virginia Mountains. It is estimated that GRSG currently utilize approximately 54,000 acres or 15 percent of the 356,034 acres in the Virginia PMU. Only 65 percent is under BLM management while 24 percent is under private ownership and 9 percent belongs to the Pyramid Lake Indian Tribe. Urbanization particularly in the Pah Rah Range threatens existing GRSG habitat. Of the estimated 53,760 acres of habitat currently used by GRSG in the Pah Rah and Virginia Mountain Ranges 27,520 acres or 51 percent are under private ownership. Within the Pah Rah Range it is estimated that 69 percent of existing GRSG habitat is under private ownership. A qualitative population viability analysis was completed using parameters outlined in Appendix 6 of the Nevada Governor's Greater Sage-Grouse plan. Analysis by Nevada Division of Wildlife of factors in these mountain ranges indicates a high probability of extirpation within the next 20 years. Only three active leks are known. Current population estimates based on these leks indicates declining numbers with a spring breeding population of 150 to 200 GRSG. (NDOW 2004b). The COT Report notes only two leks and characterizes the population at less than 200 males. It does not provide estimates for persistence. The report highlights a myriad of threats including fire infrastructure, weeds/annual grasses, conifer, energy, free-roaming horses and burros, recreation, and urbanization. The COT Report identifies the population as "at risk" overall.

There are various forms of industrial development that affect GRSG habitats in this region. No active oil and gas wells currently exist in the management zone (Manier 2013, Figure 15), and no, measurable, additional acreage has been leased for fluid mineral exploration (Manier 2013, Table 13). Mining claims are extremely limited by the basalt cap characterizing the management zone

within the sub-region. Urbanized areas, power lines, and railroads are less dense in Management Zone V than in eastern portions of the GRSG range (Manier 2013, Tables 5 - 7; Figures 10 - 12). However, the Warm Springs Valley population, a small area on the California-Nevada border (Garton et al. 2011) is known to be influenced by urbanization and a transmission line (USFWS 2013a). Agricultural developments currently influence less than 1 percent of the management zone, however 75 percent of PPH and PGH are within the influence of cropland (Manier et al. 2013, Table 4; Figure 9) indicating a high likelihood of influence, without direct displacement.

Actions by Category	Warm Springs Valley Population	Northeast CA/North-west NV Subpopulation	South Central OR/North Central NV Subpopulation
Mining	0	0	0
Infrastructure (ROW)	0	0	0
Fluid Minerals	0	0	0
Renewable energy	0	0	0
Fuels/Vegetation treatments	0	3	1
Other	0	0	0

## Major Threats

### Fire

Fire has largely negative effects on GRSG by directly affecting the distribution and condition of available sagebrush habitats (Nelle et al. 2000; Beck et al. 2009; Rhodes et al. 2010; Baker 2011). Wildfire and prescribed fires typically kill sagebrush thereby reducing cover and forage in the short-term. However, fire is also associated with natural dynamics and spatial heterogeneity of many sagebrush ecosystems, suggesting that not all fires in sagebrush communities have net-negative effects on GRSG populations and habitats. In some higher elevation habitats, where mountain big-sagebrush is the dominant canopy, rapid regeneration due to site potential, seed production and layering can produce 25 percent cover within 20 years (Winward 2004). There is little evidence that fire will enhance GRSG habitat in Wyoming big sagebrush communities (Crawford et al. 2004). In low elevation Wyoming big sagebrush, due to increased fuel potentials caused by annual grasses and landscape-scale decrease in intact sagebrush habitats, wildfire represents an important threat to habitat conservation and population stability (USFWS 2010). Within Management Zone IV in the sub-region, effects and extent of habitat conversion from wildfire are variable, but most severe in subpopulations with cheatgrass dominance, the California portion of the Northeast California/Northwest Nevada subpopulation, and the south-central Oregon/north-central Nevada subpopulation, each of which were affected by wildfires exceeding 300,000 acres in size in 2012 alone (see **Table 3-9**, Fire Starts and Acres Burned by Decade by Population/Subpopulation)

### Analysis of Alternatives A-F Relative to Fire

Current wildfire suppression operations and fuels management activities would continue under Alternative A. The limitation or prohibition of the use of prescribed fire in sagebrush habitats and emphasis on sagebrush during wildland fire operations would not be instituted as they would be in Alternatives B, C, D, E, and F. Management Zone V contains the western most extent of GRSG distribution. Population stability within the management zone is highly mixed. Some areas are undergoing range contraction as populations on the western edges of the range become extirpated, while other areas in northwestern Nevada through southeastern Oregon remain stable in Management Zone V, retaining some of the highest bird densities of all of the seven WAFWA

management zones. Under Alternative A, the direct and indirect effects described in Chapter 4, in conjunction with the listed past, present and reasonably foreseeable future actions and the likelihood of increasing future fires from annual weed invasions and predicted climate change may result in the increased loss and fragmentation of the existing sagebrush habitat from wildfire in this management zone.

Some of the ongoing activities that may help alleviate impacts from fire include ongoing vegetation management actions that control noxious weeds and post-fire rehabilitation such as the Vya PMU Habitat Restoration and Fuels Reduction project (up to 100,000 acres), and the Northeast California Juniper Treatments (32,100 acres).

Management actions under Alternative B with regard to fire are all focused on increased protection of GRSB habitat, primarily within PPMA, thereby benefitting GRSB rather than removing or fragmenting habitat. Cumulative effects under Alternative B in Management Zone V, with regard to fire, are similar to the effects described for fire in Management Zone III. Namely, the direct and indirect effects of fire to GRSB from the management actions under Alternative B, when combined with the past, present and reasonably foreseeable future actions do not substantially increase impacts on GRSB.

The cumulative effect of management actions under Alternatives C, D, E, or F, as described in Chapter 4, when combined with the past, present, and reasonably foreseeable future actions, are similar to the cumulative effects described in Alternative B. Cumulative impacts are not expected to be substantial and are not expected to change the existing population trend or remove and fragment sagebrush habitat beyond that which is induced as a result of current interaction of fire and invasive species.

### *Invasive Species*

Invasive weeds alter plant community structure and composition, productivity, nutrient cycling, and hydrology and may cause declines in native plant populations, including sagebrush habitat, through competitive exclusion and niche displacement, among other mechanisms. Invasive plants reduce and, in cases where monocultures occur, eliminate vegetation that GRSB use for food and cover. Invasive species do not provide suitable GRSB habitat, since the species depends on a variety of native forbs and the insects associated with them for chick survival. GRSB also depend on sagebrush, which is eaten year-round and used exclusively throughout the winter for food and cover. Along with competitively excluding vegetation essential to GRSB, invasive species fragment existing GRSB habitat or reduce habitat quality. Invasive species can also create long-term changes in ecosystem processes, such as fire-cycles and other disturbance regimes that persist even after an invasive plant is removed (Connelly et al. 2004, pp. 5-9). All the subpopulations in the Great Basin sub-region are threatened to some extent by spread of invasive weeds, especially cheatgrass.

All four populations within this Management Zone V (three within the planning area) are threatened by widespread weeds and annual grasses (USFWS 2013a, Table 2). About 77 percent of lands within this management zone are under federal management. Since 2000, more than 1.5 million acres have burned and a majority of the management zone is considered at high risk of fire and about 44 percent of lands are considered to be at high risk of cheatgrass. Approximately 8 percent and 4 percent of PPH and PGH respectively do not meet BLM land health standards in this management zone (Manier et al. 2013, Table 22).

Impacts would be similar to those which would occur in Management Zones III and IV. Most PGH and all PPH occur on BLM-administered lands. Management Zone V has approximately the same amount of lands in PPH and PGH as Management Zone IV but possibly more importantly has a much greater percentage of its landscapes in PPH and PGH as either management zone, potentially providing much greater opportunities for restoration and to reduce the potential for invasive species.

### *Conifer*

Expansion of conifer woodlands, especially juniper (*Juniperus* spp.) present a threat to GRSG because they do not provide suitable habitat, and further, mature trees displace shrubs, grasses and forbs through direct competition for resources which are important components of GRSG habitat; juniper expansion is associated with increased bare ground and an increased potential for erosion (Petersen et al. 2009). Mature trees may offer perch sites for raptors, thereby, woodland expansion may also represent expansion of raptor predation threat, similarly to perches on power lines, poles and other structures. In some areas (best documented in Management Zones III, IV, V, and VI) conifer encroachment is connected to reduced habitat quality in important seasonal ranges when woodland development is sufficient to restrict shrub and herbaceous production (Connelly et al. 2004). While widespread, this problem affects specific sagebrush habitats and GRSG populations because of local juniper and/or pinyon-juniper expansions; notably, Forest Service research indicated more than 55 percent of Great Basin sagebrush ecosystems (Management Zones III and V) are at risk of cheatgrass invasion, whereas approximately 40 percent of this same landscape was at risk of displacement by juniper expansion. Within Management Zone IV in California and Nevada, the Northeast California/Northwest Nevada subpopulation has significant juniper encroachment increasing isolation and causing extirpation of some populations on the western edge of the range.

Conifer removal (vegetation treatments) would be implemented under all alternative scenarios and continue to improve GRSG habitat by increasing forage, cover quality and composition, reducing predator perches, decreasing fire spread and intensity and potentially increasing water availability within Management Zones III, IV and V. Most alternatives specify areas where vegetation treatments would be prioritized and how treatments would be developed. However, treatment acres are not specified within the alternatives and therefore, not quantifiable by alternative.

Management under Alternative A would continue to use GRSG habitat standards defined by Connelly et al. 2000 and Hagen et al. 2007, which are based on research conducted outside of the Nevada and Northeast California Sub-region. Vegetation treatments for GRSG would continue to be prioritized in PMUs and follow the associated conservation strategy. Treatments would also be prioritized within close proximity to active lek sites and within Phase 1 and II juniper stands. The BLM and Forest Service would continue to coordinate vegetation treatments with other federal and state agencies, private landowners and tribes. Within the Northeastern California/Northwestern Nevada subpopulation, the Sage Steppe Ecosystem Restoration Strategy (BLM 2008) would continue to be implemented. This strategy targets conifer reduction starting at 14,000 acres per year, increasing to an annual rate of 34,000 acres per year. The restoration strategy is a critical management action toward sustaining GRSG populations on the western edge of the range.

Alternatives B and F emphasize conifer removal in riparian sites. Alternatives D and E emphasize a more broadly applied approach to encroaching conifer in all habitat types. Alternative D provides specific conifer objectives by habitat type to guide restoration. Alternative C

de-emphasizes conifer removal in favor of natural restoration processes resulting from the removal of livestock grazing.

Cumulatively, Alternatives D and E provide the greatest reduction of the impacts from conifer on GRSG habitats and may reverse habitat declines and result in the elimination of conifer encroachment as a contributor to cumulative effects of other actions on the landscape. Alternatives B and F improve site-specific habitats, such as late-summer brood-rearing, but would not appreciably reduce the impacts of conifer encroachment over broader landscapes. Alternative C does not include actions that indicate a broad-scale approach to conifer encroachment into GRSG habitats.

Management for conifer encroachment is well-established for the Northeastern California/Northwestern Nevada subpopulation under Alternative A and would be continued through all alternatives. Provisions of the action alternatives include guidance for increasing conifer management in the Warm Springs Valley and South-central Oregon/North-central Nevada subpopulations, which would incrementally improve management of conifer encroachment in the Management Zone, cumulatively reducing the threat of conifer to GRSG habitats.

## ***Lesser Threats***

### *Grazing*

Grazing occurs throughout all management zones. Current literature describes the negative effects of livestock grazing (Connelly et al. 2004) and the “press” form of disturbance created (Knick 2011), but attributes overall loss of habitat quality to grazing being conducted at “unsustainable” levels (Wisdom et al. 2002). Additionally, large portions of Management Zone III (89 percent of BLM land/8 percent Forest Service), IV (95 percent of BLM land/0 percent Forest Service), and V (91 percent of BLM land/0 percent Forest Service) are within wild horse and burro HMAs and Territories compounding the effects of livestock grazing on these lands (Manier et al. 2013).

### *Urbanization*

Urbanization is recognized as a threat within the sub-region in the Northeast Nevada subpopulation and the Warm Springs population on the northern outskirts of Reno where it has been a major factor in the decline of GRSG (USFWS 2012). Generally, urbanization and infrastructure proliferation is not significant in the sub-region and, if left unregulated, is characterized as having the potential to influence only an additional 1.4 percent of GRSG habitat by the year 2060 in Management Zone III (Comer et al. 2012a). This assessment included the Warm Springs population.

### *Recreation*

Recreation activities in the sub-region are primarily dispersed, including but not limited to off-highway vehicles, camping, bicycling, and hunting. Effects from recreation are well-documented and include noise, distribution of invasive plants, dust, and predator and prey behavior modifications (Manier et al. 2013). These impacts generally increase with expanding population, urbanization, and expanding infrastructure. Roads and high road densities exert great influence over GRSG habitat (Knick and Connelly 2011) but are not expected to expand significantly within the sub-region (Comer et al. 2012a).

### 5.3.5. Conclusion

Regardless of alternative, amelioration of the major threats in Management Zones III, IV, and IV can be greatly enhanced through implementation of GRSG conservation strategies. Because 82 percent of all designated GRSG habitat Management Zone III, 65 percent in Management Zone IV, and 74 percent in Management Zone V is comprised of BLM- and Forest Service-administered lands, the relative ability of BLM and Forest Service actions to reduce the major threats—in terms of acres affected—is greater than that of tribal, state, and local governments, and private land owners.

Under Alternative A, current management would continue on BLM- and Forest Service-administered lands and there would be less amelioration of major threats in Management Zones III, IV, and V than under other alternatives. With regard to regulatory mechanisms affecting use authorizations, there would be no new ROW avoidance or exclusion areas established and no new areas closed or restricted to fluid mineral leasing. Current management does consider wildlife habitat value in decision-making, which provides limited protection for GRSG. State sagebrush protection and restoration efforts to restore habitat, improve rangeland, and establish or improve linkages between habitat areas, in coordination with private landowners, oil and gas leaseholders, and federal and state agencies, would continue. In addition, the NRCS Greater Sage-Grouse Initiative would continue to work with ranchers to reduce impacts on GRSG on private lands. Planned transmission lines and ROWs across federal, state, and private lands would increase fragmentation of GRSG habitat, and a substantial number of mines and other infrastructure are planned on BLM- and Forest Service-administered lands, which would increase loss of habitat and disturbance of GRSG populations. Voluntary protections would continue to be implemented on private land. Overall the limited number and extent of regulatory mechanisms under Alternative A would result in continued proliferation of use authorizations potentially degrading GRSG habitat in Management Zones III, IV, and V. Cumulatively, the impact of projected marginal anthropogenic increase in these Management Zones does not significantly decrease the likelihood for persistence when combined with other management activities. The determining factors of GRSG persistence under Alternative A are the degree to which the combined threats of fire, invasive species, and conifer encroachment are addressed. Data from Nevada indicate a dramatic increase in fire occurrence and extent over the last three decades with 10-year running averages of acres burned of less than 50,000 acres per year (1981 to 1990), reaching nearly 250,000 acres per year in the decades ending in 2007 and 2008. Recent data indicates a possible reduction in the 10-year running average to approximately 180,000 acres per year. Though this trend is relatively short-term, it may be indicative of the additional resources and emphasis the agencies have placed on fire and invasive species management in recent years under current management. Similarly, in Management Zones III and V, where conifer encroachment has had maximum impact on GRSG populations, current management includes extensive treatments to improve connectivity in Management Zone III and to recover habitats in Management Zone V.

Under Alternative B, the BLM and Forest Service would implement a number of protections for GRSG, including designating PPMA and PGMA and new ROW exclusion and avoidance areas. Habitat would be protected by NSO stipulations or closure to fluid mineral leasing. Land disposals and acquisitions would focus on maintaining sagebrush acreage and connectivity. Management under Alternative B would site transmission lines to minimize impacts on GRSG, would recommend withdrawal of PPMA to locatable mineral entry, and would close PPMA to fluid mineral leasing, likely reducing the number of planned wells and acres of habitat disturbed by mining and energy development, compared to Alternative A. These restrictions are likely to

influence the siting of development outside of identified GRSG habitats. Management under Alternative B would be sufficient to reduce threats from future development on BLM- and Forest Service-administered lands on a cumulative scale. Alternative B focuses fire pre-suppression and suppression, and habitat restoration efforts within PPMA and PGMA and sets thresholds for both limiting disturbance from development and for attaining habitat objectives within PPMA. Cumulatively, the management actions for habitat protection and restoration, when combined with current management, provide a basis for stabilizing or reversing habitat trends that currently impact GRSG habitat across the affected management zones.

Management under Alternative C would provide more protected area for GRSG on BLM- and Forest Service-administered lands in Management Zones III, IV, and V than any other alternative. These protections significantly reduce threats from all forms of development-generated disturbance. All occupied habitat would be closed to fluid mineral leasing, reducing the amount of development allowed within GRSG habitat on BLM- and Forest Service-administered lands. Grazing would also be greatly reduced in GRSG habitat by excluding livestock grazing in priority habitats. These policies would provide the most protection for GRSG habitat from loss and fragmentation and limit human disturbance. Alternative C reduces emphasis on active habitat restoration by applying criteria which restrict the areal scope and available tools for these types of actions. The alternative relies on natural processes to promote landscape-scale restoration over time. While having the greatest regulatory effect across all management zones with respect to a projected minor increase in human development, the alternative de-emphasizes and, cumulatively, may not adequately address broad-scale ecological processes such as fire, invasive species, and conifer encroachment, which are the greatest contributors to the decline of GRSG and their habitats across the management zones.

Management under Alternative D would improve GRSG habitat protection over current management, but is less restrictive to disturbance from development than Alternatives B or C. Management under Alternative D would not close habitat to fluid mineral leasing and would rely on NSO, CSU or TL stipulations to minimize disturbance within PPMA and PGMA. Similarly, it would establish ROW avoidance areas rather than exclusion in PPMA and PGMA with the exception of renewable energy, which is excluded from PPMA and PGMA. These provisions would allow for limited development on BLM- and Forest Service-administered lands, but still retain a high level of protection from the impacts of future development. Alternative D focuses management on the broad-scale ecological processes that are the greatest contributors to the decline of GRSG and their habitats across the management zones. Detailed actions are identified for fire pre-suppression, suppression, control of invasive species, and conifer encroachment which are essential components to arresting GRSG declines. Cumulatively, the management actions for habitat protection and restoration, when combined with current management, provide a basis for stabilizing or reversing habitat trends that currently impact GRSG habitat across the affected management zones.

Management under Alternative E is similar to Alternative D. The alternative designates SGMA, which replicate the mapped PACs from the COT report (FWS-2013). SGMAs apply only to the Nevada portion of the planning area. Management in California would be subject to current management. In California, recent land use planning provides a high level of protection to GRSG and includes aggressive management of the primary broad-scale influences affecting habitat as noted in Alternative A, above. Acreage to which use restrictions are applied within Nevada is less than acreage of PPMA and PGMA in the other action alternatives. The underlying management approach is one of avoidance of human disturbance and reliance on an oversight management structure consisting of the Nevada Sagebrush Ecosystem Council and Nevada

Sagebrush Ecosystem Technical Team to provide guidance. Similar to Alternative D, it provides a high level of emphasis on the broad-scale ecological processes that are the greatest contributors to the decline of GRSG and their habitats across the management zones. Detailed actions and management approaches are identified for fire pre-suppression and suppression, control of invasive species, and conifer encroachment which are essential components to reducing GRSG habitat decline. Cumulatively, the management actions for habitat protection and restoration, when combined with current management, provide a basis for stabilizing or reversing habitat trends that currently impact GRSG habitat across the affected management zones.

Management under Alternative F would generally adopt the provisions of Alternative B with respect to disturbance from development and restoration of habitats. Additional management actions include designation of a system of ACECs and reducing wild horse and burro numbers by 25 percent in PPMAAs. Cumulatively, the management actions for habitat protection and restoration, when combined with current management, provide a basis for stabilizing or reversing habitat trends that currently impact GRSG habitat across the affected management zones.

## **5.4. Vegetation and Soils**

### **5.4.1. Vegetation**

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect vegetation and soils resources are locatable and fluid mineral development, lands and realty actions, livestock grazing and range improvements, vegetation management, wildfires, invasive plant species, drought, and climate change.

The combination of all of these actions would likely cause an increased chance of invasive weed spread and establishment. Drought conditions, combined with wildfires and invasive species presence and potential climate change effects could lead to increased invasive annual vegetation and shorten the wildfire cycle, causing a cyclic effect, compounding the vegetation loss and conversion to invasive annual grass communities. The Central Basin and Range REA provides a risk potential of invasive annual grass cover due to a combination of factors, such as proximity to past wildfires, wildfire history, and other criteria. The REA data shows that much of the central Great Basin is at risk of invasive annual grass presence. Also, the potential for soil erosion could increase as invasive weed populations crowd out the native vegetation and its soil holding characteristics. Post fire vegetation treatments and other restoration projects designed to bring damaged sites to healthy functioning systems, combined with mitigation measures from the above mentioned actions and invasive weed control treatments may offset vegetation and soil disturbances.

### ***Alternatives Analysis***

Alternatives that reduce livestock grazing, locatable and fluid mineral development, lands and realty actions may help to reduce vegetation and soil disturbance on a landscape scale. Sagebrush is killed by wildfires and recovery requires many years, especially in the case of large fires. Contiguous old-growth sagebrush sites are at high fire risk, as are large blocks of continuous dead sagebrush. Prior to recovery, these sites are of limited use by GRSG except along the edges in unburned islands. As a result of this loss of habitat, fire has been identified as a primary factor associated with GRSG population declines. Depending on the species and the size of a burn,

a return to a full pre-burn community cover can take 13 to 100 years (Connelly et al. 2004). In addition, fires can result in a reduction of invertebrate food sources and may facilitate the spread of invasive weeds. Cheatgrass readily invades sagebrush communities especially in drier, lower elevation areas, and disturbed sites after wildfire (Balch et al. 2012). Cheatgrass changes historical fire patterns by providing an abundant, continuous and easily ignitable fuel source that facilitates rapid fire spread. While most sagebrush subspecies are killed by fire and slow to reestablish, cheatgrass recovers within one to two years of a fire event from seed in the soil.

Invasive weeds alter plant community structure and composition, productivity, nutrient cycling, and hydrology and may cause declines in native plant populations, including sagebrush habitat, through competitive exclusion and niche displacement, among other mechanisms. Invasive plants reduce and, in cases where monocultures occur, eliminate vegetation that GRSG use for food and cover. Invasive plant species do not provide suitable GRSG habitat, since the species depends on a variety of native forbs and the insects associated with them for chick survival. GRSG also depend on sagebrush, which is eaten year-round and used exclusively throughout the winter for food and cover. Along with competitively excluding vegetation essential to GRSG, invasive weeds fragment existing GRSG habitat or reduce habitat quality. Invasive annual grasses can also create long-term changes in ecosystem processes, such as fire-cycles and other disturbance regimes that persist even after an invasive plant is removed (Connelly et al. 2004, pp. 5-9).

All the management areas in the planning area are threatened to some extent by spread of invasive weeds, especially cheatgrass. Beyond managing risk, restoration of potentially valuable areas, such as those that would increase connectivity among seasonal habitats or sub-populations, or increase quality of current seasonal ranges, may become an important management option where natural and anthropogenic patterns and processes have fragmented and degraded habitats (Manier et al. 2013).

## **5.4.2. Soil Resources**

The cumulative impact analysis area used to analyze cumulative impacts on soils includes the entire planning area. Surface-disturbing activities occurring within the planning area are not expected to affect soil resources outside of the planning area. The cumulative impact analysis area used to analyze cumulative impacts on water quality and watershed resources extends outside of the planning area, following fourth-order watershed boundaries. Given that the hydrologic influence of the surrounding area is primarily focused in the stream channels and that delineation of the cumulative impact analysis area was based on watershed boundaries, the area of analysis is sufficient. The hydrologic influence of the planning area on areas outside the planning area is primarily the result of hydrograph alteration and quality of the water flowing from the area. Areas extending beyond the planning area may be considered for cumulative impact analysis where the hydrologic unit extends outside the planning area.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect soil and water resources are mineral development, livestock grazing, infrastructure development, vegetation treatments, wildfires, recreation, and travel and transportation activities.

### ***Alternatives Analysis***

Mineral development, including oil and gas, coal, and other minerals, could cause localized impacts on soils. Intensive mechanical vegetation treatments likely have and would continue to impact soils resources locally, but they would increase vegetation cover, and thus soil health, over the long term. Past livestock grazing has impacted soil resources. Active management of grazing allotments has led to improvements in soil health over time in the planning area.

An important trend in the planning area is rapidly increasing recreational use. This growth in recreation on public lands is due to local population growth, as well as the planning area's reputation as a national and international recreation destination. All forms of recreational activities can increase potential for erosion, sedimentation, gully creation, biologic soil crust damage, and riparian and upland vegetation damage. Recreation activities may also directly and indirectly impact water quality due to erosion and sediment production potential. However, the significance of such impacts varies with the nature and degree of disturbance as well as site specific environmental conditions. Typically larger disturbances represent greater potential to damage soils and vegetation, degrade water quality, and impair overall watershed function and condition than smaller disturbances.

Potential cumulative impacts on water resources in the planning area would result from alteration of functional vegetative communities and could lead to increased runoff and sediment/contaminant delivery. Activities with impacts on water resources include management actions attributed to the alteration of natural vegetative communities (e.g., pinyon-juniper encroachment and cheatgrass), historic grazing practices, surface-disturbing actions in areas of low reclamation potential, conversion of native rangelands to irrigated agricultural lands (on non-BLM- and Forest Service-administered lands), improper maintenance of transportation facilities, spills/leaks of substances used to develop mineral resources, and recreational use. These activities cause surface disturbances by removing vegetation cover, displacing and compacting soils, and altering soil structure and chemistry. The result is exposed surfaces that increase the potential for runoff and erosion, which delivers sediment and contaminants to nearby waterways.

The cumulative effect of mineral development, invasive species, wildfires, livestock grazing and other ground-disturbing activities could damage biological soil crusts.

## **5.5. Riparian Areas and Wetlands**

The cumulative impact analysis area for impacts on riparian areas and wetlands includes all GRSG habitats within the sub-region. This includes PPH, PGH, and additional habitats identified by the State of Nevada.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected or will (in the future) affect riparian areas and wetlands include: leasable, salable, and locatable minerals management; travel management; lands and realty actions; energy development; livestock grazing; wild horse and burro management; vegetation management, wildlife management; recreation management; special use designations; and climate change.

These land uses, management actions and conditions can collectively affect riparian areas and wetlands in both negative and positive ways. Negative cumulative impacts include ground disturbance, loss of hydrologic and ecological function and replacement of mesic plant communities with non-native invasive species or species associated with drier conditions. Positive cumulative impacts include restoration and/or protection of riparian ecosystems. With

the exception of climate change, essentially all of the actions and land uses described above can have both negative and positive cumulative impacts depending on such variables as project design features, management strategies, mitigation programs, special designations and other factors. Essentially, these actions or conditions act to either increase cumulative impacts on riparian areas and wetlands or to reduce the magnitude and extent of those impacts through restoration, management or avoidance measures.

The following cumulative effects analysis for each of the alternatives examines relative differences in increasing and decreasing impacts on riparian areas and wetlands within PPH and PGH over the next 20 years.

### **5.5.1. Alternative A**

Disturbance to riparian areas and wetlands is expected to accelerate in PPH and PPG within the planning area. Under Alternative A, the vast majority of the planning area is open to surface disturbing activities associated with mineral and energy development. Numerous projects or activities which could adversely impact riparian habitats are foreseeable across the planning area. Some impacts would be offset or reduced as result of stipulations or other measures incorporated into the permitting process.

Land uses such as grazing by livestock and wild horses and burros would continue under current policies and regulations resulting in both positive and negative cumulative impacts depending on effectiveness of management applications. Recreational use of public lands within the planning area is expected to increase causing additional impacts on riparian areas and wetlands. Predicted changes in environmental conditions as a result of climate are also likely to adversely affect riparian habitats.

Numerous vegetation treatments including projects designed to improve wildlife habitat as well as overall rangeland health have or will be implemented within PPH and PGH within the planning area (refer to **Table 5-1**). Collectively, these projects cover many thousands of acres and will add positive cumulative effects on riparian areas and wetlands in PPH and PGH.

### **5.5.2. Alternative B**

Under Alternative B, surface disturbing activities associated with mining, travel, recreation, energy development and lands actions in GRSG habitat would decrease in comparison to Alternative A. Uses which have the potential to cause direct or indirect disturbance to riparian areas and wetlands would be restricted or limited over significant portions of the planning area.

Changes to the livestock grazing and while horse and burro programs proposed under Alternative B would provide more benefits to riparian areas in comparison to Alternative A.

Added restrictions for range improvements and for vegetation treatments under Alternative B could indirectly affect riparian areas if tools for better livestock distribution were reduced and if certain vegetative treatments for fuels or watershed health were not implemented.

### **5.5.3. Alternative C**

When considered in conjunction with other non-BLM/Forest Service actions and compared to the other alternatives, management under Alternative C would result in the least amount of surface disturbance and the least cumulative effects to riparian areas and wetlands in PPMA. Management under Alternative C would also result in decreased cumulative impacts from livestock grazing across the planning area.

Opportunities for positive and indirect cumulative effects as a result of collaborative watershed management across jurisdictional boundaries would likely decrease under Alternative C compared with Alternative A.

### **5.5.4. Alternative D**

Cumulative impacts on riparian areas and wetlands from management under Alternative D would be similar to Alternative B with the exception that fewer acres would be restricted from surface disturbing activities. Management under Alternative D also provides more emphasis on collaborative management and on restoration. If successful, these efforts would result in positive direct and indirect cumulative impacts on riparian areas and wetlands in PPMA and PGMA.

### **5.5.5. Alternative E**

Strategies proposed under Alternative E to avoid, minimize, or mitigate impacts on riparian areas and wetlands would provide direct and indirect positive cumulative effects to riparian habitats in occupied, suitable and potential GRSG habitats including PPMA and PGMA. The proposed mitigation banking and credit system as well as the increased focus on collaborative management across jurisdictional boundaries would also add to positive cumulative effects for riparian areas and wetlands within the planning area.

### **5.5.6. Alternative F**

Cumulative impacts on riparian areas and wetlands in PPMA and PGMA would be similar to those under Alternative B, although more acres within the planning area would be closed to surface disturbing activities.

## **5.6. Wild Horses and Burros**

The cumulative impact analysis area used to analyze cumulative impacts on wild horse and burro management includes the planning area because impacts are expected to be limited to those actions originating within the planning area.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect wild horse and burro management are actions that change forage and water availability, access to water sources, range conditions, barriers to movement and population control activities (removal of excess animals, population growth suppression, etc.). In addition, actions that result in indirect disturbance to wild horses and burros include recreational activities and development for minerals, energy, and transmission.

### 5.6.1. Alternatives Analysis

Under all alternatives, no direct change would occur to areas allocated as HMAs/WHBTs for wild horses and burros. Under Alternatives B, C, D, E, and F, the potential for long-term reduction of AMLs exists should management for wild horses and burros conflict with GRSG management objectives, resulting in a cumulative addition to the management needs and associated costs of wild horse and burro management in the planning area. In addition, should management resources be concentrated in GRSG habitat, HMAs/WHBTs outside of GRSG habitat may be allotted fewer resources. In general, actions to improve land health for GRSG are also likely to improve rangelands for wild horses and burros resulting in a cumulative improvement in ability to meet AMLs.

## 5.7. Wildland Fire and Fire Management

The cumulative impact analysis area used to analyze cumulative impacts on wildland fire ecology and management is the planning area.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect wildland fire ecology and management are vegetation management projects, projects that impact ability to respond to wildland fire, projects that would increase ROWs and energy and mineral development, and projects that would increase access to land and consequently increase the risk of human-caused ignitions. Past and present impacts resulting from livestock grazing has affected wildland fire management depending on the degree or intensity of livestock grazing. In areas heavily grazed, less vegetation would be available to burn.

From 1982 to the present, minerals, lands and realty, and renewable energy developments have impacted fire management as more areas have been developed increasing fire suppression priorities to protect buildings and infrastructure. This holds true with development and expansion of wildland urban areas. Recreation activities and OHV use have increased the potential for human caused fire.

Continued large wildfires due to drought conditions and increasing fine fuels due to establishment and spread of annual invasive plants have increased demands on fire suppression operations and emergency stabilization and rehabilitation efforts. Emergency stabilization and rehabilitation efforts have limited establishment and spread of annual invasive plants (cheatgrass) in areas treated. This could impact wildland fire management through increased personnel requirements, and increased need for fire-suppression activities, as well as increased costs to the wildland fire management program.

Past fuels treatments within the planning area, including hazardous fuels reduction, prescribed fires, chemical and mechanical treatment, and seeding, would likely continue and potentially increase in the future.

ROWs and the associated development may increase the risk of human-caused ignitions due to vehicular travel to and from the site, construction, maintenance, and operation of the facilities. The development allowed under these authorizations would result in surface-disturbance, which would generally contribute to the modification of the composition and structure of vegetation communities in the vicinity of developed areas, which could then be more likely to fuel high-intensity fires.

Similarly, energy and mineral development particularly that including surface disturbing activities, has contributed to human-caused ignitions in the planning and would do so in the future. As the global effects of climate change continue into the future, the likelihood of natural, unplanned ignition within the planning area may increase due to the irregular weather patterns, increased likelihood of storms, and drought. The more restrictive alternatives, as climate change is a global process, impacts on climate change from management actions related to this project would be negligible and would be similar across all alternatives.

### **5.7.1. Alternative A**

Under Alternative A, trends as described above would continue to affect fire management in the planning area.

### **5.7.2. Alternative B**

Under Alternative B, increased restrictions on land uses may reduce new sources of ignition and decrease the risk of human-caused ignitions. Though some of these restrictions may limit the ability of the wildland fire management program to suppress and preventatively treat fires, other restrictions, such as restrictions on types of recreation, may also lessen the occurrence of fires in the first place, potentially resulting in fewer fires for the planning area as a whole.

### **5.7.3. Alternative C**

Under Alternative C (the most restrictive alternative), responses to wildland fire or appropriate treatments to prevent wildland fire may be prohibited. There is the possibility that planning decision would result in changes in fuels level or changes to management option for fuels treatments and wildfire suppression. Drought may affect vegetation health, which consequently makes vegetation more vulnerable to wildland fires. These cumulative circumstances may result in a greater need for flexibility in access to the planning area and in fire-suppression activities. The management actions under Alternative C that inhibit responses to and preventative treatments for wildland fire may struggle to meet the growing need for this flexibility in the future.

### **5.7.4. Alternative D**

Under Alternative D, greater flexibility in fuels management options would reduce the potential for changes in fuel levels that would increase cumulative fire risk in the planning area.

### **5.7.5. Alternative E**

Under Alternative E, the emphasis on fire risk reduction in GRSG habitat and efforts to coordinate with local and state governments would result in a cumulative reduction in fire risk.

### **5.7.6. Alternative F**

Under Alternative F, there is the possibility that planning decisions would result in changes in fuels level or changes to management option for fuels treatments and wildfire suppression. Drought may affect vegetation health, which consequently makes vegetation more vulnerable

to wildland fires. These cumulative circumstances may result in a greater need for flexibility in access to the planning area and in fire-suppression activities. The management actions under Alternative F that inhibit responses to and preventative treatments for wildland fire may struggle to meet the growing need for this flexibility in the future.

## 5.8. Livestock Grazing

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect range management are wildfires, surface-disturbing activities, the presence and abundance of grazing wildlife and/or wild horses, increased recreational demands, and protections for sensitive resources.

The cumulative impact analysis area used to analyze cumulative impacts on range management includes allotments located entirely or partially within the planning area. Past actions that have affected livestock grazing include human-caused surface disturbances (mineral development, recreation, prescribed burning, mechanical vegetation treatments, WSAs, and historic grazing practices) and wildland fires that have contributed to current ecological conditions.

Cumulative projects that increase human disturbance in grazing areas could also directly impact grazing by increasing weeds and invasive species. As stated above, weed invasion can reduce preferred livestock and wildlife forage and increase the chance of weeds being dispersed by roaming cattle. Cumulative projects that increase human disturbance in grazing areas could also directly impact grazing by displacing, injuring, or killing animals.

Present actions affecting livestock grazing are mainly those that reduce available grazing acreage, restrict management actions or the level of forage production in those areas. Key examples include wildland fires, land disposals, motorized vehicle use, recreation, habitat restoration, fuels reduction, and special designations that restrict grazing. Future actions affecting livestock grazing would be similar to present actions, except under Alternative C, under which the BLM and Forest Service would close PPMA to grazing.

The cumulative impacts under each alternative would parallel the impacts of the alternatives in the general impact analysis, (Chapter 3). In general, management actions in every alternative would result in short- and possibly long-term reductions of forage due to treatment activities, other surface-disturbing and disruptive activities, human disturbance, special designations, and the presence of grazing wildlife, threatened, or endangered species.

Under Alternatives A, B, D, and E, forage would be utilized annually at various levels relative to the protections provided in the three alternatives.

### 5.8.1. Alternative A

On BLM-administered lands, permitted active use would decline under Alternative A, over time, primarily due to the implementation of grazing management changes required to meet rangeland health standards for riparian resources, and wildlife and special status species habitats, including GRSG, and levels of surface disturbing activities. These will include changes to type of livestock, timing, duration or frequency of authorized use, including temporary closures.

Restrictions on the ability to construct or maintain range improvements and conduct treatments (infrastructure and vegetation) would increase due to the above factors although, in some cases, infrastructure may be required to implement needed grazing management.

Increased forage levels due to improved grazing management would likely result in increased fuel loads and potentially increased frequency and intensity of wildfire on the landscape. This in turn would likely result in expansion of annual grass communities and noxious weed communities within and outside the planning area. Adaptive management would allow livestock grazing to be used as a tool to manage fuel loads under this alternative.

Management under Alternative A would contribute the most cumulative effects to range management by allowing the most surface disturbance, which would cumulatively decrease forage availability.

### **5.8.2. Alternative B**

The goal of this alternative is to “maintain and/or increase GRSG abundance and distribution by conserving, enhancing or restoring the sagebrush ecosystem upon which populations depend in cooperation with other conservation partners (NTT 2011). GRSG populations have the greatest chance of persisting when landscapes are dominated by sagebrush and natural or human disturbances are minimal (Aldridge et al. 2008; Knick and Hanser 2011; Wisdom et al. 2011).

Permitted active use would likely decline over time, due to the implementation of grazing management changes required to meet the stated goal of this alternative. Restrictions on livestock grazing in GRSG habitat would result in operations being scaled down, and economic viability could be compromised.

Restrictions on the ability to construct or maintain range improvements and conduct treatments (infrastructure and vegetation) would increase. Infrastructure required to implement needed grazing management would be designed to conserve enhance, restore GRSG habitat.

Increased forage levels due to reduced levels of grazing would result in increased fuel loads and increased frequency of wildfire on the landscape. This in turn would likely result in expansion of annual grass communities and noxious weed communities within and outside the planning area. Adaptive management would allow livestock grazing to be used as a tool to manage fuel loads under this alternative.

Surface disturbing activities would be sited in lower priority habitat areas and mainly in non-habitat areas. This would likely result in declines in permitted use and restrictions to range improvement construction in non-habitat areas. Concentrating these activities in smaller and smaller areas would magnify the effects of the activities on forage availability and management options.

### **5.8.3. Alternative C**

Although forage would be expected to increase over the long term under Alternative C with no livestock grazing, this forage would not be available for grazing in these areas. The elimination of grazing use in occupied habitat would result in an overall reduction in livestock grazing. Elimination of grazing in occupied habitat would likely result in operations being scaled down to a point that economic viability could be compromised. Livestock operations dependent solely

on public lands in GRSG habitat would be most affected. Range improvements would not be constructed in PPMA.

Increased forage levels due to elimination of grazing would result in increased fuel loads and increased frequency of wildfire on the landscape. This in turn would likely result in expansion of annual grass communities and noxious weed communities within and outside the planning area.

Surface disturbing activities would be concentrated in non-habitat areas which would impact livestock grazing use on those areas.

#### **5.8.4. Alternative D**

Permitted active use would likely decline over time due to the implementation of grazing management changes required to maintain or enhance priority and general habitat for GRSG.. These will include changes to type of livestock, timing, duration, intensity or frequency of authorized use, including temporary closures. Restriction on grazing in occupied habitat would likely result in operations being scaled down to a point that viability could be compromised.

Range improvements will be authorized primarily when they directly benefit GRSG habitat. Furthermore, improvements will be evaluated and modified/removed if not beneficial to GRSG. Restrictions to the ability to construct or maintain range improvements and conduct treatments (infrastructure and vegetation) will increase due to the above factors although, in some cases, infrastructure may be required to implement needed grazing management.

Increased forage levels due to reduced levels of grazing would likely result in increased fuel loads and increased frequency of wildfire on the landscape, both inside and outside the planning area. This in turn would likely result in expansion of annual grass communities and noxious weed communities within and outside the planning area. Adaptive manage management would allow livestock grazing to be used as a tool to manage fuel loads under this alternative.

This alternative would likely result in the siting of surface disturbing activities primarily in non-habitat areas. This would likely result in declines in permitted use and restrictions to range improvement construction in non-habitat areas. Concentrating these activities in smaller and smaller areas would magnify the effects of the activities on forage availability and management options and consequently the viability of the livestock operation as a whole.

#### **5.8.5. Alternative E**

The goal of this alternative is no net loss in the occupied, suitable, and potential habitat categories within the sagebrush ecosystem for activities that can be controlled such as a planned disturbance or development.

Implementation of prescribed grazing practices would result in changes to current permitted grazing use in some areas. These could include changes to type of livestock, timing, duration, intensity or frequency of authorized use.

Construction and maintenance of range improvements would increase under this alternative. Range improvements would be designed to benefit both livestock grazing and GRSG habitat. Implementation of proper grazing management would rely on infrastructure such as pasture fences and water developments designed to mitigate the effects of improper grazing use on

GRSG habitat. Riparian management would rely on the development of fencing and off-site waters. Due to the extent of riparian area acreage present in GRSG habitat, this would increase the infrastructure footprint in priority habitat.

Surface disturbing activities would likely be concentrated in non-habitat areas which could impact livestock grazing use on those areas.

### **5.8.6. Alternative F**

Forage would be expected to increase over the long term under Alternative F as grazing is highly restricted in PPMA/PGMA. This alternative rests 25 percent of the acreage annually and then limits utilization to 25 percent on the areas that are available each year. The restrictions on grazing use in occupied habitat would result in an overall reduction in livestock grazing. Restrictions on grazing in occupied habitat would result in operations being scaled down and economic viability compromised. Fewer range improvements would be constructed.

The reductions in grazing use on public lands would likely increase fuel loads and contribute to increased wildfire intensity and occurrence on the landscape. Wild fire would affect lands both inside and outside the planning area. Adaptive management would allow livestock grazing to be used as a tool to manage fuel loads under this alternative.

Surface disturbing activities would be concentrated in non-habitat areas which would impact livestock grazing use on those areas and consequently the viability of the livestock operation as a whole.

## **5.9. Recreation**

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect recreation include large electrical transmission lines, pipeline projects, and similar linear ROW development projects that conflict with recreation opportunities. In addition, mineral extraction and oil and gas development would impact recreation opportunities by conflicting with recreation users and through the creation of noise and visual disruptions the affect user experiences.

### **5.9.1. Alternatives Analysis**

The degree of conflict with recreation users and creation of barriers to recreation opportunities would be greatest under Alternative A because of fewer restrictions on conflicting activities. The implementation of increased restrictions to protect GRSG under Alternatives B, C, D, E, and F such as ROW exclusion, and closure to mineral development would result in the fewest impacts on recreation.

At the same time, management to protect GRSG under Alternatives B, D, and F would only allow SRPs in PH that have a neutral or beneficial effect on PH. As a result, some types of permitted activities (e.g., OHV races) that could negatively affect GRSG habitat may be impacted, resulting in fewer opportunities to engage in the types of events and activities affected.

Management under Alternative F, which would seasonally prohibit camping and other non-motorized recreation activities within four miles of active leks, would decrease the area

available for recreational opportunities such as camping, mountain biking, hiking, and hunting resulting in seasonal reductions in recreational opportunities.

Reasonably foreseeable trends that would result in cumulative impacts on recreation include continued growth patterns in demand for all recreation experiences, increased demand for close-to-home recreation opportunities for local residents, continued and increased visitation from a growing regional population, and increased popularity of adjacent public lands. However, restrictions on development of public lands to protect GRSG habitat could cumulatively benefit recreation.

## **5.10. Travel and Transportation Management**

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect travel management are the result of management actions to limit motorized travel to existing or designated routes.

### **5.10.1. Alternatives Analysis**

Under Alternative A there would be no new restrictions related to GRSG habitat management, and no change in impacts on travel management. Management under Alternative B would limit motorized travel to existing roads and trails in PPMA, thereby reducing cross-country access in those areas. Alternatives C, D and E would limit motorized use in both PPMA and PGMA, further reducing cross-country travel. Alternatives B and E limit routed construction to realignments of existing routes only. Alternatives D and E provide for new road construction as long as there is no net loss and maintains or enhances PPMA. Reduction in access would be greatest under Alternative F due to management that would limit motorized use in both PPMA and PGMA and prohibit new road construction within four miles of active leks.

Reasonably foreseeable trends that would result in cumulative impacts on travel and transportation include continued growth patterns in demand for OHV recreation experiences, continued and increased visitation from a growing regional population, and increased popularity of adjacent public lands.

## **5.11. Lands and Realty**

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect lands and realty include new electrical transmission line development projects such as the Transwest Express 600-kV project designed to deliver energy generated at large-scale wind energy development sites in Wyoming and the Dakotas to large load centers, such as Las Vegas, in the southwest. Since California and Nevada are located between generation sources and several load centers throughout the west, transmission lines such as those identified in **Table 5-1** would continue to affect lands and realty. California and Nevada are also prime locations for renewable energy development. Large-scale wind developments like Horse Lake Wind in California would help the state and nation meet its renewable energy goals.

Several ROWs for utilities, pipelines, and fiber-optic lines are approved or in development in the planning area. The Forest Service has 31 existing special use permits for these uses, but no permits are currently approved or in development.

Limitations on land tenure adjustments (which provide the BLM with opportunities to sell, exchange, withdraw, or acquire lands, and the Forest Service to exchange, purchase, donate, and acquire ROWs to bolster effective management) would be the most restrictive under Alternatives C and F, and least restrictive under Alternative A. Management under Alternatives D and E would allow land sales under certain conditions.

The Lincoln County Conservation, Recreation, and Development Act (Public Law 108-424) was signed in 2004 allowing for the disposal of 90,000 acres of federal land as identified in the Ely RMP. Approximately 6,909 acres of PGH and 224 acres of PPH have been identified for disposal in the planning area.

The White Pine County Conservation, Recreation, and Development Act (Public Law 109-432) was enacted in 2006. It allowed for the disposal of 45,000 acres of federal lands in White Pine County, of which 5,691 acres of PGH and 586 acres of PPH are identified for disposal.

Two land adjustments in GRSG habitat are currently being evaluated on the Forest Service Mountain Ranger District—the disposal of the Mountain City Administrative Site and the Small Tract Sale at the Rizzi Ranch. In addition, the Rosenlund purchase on the Austin Ranger District and the Cave Lake State Park conveyance on the Ely Ranger District are expected to occur.

Forest Service Forest Plan Prescriptions are similar to BLM exclusion and avoidance areas. Additionally, the Forest Service authorizes SUAs on Forest Service-administered lands, while the BLM grants ROWs on their respective agency lands.

Impacts on lands and realty across alternatives are largely dependent on the number of acres where the BLM would exclude or avoid new ROW development. Since ROW exclusion designations prevent new ROW development, the resulting impact on the lands and realty program would be an inability to accommodate new ROW infrastructure in exclusion areas. **Table 5-3**, Exclusions and Avoidance by Alternative (BLM- and Forest Service-administered Lands), applies to areas in occupied habitat.

Management under Alternatives A and D would result in the fewest impacts on lands and realty from ROW exclusions, while management under Alternatives B, C, E, and F would result in varying degrees of restrictions on ROW development, with B, C, and E being the most restrictive. Conversely, limitations on mineral development under Alternatives B and C would decrease demand for new ROWs to support those types of activities.

**Table 5.4. Exclusion and Avoidance Areas by Alternative (BLM- and Forest Service-administered Lands)**

	Alternative					
	A	B	C	D	E	F
Exclusion	3,229,500	15,469,200	33,086,400	3,229,500	Not Mapped	20,341,400
Avoidance	190,900	5,217,200	190,900	17,809,500	Not Mapped	Not mapped

Source: BLM and Forest Service GIS 2013

### 5.11.1. Alternative A

Under Alternative A, 3,229,500 acres would be managed as ROW exclusion, and 190,900 acres would be managed as ROW avoidance.

Management under this alternative would be the least restrictive to ROWs because it would manage the fewest acres of avoidance and exclusion areas. Pending and existing ROWs would continue to be managed through the same process as directed by existing LUPs.

Management under this alternative would also have the least amount of restrictions on land tenure.

### **5.11.2. Alternative B**

Under Alternative B, 15,469,200 acres would be managed as ROW exclusion, and 5,217,200 acres would be managed as a ROW avoidance area.

Management under this alternative would have the most impact on ROWs because of the number of acres managed as ROW avoidance and exclusion. Pending ROWs within habitat could be rejected or withdrawn due to restrictions and heightened mitigation cost. Existing ROWs would have to undergo new restrictions. Management under this alternative would impact the BLM and Forest Service Lands and Realty Programs.

In general habitat, the amount of land available for disposal (3,199,800 acres) would be the same as Alternative A.

### **5.11.3. Alternative C**

Under Alternative C, 33,086,400 acres would be managed as ROW exclusion, and 190,900 acres would be managed as ROW avoidance.

Management under this alternative would have the most restrictions on ROWs because of the number of acres managed as ROW exclusion areas. Pending ROWs within habitat could be rejected or withdrawn due to restrictions and heightened mitigation cost. Existing ROWs would have to undergo new restrictions when maintaining and managing the existing ROWs. Management under this alternative would impact the BLM and Forest Service Lands and Realty Programs.

Land tenure adjustments would have more restrictions in GRSG habitat and would not allow the disposal of lands to be flexible for consolidation and effective management of other resources.

### **5.11.4. Alternative D**

Under Alternative D, 3,229,500 acres would be managed as ROW exclusion, and 17,809,500 acres would be managed as ROW avoidance.

Management under this alternative would have moderate impact on ROWs because of the number of acres managed as ROW avoidance. Pending ROWs within habitat could be rejected or withdrawn due to restrictions and heightened mitigation cost. Existing ROWs would not be subject to new restrictions. Management under this alternative would impact the BLM and Forest Service Lands and Realty Programs.

Management under this alternative would allow the most flexibility in acres available for acquisition, disposal, or exchange because there is no management action proposed to retain public ownership of PPMA.

### **5.11.5. Alternative E**

Management under this alternative would have moderate impact on ROWs because of the number of acres managed as ROW avoidance. Pending ROWs within habitat could be rejected or withdrawn due to restrictions and heightened mitigation cost. Existing ROWs would have to undergo new restrictions upon modification or renewal of the ROW authorization. Management under this alternative would impact the BLM and Forest Service Lands and Realty Programs.

In general habitat, the amount of land available for disposal (3,199,800 acres) would be the same as Alternative A.

### **5.11.6. Alternative F**

Under Alternative F, 20,341,400 acres would be managed as ROW exclusion, and 5,039,400 acres would be managed as ROW avoidance.

Management under this alternative would have moderate impact on ROWs because of the number of acres managed as ROW avoidance areas. Pending ROWs within habitat could be rejected or withdrawn due to restrictions and heightened mitigation cost. Existing ROWs would have to undergo new restrictions. Management under this alternative would impact the BLM and Forest Service Lands and Realty Programs.

Under Alternative F, the BLM would retain public ownership in PPMA with no exceptions. Impacts from land tenure would be the same as Alternative B, with the exception that the BLM would propose all PPMA, including mineral split-estate, for mineral withdrawal.

## **5.12. Renewable Energy Resources**

Several ROWs for utilities, pipelines, and fiber-optic lines are approved or in development in the planning area.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect wind energy development are the construction of existing and proposed roads and transmission lines. They would have a minor cumulative effect by increasing the routing options and possibly reducing project construction or implementation costs. The primary indicators of impacts on renewable energy is whether an alternative restricts the availability of BLM- or Forest Service-administered lands to a level below that of the acreage estimated in the reasonably foreseeable development scenario.

Impacts on renewable energy across alternatives are largely dependent on the number of acres the BLM would manage as ROW exclusion or avoidance for new development. Since ROW exclusion would prevent new renewable energy ROW development, the resulting impact on the lands and realty program would be an inability to accommodate new renewable energy ROW infrastructure in exclusion areas. It should be noted that a Forest Plan Prescription Area on Forest Service-administered land either restricts or prohibits certain uses and is considered the same as a BLM exclusion or avoidance.

Cumulative impacts on renewable energy would be greatest under Alternatives B, C, D, and F, since these management strategies would place the most restrictions on development by

designating habitat as exclusion areas. In contrast, management under Alternative A would place the fewest restrictions on the renewable energy program and would, therefore, be expected to contribute the fewest cumulative impacts on lands and realty. Management under Alternative E would also place restrictions on development (e.g., by managing areas a ROW avoidance) but to a lesser extent than under Alternatives B, C, D, and F. Management under Alternative E would, therefore, be expected to cumulatively contribute fewer impacts on lands and realty than Alternatives B, C, D, and F, but more impacts than Alternative A.

**Table 5-4**, Renewable Energy ROW Exclusion and Avoidance Areas by Alternative (BLM- and Forest Service-administered Lands), applies to areas in occupied habitat.

Restrictions in Alternatives B and C would prevent ROWs from being located in PPMA, while Alternatives D and E would avoid siting in PPMA if possible, preserving management flexibility at the expense of localized habitat degradation. Management under Alternative A would not restrict the siting of ROWs, though existing policy does recommend co-locating ROWs where possible. Management under Alternatives B and C would benefit GRSG the most on public lands. Management under Alternatives D and E would site ROW infrastructure to minimize loss and fragmentation of habitat, predation risk, and other threats.

**Table 5.5. Renewable Energy ROW Exclusion and Avoidance Areas by Alternative (BLM- and Forest Service-administered Lands)**

	Alternative					
	A	B	C	D	E	F
Exclusion	3,229,500, 1,492,800 Solar exclusion. - Solar, no similar actions on wind	15,469,200-ROWs  No similar actions on wind or solar	33,086,400- ROW, 32,286,000- Solar, No similar actions on wind	3,229,500- ROW,  20,341,400-Wind, 17,773,300- solar	No similar actions on wind or solar	20,341,400- ROWs and wind, no similar actions on solar
Avoidance	190,900	5,217,200	190,900	17,809,500	No similar actions on wind or solar	190,900
Source: BLM and Forest Service GIS 2013						

Energy development is among the greatest threats to GRSG, and it can result in direct habitat loss; fragmentation of important habitats by roads, pipelines, and power lines; noise; and direct human disturbance. The effects of energy development often add to the impacts from other human development and would result in GRSG population declines.

Renewable energy facilities, including solar and wind power, typically require many of the same features for construction and operation as do nonrenewable resources (USFWS 2010, p. 13951-2).

Future wind energy development would likely be restricted under Alternatives B, C, D, E, and F, but quantification currently is not possible given the existing data.

### **5.12.1. Alternative A**

Under Alternative A, 3,229,500 acres would be managed as ROW exclusion, 190,900 acres would be managed as ROW avoidance, and 1,492,800 acres would be managed as solar ROW avoidance.

Management under this alternative would be the least restrictive to renewable energy ROWs because the fewest acres would be managed as avoidance and exclusion areas. Pending and existing renewable energy ROWs would continue to be managed through the same process as directed by existing LUPs.

### **5.12.2. Alternative B**

Under Alternative B, 15,469,200 acres would be managed as ROW exclusion areas, and 5,217,200 acres would be managed as a ROW avoidance area.

Management under this alternative would have the most impact on renewable energy ROWs because of the number of acres managed as ROW avoidance and exclusion. Pending renewable energy ROWs within habitat could be rejected or withdrawn due to restrictions and heightened mitigation cost. Existing renewable energy ROWs would have to undergo new restrictions. Management under this alternative would impact the BLM and Forest Service Lands and Realty Programs.

### **5.12.3. Alternative C**

Under Alternative C, 33,086,400 acres would be managed as ROW exclusion, 190,900 acres would be managed as ROW avoidance, and 32,286,000 acres would be managed as solar ROW exclusion.

Management under this alternative would impact renewable energy ROWs because of the number of acres managed as ROW exclusion. Pending renewable energy ROWs within habitat could be rejected or withdrawn due to restrictions and heightened mitigation cost. Existing renewable energy ROWs would have to undergo new restrictions. Management under this alternative would impact the BLM and Forest Service Lands and Realty Programs.

### **5.12.4. Alternative D**

Under Alternative D, 276,600 acres would be managed as ROW exclusion, 17,456,300 acres would be managed as ROW avoidance, and 17,732,900 acres would be managed as ROW exclusion for wind and solar development. Refer to **Table 5-4**.

Management under this alternative would impact renewable energy ROWs because of the number of acres managed as ROW avoidance. Pending renewable energy ROWs within habitat could be rejected or withdrawn due to restrictions and heightened mitigation cost. Existing renewable energy ROWs would have to undergo new restrictions.

### **5.12.5. Alternative E**

Under Alternative E, 620,700 acres of occupied and suitable habitat would be managed as ROW exclusion, and 12,950,800 acres would be managed as ROW avoidance, similar to Alternative D but with less total acreage of exclusion and avoidance. Management under this alternative would impact renewable energy ROWs due to the number of acres managed as ROW avoidance. Pending renewable energy ROWs within habitat could be rejected or withdrawn due to restrictions and heightened mitigation costs. Existing renewable ROWs would have to undergo new restrictions.

### **5.12.6. Alternative F**

Under Alternative F, 20,341,400 acres would be managed as ROW exclusion, and 190,900 acres would be managed as ROW avoidance.

Management under this alternative would have moderate impacts on renewable energy ROWs because of the number of acres managed as ROW avoidance. Pending renewable energy ROWs within habitat could be rejected or withdrawn due to restrictions and heightened mitigation cost. Existing renewable energy ROWs would have to undergo new restrictions. Management under this alternative would impact the BLM and Forest Service Lands and Realty Programs.

## **5.13. Mineral Resources**

### **5.13.1. Fluid Minerals**

Past, present and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect leasable minerals are: market fluctuations, available markets for distribution, regulatory constraints, new technologies, and reservoir/reserve depletion.

#### **5.13.1.1. Alternative A**

Under Alternative A, the oil and gas and geothermal production would be those described in RFD for geothermal and oil and gas (see **Appendix H**, Oil and Gas Reasonable Foreseeably Development Scenarios) for the life of the LUP. The management actions proposed under Alternative A would cumulatively impact mineral development through existing and future surface use restrictions (e.g., closures and NSO, CSU, and TL stipulations). These restrictions could ultimately decrease the number of geothermal and oil and gas wells drilled in the decision

area over the life of the LUP. In addition, fluid mineral exploration and development would be expected to continue as correlated with mineral commodity prices.

#### **5.13.1.2. Alternative B**

When compared with Alternative A, the management actions proposed under Alternative B would cumulatively impact mineral development through more constraining surface use restrictions (e.g., closures and NSO, CSU, and TL stipulations). These restrictions could ultimately decrease the number of geothermal and oil and gas resources developed when compared to Alternative A.

#### **5.13.1.3. Alternative C**

Under Alternative C, no new fluid mineral development would occur within the decision area. Existing leases would expire under their own terms and no longer be available for leasing. Existing fluid mineral projects could not be expanded, and production of fluid mineral resources would decline.

#### **5.13.1.4. Alternative D**

When compared with Alternative A, the management actions proposed under Alternative D would cumulatively impact mineral development through more constraining surface use restrictions (e.g., closures and NSO, CSU, and TL stipulations). The application of NSO stipulations in areas with high geothermal potential would reduce fluid mineral development in that current drilling technologies only allow for directional drilling of maximum lateral length of approximately 2,800 feet (EPA 2002).

#### **5.13.1.5. Alternative E**

Under Alternative E, the impacts on fluid minerals would be similar to those described under Alternative A. However, because of the limited detailed information included in this alternative, it is not possible to quantify these affects.

#### **5.13.1.6. Alternative F**

When compared with Alternative A, the management actions proposed under Alternative F would cumulatively impact mineral development as a result of more constraining surface use restrictions (e.g., closures and NSO, CSU, and TL stipulations). These restrictions could ultimately decrease the number of geothermal and oil and gas resources developed when compared with Alternative A.

### **5.13.2. Locatable Minerals**

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect locatable minerals are: market fluctuations in price and demand, available markets for distribution, regulatory constraints, and new technologies.

The cumulative impact analysis area for locatable minerals is the planning area, northern Nevada and northeastern California, regardless of land ownership. Impacts on the ability to develop and

extract mineral resources could cumulatively reduce exploration and production of commodities from BLM- and Forest Service-administered lands.

Impacts on mineral resources that are individually minor may cumulatively reduce exploration and production of commodities from BLM- and Forest Service-administered lands. The locatable minerals program is non-discretionary for the BLM and Forest Service. Factors that impact the development of these minerals include regulations, policy, public perception and concerns, transportation, commodity prices, taxes, and housing and other necessities for workers.

Locatable mineral development is an ongoing enterprise in the cumulative impact analysis area and is expected to continue under Alternatives A and C. As prices for gold remain high, demand from companies to conduct exploration activities for gold and develop projects is expected to continue. Under all of the action alternatives (Alternatives B, D, E, and F), locatable mineral development would be expected to decrease due to restrictions and mitigation measures placed on development. Decreases in production would be expected to be greatest under Alternatives B and F, under which the BLM and Forest Service would recommend all PPMA be withdrawn from mineral entry.

Given that the locatable minerals program is a non-discretionary program by the BLM and Forest Service, mineral exploration and development would be expected to continue to occur under all alternatives. However, acreages open to exploration and development would vary by alternative. Overall, management under Alternatives B, E, and F may be restrictive to mineral development and could significantly impact mineral exploration and development in the study area. All action alternatives potentially allow for an increase in sagebrush habitat and could benefit the GRSG population due to alternative measures that will avoid, minimize and mitigate surface disturbance.

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

### 5.13.2.1. Alternative A

Under Alternative A, 6,547,200 acres (12 percent) of federal mineral estate would remain withdrawn from location under the Mining Law of 1872.

**Table 5-5**, Locatable Mineral Withdrawals, shows the total acreage withdrawn, recommended for withdrawal, and open to locatable mineral entry.

**Table 5.6. Locatable Mineral Withdrawals**

Alternative	Withdrawn from Locatable Mineral Entry	Recommended for Withdrawal from Locatable Mineral Entry	Open to Locatable Mineral Entry
Alternatives A and C	6,547,200	0	43,321,500
Alternatives B and F	6,547,200	11,466,300	32,249,700
Alternative D	6,547,200	0	43,321,500
Alternative E	6,547,200	0	43,321,500

Source: BLM and Forest Service GIS 2013

This alternative would be the least restrictive to locatable minerals because a larger percentage of the planning area would be open to locatable mineral entry and no additional restrictions would be applied to mining operations.

Existing mining claims in areas withdrawn from locatable mineral entry would have to undergo a validity exam to be approved for notices or plans of operations.

There are 95 pending plans of operations and 100 notices of exploration within the Nevada and Northeastern California sub-region. This alternative would have the least amount of restrictions on these pending cases.

### **5.13.2.2. Alternative B**

Under Alternative B, 6,547,200 acres (12 percent) of federal mineral estate would remain withdrawn from location under the Mining Law of 1872, and an additional 11,466,300 acres (23 percent) would continue to be petitioned for withdrawal. If the Secretary issues a Public Land Order to formally withdraw these lands, subject to valid existing rights, the location of new mining claims under the Mining Law of 1872 would be forbidden. Exploration and mining would be allowed on existing, valid mining claims.

**Table 5-5** shows the total acreage withdrawn, recommended for withdrawal, and open to locatable mineral entry.

This alternative would restrict locatable minerals because a larger percentage of the planning area would be closed to locatable mineral entry.

Withdrawal or closure of an area to mining development removes the mineral resources in that area from being able to be accessed and extracted under new mining claims. This represents an impact on the potential discovery, development, and use of those resources by decreasing the availability of those mineral resources. Existing mining claims in areas withdrawn from locatable mineral entry would have to undergo a validity exam to be approved for notices or plans of operations. This validity exam would increase up-front costs of locatable mineral development and would delay the start of locatable mineral development on those claims. Existing notices or plans of operations would also have to undergo a validity exam before any material change to the operation. Alternative B is expected to impact the locatable minerals program.

There are 95 pending plans of operations and 100 notices of exploration within the Nevada and Northeastern California sub-region. This alternative would restrict these pending cases and could cause them to be rejected, withdrawn or closed.

### **5.13.2.3. Alternative C**

Management under Alternative C has the same goals and objectives as Alternative A and would have the same cumulative impacts.

### **5.13.2.4. Alternative D**

Under Alternative D, 6,547,200 acres (12 percent) of federal mineral estate would remain withdrawn from location under the Mining Law of 1872.

**Table 5-5** shows the total acreage withdrawn, recommended for withdrawal, and open to locatable mineral entry.

This alternative emphasizes conservation, maintenance, and enhancement of PPMA while managing locatable mineral development. This alternative would be more restrictive to locatable mineral development than Alternative A due to an emphasis on minimizing the net loss to PPMA by applying best management practices to plans of operations or provide for enhancement of priority habitat through off-site mitigation. Also, claimants and operators would be encouraged to consolidate exploration activities into plans of operations to reduce proliferation of discrete exploration notices under 43 CFR 3809.21(b).

Existing mining claims in areas withdrawn from locatable mineral entry would have to undergo a validity exam to be approved for notices or plans of operations.

There are 95 pending plans of operations and 100 notices of exploration within the Nevada and Northeastern California sub-region. This alternative would restrict these pending cases and could cause them to be rejected, withdrawn or closed.

### **5.13.2.5. Alternative E**

Under Alternative E, 6,547,200 acres (12 percent) of federal mineral estate would remain withdrawn from location under the Mining Law of 1872.

**Table 5-5** shows the total acreage withdrawn, recommended for withdrawal, and open to locatable mineral entry.

This alternative would have similar restrictions as Alternative A but would create an oversight committee to provide consistent evaluation, reconciliation, and guidance for project development to avoid or minimize conflicts with GRS habitat.

There are 95 pending plans of operations and 100 notices of exploration within the Nevada and Northeastern California sub-region. This alternative would have a similar amount of restrictions on these pending cases as Alternative A.

### **5.13.2.6. Alternative F**

Management under Alternative F would result in cumulative impacts similar to Alternative B.

## **5.13.3. Mineral Materials**

Analysis of impacts on mineral materials from this report focuses on the impacts of conservation measures to protect GRS habitat. These impacts may be direct or indirect. For example, a direct impact on mineral materials would result from closure of an area to mineral material disposal. An indirect impact would result from removal of a road, which would change the economic feasibility of developing a site.

Given that the mineral materials program is a discretionary program by the BLM and Forest Service, mineral development would be expected to continue to occur under all alternatives. However, acreages open to development would vary by alternative. Overall, management under Alternatives B and D are the most restrictive to mineral development and could significantly

impact mineral development in the study area. All action alternatives potentially allow for an increase in sagebrush habitat and could benefit the GRSG population due to alternative measures that will avoid, minimize and mitigate surface disturbance.

### 5.13.3.1. Alternative A

Under Alternative A, 6,547,200 acres (12 percent) of federal mineral materials would remain withdrawn from development.

**Table 5-6**, Mineral Material Withdrawals, shows the total acreage withdrawn, recommended for withdrawal, and open to mineral material development.

**Table 5.7. Mineral Material Withdrawals**

Alternative	Withdrawn from Mineral Material Development	Recommended for Withdrawal from Mineral Material Development	Open to Mineral Material Development
Alternatives A and C	6,547,200	0	43,321,500
Alternatives B and F	6,547,200	11,466,300	32,249,700
Alternative D	6,547,200	0	43,321,500
Alternative E	6,547,200	0	43,321,500
Source: BLM and Forest Service GIS 2013			

This alternative would be the least restrictive to mineral material development because a larger percentage of the planning area would be open to mineral entry, and no additional restrictions would be applied to mining operations.

There are 108 pending material site cases within the Nevada and Northeastern California sub-region. This alternative would have the least amount of restrictions on these pending cases.

### 5.13.3.2. Alternative B

Under Alternative B, 6,547,200 acres (12 percent) of federal mineral estate would remain withdrawn from mineral material development, and an additional 11,466,300 acres (23 percent) would continue to be petitioned for withdrawal.

**Table 5-6** shows the total acreage withdrawn, recommended for withdrawal, and open to mineral material development.

This alternative would restrict mineral material development because a larger percentage of the planning area would be closed to mineral entry.

Withdrawal or closure of an area to mineral development removes the mineral resources in that area from being able to be accessed and extracted. This represents an impact on the potential development and use of those resources by decreasing the availability of those mineral resources. Management under Alternative B is expected to impact the mineral materials program which would affect the supply of base materials for community infrastructure, mining, and other industry development.

There are 108 pending material site cases within the Nevada and Northeastern California sub-region. This alternative would place restrictions on these pending cases that could cause them to be withdrawn, rejected, or closed.

### **5.13.3.3. Alternative C**

Management under Alternative C has the same goals and objectives as Alternative A and would have the same cumulative impacts.

### **5.13.3.4. Alternative D**

Under Alternative D, 6,547,200 acres (12 percent) of federal mineral estate would remain withdrawn from mineral material development. Salable minerals will be managed to meet the states demand for sand, grave, and mineral materials while providing for conservation and maintenance or enhancement of PPMA.

Provide reasonable access opportunity to Federal Highway Administration, NDOT, counties, and the public for existing mineral material pits in priority and general habitat.

**Table 5-6** shows the total acreage withdrawn, recommended for withdrawal, and open to mineral material development.

This alternative emphasizes conservation, maintenance, or enhancement of PPMA while managing mineral material development. Management under this alternative would be more restrictive to mineral material development than Alternative A due to no new salable mineral material sites development in priority and general habitat. Loss of habitat through disturbance at current sites would be offset through offsite mitigation. Additional mitigation, including offsite mitigation, would be required to offset any net loss of habitat as a result of authorizing an expansion of existing material pits. Habitat loss in priority and general habitat would be offset through mitigation to ensure no net unmitigated loss. All mineral materials activities would be subject to compliance with standard surface use stipulations for GRSG in PPMA and PGMA.

There are 108 pending material site cases within the Nevada and Northeastern California sub-region. This alternative would place restrictions on these pending cases that could cause them to be withdrawn, rejected, or closed.

### **5.13.3.5. Alternative E**

Under Alternative E, 6,547,200 acres (12 percent) of federal mineral estate would remain withdrawn from mineral material development.

**Table 5-6** shows the total acreage withdrawn, recommended for withdrawal, and open to mineral material development.

Management under this alternative would have similar restrictions as Alternative A, but would create an oversight committee to provide consistent evaluation, reconciliation, and guidance for project development to avoid or minimize conflicts with GRSG habitat. The goal of the committee will be to encourage a strong conservation ethic in the mining industry by implementing enhancement and reclamation of disturbed lands to preserve, protect, and improve habitat in GRSG management areas. On federal, state, and private lands, projects with an approved

Nevada Department of Environmental Protection permit are exempt from any new mitigation requirements above and beyond what has been stipulated in the projects approvals.

There are 108 pending material site cases within the Nevada and Northeastern California sub-region. Management under this alternative would have a similar amount of restrictions on these pending cases as Alternative A.

### **5.13.3.6. Alternative F**

Management under Alternative F would result in cumulative impacts similar to Alternative B.

## **5.14. Special Designations – Areas of Critical Environmental Concern**

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect ACECs are those management decisions which are specific to restoring GRSG habitat, as opposed to those management decisions which will maintain existing habitat.

### *Alternatives Analysis*

Under alternatives A, B, D and E there would be no new management restrictions regarding GRSG habitat management or impacts on existing ACECs.

Alternatives C and F will increase substantially the amount of acreage under ACEC management and subsequently encompass existing ACECs. The majority of management decisions in these two alternatives will provide beneficial and supportive measures in the long term to existing ACECs where Relevance and Importance values are primarily scenic, geologic and in some cases vegetative.

Reasonably foreseeable trends that would result in cumulative impacts on some existing ACECs would include moderate to large changes in vegetative cover from pinyon-juniper woodland to sage brush steppe. This may allow for potential fire impacts from invasive and noxious weeds which can provide fine fuels to propel large scale fires through ACECs with vegetative and/or cultural Relevance and Importance values.

## **5.15. Water Resources**

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect water resources are fluid mineral development, lands and realty actions, livestock grazing and range improvements, vegetation management, drought and climate change.

Mineral development will continue to impact water resources in the planning area. These activities could impact water resources through an increase in the presence of petroleum-using vehicles and equipment which increases the likelihood of chemical spills, erosion, and contamination of waterways. Mineral development can increase the likelihood of the creation of pools of standing water, which can serve as mosquito breeding habitat, increasing the ability for West Nile virus to spread into a landscape otherwise not at risk to the pathogen.

Vegetation management is important for soil stability as vegetation anchors soils in place and prevents excessive erosion and runoff into waterways. Vegetation management includes hazardous fuels reduction through prescribed fires, chemical and mechanical treatments, and seeding. Active vegetation management should contribute to the stabilization and protection of soils in these areas from erosion and subsequent runoff contributing to higher pollutant loads in waterways.

Existing, proposed, and foreseeable ROW development in the planning area will also result in cumulative impacts on water resources through human-made runoff of soils and chemicals into waterways. The development allowed under these authorizations would result in surface-disturbance, which would generally contribute to a decrease in water quality through compaction, erosion, and sediment runoff into waterways as well as an increase in the potential for chemical contamination.

Grazing by livestock and wild horses and burros can affect water resources through the trampling of soils and vegetation along and within natural water features and through the formation of fecal coliform and nutrients in waterways. Livestock grazing is associated with range management, which involves constructing infrastructure in order to support livestock grazing. Proposed rangeland improvement projects are on-going and the most common ones include water developments and fencing. These types of actions could cumulatively impact waters through compaction and erosion of soils during construction, modification of water sources and riparian habitats and subsequent runoff into waterways.

Drought affects the health of rangeland, riparian areas, and forests which make them more susceptible to the invasion of weeds and fire. Fire can impact water resources in the short term through the removal of vegetation resulting in instability of soils and increased erosion and sediment into waterways. Long-term effects of fire are considered beneficial as the landscape can be returned to a healthier state with proper seeding and management, which would indirectly reduce the risk of fire which would reduce erosion of soils into waterways. Climate change would also pose a long-term threat of cumulative impacts water resources. Cumulative impacts from climate change on GRSG habitat and, consequently, water resources could include vegetation regime changes (e.g., from sagebrush to grasslands), increased wildfire potential due to drought, and increased sedimentation and erosion into waterways (Connelly et al. 2004).

### **5.15.1. Alternatives Analysis**

Under Alternative A, the BLM would continue to allow ROWs, mineral development, and grazing throughout the planning area with the result of continued cumulative impacts on water resources. Alternatives B, C, D, and F would include limitations on surface disturbing activities, such as ROW development, grazing, and mineral development, reducing the potential for long-term cumulative impacts on water resources. When considered in conjunction with other non-BLM actions and compared with the other alternatives, management under Alternative C would result in the least amount of cumulative impacts on waters due to proposed management prescriptions that include the designation of occupied habitat as ROW exclusion, removal of livestock grazing in GRSG habitat, and closure or application of lease stipulations to mineral development in PPMA. Alternative E would result in more positive cumulative impacts on water resources than Alternative A as a result of strategies to avoid, minimize, and mitigate impacts on riparian and water resources.

## 5.16. Tribal Interests (Including Native American Religious Concerns)

The cumulative impact analysis area used to analyze cumulative impacts on tribal interests consists of PPH and PGH.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect tribal interests are similar to those described above in Chapter 4. These include proposed mine expansions for locatable minerals, transmission lines, fuels reduction projects, habitat restoration projects, renewable energy projects, and the creation of a wild horse eco-sanctuary. These projects could decrease the opportunities for tribes to continue valued traditional cultural practices if one or more of them cause GRSG populations to decrease in the future. In addition, fuels reduction projects that remove or thin pinyon and juniper trees could decrease tribal opportunities to utilize these resources in their traditional cultural practices. Habitat restoration projects conducted in PPH and PGH within tribal allotments could decrease tribal revenues.

### 5.16.1. Alternatives Analysis

All of the action alternatives propose some degree of management goals and objectives to increase GRSG populations. Implementing these protective measures could increase tribal opportunities to continue valued traditional cultural practices such as observing lekking behavior because GRSG would continue to be present into the future. Removing pinyon and juniper trees for fuels reduction would be initiated only after additional site-specific NEPA analysis. Tribal concerns would be taken into consideration prior to removal. In addition, site-specific habitat restoration projects would also be subjected to NEPA analysis and additional tribal consultation to take into account tribal concerns.

## 5.17. Climate Change

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have contributed greenhouse gases to the atmosphere include mineral development, wildfire, and fuel combustion.

Mineral development has occurred, is occurring, and will continue to occur on both federal and nonfederal mineral estate lands within the planning area. Mineral development results in short-term and long-term emissions of GHGs during fuel combustion in vehicles, drill rigs, and construction equipment. The management actions proposed in this LUPA/EIS would close areas of high potential to development in the planning compared with current management actions, thereby reducing GHG emissions associated with these actions on BLM-administered lands. While GHG emissions would likely be reduced, restricting mineral development on federally administered lands could shift development to non-federal lands.

Fires, particularly uncontrolled fires, can emit large quantities of GHGs into the atmosphere, including carbon dioxide, methane, and nitrous oxide (EPA 2012h, pp. 7-21 - 7-22); fires also remove vegetation that acts as a carbon sink. Proposed management actions would restrict the amount of vegetation that can be burned in a prescribed burn, or that can be allowed to burn in an unplanned natural ignition, to maintain sagebrush canopy cover, potentially resulting in fewer fire-related emissions in the short term.

### 5.17.1. Alternatives Analysis

Compared with Alternative A, cumulative air quality impacts would be slightly reduced under Alternatives B, D, and F and would be the same under Alternatives C and E. The cumulative actions identified in **Table 5-1** are not expected to cumulatively result in a violation of the national ambient air quality standards under any alternative.

Overall, federal and nonfederal actions within the planning area would not have a significant cumulative impact on climate change. Actions in the planning area contribute a very small percentage of state and national greenhouse gas emissions; CO<sub>2</sub> emissions for all of Nevada were 0.7 percent and California were 6.5 percent of total US CO<sub>2</sub> emissions (2010 numbers; EIA 2013).

### 5.18. Social and Economic Impacts (Including Environmental Justice)

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect social and economic conditions are chiefly mining and mineral exploration and development, lands, realty, transportation, ROWs, renewable energy development, recreation, and livestock grazing.

The cumulative impact analysis area used to analyze potential impacts on social and economic conditions consists of the counties identified as the socioeconomic study area.

Changes to social and economic conditions result when individuals, businesses, governments, and other organizations initiate actions. Millions of decisions will be made by thousands of residents of the counties in the socioeconomic study area, and others, over the next several decades, which will affect trends in employment, income, housing, and property. Projections published by the Research and Analysis Bureau of the Nevada Department of Employment, Training, and Rehabilitation, and the Employment Development Department of California, account for these individual decisions in the aggregate, and provide a baseline for comparing effects of alternatives in the future. The projections represent a regional forecast taking a wide range of actions into account – management actions by the BLM and Forest Service as well as many other government entities, private citizens, and businesses. As a result, they incorporate the past, present, and reasonably foreseeable future projects that will form the basis of future economic and social trends in the cumulative impact analysis area. Current and future trends in the cumulative impact analysis area include population growth, changes in mining activity, including gold, silver, copper and other locatable and salable minerals as well as exploration for hydrocarbons; renewable energy development, especially geothermal and wind power; changing recreational demands; livestock grazing; and other activities, as noted in **Section 4.21**, Socioeconomics and Environmental Justice.

Some of the predicted employment and income effects of the actions considered in this EIS were able to be quantified, and where possible, BLM and Forest Service used IMPLAN, a regional economic model, to calculate indirect and induced impacts of these actions. **Table 5-7**, Projected Employment by Alternative for Socioeconomic Study Area, shows projected employment for approximately 2020, as forecast by Nevada and California state agencies. Because Alternative A represents current management plans, employment would correspond most closely to the existing forecasts. By contrast, employment under Alternatives B through F would be expected to change from the projections, with the best estimate for those changes being the quantities shown in **Chapter 4**, Environmental Consequences. Thus, **Table 5-7** shows the estimated change in

employment for these alternatives, based on modifying the projected future employment by the estimated changes for the socioeconomic study area (from IMPLAN). The Nevada and California state agencies do not provide projections for labor income or output.

**Table 5.8. Projected Employment by Alternative for Socioeconomic Study Area**

Item	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Employment (2010) <sup>1</sup>	287,953	287,953	287,953	287,953	287,953	287,953
Average annual change in future employment related to grazing <sup>2</sup>	N/A	0	-1,489	0	0	-726
Average annual change in future employment related to geothermal development	N/A	-236	-336	-202	0	-336
Average annual change in future employment related to oil development	N/A	-175	0	0	0	-175
Overall change in 2018-2020 employment	N/A	-411	-1,825	-202	0	-1,237
Projected 2018-2020 employment <sup>3</sup>	316,672	316,261	314,847	316,470	316,672	315,435
% change, 2010 to 2018-2020	10.0%	9.8%	9.3%	9.9%	10.0%	9.5%

Source: Nevada Department of Employment, Training, and Rehabilitation (2013a, 2013b, 2013c), and Employment Development Department of California (2013) (projected employment data), modified by estimates from IMPLAN reported in **Section 4.21**, Socioeconomics and Environmental Justice. Changes related to specific sectors include direct, indirect, and induced effects from IMPLAN; see **Appendix M**, Detailed Employment and Earnings Data, for a detailed description of this model.

1. The source of 2010 employment data used in this table differs from that used in **Section 3.22**, Socioeconomics and Environmental Justice, so there may be differences between the estimates shown.
2. The values for livestock grazing represent the midpoint of the low and high scenarios described in **Section 4.21**, Socioeconomics and Environmental Justice.
3. Due to inconsistent projection years in the underlying data, projected 2018-2020 employment is calculated from 2020 projections for Churchill and Washoe Counties, and 2018 projections for the remaining counties. Where the underlying data sources do not provide county-level employment projections, they were imputed based on the county shares of current employment.

Changes in employment, especially in Alternatives C and F, would have a measurable although relatively small effect on future employment, according to this analysis. Employment changes related to livestock grazing – including sectors that support and are supported by grazing – account for the majority of this effect in both Alternative C and Alternative F. Employment changes from geothermal development and related industries would also play a role, as would oil-related sectors in Alternatives B and F. In Alternatives A, B, D, and E, employment would increase by about 10 percent, with very small reductions to 9.8 percent projected in Alternative B and 9.9 percent projected in Alternative D. In Alternatives B and D, these reductions would not likely be noticeable given the size of the study area and the uncertainty associated with a long-term forecast. In Alternatives C and F, employment would be projected to increase by somewhat less: 9.3 percent in Alternative C, and 9.5 percent in Alternative F. Although these reductions would be noticeable, they would also be relatively insignificant given the size of the study area and the uncertainty inherent in long-term forecasting.

Of the effects documented in **Section 4.21**, Socioeconomics and Environmental Justice, the impact that most exacerbates current economic challenges is the potential for several of the management alternatives to result in increased costs for livestock grazing operators. Long-term trends including changing market conditions, consolidation supported by economies of scale,

demographic change, and environmental concerns have resulted in increasingly challenging economic conditions for ranch operators, especially smaller operators.

Alternatives C and F would have some degree of cumulative social and economic impact related to grazing, due to the AUM reductions proposed in these alternatives and the already challenging conditions for operators of ranches and grazing operations. Alternatives B, D and E would also entail some changes to management of grazing lands, but in the long run it is expected that changes to vegetation treatments would sustain rangeland health and would ultimately not adversely impact counties and communities.

In terms of geographic regions, the cumulative effects on livestock grazing operators would occur in several counties, but would be most important in Modoc and Nye Counties (in which **Section 4.21**, Socioeconomics and Environmental Justice also identifies a potential disproportionately high and adverse impact on low-income populations), as well as in Pershing County, Nevada.

The other effect identified in **Section 4.21**, Socioeconomics and Environmental Justice that could lead to a cumulatively considerable contribution to impacts would be potential fiscal effects, especially in the smaller counties that are also more dependent on economic activities on public lands. Because specific impacts on local government tax revenues could not be quantified, the nature of the potential cumulative effect is not possible to characterize beyond the analysis in **Section 4.21**, Socioeconomics and Environmental Justice. That analysis notes specific counties in which local tax revenues could be most affected by the management alternatives.

Other effects, including potential changes in recreation patterns and changes in economic activity related to wind energy and transmission lines, would not be expected to contribute to cumulative effects. From a cumulative effects standpoint the economic and social impacts of these changes would be relatively minor, as documented in **Section 4.21**, Socioeconomics and Environmental Justice, and do not particularly exacerbate existing trends in the study area.