DRAFT RECOVERY PLAN FOR
GUNNISON SAGE-GROUSE
(*CENTROCERCUS MINIMUS*)

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U.S. Fish and Wildlife Service
Interior Region 7
Denver, Colorado

August 2019 - Draft Recovery Plan

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In this document, the first uses of technical terms are <u>underlined</u>, and are defined in the glossary on page 20.

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I. Introduction

Gunnison sage-grouse (*Centrocercus minimus*; GUSG) is a bird in the grouse family that lives exclusively in the sagebrush steppe ecosystems of southwestern Colorado and southeastern Utah. On November 20, 2014, the Service listed GUSG as a threatened species (79 FR 69191) and designated critical habitat for the species (79 FR 69311) under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*; hereafter Act). GUSG are closely associated with sagebrush (*Artemisia* spp.) ecosystems in North America (Young *et al.* 2015, p. 1).

We conducted a Species Status Assessment (SSA) for GUSG and documented our analysis in an SSA report (Service 2019), which is an in-depth, scientific review of the species' biology and threats, an evaluation of its biological status, and an assessment of the resources and conditions needed to maintain populations over time. In our SSA, we identified individual, population, and species requirements, or needs, and the factors affecting the species' survival. We then evaluated the species' current condition in order to assess the species' current and future viability in terms of its resiliency, redundancy, and representation (the three Rs). Resiliency is the ability for populations to sustain in the face of stochastic events, or for populations to recover from years with low reproduction or reduced survival, and is associated with population size, growth rate, and the quality and quantity of habitats. Redundancy is the ability for the species to withstand catastrophic events, for which adaptation is unlikely, and is associated with the number and distribution of populations. Representation is the ability of a species to adapt to changes in the environment and is associated with its diversity, whether ecological, genetic, behavioral, or morphological.

This streamlined Recovery Plan is derived from the SSA and focuses primarily on the elements required under section 4(f)(1)(B) of the Act:

(i) Objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of this section, that the species be removed from the list;

(ii) A description of such site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the species; and

(iii) Estimates of the time required and the cost to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal.

In cooperation with our partners, we are also preparing a Recovery Implementation Strategy (RIS), which serves as an operational plan for stepping down the higher-level recovery actions into specific tasks, or activities. The RIS is a separate document from this Recovery Plan and can be modified if monitoring reveals that expected results are not being achieved, thereby maximizing flexibility of recovery implementation

Overview

The following is a brief overview of the natural history and status of GUSG, as documented in our SSA report (Service 2019). Please refer to the SSA report (Service 2019) for additional discussion, full analysis, and complete literature citations.

The GUSG is the second largest grouse in North America, weighing from 2.0 to 5.3 pounds (0.9 to 2.4 kilograms) (Young *et al.* 2000, p. 447). Taxonomists previously considered GUSG and greater sage-grouse (*C. urophasianus*) a single species, but GUSG are now considered a distinct species based on geographic isolation and morphological, genetic, and behavioral differences (Young *et al.* 2000, 445; Banks *et al.* 2000, p. 850). GUSG are dark brown in color with black underparts, and coarsely barred brown-white or white-yellow tail feathers. GUSG are a lek breeding species and males breed with multiple females during the same season. Breeding occurs on leks, or distinct areas where males strut, or display, to attract females. While strutting on leks, males inflate air sacs on their chest to create a popping sound to attract females.

GUSG were formerly native to southwestern Colorado, northern New Mexico, southeastern Utah, and northeastern Arizona (Young *et al.* 2000, p. 446). Since the 1900s, the GUSG's occupied range contracted, due largely to habitat loss associated with the conversion of sagebrush habitats to agriculture and residential and commercial development. GUSG now occupy an estimated 10 percent of its historical range (Schroeder *et al.* 2004, p. 370). The Bureau of Land Management (BLM) manages approximately 42 percent of the currently occupied habitat and 43 percent is privately owned. The U.S. Forest Service (USFS) manages approximately 10 percent, the National Park Service manages approximately 2 percent, and the States of Colorado and Utah collectively manage approximately 2 percent of the occupied GUSG habitat.

Currently, GUSG are found in eight, small populations distributed across eight counties in Colorado and one county in Utah, with seven populations located in Colorado (Gunnison Basin, Poncha Pass, Crawford, Cerro Summit-Cimarron-Sims Mesa (CSCSM), Piñon Mesa, San Miguel Basin, Dove Creek) and one population in Utah (Monticello) (Figure 1). The Gunnison Basin population is the largest population and has the most occupied habitat, covering approximately 239,641 hectares (592,168 acres). The Poncha Pass population, located to the east of the Gunnison Basin population, is the smallest population and has the least amount of occupied habitat, covering approximately 11,234 hectares (27,776 acres). All of the GUSG in the Poncha Pass population were translocated from the Gunnison Basin population in the 1970s after the population was considered extirpated in the 1950s (GSRSC 2005, p. 94). The Gunnison Basin population supports approximately 85 percent of breeding GUSG and 65 percent of the occupied habitat. The remaining 15 percent of the individuals are distributed among the remaining seven populations, which comprise approximately 35 percent of the overall occupied habitat. The eight GUSG populations occupy six different ecoregions, or areas delineated by common geology, landforms, soils, vegetation, climate, land use, wildlife, and hydrology (EPA 2018). The ecoregions represent distinct ecological, or habitat, differences between the populations.

Throughout their life cycle, GUSG depend on a variety of shrub-steppe habitats and are obligate users of several sagebrush species, to breed, feed, and shelter. Individual GUSG rely on ecosystems with relatively continuous and healthy sagebrush stands for food and shelter throughout the year, while grasses and forbs in the understory provide cover and food during nesting and early brood-rearing periods (Connelly *et al.* 2000, p. 971). GUSG use a mosaic of sagebrush habitats throughout their range, including sagebrush along riparian areas and intermountain basins, characterized by several sagebrush species and mountain shrubs (Young *et al.* 2015, p. 4). During the early summer/brood-rearing season, mesic (wet) areas within or near sagebrush habitats provide important habitats for females and chicks. Juveniles and all other life stages use mesic habitats that provide abundant forbs and invertebrates, especially once those resources are less available in nesting areas. Mesic habitats and drainages also provide cover from predators (Young *et al.* 2015, p. 5).

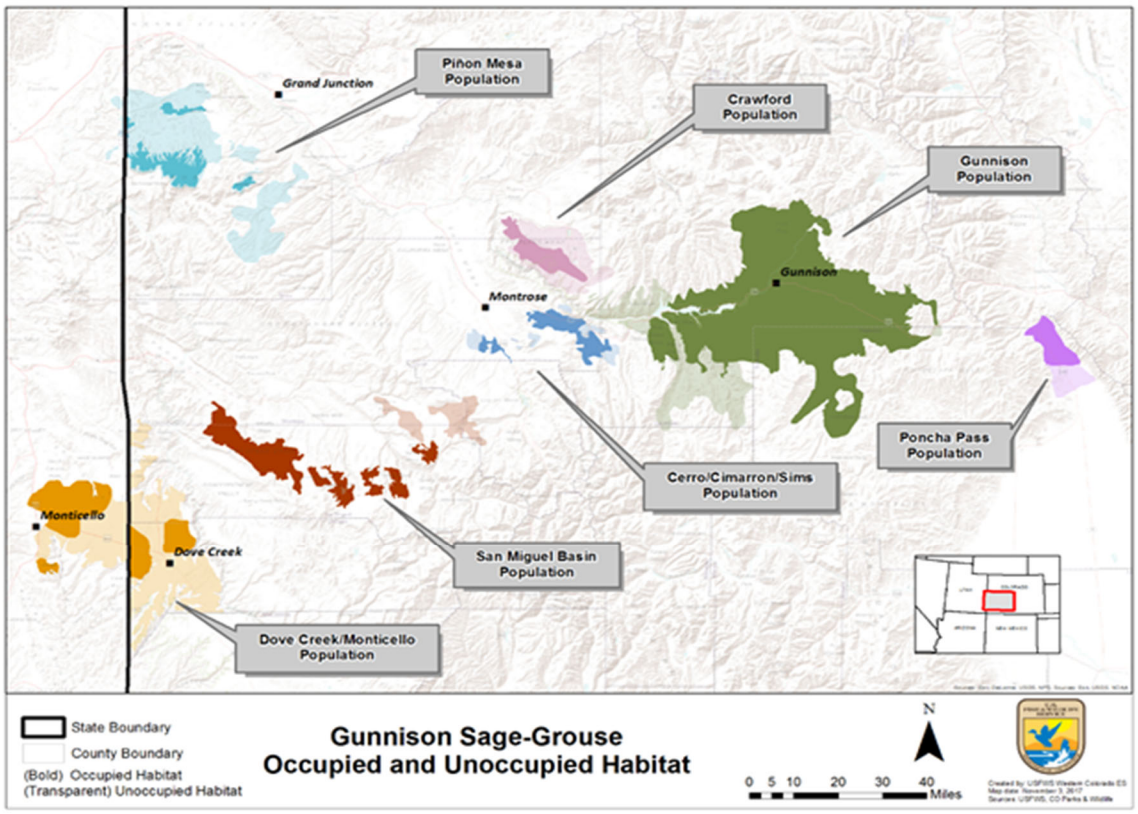

Figure 1. Current distribution of the eight GUSG populations in Colorado and Utah. Colors distinguish the populations. Light shading indicates formerly occupied areas that still contain some of the appropriate biological and physical features for GUSG. The darker colors indicate occupied habitat where breeding takes place or is known to have taken place. The eight populations occupy six different ecoregions, areas with distinct soils, vegetation, temperature, and precipitation patterns.

We base our assessment of species viability, defined as the likelihood of persistence over the long-term, on the concepts of **resiliency**, **redundancy**, and **representation**. Three of the eight GUSG populations currently have low resiliency (Crawford, Poncha Pass, and Monticello), two populations have moderate resiliency (CSCSM and San Miguel Basin), two populations have

high resiliency (Gunnison Basin and Piñon Mesa), and one population (Dove Creek) has critically low resiliency (Service 2019, p. 39). The Gunnison Basin population currently has high resiliency due to its consistently large population size and large quantity of available sagebrush habitat (Service 2019, pp. 39, 50). Similarly, the Piñon Mesa population currently has high resiliency due to high quality sagebrush habitats and moderate demographic conditions (Service 2019, pp. 39, 50). The CSCSM and San Miguel populations currently have medium resiliency. The Crawford, Poncha Pass, and Monticello populations are currently in low condition, due to critically low demographic factors and low quantities of sagebrush habitat (Service 2019, p. 39). The Dove Creek population is the only population currently in an overall critical condition due to a critical decrease in demographic factors and low quantity and quality of sagebrush habitats (Service 2019, p. 39).

Currently, the Gunnison Basin population contributes the most to the viability of GUSG. As one of two populations with high resiliency, due to its high population numbers and natural recruitment, the Gunnison Basin population is currently the most resilient of the eight GUSG populations (Service 2019, p. 52). Although less resilient than the Gunnison Basin population, the Piñon Mesa population also has high resiliency, but requires conservation efforts, such as translocations and piñon-juniper removal projects, to stay resilient. The remaining six populations are currently in moderate, low, or critical condition, so are at greater risk from stochastic events, and contribute less to the viability of the species. The Poncha Pass population is genetically and ecologically similar to the Gunnison Basin population, and with low overall resiliency, contributes little to GUSG's redundancy and representation. Therefore, Poncha Pass is not essential for recovery of GUSG and viability of the species, although this does not reduce the importance of the conservation efforts that have occurred there and should continue into the future. If demographic factors and habitat quality are improved in this population, the population's contribution to species-level redundancy could improve the species' viability. Species viability is reliant on translocations to satellite populations to maintain population resiliency, species redundancy, and representation due to the limited quantity of habitat and low connectivity between populations. Translocation efforts have been and will continue to be important to ensure population resiliency (Zimmerman *et al.* 2019, p. 8).

For **redundancy**, there are eight populations distributed narrowly in southwestern Colorado and a small corner of Utah. This narrow distribution increases risk that a catastrophic event could affect the entire species, such as multi-year, widespread drought. For the current state of **representation**, the eight GUSG populations occupy six different ecoregions, each with unique ecological differences, which provide ecological variation that may confer adaptive capacity to the species. Additionally, genetic differences have been documented between many of the populations, likely caused by low connectivity, yet may have resulted in adaptation to differing habitat conditions, which could confer some level of adaptive capacity to future environmental change (Service 2019, p. 49). It is not clear that genetic differences between populations indicate localized adaptations, so we use the presence of resilient GUSG populations in diverse ecological settings, ecoregions, to describe species' representation.

Recovery Vision:

The recovery vision is the survival and conservation of GUSG. Recovery will be signified by at least five resilient populations (Gunnison Basin, San Miguel Basin, Piñon Mesa, Crawford, and Monticello) and improved habitat in two populations (Dove Creek and CSCSM). These conditions provide sufficient representation and redundancy across the species range through occupancy of multiple ecoregions, connectivity, and a broad distribution.

Recovery Strategy:

Gunnison sage-grouse populations are considered resilient when they are sufficiently large to endure stochastic environmental change. Population size, and hence the resiliency of GUSG populations, is tied to the quality and quantity of sagebrush habitats, as evidenced by prolonged habitat loss that has negatively affected the current viability of GUSG. Redundancy for GUSG is considered sufficient when the number and distribution of populations adequately reduces risk from catastrophes. For sufficient representation, the ecological and genetic diversity across the populations needs to provide GUSG the ability to adapt to novel biological and physical changes in its environment. Additionally, connectivity between populations, whether natural or facilitated, helps maintain population size. In general, GUSG needs a sufficient number of resilient populations distributed across the overall range that maximize ecological and genetic diversity in order to withstand catastrophes and adapt to environmental change.

The Gunnison Basin population has the highest resiliency of all eight populations and contributes the most to the viability of the species. As the largest population, containing approximately 85 percent of the species' adult individuals (79 FR 69191), Gunnison Basin has also served as a source population to 6 of the other populations (all but the Monticello population) by facilitated translocation. Populations with lower resiliency currently contribute less to the overall viability of the species, but do provide redundancy and representation. As a result, recovery of GUSG will focus on the populations with the greatest potential to support viability in the future, the Gunnison Basin, Piñon Mesa, San Miguel Basin, Crawford, and Monticello populations.

Resiliency of the Gunnison Basin, Piñon Mesa, San Miguel Basin, Crawford, and Monticello populations will be indicated by stable or increasing demographic trends over time with a sufficient number of individuals that successfully reproduce. The demographic metric to quantify a population's resiliency is the running 3-year average of its annual high male count (HMC), the standard, rangewide metric for evaluating population size.

Because habitat and demographic factors vary among the five populations, we are unable to establish a single, standard rangewide target for resiliency. Instead, past demographic trends inform when each of these populations were, and could again be, most resilient. For each population, we assessed historic periods of stability and growth between 1996 and 2018 and used the median to develop reasonable and objective HMC targets. We used the median of the raw annual HMC data to estimate these population targets because it is a preferred descriptive statistic for data sets with a skewed distribution, and better represents the central tendency more than a mean (CGSGSC 2008, p. 248). We will consider populations resilient when the populations meet and maintain these target HMCs for 7 out of 9 consecutive years, as measured

with the running 3-year average. GUSG populations naturally fluctuate and this period is sufficient to capture population highs and lows as well as allowing for stochastic events that could temporarily reduce HMCs or affect accessibility to monitor leks.

Meeting and maintaining population targets will require a variety of actions including, but not limited to, translocations, habitat protections, and habitat improvements. Because HMCs are the direct demographic factor measured, we use that as our target. Total population estimates can be calculated from the HMCs using assumed sex ratios, percentage of leks counted, and percent of males counted at leks, but these extrapolations have many assumptions so are not as useful as targets (GSRSC 2005, p. 40). Assumptions for these calculations in the Rangewide Conservation Plan (RCP) include a 1:1.6 male to female ratio, that 100 percent of the leks are counted, and that HMCs represents 53 percent of males in each population (GSRSC 2005, p. 45). In our delisting Criterion 1 (Table 1), we provide the approximate population sizes associated with the target HMCs for each population as relative estimate of population size for informational purposes only.

Presently, Gunnison Basin is the only population that is highly resilient as indicated by long-term, stable HMCs. This population has sustained counts greater than the target HMC (Criterion 1) and has significant habitat protections such that the population is likely to persist at current levels into the future (Service 2019, p. 81). Carefully managed and strategic augmentation of the San Miguel Basin, Piñon Mesa, Crawford, and Monticello populations by translocations of birds from the Gunnison Basin population will be an essential tool towards achieving the demographic recovery criteria in those populations. Regulatory certainty in the form of Federal land use plans, county regulations, and conservation agreements will help reduce the risk of future population declines.

The Dove Creek population has not demonstrated demographic resiliency as indicated by severe decreases in HMCs that did not rebound, and is not expected to have more than low resiliency in the future (Service 2019, p. 69). The decline in Dove Creek is likely due to the low quality and quantity of existing habitats from prolonged human activities including land conversion to agriculture, residential development, and improper livestock grazing (Service 2019, p. 47). The CSCSM population has had very low HMCs since standardized counts started in 1996, and they have remained steady with very little increase or decrease. The consistently low HMCs in CSCSM are likely due to the natural topography limiting sagebrush habitat, as well as habitat reduction from human activities including residential development, construction of roads, recreation, and improper livestock grazing (Service 2019, p. 46).

Therefore, establishing demographic targets for the Dove Creek and CSCSM populations would not be feasible or contribute significantly to recovery. However, habitats in Dove Creek and CSCSM populations provide important connectivity between other populations and can maintain a degree of resiliency, and should therefore be maintained even if GUSG do not use the areas as long-term habitat. Additionally, the habitats in the Dove Creek and CSCSM populations may support the species rangewide by supporting resiliency in nearby populations through maintaining forage habitat. Therefore, recovery in the Dove Creek and CSCSM will be measured by the maintenance and improvement of habitats, rather than by establishing or maintaining populations to meet HMC targets. Increasing and maintaining habitats in Dove

Creek and CSCSM will provide important habitat connectivity between other populations, ensuring that these populations continue to contribute to the redundancy and representation of the species rangewide.

To measure the quantity of habitat needed in Dove Creek and CSCSM for recovery, we will estimate the habitat quantity needed to support a surrogate target HMC. The habitat quantity will be calculated per methods described in the RCP (GSRSC 2005, p. 191) and SSA (Service 2019, p. 91), using a linear model to compare a quantity of available GUSG habitat to the surrogate HMC. The target for habitat quantity in the Dove Creek and CSCSM populations would be enough to support the HMC surrogate targets, which we identified using the same methods for the population targets previously developed for the Gunnison Basin, San Miguel Basin, Piñon Mesa, Crawford, and Monticello populations. As such, the Dove Creek population needs a quantity of habitat that could support a population with a HMC of 30 and CSCSM needs a quantity of habitat that could support a HMC of 7.

To summarize the state of the three Rs needed for recovery of GUSG, resilient populations in the Gunnison Basin, San Miguel Basin, Piñon Mesa, Crawford, and Monticello populations, and improved and conserved habitat in the Dove Creek and CSCSM populations will indicate **resiliency** and **redundancy** for GUSG. **Representation** of GUSG will be maintained through the conservation of these five resilient populations in ecologically diverse areas. Gunnison Basin, San Miguel Basin, Piñon Mesa, Crawford, and Monticello contain approximately 99 percent of the breeding birds of the species (Service 2019, p. 88) and occur in five out of the six currently occupied ecoregions.

The SSA evaluated threats to the viability of GUSG and ameliorating those threats is a key component of the recovery of GUSG. Because the resiliency of GUSG populations is intricately tied to the quality and quantity of sagebrush habitats, an increase in the quality or quantity of habitat should increase the number of GUSG in a population. Habitat management to reduce or ameliorate threats may continue into the foreseeable future, as needed. Commitments to improve and maintain the quality and quantity of habitat are necessary to ensure the viability of GUSG into the future. Improvement of regulatory mechanisms in smaller populations will reduce habitat loss, which was a significant factor for the decision listing GUSG as a threatened species on November 20, 2014 (79 FR 69191).

Adequate **rangewide habitat conservation and restoration** will be achieved when the factors negatively affecting GUSG demographic and habitat needs are addressed through a variety of actions, including regulatory mechanisms and other conservation plans. Resilient populations in Gunnison Basin, San Miguel, Piñon Mesa, Crawford, and Monticello will indicate that threats have been effectively reduced or ameliorated. Improved habitat quantity and protections in Dove Creek and CSCSCM will also indicate the effectiveness of threat reduction and amelioration.

The BLM manages approximately 42 percent of the GUSG habitat within the overall occupied range (79 FR 69191). As a result, the BLM is a critical partner in GUSG recovery. BLM manages lands for a variety of uses; therefore, the Service will continue to assist the BLM in improving and conserving the condition of GUSG habitats under their purview, as well as with

reducing and ameliorating threats. Establishing durable regulatory mechanisms that are binding and enforceable, such as revised land use planning amendments, will be important for recovery.

Approximately 43 percent of the GUSG occupied habitat lands are privately owned, and habitat in 4 of the 7 populations needed for recovery is more than 50 percent privately owned (79 FR 69191). Therefore, recovery depends on the voluntary cooperation and willing participation of private landowners. The collaboration of private landowners, city and county leaders, and relevant State and Federal agencies to advance local conservation strategies will also be important. Much of the private lands in the Dove Creek and Monticello populations are used for agriculture, and the Farm Service Agency (FSA) and Natural Resources Conservation Service (NRCS) have programs that will play an essential role in improving GUSG habitat there.

The period required to improve the viability of GUSG is largely influenced by its life history, the growth rates of sagebrush habitat, and annual climate variation. Because GUSG populations often fluctuate between years on an unpredictable cycle, managing for recovery over seven to nine years allows sufficient time for populations to successfully indicate resiliency through sustained HMCs supported by ongoing habitat management.

II. Recovery Criteria

Delisting Criteria

The following recovery criteria for delisting, when met would indicate that Gunnison sage-grouse may no longer need the protections of the Act:

1. High male count (HMC) targets are maintained in the Gunnison Basin, San Miguel Basin, Piñon Mesa, Crawford, and Monticello populations as described in Table 1, as measured by the running 3-year average for at least 7 out of 9 consecutive years.

Table 1. Summary of demographic targets for GUSG (HMC) and the estimated corresponding population size derived using the equation in the Rangewide Conservation Plan for GUSG (GSRSC 2005, p. 45) and based on the target HMC. The target HMC is the demographic target for this criterion and we provide the estimated population size only as a reference for scale.

Population Name	Target HMC (Recovery Criteria)	Corresponding Estimated Population Size*
Gunnison Basin	748	3669
San Miguel	57	280
Piñon Mesa	28	137
Crawford	41	201
Monticello	31	152

*Estimated population size is not a criterion and is provided as an approximation of the corresponding population size associated with the corresponding target HMC.

The HMC targets described in Table 1 are based on consecutive years of stable or increasing growth since 1996, specific to each population, and have been selected as targets that best capture the achievable resiliency for each population, while also considering limitations associated with the decreased quantity of available habitat. In the "Corresponding Estimated Population Size" column, we provide the estimated population size for these targets as a reference only. The targets were created using the raw median, or midpoint, HMC from the periods of stability or increasing growth for each population. The median is a preferred descriptive statistic for data sets with a skewed distribution because it represents the central tendency better than a mean or average (CGSCSC 2008, p. 248). A new population viability analysis (PVA) to be developed could help refine these HMC targets for the final recovery plan. Maintaining targets for at least 7 out of 9 years is sufficient to indicate that populations are stable, while also accounting for natural fluctuations in population size, environmental stochasticity, or unforeseen challenges to completing annual counts. For example,

normal, stochastic events could decrease a population's HMC below the target and not be indicative of a declining population, especially if the HMC rebounds the following year. Achieving and maintaining these HMC targets indicate that the populations are resilient and will contribute to the viability of the species. These targets will only be achieved through actions that reduce or ameliorate threats that degrade and destroy habitat, such as the implementation of conservation plans and programs.

2. Regulatory mechanisms or other conservation plans or programs, such as land-use management plans, reduce and ameliorate threats associated with habitat loss and degradation in all populations, such that:

    A. Habitat in Dove Creek is improved and maintained at a quantity calculated to support a HMC of 30, although this criterion is not measured by achieving the target HMC.

    B. Habitat in CSCSM is maintained at a quantity calculated to support a HMC of 7, although this criterion is not measured by achieving the target HMC.

    C. Habitat is improved and maintained in Gunnison Basin, San Miguel, Piñon Mesa, Crawford, and Monticello at a quantity calculated to support the target HMCs as listed in Table 1.

Increasing the quantity and quality of habitats in GUSG populations will support resiliency and increases in the number of resident GUSG in these populations. Increasing and maintaining habitats in Dove Creek and CSCSM will also ensure that the Dove Creek and CSCSM populations continue to contribute to redundancy and representation, and provide habitat connectivity between other populations.

III. Prioritized Recovery Actions

The following is a list of prioritized actions, including site-specific management actions, that when fully implemented are expected to result in recovery of GUSG. Priority 1 actions are defined as those actions that currently available information suggests, must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future. Priority 2 actions are those that must be taken to prevent a significant decline in population size or habitat quality or some other significant negative impact. The assignment of priorities does not imply that some recovery actions are of low importance, but instead implies that lower priority items may be deferred while higher priority items are being implemented. Please refer to Table 2 for a clear association among recovery actions and the threats addressed by these actions. Specific tasks required to implement these recovery actions will be detailed in the RIS to be completed following finalization of this draft recovery plan.

Priority 1 Actions

1. Translocate GUSG from the Gunnison Basin population into the Piñon Mesa, San Miguel Basin, Crawford, and Monticello populations or augment these populations with other appropriate methods (Criteria 1). Augmentation will be prioritized into populations with sufficient existing habitat to support more birds and regulatory mechanisms that ensure threats to birds and habitat are ameliorated. High priority augmentation will also be conducted in emergency situations to prevent extirpation while waiting for habitat quantity and quality improvements.

    a. The Piñon Mesa and San Miguel Basin populations have existing habitat that could support more than the current number of birds, therefore augmentation should begin there and be concurrent with habitat improvement actions.

    b. Augmentation in the Monticello and Crawford populations may be used to prevent extirpation because current HMCs are very low. However, prior to a greater population augmentation effort, significant habitat improvements to improve habitat need to be completed to provide sufficient suitable habitat to reach target HMCs. In the Monticello population, habitat improvements need to increase sagebrush cover, sagebrush age diversity, and forb diversity and abundance. In the Crawford population, habitat improvements need to increase sagebrush cover, sagebrush age diversity, reduce piñon-juniper, and manage oak brush and serviceberry to maintain sagebrush.

2. Conserve existing habitats (Criteria 1 and 2) by:

    a. Improving Federal resource management plans (RMPs) and collaborating with counties to avoid, minimize, and mitigate disturbances to GUSG and the loss or degradation of their habitat, including on both Federal surface estates and Federal mineral estates. Areas to be prioritized include occupied and suitable habitat within 4 miles (6.4 kilometers) of currently active leks (where suitable/potential habitat exists) and by following avoidance, minimization, and mitigation near

active leks. Inactive and historic leks can be prioritized next for conservation if habitats in these areas could potentially be improved. Disturbances include oil, gas, and mineral development, traffic, and noise in Dove Creek, CSCSM, and San Miguel Basin populations, residential development, and road developments.

b. Improving public awareness, incentives, and resources for conservation easements and fee-title acquisitions on private lands in all populations, while prioritizing properties near leks.

Priority 2 Actions

3. Identify and develop tools to improve habitat data collection, quantify existing seasonal habitat availability, and monitor habitat changes over time in all populations (Criteria 2).

4. Improve habitat quality and quantity (Criteria 1 and 2) by:

    a. Restoring and developing mesic and summer habitats in the Gunnison Basin, Piñon Mesa, San Miguel Basin, Crawford, Monticello, Dove Creek, and CSCSM populations.

    b. Treating and removing phase I and II piñon-juniper encroachment levels (November 20, 2014; 79 FR 69191). Areas with a high quality understory and adjacent to existing, occupied habitat should be prioritized, especially in the Crawford, Dove Creek, San Miguel Basin, CSCSM, and Piñon Mesa populations.

    c. Maximize effectiveness of all Federal programs on private and public lands, through increased collaboration and implementation of existing programs. This includes and is not limited to increasing the number of acres enrolled in Conservation Reserve Programs through the FSA and NRCS, especially in the Monticello and Dove Creek populations. Federal program implementation and collaboration may also include encouraging range maintenance practices that are more conducive to GUSG habitat needs, planting sagebrush, developing water features, and improving understory growth in all populations.

    d. Targeting habitat improvement projects that improve the understory in all populations through seeding, planting, and irrigation if possible.

    e. Collaborating with Federal land managers and landowners to modify current improper domestic grazing of cattle and sheep in the CSCSM and Crawford populations, respectively. Utilize best management practices for proper livestock grazing in all populations.

    f. Collaborating with Federal land managers, county weed control programs, and private landowners to target noxious weed treatments in GUSG habitat.

g. Assessing new and existing utilities (oil and gas, transmission lines, renewable energy, etc.) for areas that may cause greatest effects to GUSG. Actions to avoid or minimize effects from utilities include rerouting new utilities to avoid GUSG habitat, burying new or existing lines where feasible and appropriate, or retrofitting utilities with perch deterrents. This is of greatest concern in the Monticello, San Miguel Basin, CSCSM, and Gunnison Basin populations.

5. Continuing to implement road closures, road decommissioning, seasonal timing restrictions, and siting of roads to eliminate or minimize disturbance to GUSG and their habitat in all populations (Criteria 1 and 2). Road closures and decommissioning should be focused on federal system lands where roads are no longer used or are duplicative. Seasonal timing restrictions for non-residential traffic and siting of roads should be maintained on federal lands, as well as county road systems, as appropriate.

6. Assess areas of occupied habitat for high impacts from predators, then develop and implement strategic and collaborative predator management. Techniques include and are not limited to minimizing subsidies (roadkill, livestock mortalities, landfills, etc.) and/or predator control.

Table 2. Factors affecting the survival of GUSG (Service 2019, pp. 41–48; 79 FR 69192) and associated recovery actions and criteria. Although climate change and drought are factors negatively affecting GUSG throughout their range, the SSA (Service 2019, entire) and draft Collaborative Action Plan (EOCCGS 2018, entire) recognize that actions to address them are outside the scope of conservation planning. However, actions that increase the resiliency (health) of the landscape can help buffer the effects of climate change and drought to GUSG. Additionally, these more recent documents do not currently consider disease, predation, and recreation as driving forces behind population decline. Similarly, improved landscape health through habitat restoration and conservation can reduce the effects of these stressors.

Listing Factors under the Act	Threats Description	Recovery Actions	Recovery Criteria
Factor A The present or threatened destruction, modification, or curtailment of its habitat or range	Habitat decline due to residential development and conversion to agriculture	2, 3, 4, 5	II
	The effects of global climate change	2, 3, 4	II
	Invasive plants	4	II
	Piñon-juniper encroachment	4	II
	Improper grazing practices	4	II
Factor C	Disease	3, 4	II
	Predation	4, 6	II
Factor E	Small population size and structure	1	I
	Drought	2, 3, 4	II
	Recreation	5	II

IV. Estimated Time and Costs to Achieve Recovery

Table 3 summarizes the estimated time and costs to achieve the recovery of GUSG. The values in this table are derived from estimates of time and costs of actions similar to those described as recovery actions. These estimates will be described more specifically in the actions to be developed collaboratively with Federal, State, NGO, and local stakeholders in the Recovery Implementation Strategy (RIS). Costs include financial as well as volunteer and in-kind support. Table 3 shows only the actions to be implemented specifically for the recovery of GUSG. We estimate that the full implementation of these actions would improve the status of GUSG so that it could be delisted within 50 years following the adoption of this plan. Table 3 projects estimated costs through years 1 to 50.

Table 3. Estimated time and costs of conservation actions specifically for recovery of GUSG.

Action Number	Costs ($1,000s) and Time Frames (Years)								
	Action	Sub-Action	1-5	6-10	11-15	16-20	20-30	30-50	Total
1	Population Augmentation	N/A	660	660	660	660	1,320	2,640	6,600
2	Conserve Existing Habitat	land-use planning	18,000	18,000	18,000	-	-	-	54,000
		conservation easements and fee-title acquisitions	48,160	48,160	48,160	48,160	96,320	20,000	308,960
3	Habitat data collection tools	N/A	120	100	100	100	200	400	1,020
4	Improve Habitat Quality and Quantity	mesic habitat restoration	341	341	341	168	336	672	2,199
		pinyon-juniper maintenance	238	238	238	238	476	952	2,380
		NRCS/FSA programs	12,500	12,500	12,500	12,500	25,000	50,000	125,000
		Understory improvements	175	175	175	175	350	700	1,750
		Improve livestock grazing practices	638	30	30	30	60	120	905
		invasive weed treatments	762	762	762	762	1,524	3,048	7,620
		utility corridor management	400	3,130	3,130	3,130	6,260	12,520	28,570
5	Roads	N/A	2,550	2,550	2,550	2,550	-	-	10,200
6	Predator Management	N/A	1,134	1,134	1,134	1,134	2,268	4,536	11,340
Totals:			85,678	87,780	87,780	69,607	134,114	95,588	560,547

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VI. Glossary

Term	Definition
Catastrophe	A wide-ranging event that may result in the loss of one or more populations.
High Male Count (HMC)	Annual counts of males strutting at leks. Leks are visited multiple times during the breeding season, and the highest count from the visits is the annual HMC. Standardized collection rangewide and the best available data to evaluate demographic conditions of GUSG populations.
Median	A value or quantity lying at the midpoint of a frequency distribution of observed values or quantities, such that there is an equal probability of falling above or below it.
Redundancy	Redundancy is the ability for the species to withstand catastrophic events, for which adaptation is unlikely, and is associated with the number and distribution of populations. The number of populations or sites necessary to endure catastrophic losses (Shaffer and Stein 2000, pp. 308-310).
Representation	Representation is the ability of a species to adapt to changes in the environment and is associated with its diversity, whether ecological, genetic, behavioral, or morphological. The genetic diversity necessary to conserve long-term adaptive capability (Shaffer and Stein 2000, pp. 307-308).
Resilience	Resiliency is the ability for populations to sustain in the face of stochastic events, or for populations to recover from years with low reproduction or reduced survival, and is associated with population size, growth rate, and the quality and quantity of habitats. In general, it is the size of populations necessary to endure random environmental variation (Shaffer and Stein 2000, pp. 308–310).
Species viability	A species' ability to sustain populations in the wild beyond the end of a specified time period, assessed in terms of its resilience, redundancy, and representation (USFWS 2016).
Stochastic	Random or non-deterministic events. Can also refer to natural changes in genetic composition of a population, unpredictable fluctuation in environmental conditions, or variation in population demographics (USFWS 2016).
Taxonomy/Taxon-omist	Scientific classification of living organisms and biologist specializing in classification of organisms.
Viability	See “Species Viability” above

VII. Literature Cited in Glossary

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