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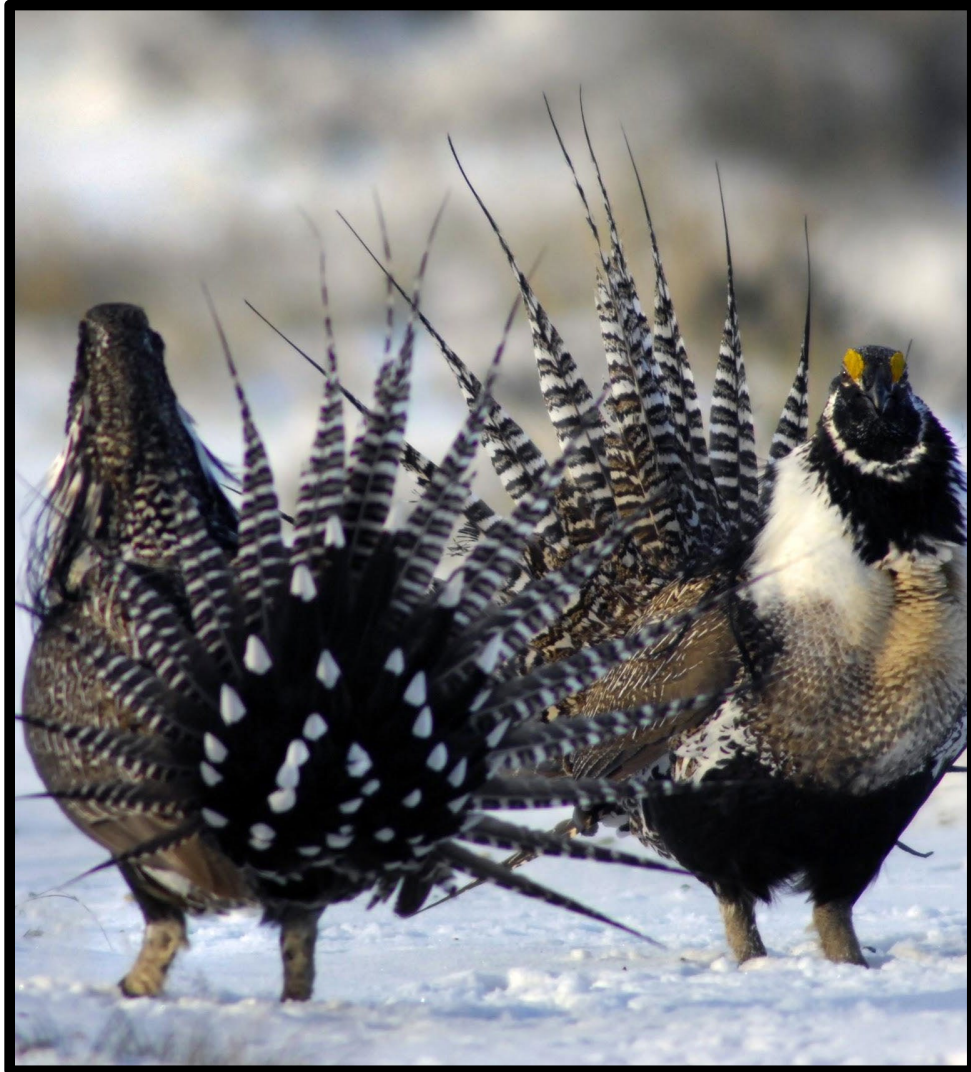

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U.S. Fish and Wildlife Service
Upper Colorado Basin Region
Lakewood, Colorado

Final Approved_____ **Date**_____
Regional Director, U.S. Fish and Wildlife Service

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In this document, the first uses of technical terms are underlined, and defined in the appendix glossary.

Prepared by Allison Hearne, U.S. Fish and Wildlife Service, Colorado Ecological Services Field Office, Grand Junction.

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, entire), 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 prepared 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 as needed if monitoring reveals that expected results are not being achieved, thereby maximizing flexibility of recovery implementation. The SSA report can also be updated as needed to incorporate the latest scientific information. To summarize, there are three documents under the Service's recovery planning and implementation (RPI) process: (1) the SSA report, which provides the foundational scientific information to guide recovery planning; (2) the recovery plan (this document) which provides the recovery vision, objective and measurable

recovery criteria, site-specific management actions, and estimates of time and cost; and finally (3) the RIS, the operational plan of detailed activities for recovery.

Overview

The following is a brief overview of the natural history and biological status of GUSG, as documented in our SSA report (Service 2019, entire). Please refer to the SSA report (Service 2019, entire) 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 known to be 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 possibly northeastern Arizona (Schroder *et al.* 2004, p. 370). 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 of the eight 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, with additional translocations in the 2000s (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 7 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 (Service 2019, p. 15).
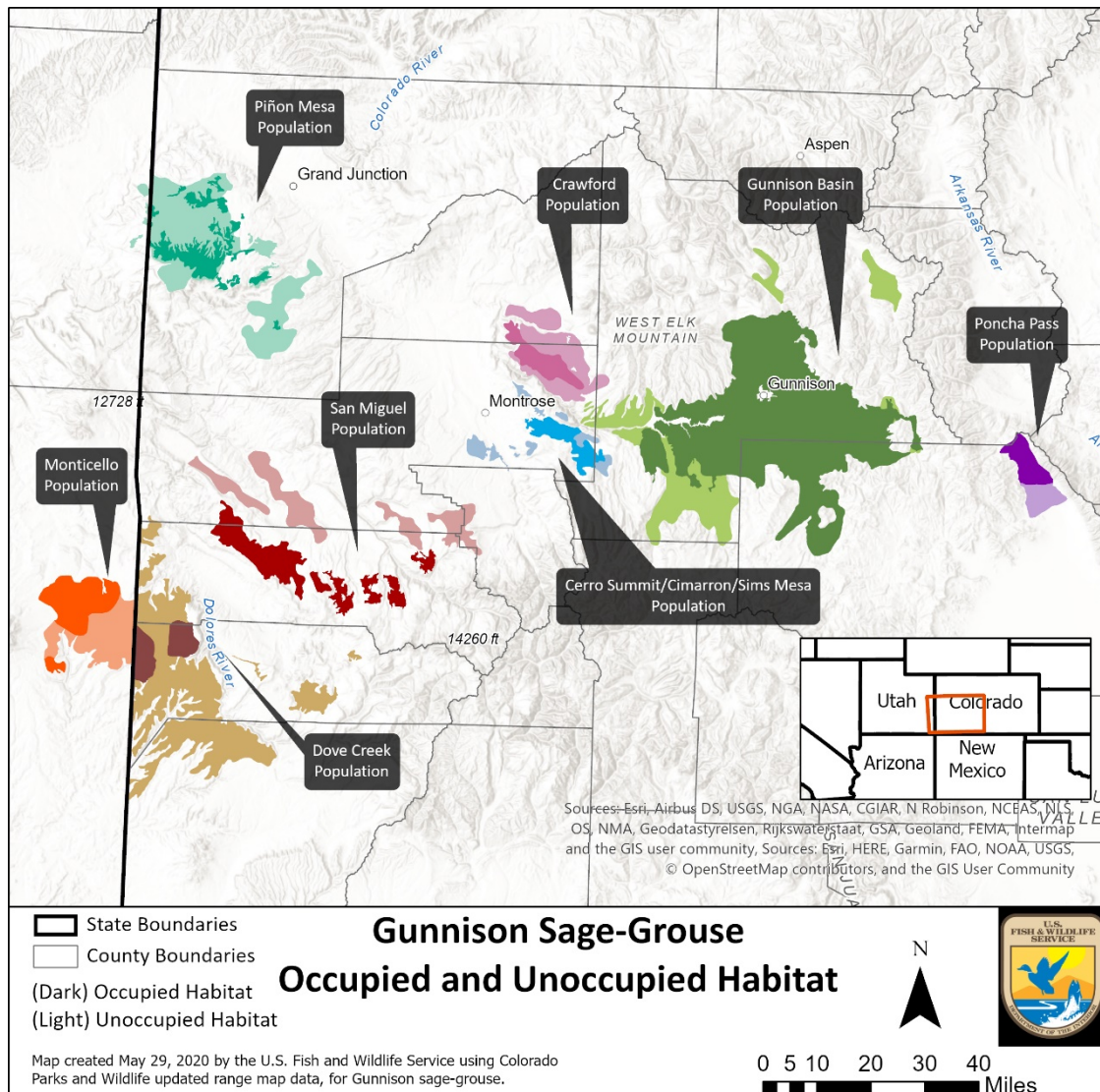

Figure 1. Current distribution of the eight GUSG populations in Colorado and Utah. Colors distinguish the populations. Light shading indicates likely, formerly occupied areas that still contain some of the appropriate biological and physical features for GUSG. The darker colors indicate occupied habitat 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.

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).

As described in our SSA report (Service 2019, entire), 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**,** collectively known as the 3Rs (Smith *el al.* 2018, p. 306). Based on the analysis documented in our SSA report (Service 2019, entire), 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). At the time of writing this final recovery plan, most populations, including the Gunnison Basin population, have decreased from their 2019 levels (CPW 2020, entire). Although the exact reasons for population declines are unknown, stochastic environmental and demographic changes have likely contributed. Subsequent updates to the SSA report as new scientific information becomes available, implementation of this recovery plan, and annual RIS stakeholder meetings (Recovery Action 12) will continue to guide recovery efforts to increase and maintain population resiliency throughout the range of GUSG.

Currently, the Gunnison Basin population contributes the most to the viability of GUSG (Service 2019, p. 52). As one of two with high resiliency, the Gunnison Basin population is currently the most resilient of the eight GUSG populations due to its high population numbers and natural recruitment, (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 augmentation, mesic habitat restoration, 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, the Poncha Pass population is not considered 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 relies on augmentation in smaller 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.* 2019a, p. 8) and careful consideration of locally adapted genetic variation will be needed (Zimmerman *et al.* 2019b, p. 1672).

For redundancy, there are currently eight populations distributed narrowly in southwestern Colorado and a small corner of Utah (Figure 1, above). This narrow distribution increases risk

that a <u>catastrophic</u> event could affect the entire species, such as multi-year and 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). Zimmerman *et al.* (2019b, p. 1673) identified signals of adaptive divergence associated with potentially ecologically important genes and groups of genes, which may underlie adaptive divergence among populations of GUSG, and adaptations to the specific sagebrush and ecosystems within each population.

Recovery Vision

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

Recovery Strategy

The recovery strategy describes the path needed to achieve the recovery vision. We consider Gunnison sage-grouse populations 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 and degradation that has negatively affected the current viability of GUSG (Service 2019, p. 36). However, the quantity of sagebrush habitats available to GUSG across the seven populations is largely limited by the unique geography and topography that surrounds and defines the outer boundaries of each population (Figure 1, above). Although reducing threats and improving habitats will be necessary to maintain or increase habitat quality and quantity across the seven populations, the quantity of GUSG habitats that each population currently provides or could provide in the future is somewhat static and confined by areas of non-habitat. This limits the population sizes of GUSG that each population historically supported, currently supports, or could support in the future, which means that the maximum state of resiliency achievable by each population varies. The Rangewide Conservation Plan recognized this when they established target High Male Counts (HMCs) for each GUSG population (GSRSC 2005, p. 2) and we accounted for this in our SSA report's evaluation of resiliency for each population by calibrating resiliency not to a specific HMC that is the same for each population, but instead by evaluating how close each population is to meeting its maximum achievable HMC as identified in the Rangewide Conservation Plan (Service 2019, pp. 31–34, 91–93). This ensured that our evaluation of resiliency could be applied consistently across the populations. Our recovery criteria rely on this calibration of resiliency, again based on how close each population is to achieving its target HMC, not one standard demographic target. We note that our evaluation of resiliency for each population is tied to that population's past demographic trends, as the target

numbers for each population are informed by periods in the past when high male counts were the highest.

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, defined specifically for each population based on target HMCs (GSRSC 2005, p. 2; Service 2019, pp. 31–34, 91–93) distributed across the overall range that maximize ecological and genetic diversity in order to withstand catastrophes and adapt to environmental change.

The recovery vision, as described above, addresses these species needs by describing four resilient populations (Gunnison Basin with high resiliency, San Miguel Basin with high resiliency, Piñon Mesa with high resiliency, and Crawford with moderate resiliency) to provide redundancy and representation and three populations with improved habitat conditions (high condition for habitat factors, but low resiliency overall due to low demographic factors) to provide connectivity and additional redundancy and representation. Therefore, the recovery strategy for GUSG is to implement actions and activities to improve and maintain the condition of four populations and habitats for seven populations such that these species needs, as described in the recovery vision, are met. As described below, we will use a demographic recovery criterion (Criterion 1), with population targets for the four populations and a threats-reduction criterion for seven populations (Criterion 2) to objectively measure when the recovery vision may have been reached. We describe this recovery strategy in more detail below.

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 (November 21, 2014; 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, and Crawford populations (Criterion 1). The recovery focus on these populations does not detract from ongoing or future conservation efforts in other populations, as improvements in resiliency in all populations will contribute to species viability and recovery. Improved and maintained habitats in the Dove Creek, Monticello, and CSCSM populations (Criterion 2) will contribute to connectivity, redundancy, and representation.

Recovery Criteria as Objective and Measurable Thresholds to Strategically Gauge Progress

Below, we describe how we developed and will strategically use two recovery criteria, a demographic criterion based on HMC demographic targets for four populations and a threat-reduction criterion for seven populations, to objectively measure progress toward recovery. Resiliency of the Gunnison Basin, Piñon Mesa, San Miguel Basin, and Crawford populations

will be objectively measured by stable or increasing demographic trends over time with a sufficient number of individuals that successfully reproduce (Criterion 1). The demographic metric to quantify a population's resiliency is the running 3-year average of its <u>annual high male count (HMC)</u>, the standard, rangewide metric for evaluating population size (Service 2019, p. 31).

The recovery vision for GUSG describes resilient populations, with stable or increasing demographic trends and a number of reproducing individuals, in the Gunnison Basin, Piñon Mesa, San Miguel Basin, and Crawford populations. According to our calibrated scale for resiliency as described in our SSA report (Service 2019, pp. 31–34, 91–93), this translates to high HMCs for the Gunnison Basin population, and medium HMCs for the Piñon Mesa, San Miguel Basin, and Crawford populations. We used the best available scientific information to establish demographic targets for these populations, as described below under Criterion 1, which could objectively and measurably signify when recovery has been achieved. Because habitat and demographic factors vary among the eight populations, we were unable to establish a single, standard rangewide demographic target for resiliency to use as a criterion to objectively measure recovery across all the populations. Instead, past demographic trends inform when each of the populations were, and could again be resilient (GSRSC 2005, p. 2; Service 2019, pp. 31–34, 91–93). For these four populations identified in the recovery vision (Gunnison Basin, Piñon Mesa, San Miguel Basin, and Crawford populations), we used the <u>median</u> HMC observed during periods of stability and growth between 1996 and 2019 to develop reasonable and objective HMC targets for a demographic recovery criterion (Criterion 1) (Service 2020, p. 2). 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). Criterion 1, as described below, establishes that these four populations would be considered resilient when the populations meet and maintain the described target HMCs for 7 out of 9 consecutive years, as measured with the running 3-year average. Although the 7 years that each population meets or exceeds the demographic target may be different, the 9-year period must be the same for all four populations (Criterion 1). GUSG populations naturally fluctuate and this period of measurement 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.

As described below, Criterion 1 establishes demographic targets needed for four populations (the Gunnison Basin, Piñon Mesa, San Miguel Basin, and Crawford populations) identified in the recovery vision for each population to be considered resilient in terms of our calibrated scale for resiliency (GSRSC 2005, p. 2; Service 2019, pp. 31–34, 91–93): high HMC for Gunnison Basin, and moderate HMC for the Piñon Mesa, San Miguel Basin, and Crawford populations (Table 1, below). In conjunction with Criteria 2, these targets would result in high resiliency for the Gunnison Basin, Piñon Mesa, San Miguel Basin populations and moderate resiliency in the Crawford population.

We developed and refined Criterion 1 using the best available scientific information as summarized in our SSA report (Service 2019, entire), expert judgement from a technical team of scientific experts, and by reviewing and incorporating feedback and comments that we received following the announcement of the draft recovery plan in the *Federal Register* (November 1,

2019; 84 FR 58734). As an extra step, we also used computational population modeling (Service 2020, entire) to verify that the demographic targets in Criterion 1 for the Gunnison Basin, Piñon Mesa, San Miguel, and Crawford populations (Table 1, below) would be indicative of resilient populations, according to the recovery vision, such that recovery for the species could be considered. The computational model to test these targets included a variety of demographic factors for GUSG as inputs, including reproductive rates, juvenile, yearling, and adult mortality rates, estimates of current carrying capacity, and initial population sizes drawn from existing literature and data for GUSG, and greater sage-grouse where GUSG-specific information wasn't available (Service 2020, entire). Stochastic events (environmental variation) were inherent in the model and further captured by standard deviations in the underlying data (Service 2020, entire). At these targets, the model predicted population trends that were stable or increasing for each population, which supports that they are indicative of resiliency for each population. This modeling exercise verified that the demographic targets described in Criterion 1 are indicative of resilient populations for the Gunnison Basin, Piñon Mesa, San Miguel, and Crawford populations, so they are suitable objective and measurable thresholds to measure progress toward achieving the recovery vision, and hence, recovery of the species.

The demographic targets for the four populations established in Criterion 1 will be objectively measured using the HMC, the standard rangewide metric for populations of GUSG. 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 demographic 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 known leks are counted, and that HMCs represents 53 percent of males in each population (GSRSC 2005, p. 45). Therefore, Criterion 1 will be objectively measured using HMCs. Given the inherent assumptions in their use, we provide for informational purposes only the approximate population sizes associated with the target HMCs for each population as relative estimates of population size under Criterion 1 (Table 1, below).

In addition to the four resilient populations of GUSG, the recovery vision describes improved habitats in all seven populations. This means that three populations, the Dove Creek, Monticello, and CSCSM populations, need improved habitats, but not resilient populations for recovery. According to our calibrated scale for resiliency (Service 2019, pp. 31–34, 91–93), the habitat quality and quantity would be of high condition, but these populations would overall have low resiliency, due to the low condition of the demographic factors needed for recovery. The Dove Creek and Monticello populations occur in the same ecoregion, the Monticello-Cortez Uplands ecoregion. Historically, these populations were part of a single, continuous population. Neither population has demonstrated demographic resilience, as indicated by severe decreases in HMCs that have not rebounded. We expect at best, they will have low resiliency in the future (Service 2019, p. 69). The declines in Dove Creek and Monticello are likely due to the low quality and quantity of existing habitats from prolonged human activities, primarily land conversion to dry-farming agriculture and associated residential development, and very dry climate conditions (Service 2019, pp. 47–48). Given the low numbers of birds in the Dove Creek and Monticello populations, even if habitat factors improve, we expect HMCs to remain low unless we are able to reestablish habitat connectivity (reduce habitat fragmentation) within and between these two populations, and subsequently increase population sizes through augmentation. Therefore, the

recovery vision describes improved habitats for the Dove Creek and Monticello populations, not resilient populations, and recovery will be signified by the improvement and maintenance of habitats. We note that although recovery of the GUSG does not require resilient Dove Creek, Monticello, and CSCSM populations, reestablishing or augmenting these populations is possible and could contribute to overall species viability.

The CSCSM population is very small with consistently low HMCs since standardized counts started in 1996. The 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). Even if habitat factors improve in the remaining habitat area, we expect HMCs to remain low in the CSCSM population. However, the CSCSM population's habitat area is important to maintain connectivity between other GUSG populations. Therefore, similar to Dove Creek and Monticello, recovery of the GUSG as stated in the recovery vision does not require a resilient CSCSM population, but rather improved habitat conditions to support connectivity, redundancy, and representation.

The Dove Creek, Monticello, and CSCSM populations contribute to connectivity between resilient populations and to the redundancy and representation of the species rangewide. As stated above, the recovery vision describes improved habitats, not resilient populations, in these three populations. Improved habitats in these three populations will require recovery actions that reduce threats associated with habitat loss and fragmentation. Therefore, in order to objectively measure progress toward achieving this recovery vision, we developed a threat-reduction, habitat quality-and quantity-based recovery criterion for these three populations, as described under Criterion 2, below. Under Criterion 2, there is only one habitat target for both the Dove Creek and Monticello populations, because it is important to reestablish the connectivity between the two populations.

The recovery vision describes improved and maintained habitats in the Dove Creek, Monticello, and CSCSM populations. As stated above, resilient populations are not needed in these three populations for recovery, but their habitats are needed to provide connectivity and additional redundancy and representation. However, there is currently no consistent, standard methodology to measure GUSG's sagebrush habitats range wide, and given the variation in habitats across the seven populations, we could only establish target HMCs for these three populations as a surrogate for the amount of habitat that would be indicative of recovery (Criterion 2). We also established a recovery action to identify and adopt this needed habitat metric (Recovery Action 10). In other words, in the absence of quantifiable metric for habitat quality and quantity, Criterion 2 provides demographic targets for the Dove Creek, Monticello, and CSCSM populations, as a surrogate for describing the amount and quality of sagebrush habitat that would maintain GUSG populations of that HMC size, with the methodology to measure the amount of habitats to be identified later as a recovery action (Recovery Action 10).

Recovery Action 10 describes the need to identify existing tools and develop tools as needed to improve habitat data collection, and to quantify existing seasonal habitat availability, and monitor habitat changes over time in all populations, in order to measure Criterion 2. A variety of metrics to measure habitats are already available that could be adopted and used to measure

Criterion 2, including those described in the RCP (GSRSC 2005, p. 191) and the SSA report (Service 2019, p. 91) that consider habitat quantity. Methods may also include any new methods that are developed as improved habitat data and conservation effort information becomes available. Although the exact methodology to measure Criterion 2 has yet to be determined, the HMC targets to be used as a surrogate for habitat quality and quantity are achievable and reflective of the recovery vision given their acreage and site-specific habitat factors (Service 2020, p. 3). We again used the best available scientific information as summarized in our SSA report (Service 2019, entire), feedback from our technical team of scientific experts, and feedback from our public comment period on the draft recovery plan, to develop and refine this recovery criterion.

Recovery Actions to Strategically Meet the Recovery Vision

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 to list GUSG as a threatened species under the Act on November 20, 2014 (79 FR 69191).

Adequate rangewide habitat conservation and restoration will be achieved when the threats negatively affecting GUSG demographic and habitat needs are addressed through a variety of actions, including regulatory mechanisms (Recovery Actions 3 and 6), habitat treatments (Recovery Actions 1, 2, 5, 7, 8, 9, and 11), and other conservation plans and actions (Recovery Actions 4, 10, and 12). Resilient populations in the Gunnison Basin, Piñon Mesa, San Miguel, and Crawford populations, as objectively measured under Criterion 1, will indicate that threats have been effectively reduced or ameliorated. Improved habitat quantity and protections in the Dove Creek, Monticello, and CSCSCM populations, as objectively measured under Criterion 2, will also indicate the effectiveness of threat reduction and amelioration.

Meeting and maintaining the HMC targets of Criterion 1 for the Gunnison Basin, Piñon Mesa, San Miguel, and Crawford populations will require a variety of recovery actions including, but not limited to: population augmentation (through translocations or captive rearing) (Recovery Action 4), habitat protections (Recovery Actions 3 and 6), and extensive habitat improvements (Recovery Actions 1, 2, 5, 7, 8, 9, and 11). In the following discussion, we describe the recovery strategy in terms of the recovery actions for each of these four populations in more detail.

Presently, Gunnison Basin is the only population that has high resiliency, as indicated by large population sizes, large quantities of habitat, and high quality habitat. This population has historically sustained counts greater than its target HMC under Criterion 1, has significant habitat protections, and ongoing habitat improvement efforts such that the population is likely to remain resilient into the future (Service 2019, p. 81). Carefully managed and strategic augmentation of the San Miguel Basin, Piñon Mesa, and Crawford, populations by translocations or augmentation

will be an essential tool towards achieving the demographic recovery criteria in those populations (Recovery Action 4).

In all GUSG populations, including the Monticello, Dove Creek, and CSCSM populations, recovery actions that protect and improve habitat will be essential towards reducing threats and improving habitat (Criterion 2 and Recovery Actions 1, 2, 5, 7, 8, 9, and 11). For example, Gunnison County has implemented a process for tracking effects to habitat from development and a thorough review process to avoid and minimize effects to GUSG. Further regulatory certainty in the form of Federal land use plans, county regulations or mitigation processes in all counties where GUSG are present, and conservation agreements or broad stakeholder and collaboration in all populations will help reduce the risk of future population declines (Recovery Actions 3 and 6).

The BLM manages approximately 42 percent of the GUSG habitat within the overall occupied range (79 FR 69191; November 20, 2014). As a result, the BLM is an important partner in GUSG recovery. The 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 actions to reduce and ameliorate threats. Working with all Federal agencies within the range of GUSG to establish durable regulatory mechanisms that are binding and enforceable, such as revised land use planning amendments, will be important to the recovery of GUSG (Recovery Actions 3 and 6).

Much of the private lands in the Dove Creek and Monticello populations are now used for agriculture. For the past 25 years, the Farm Service Agency's (FSA) Conservation Reserve Program, implemented by the Natural Resources Conservation Service (NRCS), provided landowners with financial incentives to plant lands with grasses and native forbs instead of active agricultural production. Much of the lands enrolled in the CRP program may contribute to providing some feeding and sheltering habitat for GUSG. However, this program can be improved through increased efforts of planting sagebrush and establishing more GUSG habitats through longer-term habitat maintenance incentives. In 2010, the NRCS launched the Sage Grouse Initiative (SGI) a partnership-based, science-driven effort that uses voluntary incentives to proactively conserve western rangelands, wildlife, and rural way of life. These efforts are part of Working Lands for Wildlife (WLFW) program through which the NRCS systematically targets conservation efforts to improve agricultural productivity, which enhance wildlife habitat on working landscapes. Expanding NRCS partnerships in Dove Creek and Monticello will play an essential role in habitat and environmental restoration for GUSG within these populations and throughout the range of GUSG.

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; November 20, 2014). 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 is important to the recovery of GUSG.

Summary of the Recovery Strategy

The recovery vision describes resilient populations in the ecologically diverse areas of Gunnison Basin (high HMC; high resiliency), San Miguel Basin (medium HMC; high resiliency), Piñon Mesa (medium HMC; high resiliency), and Crawford (medium HMC; medium resiliency) populations will indicate resiliency, redundancy, and representation for GUSG. Gunnison Basin, San Miguel Basin, Piñon Mesa, and Crawford contain approximately 98 percent of the breeding birds of the species (Service 2019, p. 91) and occur in 4 out of the 6 currently occupied ecoregions. Additionally, improved and conserved habitat in the Dove Creek, Monticello, and CSCSM populations (high habitat conditions; low resiliency) will contribute to redundancy and representation needed for recovery of GUSG. The recovery strategy for GUSG is to complete recovery actions and activities, such as augmentation, regulatory protections, and habitat improvements, to improve and maintain demographic conditions for four populations and habitat conditions in seven populations. We will objectively measure progress toward recovery using two recovery criteria.

The period required to improve the viability of GUSG is largely influenced by its life history, the restoration and recovery timeline of sagebrush communities, and annual climate variation. Therefore, based on our understanding of the sagebrush ecosystem, current population levels, and current habitat conditions, we expect that recovery of GUSG could take approximately 30 years from the present.

II. Recovery Criteria

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted to threatened, or that the protections afforded by the Act are no longer necessary and a species may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from an endangered species to a threatened species. The term "endangered species" means any species (species, subspecies, or Distinct Population Segment) that is in danger of extinction throughout all or a significant portion of its range. The term "threatened species" means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made "solely on the basis of the best scientific and commercial data available." Thus, while recovery plans provide important guidance on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents. Recovery criteria help indicate when we would anticipate that an analysis of a species' status under section 4(a)(1) would result in a determination that the species

is no longer an endangered species or a threatened species. A decision to revise the status of, or remove a species from the Lists, however, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment, followed by a final decision announced in the *Federal Register*. The following recovery criteria are based on information compiled in the SSA report (Service 2019, entire), and other input provided by GUSG experts as well as conservation partners from across the range of the species. All criteria must be met in order for recovery to be considered.

Delisting Criteria

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

1. **Criterion 1 –** High male count (HMC) targets are maintained in the Gunnison Basin, San Miguel Basin, Piñon Mesa, and Crawford populations as described below 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 (high male count or 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 as a reference for scale only due to uncertainties and assumptions in the underlying crosswalk equation. These demographic targets are based on the best available information, expert judgement, and were verified using computational modeling.

Population Name	Target HMC (Recovery Criterion**)	Corresponding Estimated Population Size*
Gunnison Basin	752	3687
San Miguel	62	302
Piñon Mesa	29	142
Crawford	41	201

   *Estimated population size is not a criterion and is provided as an approximation of the corresponding adult population size associated with the target HMC.
   ** The quantity of GUSG habitats that each population currently provides or could provide in the future is somewhat static and confined by areas of non-habitat. This limits the population sizes of GUSG that each population historically supported, currently supports, or could support in the future, which means that the maximum state of resiliency achievable by each population varies.

Justification for Criterion 1 – The Recovery Strategy section, above, provides additional justification for Criterion 1, which we summarize here. We used the best available scientific information, as compiled and evaluated in our SSA report (Service 2019, entire), input from scientific experts, and feedback received during our public comment period on the draft recovery plan, to develop and refine this recovery criterion. This recovery criterion provides demographic targets for four GUSG populations that when met and maintained for at least 7 out of 9 consecutive years, and when considered in conjunction with Criterion 2, would signify that the recovery vision has been achieved, such that recovery of the species could be considered. This criterion is objective in that it clearly establishes demographic and temporal thresholds indicative of resilient populations, and redundancy and representation for the species, as described by the recovery vision. This criterion will be quantitatively measured using HMCs, a broadly accepted and rigorous demographic monitoring metric specifically used for GUSG. Scientific and technical experts on GUSG and computational modeling helped verify that these HMCs are suitable and sufficient targets for a recovery criterion that when met in conjunction with other criteria may indicate recovery of the species.

Criterion 1's HMC demographic targets, as outlined above in Table 1, are based on a period of consecutive years when each of these four population had stable or increasing growth between years 1996 and 2019. These HMCs are suitable demographic targets for each of these populations because at these HMCs, these populations will have sufficient resiliency to endure stochastic events, such that the recovery vision can be achieved. These HMC targets indicative of resilient populations were identified using the raw median, or midpoint, HMC from the periods of stability or increasing growth for each spring breeding period for each of the four populations. The median is a preferred descriptive statistic to the mean for data sets with a skewed distribution because it represents the central tendency better than a mean or average (CGSCSC 2008, p. 248). Scientific experts also helped justify these targets as indicative of resilient populations for each of these four GUSG populations. Further, at these targets, populations were stable or increasing, so computational population modeling helped verify that these demographic targets are suitable thresholds indicative of resilient populations, such that recovery could be considered (Service 2020, entire). Therefore, we believe that these HMC targets are indicative of the four resilient populations needed to achieve the recovery vision. In the "Corresponding Estimated Population Size" column (Table 1, above), we provide the estimated adult population size for these HMC targets as a reference only.

Our SSA report summarizes the current condition, based on the current HMCs and our calibrated scores for resiliency (Service 2020, pp. 32–34, 91–93), for each of these four populations, which we summarize here for ease of reference. Currently, the Gunnison Basin population has high resiliency with a HMC of 772 (Service 2019, p. 42). The San Miguel population currently has moderate resiliency with a HMC of 47 and the Crawford population currently has low resiliency with a HMC of 23 (Service 2019, p. 42). Recovery actions, including augmentations and the reduction and amelioration of threats, will be needed for the San Miguel and Crawford populations reach these target HMCs of 62 and 41, respectively. Although the Piñon Mesa population currently has a

medium HMC of 23, this population currently has high resiliency due to its high quality habitats (Service 2019, p. 42). Recovery actions that maintain and improve habitat quality and quantity, and improve connectivity in the Piñon Mesa population will help this population reach the HMC target of 29 from its current HMC of 23. Again, the best available scientific information, computational modeling, and species experts helped verify that the demographic HMC targets in Criterion 1 are indicative of resilient populations, such that recovery of the species could be considered when considered in conjunction with Criterion 2.

We believe that maintaining these targets for at least 7 out of 9 years is sufficient to indicate that populations are stable and resilient, while also accounting for natural fluctuations in population size, environmental stochasticity, or unforeseen challenges to completing annual monitoring counts needed to establish the HMCs. For example, normal, negative 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, especially in light of the cyclical population trends for GUSG.

The HMC targets described by Criterion 1 will only be achieved through recovery actions that reduce and ameliorate threats that degrade and destroy habitat, such as the implementation of conservation plans and programs or other actions that increase habitat quality and quantity (Criterion 2). Therefore, both criteria must be achieved before recovery may be considered.

2. **Criterion 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 and Monticello is improved and maintained at a quantity calculated to support a HMC of 51, as measured indirectly by the amount of available habitat, not the HMC or other demographic variables. The method used to measure the amount of habitat that would support a HMC of 51 has yet to be determined, but could include methods described in the RCP (GSRSC 2005, p. 191), the SSA report (Service 2019, p. 91), or new methods that are developed as improved habitat data and conservation effort information becomes available (Recovery Action 10). This HMC corresponds to a high condition for the habitat factors and low resiliency according to our calibrated scale of resiliency for GUSG (Service 2020, pp. 32–34, 91–93).

    B. Habitat in CSCSM is maintained at a quantity calculated to support a HMC of 7, as measured indirectly by the amount of available habitat, not the HMC or other demographic variables. The method used to measure the amount of habitat that would support a HMC of 7 has yet to be determined, but could include methods described in the RCP (GSRSC 2005, p. 191), the SSA report (Service 2019, p. 91), or new methods that are developed as improved habitat data and conservation effort information becomes available (Recovery Action 10). This HMC corresponds to a high condition for the habitat factors and low resiliency

according to our calibrated scale of resiliency for GUSG (Service 2020, pp. 32–34, 91–93).

C. Habitat is improved and maintained in Gunnison Basin, Piñon Mesa, San Miguel and Crawford at quantities calculated to support the target HMCs as listed in Table 1 (Criterion 1, above), and as measured using the HMCs for these four populations. These HMC corresponds to a high condition for the habitat factors according to our calibrated scale of resiliency and high resiliency for the Gunnison Basin, Piñon Mesa, San Miguel populations and medium resiliency for the Crawford population (Service 2020, pp. 32–34, 91–93).

Justification for Criterion 2 – The Recovery Strategy section, above, provides additional justification for Criterion 2, which we summarize here. We used the best available scientific information, as compiled and evaluated in our SSA report (Service 2019, entire), input from scientific experts, and feedback received during our public comment period on the draft recovery plan, to develop and refine this recovery criterion. Criterion 2 recognizes the importance of threat reduction and amelioration to the recovery of GUSG, and the importance of habitats in all seven populations. This will be achieved through the implementation of recovery actions, such as regulatory mechanisms or other conservation plans or programs that address habitat loss and degradation in all seven populations.

Although Criterion 2 is a threats-based criterion focused on the reduction and amelioration of threats needed to achieve the recovery vision's four resilient populations and habitat improvements for three populations, we again use HMCs to objectively measure this criterion. We identified these HMCs for the Dove Creek, Monticello, and CSCSM populations using the same methodology used to identify the HMC targets under Criterion 1, including computational modeling and the input of species experts. Ideally, we would have established target quantities and qualities of habitat for each population that would indicate when threats had been sufficiently reduced and ameliorated. However, the natural capacity for high quality GUSG habitat varies with each population due to the wide range of environmental variation across the species' range. Additionally, there are signals of potential genetic specialization within populations, which may indicate local environmental adaptations to specialized habitats across the seven populations (Zimmerman *et al.* (2019b, p. 1673). Lastly, there is currently no consistent or accepted methodology to measure GUSG habitats across the range, although there are several options or new methods could be developed. Therefore, much like the demographic HMCs of Criterion 1, we were unable to establish one uniform habitat target for each population that would be needed for recovery, given that there is large variation in habitat quality and quantity among and between populations. Therefore, given the variation and unique nuances in the quality and quantity of habitats across the seven populations, and in the absence of a standardized metric to measure the quantity and quality of habitats, we use HMCs to measure the reduction and amelioration of threats under Criterion 2. This is reasonable given the direct influence that threats may have on the resiliency of populations, as measured using HMCs, and the redundancy and representation of the species.

Threats will need to be reduced and ameliorated in order for the Gunnison Basin, Piñon Mesa, San Miguel, and Crawford populations to meet and sustain their HMC targets listed in Criterion 1, which is emphasized by Criterion 2-C. For these four populations, the HMCs are measured according to the methodology established in Criterion 1. However, the recovery vision does not require resilient populations in the remaining three populations (Dove Creek, Monticello, and CSCSM), but rather improved habitats that are needed to ensure connectivity, redundancy, and representation for the species. Threats must also be reduced or ameliorated in these three populations, as established by Criteria 2-A and 2-B. However, as described above, due to natural variation and no established monitoring methodology, there is no way for us to establish reasonable habitat targets for GUSG, so we developed surrogate HMCs as targets for these three populations in Criterion 2-A and 2-B that when met, would indicate improved and maintained habitats in these three populations. Although we have established a surrogate HMC for the Dove Creek, Monticello, and CSCSM populations in Criteria 2-A and 2-B, this will be measured by the amount of habitat using methodology yet to be determined. Methods to calculate habitat quality and quantity, such that the population would likely support the surrogate HMCs, may include those described in the RCP (GSRSC 2005, p. 191) and the SSA report (Service 2019, p. 91) or any new methods that are developed as improved habitat data and conservation effort information becomes available. Recovery Action 10 emphasizes the importance of identifying and adopting a rangewide habitat metric for GUSG in order to measure Criterion 2.

We emphasize that establishing these surrogate HMCs for the Dove Creek, Monticello, and CSCSM populations does not mean that these populations must maintain resilient populations at these HMCs, but rather that habitats are improved and maintained within these populations such that they *could* support populations at these HMCs. We note that as recovery actions are completed in the Dove Creek, Monticello, and CSCSM populations, establishing or augmenting these populations could be possible, but the recovery vision does not require resilient populations in these areas, which aligns with the recovery focus on the four populations with the greatest potential to support the species' viability, the Gunnison Basin, Piñon Mesa, San Miguel and Crawford populations.

This criterion is objective in that it clearly establishes quantitative thresholds for HMCs indicative of resilient populations for four populations and improved and maintained habitats for three populations, as measured using surrogate HMCs. This criterion is measurable in that it uses HMCs, a broadly accepted and quantitative demographic monitoring metric specifically used for GUSG to measure threat reduction and abatement. A recovery action is needed to identify and adopt a suitable metric to evaluate the quality and quantity of GUSG habitats, needed for three populations (Recovery Action 10).

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. Priority 3 actions are all other actions necessary to provide for full recovery of the species. 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. The RIS contains the specific tasks required to implement these recovery actions.

Priority 1 Actions

1. Improve habitat quality and quantity, and recruitment (Criteria 1 and 2), for example, by restoring and developing mesic and summer habitats in all populations.

2. Improve habitat quality and quantity (Criteria 1 and 2) by collaborating with Federal land managers, States, county weed control programs, and private landowners to target noxious weed prevention and removal in all populations.

3. Conserve existing habitats (Criteria 1 and 2) by improving Federal resource management plans and collaborating with State and local governments and private landowners to improve public awareness, incentives, and resources for conservation. Examples include and are not limited to NRCS' Sage-Grouse Initiative and Working Lands for Wildlife programs, the Service's Safe Harbor Agreements (SHAs) and Habitat Conservation Plans (HCPs), CPW's Wildlife Habitat Program, and conservation easements. Areas to prioritize for conservation and protection include occupied and suitable habitat within 4 miles (6.4 kilometers) of all leks (active, inactive, and historical) in all populations.

4. Augment the Piñon Mesa, San Miguel Basin, and Crawford populations through translocations from the Gunnison Basin or captive rearing (Criterion 1). Prior to translocations, further analysis is needed to ensure no adverse effects to the Gunnison Basin population. Until further analysis is completed, no GUSG should be removed from the Gunnison Basin if the most recent 3-year running average HMC is below the target (see Criteria 1). Augmentation will be prioritized into populations that have sufficient habitat (quality and quantity) to support GUSG and that have adequate regulatory mechanisms to ensure threats to GUSG and its habitat are ameliorated, such that the augmentation has a higher likelihood of success.

5. Improve habitat quality and quantity (Criteria 1 and 2) by targeting habitat improvement projects that improve the understory in all populations through seeding and planting native species beneficial to GUSG, and using irrigation if possible and necessary.

Priority 2 Actions

6. Improve habitat quality and quantity (Criteria 1 and 2) by collaborating with Federal land managers, Federal programs, and landowners to modify domestic grazing of cattle and sheep in allotments that are not meeting habitat structural guidelines (GSRSC 2005, Appendix H) for GUSG and livestock are the causal factor, in all populations. Modifications may include but are not limited to adjusting timing of grazing to reduce impacts to all seasonal habitats, fence removal or adjustment, modifying infrastructure development, or adjusting livestock timing and/or numbers.

7. Improve habitat quality (Criteria 1 and 2) by removing encroaching, low-density conifers (such as piñon-juniper) where best available science indicates removal will benefit GUSG and not harm other species. Areas with a high quality understory, adjacent to or within existing, occupied habitat, and sites of previous treatments should be prioritized, especially in the Crawford, Dove Creek, San Miguel Basin, CSCSM, and Piñon Mesa populations.

8. Continue to implement road and recreational closures, road and trail decommissioning, seasonal timing restrictions, and siting of roads and trails to eliminate and minimize physical and noise disturbances to GUSG and their habitat in all populations (Criteria 1 and 2), especially within 4 miles (6.4 kilometers) of all leks. Road and trail closures and decommissioning should be focused on Federal system lands where roads are no longer used or are duplicative and aim for road density of less than 0.79 miles per square mile (0.50 kilometers per square kilometer) density within the 4 miles surrounding leks (Aldridge *et al.* 2012, p. 402). Seasonal timing restrictions for recreation, non-residential traffic, and all other sources of noise disturbances should be maintained on Federal lands as well as county road systems to keep or reduce noise disturbance to no more than 10 decibels above ambient within 0.6 miles (0.97 kilometers) of leks (GSRSC 2005, p. I-6), where appropriate.

9. Assess areas of occupied habitat for high impacts from predators, then develop and implement strategic and collaborative predator management (Criterion 1). Techniques include and are not limited to minimizing subsidies (roadkill, livestock mortalities, landfills, etc.), reducing avian perches, habitat improvements, and/or predator control. This should be prioritized in the populations with HMC targets.

Priority 3 Actions

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

11. Improve habitat quality and quantity (Criteria 1 and 2) by assessing impacts to GUSG from new and existing utilities (oil, gas, and mining infrastructure, transmission lines, renewable energy, communication towers, etc.) and developing best alternatives for avoiding and minimizing effects. 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.

12. Maintain consistency and momentum in conservation efforts through communication and collaboration across jurisdictions and agencies, including through research, monitoring, and the Recovery Implementation Strategy.

Table 2. Factors affecting the survival of GUSG (79 FR 69191, November 20, 2014; Service 2019, pp. 34–39) and associated recovery actions and criteria. Although climate change and drought may negatively affect 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 although they may have localized impacts or may be likely to have greater effects in the future. 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	1, 2, 3, 5, 6, 8, 10, 11	I, II
	The effects of global climate change	1, 2, 3, 5, 7	I, II
	Invasive plants	1, 2, 3, 5, 8, 10	I, II
	Piñon-juniper encroachment	7, 10	I, II
	Improper grazing practices	1, 2, 3, 5, 6	I, II
Factor C	Disease	1, 12	I, II
	Predation	1, 5, 7, 9	I, II
Factor E	Small population size and structure	4, 12	I
	Drought	1, 2, 5	I, II
	Recreation	1, 3, 8	I, 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 and do not account for possible future inflation. These estimates may be clarified in the RIS as activities are implemented and through collaborative work with Federal, State, NGO, and local stakeholders. Cost estimates 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 30 years following the adoption of this plan.

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

Action Number	Action Summary	Costs ($1,000s) and time frames (years)					
		1-5	6-10	11-15	16-20	20-30	Total
1	Improve habitat for recruitment	917	917	917	917	1,834	5,502
2	Increase weed treatments	1,131	1,131	1,131	1,131	2,262	6,786
3	Conserve existing habitats	30,306	29,306	29,306	29,306	58,612	176,836
4	Population augmentation	611	660	660	660	1,320	3,911
5	Improve understory	175	175	175	175	350	1,050
6	Improve livestock grazing practices	638	30	30	30	60	788
7	Piñon-juniper removal	238	238	238	238	476	1,428
8	Reduce effects from roads and trails	1,967	1,967	1,967	1,967	3,934	11,802
9	Predator management	1,134	1,134	366	366	732	3,732
10	Improve habitat data collection tools	120	100	100	100	200	620
11	Reduce effects from utilities	45	3,130	3,130	3,130	6,260	15,695
12	Collaboration and research	1,092	1,092	1,092	1,092	2,184	6,552
Totals		38,374	39,880	39,112	39,112	78,224	234,702

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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 and Taxonomist	Scientific classification of living organisms and biologist specializing in classification of organisms.
Viability	See "Species Viability" above

VII. Literature Cited in Glossary

Shaffer, M.L. and B.A. Stein. 2000. Safeguarding our Precious Heritage. Pages 301–321 in B.A. Stein, L.S. Kutner, and J.S. Adams (eds.), Precious Heritage: The status of biodiversity in the United States. Oxford University Press. 399 pp.

U.S. Fish and Wildlife Service. 2016. USFWS species status assessment framework: an integrated analytical framework for conservation. Version 3.4. August 2016.

Appendix A – Summary of Public, Partner, and Peer Review Comments

We published a notice of availability in the *Federal Register* on November 1, 2019 (84 FR 58734), to announce the availability of the draft recovery plan for the Gunnison sage-grouse (*Centrocercus minimus*) for public review, and to solicit comments by the scientific community, State and Federal agencies, Tribal governments, and other interested parties on the general information, assumptions, and conclusions presented in the draft recovery plan. We also posted an electronic version of the draft recovery plan on the Service's Species Profile website:

https://ecos.fws.gov/docs/recovery_plan/2019-09-20_SIGNED_Draft_Recovery_Plan_for_GUSG_Gunnison_Sage-Grouse_1.pdf

We also developed and implemented an outreach plan that included: (1) publishing a news release on our regional External Affairs webpage (https://www.fws.gov/mountain-prairie/pressrel/archives/index.php) on October 31, 2019; (2) sending specific notifications and briefing Congressional contacts in appropriate Districts; (3) holding an in-person meeting for key stakeholders in conservation and recovery efforts on October 16, 2019; and (4) sending specific email notifications to key stakeholders in conservation and recovery efforts. These outreach efforts were conducted in advance of the *Federal Register* publication to ensure that we provided adequate notification to all potentially interested audiences of the opportunity to review and comment on the draft recovery plan.

During the public comment period, we received comment letters from 12 private citizens, 1 Federal agency, 4 State agencies, 5 environmental organizations, and 5 Counties, including a joint letter with an agricultural organization, for a total of 202 comments. We summarize the general themes of the comments and our responses below. Unless specified otherwise, criterion and action numbers refer to those in the draft recovery plan.

We received eight comments regarding the Service's Recovery Planning and Implementation (RPI) process. Most of these comments requested public meetings to engage the public on the draft recovery plan, requested clarity on the RPI process, or requested a comment period on the RIS. We held several meetings to share the Service's RPI process and draft recovery plan preceding the public comment period. We have added a communication and collaboration action (recovery action 11) with associated activities in the RIS for updating the SSA report and RIS, and because the RIS is an operational document, it does not require notice and comment in the Federal Register. We will continue to work with our conservation partners to update the RIS as needed so that it is as useful as possible.

Summary of Comments on Draft Introduction

We received two comments regarding the Overview section of the draft recovery plan, one directing us to use CPW's latest habitat map and one remedying a missed citation. We received one comment on the Recovery Vision recommending that the predicted risk of extinction should be below 1 percent out of 100 years without human interference to

indicate recovery. Our future scenarios in the SSA did not project out to 100 years because that is beyond the foreseeable future. Our foreseeable future for GUSG is 15 to 30 years, a biologically meaningful time period where we can actively plan for conservation and measure population trends. Additionally, some level of management and continued conservation will likely be needed for this species due to the limited potential habitat across the range.

We received eight comments regarding the Recovery Strategy section, which requested clarification in distinguishing between the threats of cultivated agriculture and livestock/ranching agriculture, and recognition of the significant avoidance and minimization of threats in the Gunnison Basin from Gunnison County's Habitat Prioritization Tool (HPT) and land use codes. We addressed both of these comments in the final Recovery Strategy section.

Summary of Comments on Draft Recovery Criteria

Draft Recovery Criterion 1

We received 23 comments on draft recovery Criterion 1, which set the HMC targets and duration that they should be sustained to indicate sufficient resiliency in five populations to signify recovery of the species. Generally, comments were in support of using population modeling to validate the population targets in the criterion, although one commenter disagreed. Commenters also expressed concern over the challenge to achieving the population targets in arid areas, such as the Monticello population. A few comments also referred to target population sizes being too low, and recommended targets of at least 5,000 individuals, citing outdated scientific data from 1980.

To address these comments, we continued a joint effort with CPW to model population viability, resulting in adjustments to improve Criterion 1 in the final recovery plan. Adjustments included minor changes to the HMC targets to more accurately base targets on previous years of population growth, while acknowledging the challenges in the Dove Creek and Monticello populations. Due to these comments, and our modeling exercise, for the final recovery plan we removed a population target from Monticello and replaced it with a shared habitat target with Dove Creek needed to maintain a level of redundancy and representation. The purpose of the population modeling exercise was to verify the likelihood that the recovery targets would indeed meet the 7 out of 9-year portion of the criterion, and that populations would be resilient into the foreseeable future at those targets (Service 2020, entire).

Draft Recovery Criterion 2

We received 11 comments on draft recovery Criterion 2, which focuses on reducing and ameliorating the threats that affect the habitat's capacity to support resilient GUSG populations. Comments expressed that habitat quality metrics should be included in this criterion, that habitat quantity should be more specific, and that connectivity among populations should be part of the criteria. This criterion addresses the threats that currently

reduce habitat quality and quantity and that may have in the past. Amelioration of those threats (recovery actions 1, 2, 3, 5, 6, 7, 8, and 11) and the associated habitat monitoring (recovery action 10) will lead to sufficient habitat measurements and positive demographic responses. To address the concern over connectivity, we have combined the criterion for the Monticello and Dove Creek populations, and emphasize that translocations or augmentation (recovery action 6) help address the small population size and genetic concerns.

Summary of Comments on Draft Recovery Actions

Draft Recovery Action 1

We received 15 comments specific to draft recovery action 1, which described the need for translocations from the Gunnison Basin population to other populations, or other augmentations, such as captive rearing, to bolster resiliency in smaller populations. This action is now recovery action 4 in the final recovery plan. Commenters expressed concern over the potential negative impacts on the Gunnison Basin population from removing birds and the need for rigorous planning. This led us to clarify that further analysis is needed and no GUSG will be removed from the Gunnison Basin population if the population is below the target 3-year running average HMC. Additionally, we have described the specific activities for the process by which translocations should occur in the RIS.

One comment specific to population augmentation in the Piñon Mesa and San Miguel Basin populations was to reiterate the need for improved habitat conditions prior to population augmentation. We agree that habitat restoration that improves chick survival and recruitment is essential for successful augmentation, which is why we have moved recovery actions that improve habitat quality and quantity from priority 2 actions to priority 1. Additionally, our analyses showed that both these populations are not at carrying capacity and could therefore likely support more birds than are currently present, which is why augmentation may be used earlier than in other populations.

Two comments specific to population augmentation in the Crawford and Monticello populations emphasized the need for improved sagebrush habitat prior to population augmentation. In the Crawford population, habitat treatments should focus on encroaching piñon pine and juniper until the importance of mountain shrub communities to GUSG is better understood. Monticello sagebrush improvements should focus on improving the age diversity and cover. Both populations need improvements to riparian and mesic areas that would support chick survival. We have incorporated both of these recommendations into activities specific to each population in the RIS and emphasized that habitat improvements must occur prior to augmentation. Additionally, a comment about the low resiliency in the Monticello population and drying effects of climate change led us to change the action such that no translocations will occur into the Monticello and Dove Creek populations until habitat is sufficiently improved, because these populations do not have a demographic targets, augmenting these populations is not required for recovery.

Finally, a comment encouraged that we consider the potential and value in reintroducing populations into the historical range of GUSG. Although reintroduction of a population into

the historical range could improve redundancy and representation for the species, this would not be needed for recovery.

Draft Recovery Action 2

We received 27 comments on draft recovery action 2, which focused on the conservation of existing habitat through Federal, State, private, and local government efforts. This action is now recovery action 3 in the final recovery plan. The majority of the comments related to sub action 2.a. in the draft plan and provided recommendations for specific land management measures that are outside the purview of the recovery plan. However, we may use many of the measures as recommendations for land management agencies to incorporate into their plans. Commenters also provided additional land conservation tools that we incorporated into the action as examples, such as: Safe Harbor Agreements (SHAs), renewal of Candidate Conservation Agreements with Assurances (CCAAs), Habitat Conservation Plans (HCPs), Areas of Critical Environmental Concern (ACEC), Research Natural Areas, and Wildlife Recovery Areas. Comments also stressed the importance of all leks (active, inactive, and historical) to GUSG conservation and habitat protection. Therefore, we altered the language of Action 2.a. in action 3 in the final plan to specify all leks as priorities for protection, not just active leks. Additionally, in the RIS we included activities for addressing the conservation gaps in current Federal planning and programs and improving inter-agency communication.

Draft Recovery Action 3

We received seven comments on draft recovery action 3, which is now recovery action 10 in the final recovery plan. Nearly all focused on the need for rangewide standardized habitat monitoring and publicly accessible data. These comments are addressed in the RIS with the development of a conservation efforts database (CED) for tracking all conservation actions that contribute towards recovery of the species.

Draft Recovery Action 4

We received 48 comments on draft recovery action 4, including all comments on the sub-actions, which broadly focused on improving habitat quality and quantity through riparian restoration, conifer encroachment, Federal programs on private lands, increasing grasses and forbs in the understory, livestock grazing management, invasive weed control, and reducing habitat fragmentation from development. Comments on draft recovery action 4, as a whole, recommended that we categorize this action as a priority 1 action. After consideration and development of the RIS with stakeholders in each population, we have moved some sub-actions to priority 1 and some have remained as priority 2. Although none of the actions specifically addresses climate change, Table 2 in the recovery plan indicates the link between habitat quality improvements and ameliorating threats associated with climate change.

Draft Sub action 4.a.
This draft sub action focused on riparian, wet meadow, and mesic habitat restoration. Comments supported moving this sub action to priority 1 and recognized the challenges associated with climate change in arid environments. Due to the climate and different temperatures and precipitation rates among the populations, the specific methods of riparian, wet meadow and mesic habitat restoration are contained in the RIS.

Draft Sub action 4.b.
This draft sub action addressed the threat of habitat quality reduction from conifer encroachment. The five comments specific to this sub action expressed concern that the recovery action was calling for wide-scale piñon-juniper removal and that it could cause more harm than benefit to GUSG. Therefore, we clarified the sub action to focus on young, encroaching conifers and in areas where the best available information indicates that it will not cause harm. Sources of best available information include the U.S. Geological Survey's *Piñon and juniper field guide: asking the right questions to select appropriate management actions* (Tausch *et. al.* 2009, entire).

Draft Sub action 4.c.
This draft sub action addressed the implementation of Federal programs on private lands to improve habitat quality. The five comments on this sub action emphasized that the Conservation Reserve Program (CRP) is not a viable option for increasing habitat quality for GUSG. Due to the overlap between this action and draft recovery action 2.a., we have combined them into one action that encompasses collaboration of all applicable Federal programs with private landowners to improve communication and find the best alternatives for GUSG habitat restoration and conservation.

Draft Sub action 4.d.
This draft sub action addressed the need for improved grasses and forbs in the understory to aid survival and recruitment of GUSG. The four comments addressing this draft sub action recommended it be moved to a priority 1 action and emphasized the seeding of native plants known to be used by GUSG. As a result, we have moved it to a priority 1 action and specified the type of plants that should be used.

Draft Sub action 4.e.
This draft sub action addressed the two populations where the draft Collaborative Action Plan identified livestock grazing as having a detrimental effect on GUSG and their habitat as well as continuing best management practices for livestock grazing in all populations. We received 12 comments specific to this draft sub-action. Comments provided recommendations for best management practices and emphasized the need to incorporate those practices into Federal land management plans. These recommendations are already captured in our previous draft recovery action 2, action 3 in the final recovery plan, about working with Federal Agencies to update land management plans, which is a priority 1 action.

Draft Sub action 4.f.
We received five comments regarding this draft sub action, which addressed the threat of invasive plant species on GUSG habitat quality. We have re-categorized this as a priority 1 action due to these comments.

Draft Sub action 4.g.
This draft sub action addressed the threat of utilities on habitat fragmentation and loss. We received five comments on this draft sub action. Comments recommended adding communication towers to the list of example utilities that this action applies to, so we have added that in the language of the action. Other comments provided specific measures that can be implemented through State and Federal land management practices.

Draft Recovery Action 5

Draft recovery action 5 addressed the threat of habitat fragmentation and disturbance, and is now recovery action 8 in the final recovery plan. We received six comments on this draft action. Comments recommended that we incorporate recreational use into the action, focus the action on roads within 4 miles of leks, specify the desired road density, and recommended noise levels. We have incorporated these recommendations into the action.

Draft Recovery Action 6

Draft recovery action 6 in the draft recovery plan addressed the threat of predation on GUSG. This action is now recovery action 9 in the final recovery plan. Of the nine comments received regarding this action, some provided anecdotal evidence of predation on GUSG and others emphasized the need for further analysis on the effects of predation on GUSG. We updated the RIS accordingly.

New Actions for the Final Recovery Plan

We received eight comments recommending new recovery actions for the final recovery plan. These suggestions fell into two general categories: research and stakeholder collaboration. Comments recommended a new action to capture research needs such as research relating to disease and West Nile Virus, poor recruitment, and habitat connectivity. Other comments requested a GUSG rangewide stakeholder group to maintain and increase local involvement in recovery implementation. To address this comment, we added a communication and collaboration recovery action (number 12) that also includes research. We have also added activities in the RIS for the Service to host an annual RIS meeting to discuss conservation efforts, successes, monitoring, and data collection. Another comment that recommended new actions requested state-specific actions. Collaboration with the States of Colorado and Utah are inherent in the recovery actions and as responsible parties in the RIS. However, there were some cases where state planning was inadvertently omitted from recovery actions, which we have remedied in the final recovery plan.

Draft Time and Cost Estimates

We received five comments regarding our draft estimates of time and cost, including the need for Federal funding, or regarding the estimates. We developed the time and cost estimates with the best available information as required under the Act. We also note that they are estimates and do not obligate any agency or entity to expend funds on recovery efforts.