State of California

Natural Resources Agency

Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

Evaluation of the Petition from the Center for Biological Diversity to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered under the California Endangered Species Act

Greater Sage-Grouse, photo by Katherine Miller

Prepared by

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LIST OF ABBREVIATIONS, ACRONYMS, AND TERMS

CEQA – California Environmental Quality Act
CESA – California Endangered Species Act
CNDDB – California Natural Diversity Database
Commission – California Fish and Game Commission
Department – California Department of Fish and Wildlife
DPS – Distinct Population Segment
ESA – Federal Endangered Species Act
NEPA – National Environmental Policy Act

EXECUTIVE SUMMARY

The Center for Biological Diversity submitted a petition (Petition) to the Fish and Game Commission (Commission) to list the greater sage-grouse (*Centrocercus urophasianus*) as threatened or endangered under the California Endangered Species Act (CESA).

On December 1, 2022, the Commission referred the Petition to the Department of Fish and Wildlife (Department) in accordance with Fish and Game Code section 2073 (Cal. Reg. Notice Register 2023, No. 1-Z, p. 2). Pursuant to Fish and Game Code section 2073.5 and California Code of Regulations, title 14, section 670.1, the Department prepared this evaluation report (Petition Evaluation) within 120 days of receiving the Petition to evaluate the scientific information contained in the Petition in relation to other relevant information possessed or received by the Department during the evaluation period.

After reviewing the Petition and other relevant information, the Department determined the Petition meets the requirement in Fish and Game Code section 2072.3 that it includes sufficient scientific information that the petitioned action may be warranted. Specifically, the Department determined the following:

- *Range and distribution*. The Petition provides sufficient information regarding the historical and current range and distribution of greater sage-grouse, which along with other information available to the Department, suggests that the range of the greater sage-grouse in California has declined over time.
- *Detailed distribution map*. The Petition provides a detailed range map and discusses distribution of greater sage-grouse.
- *Abundance*. The Petition provides sufficient information regarding the abundance of greater sage-grouse in California.
- *Population trend.* The Petition, along with other information available to the Department, provides sufficient information to indicate that the greater sage-grouse has experienced a long-term population decline.
- *Life history*. The Petition provides sufficient information regarding the life history of greater sage-grouse.
- *Kind of habitat necessary for survival*. The Petition provides sufficient information regarding greater sage-grouse habitat.
- *Factors affecting the ability to survive and reproduce*. The Petition provides sufficient information regarding factors affecting the ability of the greater sage-grouse to survive and reproduce, including habitat loss, modification, and fragmentation resulting from several threats, as well as predation, climate change, loss of genetic diversity, and disease.

- *Degree and immediacy of threat*. The Petition provides sufficient information detailing the degree and immediacy of threats to the greater sage-grouse. Threats to the species, coupled with long-term population declines, suggest a high degree and immediacy of threat to greater sage-grouse populations in California.
- *Impact of existing management efforts*. The Petition provides sufficient information regarding the impact of existing management efforts.
- *Suggestions for future management*. The Petition provides suggestions for future management actions for the greater sage-grouse and its habitat.
- *Availability and sources of information*. The Petition provides sufficient sources of information and has made them available to the Department along with the Petition.

In completing its Petition Evaluation, the Department has determined that the Petition does provide sufficient scientific information that the petitioned action to list the greater sage-grouse as threatened or endangered under CESA may be warranted.

INTRODUCTION

Candidacy Evaluation

The Commission has the authority to list certain "species" or "subspecies" as threatened or endangered under CESA (Fish & G. Code, §§ 2062, 2067, & 2070). The listing process is the same for species and subspecies (Fish & G. Code, §§ 2070-2079.1).

CESA sets forth a two-step process for listing a species as threatened or endangered. First, the Commission determines whether to designate a species as a candidate for listing by evaluating whether the petition provides "sufficient information to indicate that the petitioned action may be warranted" (Fish & G. Code, § 2074.2, subd. (e)(2)). If the petition is accepted for consideration, the second step requires the Department to produce, within 12 months of the Commission's acceptance of the petition, a peer reviewed report based upon the best scientific information available that indicates whether the petitioned action is warranted (Fish & G. Code, § 2074.6). Finally, the Commission, based on that report and other information in the administrative record, determines whether the petitioned action to list the species as threatened or endangered is warranted (Fish & G. Code, § 2075.5).

A petition to list a species under CESA must include "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of

habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant" (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

Within 10 days of receipt of a petition, the Commission must refer the petition to the Department for evaluation (Fish & G. Code, § 2073). The Commission must also publish notice of the receipt of a petition in the California Regulatory Notice Register (Fish & G. Code, § 2073.3). Within 90 days of receipt of the Petition (or 120 days if the Commission grants an extension), the Department must evaluate the petition on its face and in relation to other relevant information and must submit a written evaluation report to the Commission with one of the following recommendations (Fish & G. Code, § 2073.5, subds. (a)-(b)):

- Based upon the information contained in the petition, there is not sufficient information to indicate that the petitioned action may be warranted, and the petition should be rejected; or
- Based upon the information contained in the petition, there is sufficient information to indicate that the petitioned action may be warranted, and the petition should be accepted and considered.

The Department's candidacy recommendation to the Commission is based on an evaluation of whether the petition provides sufficient scientific information relevant to the petition components set forth in Fish and Game Code section 2072.3 and the California Code of Regulations, title 14, section 670.1, subdivision (d)(1).

In *Center for Biological Diversity v. California Fish and Game Commission* (2008) 166 Cal.App.4th 597, the California Court of Appeals addressed the parameters of the Commission's determination of whether a petitioned action should be accepted for consideration pursuant to Fish and Game Code section 2074.2, subdivision (e), resulting in the species being designated as a candidate species. The court began its discussion by describing the standard for accepting a petition for consideration previously set forth in *Natural Resources Defense Council v. California Fish and Game Commission* (1994) 28 Cal.App.4th 1104:

> As we explained in *Natural Resources Defense Council*, "the term 'sufficient information' in section 2074.2 means that amount of information, when considered with the Department's written report and the comments received, that would lead a reasonable person to conclude the petitioned action may be warranted." The phrase "may be warranted" "is appropriately characterized as a 'substantial possibility that listing could occur.'" "Substantial possibility," in turn, means something more than the one-sided "reasonable possibility" test for an environmental impact report but does not require that listing be more likely than not.

(*Center for Biological Diversity*, *supra*, 166 Cal.App.4th at pp. 609-10 [internal citations omitted].) The court acknowledged that "the Commission is the finder of fact in the first instance in evaluating the information in the record." (*Id.* at p. 611.) However, the court clarified:

> [T]he standard, at this threshold in the listing process, requires only that a substantial possibility of listing could be found by an objective, reasonable person. The Commission is not free to choose between conflicting inferences on subordinate issues and thereafter rely upon those choices in assessing how a reasonable person would view the listing decision. Its decision turns not on rationally based doubt about listing, but on the absence of any substantial possibility that the species could be listed after the requisite review of the status of the species by the Department under [Fish and Game Code] section 2074.6.

(*Ibid*.)

CESA defines the "species" eligible for listing to include "species or subspecies" (Fish and G. Code, §§ 2062, 2067, & 2068), and courts have held that the term "species or subspecies" includes "evolutionarily significant units." (*Central Coast Forest Assn. v. Fish & Game Com.* (2018) 18 Cal.App.5th 1191, 1236, *citing Cal. Forestry Assn.*, *supra*, 156 Cal.App.4th at pp. 1542 and 1549.) For the purposes of the Department's petition evaluation and recommendation, the range of a species only includes areas within California (*Cal. Forestry Assn. v. Cal. Fish and Game Com*. (2007) 156 Cal.App.4th 1535, 1551).

CESA Petition History

On November 21, 2022, the Commission received the Petition from the Center for Biological Diversity to list the greater sage-grouse as threatened or endangered under CESA. The petitioned action is to list the greater sage-grouse throughout its range in California. However, if the Commission determines that listing of the species throughout its range is not warranted, the Petition requests that the two populations of the species be considered for listing separately: 1) Northeastern California population in Lassen and Modoc counties, and 2) Bi-State population in Mono and Inyo counties. On December 1, 2022, the Commission referred the Petition to the Department for evaluation. At its meeting on February 8, 2023, the Commission officially received the petition and granted the Department's request for a 30-day extension of the period to review the Petition and prepare this Petition Evaluation.

The Department evaluated the scientific information in the Petition as well as other relevant information the Department possessed at the time of review. The Commission received one email from the public during the Petition Evaluation period pursuant to Fish and Game Code section 2073.4. The email expressed concern over the decline in greater sage-grouse and provided a short description of populations; it is available on the Commission's website

(https://fgc.ca.gov/Meetings/2023). Pursuant to Fish and Game Code section 2072.3 and California Code of Regulations, title 14, section 670.1, subdivision (d)(1), the Department evaluated whether the Petition included sufficient scientific information regarding each of the following petition components to indicate whether the petitioned action may be warranted:

- Population trend,
- Range,
- Distribution,
- Abundance,
- Life history,
- Kind of habitat necessary for survival,
- Factors affecting the ability to survive and reproduce,
- Degree and immediacy of the threat,
- Impact of existing management efforts,
- Suggestions for future management,
- Availability and sources of information, and
- A detailed distribution map.

Federal ESA Petition History

Between 1999 and 2001, the U.S Fish and Wildlife Service (USFWS) received three petitions to list the greater sage-grouse range-wide as endangered or threatened and began a formal status review in April 2004 (USFWS 2006). The USFWS reviewed the petitions collectively and in 2005, determined that the species did not warrant protection under the Endangered Species Act at that time (ibid.). However, the status review clearly illustrated the need for continued efforts to conserve greater sage-grouse and sagebrush habitat on a long-term basis (ibid.). In 2007, a federal court ruled that the finding was incorrect and remanded the decision to the USFWS. In 2010, the USFWS found that listing the greater sage-grouse (range-wide) was warranted but precluded by higher priority listing actions. In 2015, the USFWS again found that listing was not warranted because the primary threats to the species had been ameliorated by conservation efforts on federal, state, and private lands.

In 2002, the USFWS received a petition to list the Bi-State Distinct Population Segment (DPS) of the greater sage-grouse as threatened but later found that the petition did not present substantial scientific or commercial information indicating that the population represented a DPS. In 2005, the USFWS received a second petition to list the Bi-State DPS as threatened or endangered. In 2006, the USFWS determined that emergency listing was not warranted, and after litigation agreed to review both petitions together. In 2007, the USFWS determined that the petitions did not present substantial scientific or commercial information sufficient to warrant listing. In 2008, following additional litigation, the USFWS determined that listing may

have been warranted and initiated a status review. In 2010, the USFWS found that the Bi-State population met the DPS criteria and listing was warranted but precluded by higher priority listing actions. In 2013, the USFWS proposed to list the Bi-State DPS and designate critical habitat but withdrew the proposal in 2015. In 2018, a federal court reinstated the proposed listing. In 2020, the USFWS completed a species status review and again withdrew the proposed listing. In 2022, a federal court ruled that USFWS did not meet considerations for the best available science, reinstated the proposed listing, and ordered the USFWS to issue a new listing decision. As stated in the Petition, the Northeastern California population of greater sage-grouse has no federal ESA protections in place.

Petitioned Species Taxonomy

Greater sage-grouse is monotypic. The Petition references the Bi-State DPS in the taxonomy section. While genetically distinct, the Bi-State DPS is not considered a subspecies.

Overview of Petitioned Species Ecology

Greater sage-grouse in California occur on the southwestern periphery of the species' broad range across western North America. Historically, greater sage-grouse occurred primarily in the Modoc Plateau and Great Basin portions of the state, east of the Sierra Nevada and Cascade Range. Currently, the species occurs in two areas: the Northeastern California population in Modoc and Lassen counties, and the portion of the Bi-State Distinct Population Segment that occurs in California (primarily in Mono County). As mentioned above, the petitioned action is to list the greater sage-grouse throughout its range in California. However, the Petition frequently presents information for the two populations separately and therefore this petition evaluation also includes information for the two populations.

Greater sage-grouse are lekking birds: during the breeding season, males perform for females at designated lek sites. In California, most lek activity occurs from March through May with peak attendance in April, though birds have been observed on leks as early as January and as late as July. Typically, a few dominant males mate with most females, or hens, visiting the lek. Hens nest nearby in high quality habitat with adequate cover under sagebrush or grass, building bowl-shaped nests lined with vegetation and feathers. Average clutch size is 6–7 eggs. Sagebrush is their primary food source, but they can also eat a variety of plants including chicory, dandelion, clover, buckwheat, yarrow, and milk-vetch. Insects (e.g., grasshoppers, beetles, ants) are critical in the diet of chicks and pre-laying hens.

Greater sage-grouse are often used as an indicator species in the sagebrush ecosystem, as they are relatively easy to observe, respond relatively quickly to changes in habitat, and are associated with high-quality sagebrush habitat (Rowland et al. 2006). If a landscape supports greater sage-grouse, it is perceived as an indicator that the same area likely supports the 350+ other plant and animal species dependent on the sagebrush ecosystem (Hanser 2018).

SUFFICIENCY OF SCIENTIFIC INFORMATION TO INDICATE THE PETITIONED ACTION MAY BE WARRANTED

The Petition Evaluation addresses each component of the Petition below, pursuant to Fish and Game Code section 2072.3 and California Code of Regulations, title 14, section 670.1, subdivision (d)(1).

The Petition relies heavily on a recent USGS open-file report (Coates et al. 2021) which used a hierarchical framework of population clusters developed by O'Donnell et al. (2019) to define population boundaries, model population trends, and identify local populations exhibiting asynchronous decline relative to regional population patterns. Clusters were established at fine (neighborhood clusters) and broad (climate clusters) spatial scales using active lek locations. The Coates et al. (2021) model used habitat characteristics (e.g., elevation, tree canopy cover, sagebrush cover, bioclimatic variables) and known movement behavior to establish the spatial clusters of known greater sage-grouse lekking sites. Neighborhood clusters are fine-scale, closed population units reflecting lek groups likely to experience similar landscape-level impacts (e.g., wildfire). Climate clusters refer to broad ecological areas characterized by similar climates and habitat conditions. At both cluster scales, changes in abundance are likely to be driven by changes in vital rates (e.g., survival and productivity) within the unit, rather than by movement of individuals into or out of the population. The Department was involved in review of Coates et al. (2021) and provided lek location and count data for the analysis.

Range, Distribution, and Distribution Map

Scientific Information in the Petition

The Petition discusses the range and distribution of the greater sage-grouse in California within the Executive Summary on page 8, in sections 3.1 and 3.2 on page 18, in section 5.1 on page 23, and elsewhere throughout the document. The Petition uses the terms "range" and "distribution" somewhat interchangeably. The Petition also refers to estimates of range and habitat extent interchangeably and compares estimates from different publications that use different methodologies for estimating range extent. In the Executive Summary, the Petition provides a "Range Map of Sage-grouse Distribution" (Figure 1); this range map was created from CDFW's California Wildlife Habitat Relationships System and cited from Hall et al. (2008).

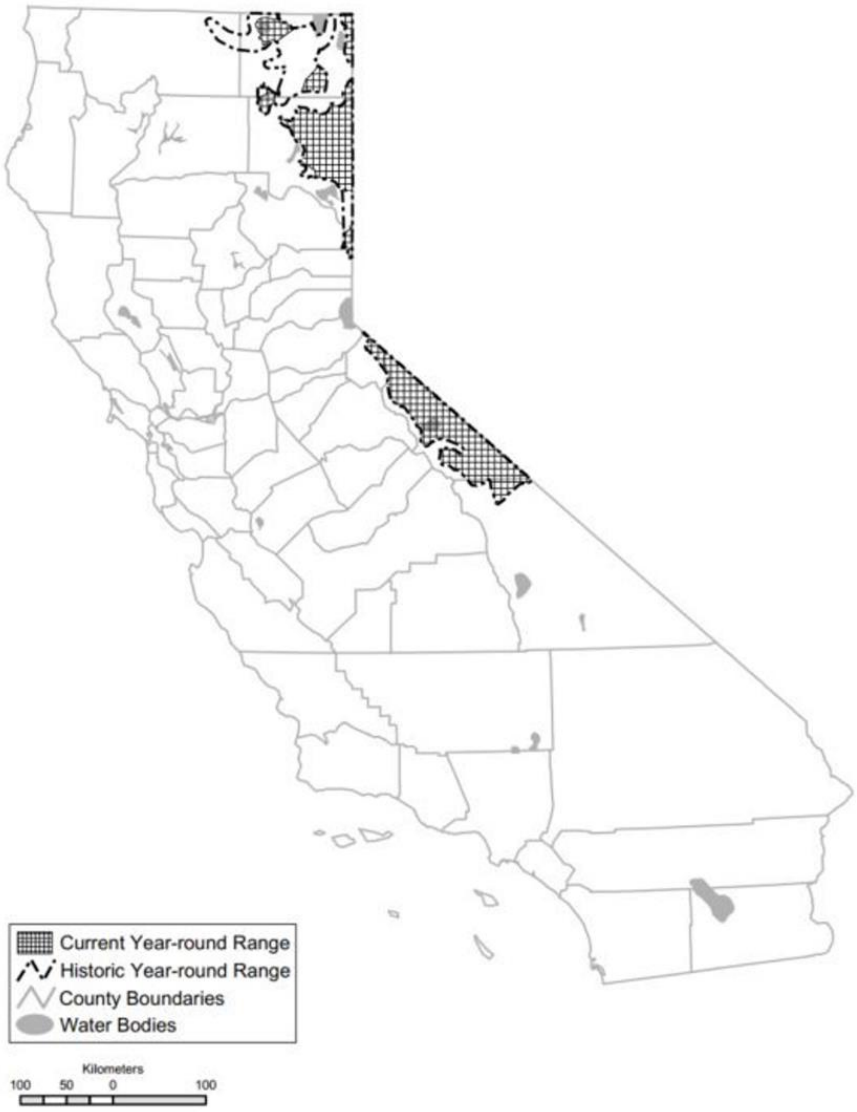


Figure 1. Current and historical range of greater sage-grouse (*Centrocercus urophasianus*) in California per Hall et al. (2008). This map was included as Figure 1 in the Petition.

The Petition also provides a map of neighborhood clusters (Figure 2) from Coates et al. (2021). While this map does not perfectly represent distribution of greater sage-grouse within its range in California, it does provide the distribution of lek groups at spatial scales that reflect closed populations, and is based on active lek locations, habitat characteristics, and movement behavior.

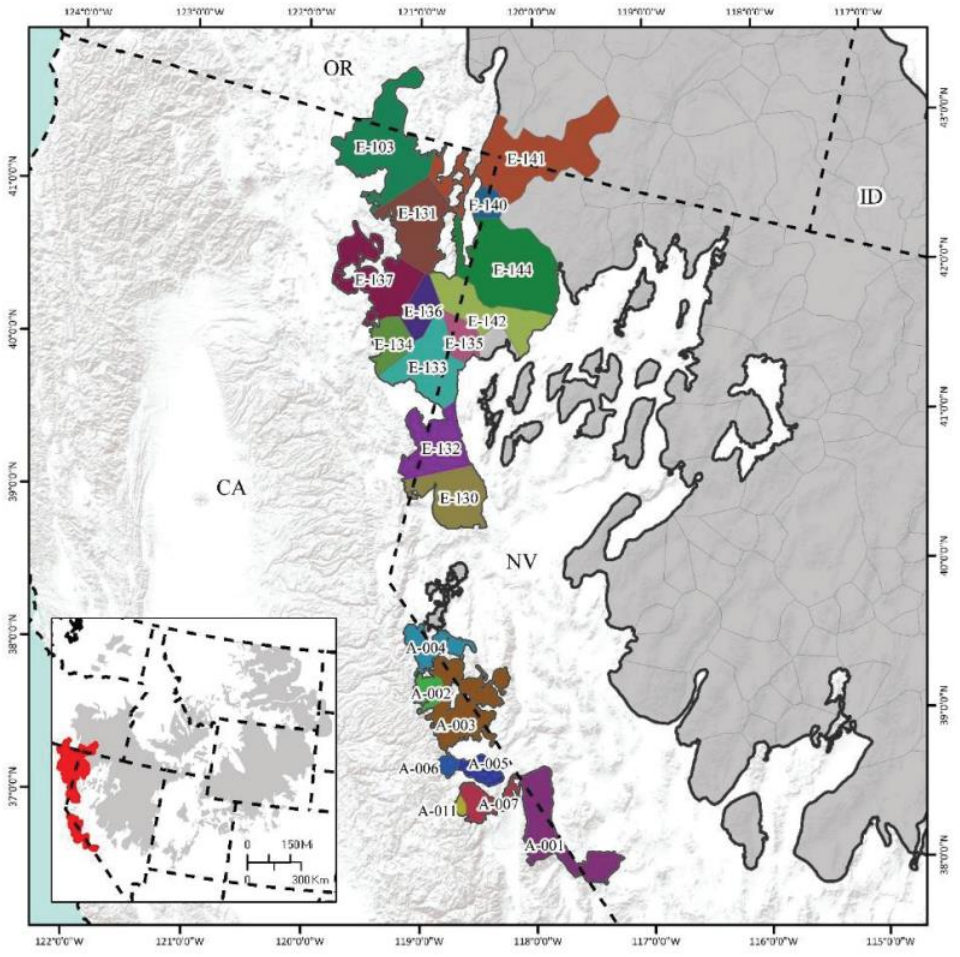


Figure 2. Map of greater sage-grouse (*Centrocercus urophasianus*) neighborhood clusters intersecting with California's boundaries from Coates et al. 2021, Appendix 4 at pg. 109. A neighborhood cluster represents a fine-scale population group based on lek sites, habitat characteristics, and movement behavior. In cluster labels, "A" denotes Bi-State Neighborhood Clusters and "E" denotes Northeastern California Neighborhood Clusters. This map was included as Figure 4 in the Petition.

Historical Range

The Petition describes the historical range of the greater sage-grouse within California in the Executive Summary on page 10 and in section 3.1 on page 18. The Petition provides the range map from Hall et al. (2008) on page 9, which includes historical but currently unoccupied range in eastern Siskiyou and portions of Modoc, Lassen, Plumas, and Sierra counties, and provides a historical range size estimate of 2,601,100 hectares (6,427,458 acres; Hall et al. 2008). The Petition also describes historical range in Shasta County. The Petition states that greater sage-grouse have been extirpated from eastern Siskiyou County over the past 35 years and were extirpated from the extreme northeastern part of Shasta County prior to 1944 (Hall et al. 2008).

The Petition states that the range has contracted in Modoc and Inyo counties and to a lesser degree, in Lassen County.

Current Range and Distribution

The Petition describes the current range and distribution in section 3.2 on page 18 using the neighborhood clusters developed by the U.S. Geological Survey (USGS; O'Donnell et al. 2019; Coates et al. 2021) and present in Modoc, Lassen, Plumas, Sierra, Alpine, Mono, and Inyo counties. The Petition describes that neighborhood clusters in California include 136 leks, which represents the entire initial dataset considered in Coates et al. (2021). For their population trend analysis, Coates et al. (2021) removed certain records (e.g., lek counts occurring before 1960 or with limited counts) for consistency in their dataset, which represents data collected by all the states in the greater sage-grouse's range. Thus, the initial dataset included 136 lek locations but only 79 leks were used for analysis. In sections 4.1 and 4.2, the Petition describes the Northeastern California population of the greater sage-grouse as being grouped into 13 neighborhood clusters containing 38 leks, while the Bi-State population is grouped into eight neighborhood clusters containing 41 leks.

The Petition describes the Bi-State population's range as encompassing an area approximately 274 km (170 miles) long and up to 97 km (60 miles) wide along the California-Nevada border, and covers portions of Alpine, Mono and Inyo counties in California. The Northeastern California population encompasses a large area of the Modoc Plateau, primarily in Modoc and Lassen counties. The petition reports the extent of all currently occupied neighborhood clusters in California at 1,764,201 hectares (4,359,436 acres). By comparing this to the historical range estimate in Hall et al. (2008), the Petition reports a 32% reduction in range within California.

The Petition describes the distribution of greater sage-grouse in relation to sagebrush habitat distribution, stating that greater sage-grouse occupation was strongly associated with measures of sagebrush abundance and distribution (Wisdom et al. 2011). The Petition states that information on the distribution and characteristics of greater sage-grouse movement corridors is limited, but that greater sage-grouse seasonal movements may depend on habitat distribution and resources (Connelly et al. 2004, Fedy et al. 2012) and that some populations are considered migratory, while others are not (Dumroese and Moser 2020).

Other Relevant Scientific Information

The current distribution of greater sage-grouse within the Northeastern California portion of the range is limited to Modoc and central and eastern Lassen counties. The Department is not aware of historical or current records of birds or leks in the southern edge of Lassen County, or in Sierra or Plumas counties, but a more detailed assessment of range would be conducted if the Department were to complete a status review.

Conclusion

The Petition provides sufficient information regarding the historical and current range and distribution of greater sage-grouse that suggests the range of greater sage-grouse in California has declined over time. The Petition includes a detailed range map and discusses distribution of greater sage-grouse in California.

Abundance

Scientific Information in the Petition

The abundance of the greater sage-grouse is discussed in Section 4, titled "Abundance and Population Trends" on pages 19–21 and elsewhere throughout the Petition.

The Petition cites a recent rangewide (i.e., California and Nevada) Bi-State population estimate of 3,305 birds (Coates et al. 2020). The Petition does not provide an abundance estimate for the Northeastern California population, but it does discuss abundance at the Clear Lake National Wildlife Refuge, one of several areas supporting leks in the Northeastern California population. Specifically, the Petition cites decline at this site from 50 leks in the 1950s to a single lek by 2017, primarily attributed to pinyon-juniper encroachment and spread of non-native annual grasses in sagebrush habitat. The Petition reports that, following extensive juniper thinning and sage-grouse translocation to the population, the number of males at the single remaining lek increased from a low of five in 2004 to a recent high of 34 in 2017, but lek counts have since declined.

Conclusion

The Petition provides sufficient information regarding abundance of the greater sage-grouse, including a population estimate for the Bi-State population and a discussion of lek count data for portions of the Northeastern California population.

Population Trend

Scientific Information in the Petition

The Petition discusses greater sage-grouse population trends in Section 4 titled "Abundance and Population Trend" on pages 19–23. The Petition relies heavily upon the population trend analysis in Coates et al. (2021) which suggests that greater sage-grouse populations in California have declined across most temporal periods over the past 60 years. The Petition summarizes results for two broad climate clusters, referred to in Coates et al. (2021) as: A: Bi-State, and E: Great Basin, and for finer scale neighborhood clusters that are nested within these climate clusters. The Petition also discusses population decline as inferred from lek counts in section 6.1.5 "Hunting Regulations" on pages 58–60.

The Petition discusses lambda (λ) as an annual rate of population change. Populations are considered stable when λ = 1, increasing when λ > 1, and decreasing when λ < 1. Coates et al. (2021) calculated $\hat{\lambda}$ estimates at two spatial scales (climate clusters and neighborhood clusters) and six timescales ranging from 10 to 60 years (recent, short, short-medium, medium, medium-long, long). Analyzing population trends at multiple timescales facilitates greater inference about the overall trend, as greater sage-grouse, like many other species, experience natural population oscillations over time. Therefore, increases or declines across a short temporal period may not be reflective of the long-term population status.

Northeastern California Population

The Petition refers to the Great Basin Climate Cluster when it addresses climate cluster-level analyses for the Northeastern California population. The Petition states that population trend analysis for the Great Basin Climate Cluster resulted in $\hat{\lambda}$ estimates from 0.949 to 0.986 depending on timescale (Coates et al. 2021). The Great Basin Climate Cluster includes all leks in Nevada, Oregon, and Idaho, and portions of populations for Montana, Utah, and California; only 4% of the total area of the Great Basin Climate Cluster includes the Northeastern California population. Therefore, the $\hat{\lambda}$ estimates provided in the Petition represent a large area outside of California.

Regarding the finer-scale neighborhood cluster analysis, the Petition states that 6 of the 13 neighborhood clusters in Northeastern California indicated at least one temporal period with a positive annual rate of change ($\hat{\lambda} > 1$). Only five of the neighborhood clusters with at least one temporal period of $\hat{\lambda} > 1$ contain leks in California, and most show very few periods of population growth. The other six neighborhood clusters in Northeastern California have negative rates of change at all temporal scales.

Although not specifically mentioned in the Petition, annual estimates of $\hat{\lambda}$ over the long temporal period for the 13 neighborhood clusters in Northeastern California range from 0.928 to 1.013 (only one neighborhood cluster has a positive annual rate of change for the long temporal period, and it is represented by a single lek). These average annual rates of change correspond to changes ranging from a population decline of 99% at one neighborhood cluster to a population increase of 117% at the single positive neighborhood cluster, over about 60 years.

The Petition concludes that in the last 60 years the Northeastern California population has shown steady decline.

Bi-State Population

The Petition states that the annual rate of change for the Bi-State Climate Cluster resulted in $\hat{\lambda}$ estimates of 0.973–0.990 across the six temporal periods (Coates et al. 2021). The Bi-State

Climate Cluster includes leks in both California and Nevada; 63% of the total area of the Bi-State Climate Cluster is within California. Although not specifically mentioned in the Petition, the estimate of annual $\hat{\lambda}$ for the long temporal period (since 1960) in the Bi-State Climate Cluster is 0.978 (Coates et al. 2021). This average annual rate of change corresponds to a population decline of 74% over about 60 years.

Regarding the neighborhood cluster analysis, two of the eight clusters in the Bi-State population indicated at least one temporal period with a positive trend ($\hat{\lambda} > 1$). These clusters correspond to Bodie Hills and Parker Meadows. The Bodie Hills Neighborhood Cluster includes more than half of the leks used in the population models of Coates et al. (2021) for the Bi-State population and had a $\hat{\lambda}$ estimate of 1.009 in the recent (10 years) temporal period. This annual rate of change corresponds to a population increase of about 9% over the past 10 years.

The Petition concludes that in the last 60 years, the Bi-State population has shown a steady decline and recent improvements do not offset the overall decline of the population.

Other Relevant Scientific Information

Coates et al. (2021) also estimated annual rates of population change dating back to 1960 for all greater sage-grouse in California (Figure 3). The average annual rates of population change ($\hat{\lambda}$) at short, medium, and long temporal scales for the entire California range were 0.963 (95-percent credible interval 0.953–0.970), 0.974 (0.962–0.981), and 0.973 (0.963–0.982), respectively.

The Department conducts lek counts (counts of displaying males) each spring in coordination with the U.S. Bureau of Land Management, U.S. Forest Service, USFWS, USGS, and other partners. The Department uses lek counts as an index of abundance to evaluate population trends over time in California. The Petition references declining lek counts in relation to hunting zones. The figure provided in the Petition includes data through 2021; the Department has updated the figure to include 2022 survey results (Figure 4), in which the abundance index for the North Mono zone increased slightly while other zones decreased or remained consistent. The number of leks counted over time, especially in Bi-State, has varied over time, and the number of leks surveyed, probability of detection, and movement dynamics are not accounted for when summing peak male counts. Therefore, the results of lek counts do not account for several variables that are incorporated in the modeled estimates of population change in Coates et al. (2021).

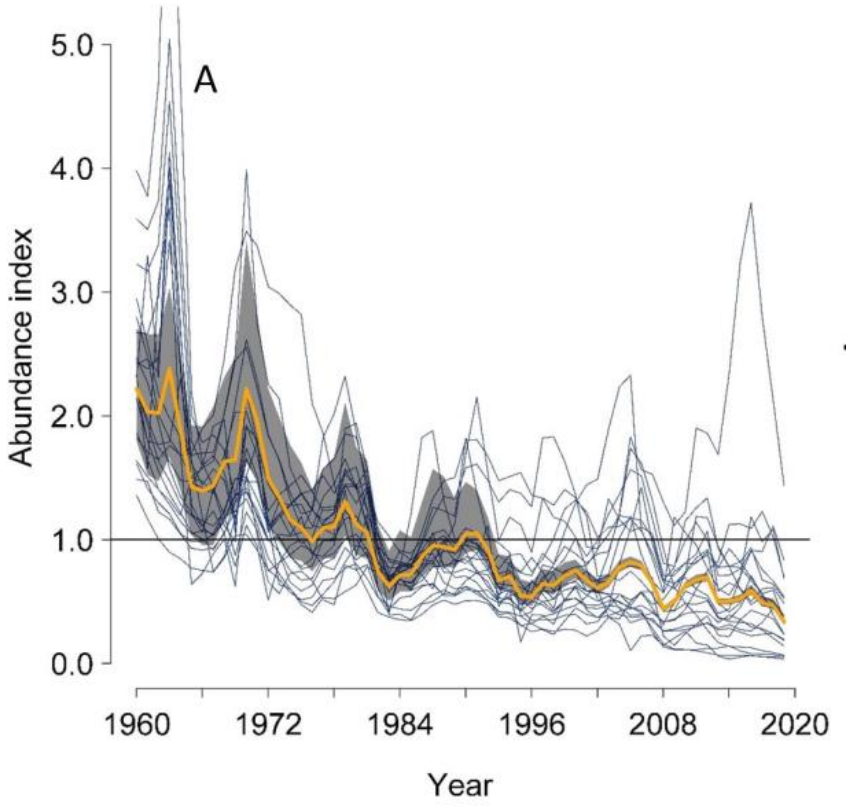
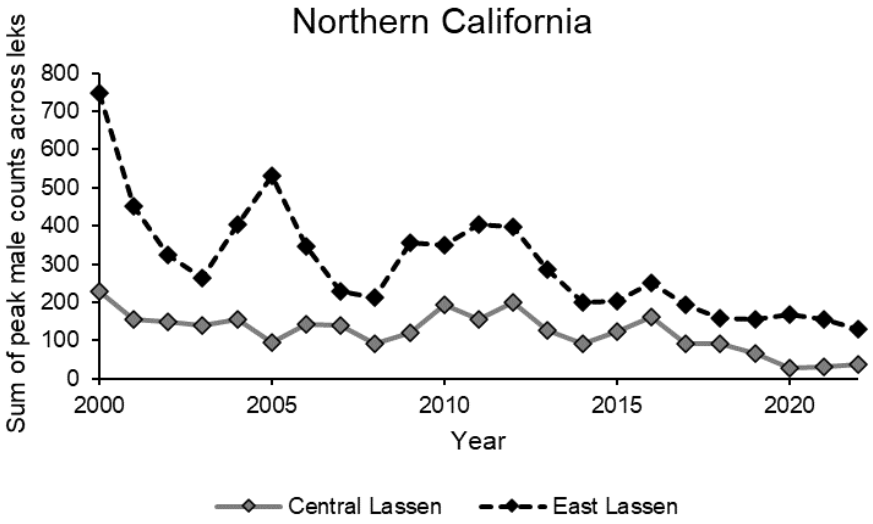


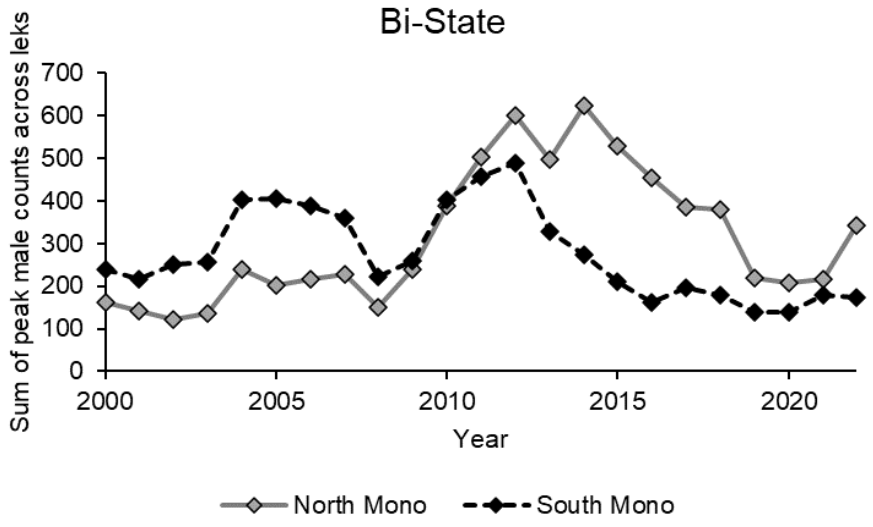
Figure 3. Abundance index derived from lek counts (calculated as estimated abundance divided by the 60-year mean of estimated abundance) of greater sage-grouse (*Centrocercus urophasianus*) within the state of California from 1960 to 2019. Thick yellow line represents median estimates across all leks. Shaded areas represent 95-percent credible limits. Thin blue lines represent median values for neighborhood clusters. Black horizontal line (abundance index=1.0) represents 60-year average (adapted from Coates et al. 2021; figure 4.2).

Conclusion

The Petition, along with other information available to the Department, provides sufficient information to indicate that both the Northeastern California and Bi-State populations of greater sage-grouse have experienced declines over the past 60 years. Some localized neighborhood clusters or leks have shown increases in recent years. However, these recent increases do not offset the longer-term declines.



a)



b)

Figure 4. Abundance indices for greater sage-grouse as determined by summing the peak male counts across leks within each hunting zone for the Northeastern California and Bi-State populations. A similar plot showing data through 2021 was included as Figure 10 in the Petition; this figure includes data through 2022. The Department has not issued hunting permits for the Lassen zones since 2011, for South Mono since 2013, and for North Mono since 2016.

Life History

Scientific Information in the Petition

The Petition provides accurate information regarding the life history of the greater sage-grouse including foraging patterns, breeding behavior, and vital rates important to population growth, in section 2, "Natural History" on pages 11–17.

The Petition lists sagebrush as the greater sage-grouse's primary adult food item, while native forbs and insects are critical for chicks.

The Petition describes the breeding style as polygyny, where greater sage-grouse males will perform for females on lekking grounds 1–16 ha in size. Leks often occur in the same location each year with males attending February to April and hens attending March to early April.

The Petition references three key vital rates important for population growth: female survival, chick survival, and nest success (Taylor et al. 2012). Survival rates reported from the southeast periphery of greater sage-grouse range in Colorado are as follows: 59.2% for adult females, 77.7% for yearling females, 36.8% for adult males, and 63.5% for yearling males (Connelly et al. 2004). In Northeastern California, Popham and Gutiérrez (2003) reported an average nest success rate of 40%. The Petition lists factors that impact nest success, including predation, food availability, habitat quality, hunting harvest, and weather. The Petition accurately describes nesting strategy and provides an average clutch size of seven eggs. The Petition states that life span is approximately 1.5 years, though individuals have lived up to 10 years.

Other Relevant Scientific Information

There is a large body of published literature on greater sage-grouse life history that the Department would summarize if a status review were conducted.

The Petition correctly lists potential causes of greater sage-grouse mortality, including historical hunter harvest. Hunter harvest has had a minimal impact in California in recent years. In 2017, the Commission adopted quotas of zero for all sage-grouse zones due to declining population estimates conducted by the Department. From 2007 to 2011, the last years greater sage-grouse hunt permits were issued for Lassen County, harvest represented <10% of the estimated fall population for each of the hunt zones. From 2007 to 2016, the last years the Department issued permits for North Mono, harvest represented <5% of the estimated fall population. From 2007 to 2013, the last year the Department issued permits for South Mono, harvest represented <3% of the estimated fall population.

Conclusion

The Petition provides sufficient information regarding the life history of the greater sage-grouse including foraging patterns, breeding behavior, and vital rates important to population growth.

Kind of Habitat Necessary for Survival

Scientific Information in the Petition

The Petition discusses the necessary habitat for greater sage-grouse in Section 2.3 "Habitat" on page 13 and in Section 5.1 "Habitat Modification/Destruction" starting on page 23.

The Petition cites several studies demonstrating that the presence of sagebrush is one of the best landscape predictors of greater sage-grouse persistence (Schroeder et al. 1999, Rowland 2004, Wisdom et al. 2005, Walker et al. 2007, Aldridge et al. 2008, Doherty et al. 2008, Wisdom et al. 2011). The Petition describes that contiguous sagebrush is needed to provide escape cover, nesting cover, brood cover, and forage. The Petition cites a landscape connectivity assessment using habitat suitability modeling and least cost path analysis in Northeastern California showing that the most suitable greater sage-grouse habitat is characterized by flat terrain with sagebrush cover (Davis 2012). Further, greater sage-grouse select areas with few to no conifers (Coates et al. 2020).

The Petition describes nesting habitat as having a diverse horizontal and vertical structure of native grasses and forbs; pre-laying and nesting females need herbaceous vegetation for nest cover and forage. The Petition states that native grass and forb diversity is critical to healthy insect species diversity, an important food source for pre-laying females and chicks (Popham and Gutiérrez 2003, Hagen et al. 2007, Kolada et al. 2010). The Petition describes brood rearing habitat with shrub canopy and grass cover to provide concealment for adults and young. As brood rearing continues and food sources desiccate, greater sage-grouse must move from uplands to mesic areas to find food for young grouse. Wetlands (primarily springs) comprise a small portion of the greater sage-grouse range in California but are important habitat for late brood rearing (Dunn and Braun 1986, Klott and Lindzey 1990, Drut et al. 1994, Coates et al. 2020).

The Petition states that there is little information available regarding the minimum sagebrush patch size required to support populations of greater sage-grouse due to several factors including the migratory nature of some individuals, availability of proximal seasonal habitat, and local, regional, and range-wide ecological conditions. While most female greater sage-grouse nest within a relatively small area near the lek, one study showed that 29% of females nested >5 km from occupied leks, of which 62% were successful in producing young (Davis 2012). The Petition also references a publication (Pyke 2011) that states more than 4,000 ha may be necessary for greater sage-grouse population sustainability, and that large movements emphasize a need for large, connected, functional landscapes.

Other Relevant Scientific Information

There is a large body of literature that describes the habitat requirements of greater sage-grouse. The Petition adequately summarizes key aspects of greater sage-grouse habitat.

Conclusion

The Petition provides a sufficient summary of information regarding the habitat necessary for survival of the greater sage-grouse.

Factors Affecting the Ability to Survive and Reproduce

The Petition describes factors affecting the greater sage-grouse's ability to survive and reproduce in Section 5, "Factors Affecting Successful Reproduction and Survival" on pages 23–53. The Petition discusses effects of the following factors:

- habitat modification and destruction
- predation
- wildfire
- non-native invasive annual grasses
- conifer expansion
- resource extraction
- climate change
- off-road vehicles
- loss of genetic diversity
- disease

Several of these factors, including wildfire, non-native invasive annual grasses, and conifer expansion contribute to the loss or modification of habitat, but we address each factor independently as was done in the Petition. The Petition acknowledges the interplay between many of these factors, especially in their impact on habitat amount and quality.

Habitat Modification and Destruction

Scientific Information in the Petition

The Petition discusses the threats to the greater sage-grouse from the cumulative effects of habitat modification and destruction resulting from land management practices throughout its range in California. The Petition states that "Actual and functional habitat loss is the most significant threat to California's sage-grouse." The Petition states that in California, "…the sage-grouse's sagebrush habitat has declined from 2,601,100 hectares to 1,764,201 hectares, a 32% contraction in habitat." As mentioned in the Geographic Range and Distribution section, these historical and current range extents are estimated using different methods, are not necessarily directly comparable, and do not necessarily represent the extent of historical or current sagebrush habitat (but instead represent estimated range or occupied area). While this comparison of area estimates might not represent actual loss of habitat, much of the reduction in range of greater sage-grouse is related to habitat loss.

The Petition discusses four types of management or land use impacts:

- Conversion of sagebrush habitat to agricultural land and urbanization of adjacent lands,
- Habitat fragmentation and loss of patch connectivity,
- Overlap in distribution with livestock and free-roaming equids,

- Impacts from wild horses and burros.

Specifically, the Petition states that land conversion to agriculture and associated increases in urbanization have reduced the extent of habitat, although the extent of this type of conversion in California is unclear. The Petition states that these disturbances affect population persistence (Knick et al. 2011; USFWS 2013; Aldridge et al. 2008; Wisdom et al. 2011). The Petition states that habitat fragmentation has led to lek abandonment, reduced survival of greater sage-grouse, and has impacted nest success and recruitment. The Petition states that the distance between leks in the Northeastern California population exceeds dispersal capability and invasive grasses and juniper expansion alter functional connectivity between leks (Davis 2012). Increases in habitat fragmentation are attributed to roads, transmission lines, fences, and other types of development in greater sage-grouse habitat.

The Petition lists numerous effects of livestock and feral equids (horses and burros) on the sagebrush biome, including trampling of plants, soil compaction, increased soil erosion, loss of vegetation from overgrazing, spread of nonnative invasive grass species (Remington et al. 2021), increased predation facilitated by decreased visual obstruction (Hall et al. 2008), and increased stress levels in sage-grouse (Behnke et al. 2022). The Petition states that livestock can also compete for food resources (Braun 1998, Hall et al. 2008). The Petition states that areas without wild horses have more shrub cover, native plants, species richness, and higher plant biomass (Remington et al. 2021). The Petition presents information for multiple herd areas, herd management areas, and wild horse territories, and points out that wild horses are well above the maximum appropriate management levels as designated by federal land management agencies.

Predation

Scientific Information in the Petition

The Petition discusses the general threats of predation and the impacts of raven expansion on greater sage-grouse reproduction and survival. Predation of adult greater sage-grouse is most often attributed to golden eagles (*Aquila chrysaetos*) and coyotes (*Canis latrans*), while juvenile greater sage-grouse are taken by a wide variety of predators. Nest predation is most often attributed to common ravens (*Corvus corax*), badgers, and coyotes (Conover and Roberts 2017).

Human development and food subsidies can increase the density and diversity of predators. The Petition states that red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), American crow (*Corvus brachyrhynchos*), and common raven populations have increased in human-altered landscapes. Raven populations in particular have increased substantially in distribution and abundance across the western U.S. since the mid-1970s (Coates 2019, Harju et al. 2022), and ravens are the most common predator of greater sage-grouse nests. Greater sage-grouse rely on their cryptic

plumage to avoid detection by predators; increased predation related to reduced vegetative cover is noted as a significant threat to greater sage-grouse nest success (Doherty et al. 2014).

Wildfire

Scientific Information in the Petition

The Petition discusses the direct and indirect impacts of wildfire on sagebrush ecosystems and sage-grouse demographic rates. Although fire is a naturally occurring process in sagebrush ecosystems, current fire regimes have been altered such that fire size, frequency, and intensity have increased which has led to conversion of sagebrush habitat to non-native annual plant communities (Remington et al. 2021, Connelly and Braun 1997). The expansion of invasive grasses facilitated by wildfire creates a positive feedback loop that leads to more frequent fires and precludes sagebrush from naturally recolonizing burned landscapes (Dumroese and Moser 2020). Prior to European settlement, wildfires were small and patchy in sagebrush dominated areas with fire return intervals of 15–25 years, with some return intervals within historical fire regimes up to 350 years (Padgett 2020).

The Petition states that, "…large fires are one of the primary factors linked to loss of sagebrush habitat." As an example of the potential for wildfire to impact greater sage-grouse habitat in California, the Petition reports that, "between 2012 to 2018 alone, 158,000 hectares (over 390,000 acres) of [greater] sage-grouse habitat has burned, representing 28.9% of the bird's habitat in the state" (Remington et al. 2021). The proportion of loss reported in Remington et al. (2021) was 29.4% and referred to the California range of greater sage-grouse, not habitat. Nevertheless, the report demonstrates the potential for wildfire to impact large proportions of greater sage-grouse habitat.

Non-native Invasive Annual Grasses

Scientific Information in the Petition

The Petition discusses the degradation of greater sage-grouse habitat from conversion of native plants and sagebrush to non-native invasive annual grasses and forbs. Invasive plant species thrive in disturbed landscapes and contribute to changes in the frequency and intensity of wildfires (Remington et al. 2021). The landscape conversion to annual grassland creates a positive feedback loop that reduces the fire return interval and provides fine fuels that facilitate the spread of fire (Bradley et al. 2018, Fusco et al. 2019). The Petition states that, "The invasive annual grass/fire cycle is one of the most impactful feedback loops that occurs in the sage-grouse habitat" and that the establishment of invasive grasses such as cheatgrass "are considered a primary reason for the decline in [greater] sage-grouse populations in northeastern California" (Padgett 2020).

Non-native herbaceous plants do not provide the resources necessary to support greater sage-grouse, because nesting and brooding females select native herbaceous cover and sagebrush to meet their life history needs (Lockyer et al. 2015, Remington et al. 2021). The Petition points out that exotic grass removal and seeding native plants can help greater sage-grouse (Poessel et al. 2022), but restoration of sagebrush at large scale is often limited by financial and logistical constraints (Remington et al. 2021) and sagebrush requires at least three to four years to mature before it becomes useful to greater sage-grouse (Pyke et al. 2020).

Conifer Expansion

Scientific Information in the Petition

The Petition discusses the impacts of single-leaf pinyon (*Pinus monophylla*) and western juniper (*Juniperus occidentalis*) expansion into sagebrush dominated communities. Greater sage-grouse demonstrate strong avoidance of pinyon-juniper even at low density (Coates et al. 2017). Tall vertical structures such as trees can provide perches and nesting substrate for avian predators (Conover and Roberts 2017), and pinyon-juniper encroachment has been shown to have population-level effects on brood survival (Casazza et al. 2011) and lek persistence (Baruch-Mordo et al. 2013). Pinyon-juniper expansion could represent natural recovery of pinyon-juniper woodlands following European settlement and removal (Romme et al. 2009). This expansion could be offset by the clearing and removal of trees (Bolsinger 1989).

Other Relevant Scientific Information

Information is available on the extent of pinyon-juniper habitat that has been treated (removed) within portions of the greater sage-grouse range. For example, in the past 10 years the BLM reported treating 11,938 ha (29,500 acres) of juniper in the Buffalo-Skedaddle area (Ehler et al. 2021). Between 2012 and 2021, 26,182 ha (64,697 acres) of pinyon-juniper have been treated in the range of the Bi-State population (Bi-State Technical Advisory Committee 2022).

Extractive Threats

Scientific Information in the Petition

The Petition discusses the impacts of traditional and renewable energy development and mining on the greater sage-grouse in California, including:

- Loss of habitat from energy development and the associated infrastructure;
- Fragmentation of habitat and increase in predator perches from transmission lines;
- Habitat loss from mineral exploration and mining;
- Disruption of habitat and life-cycle requirements from noise and vibration associated with energy and mineral development.

The Petition states that energy development results in loss of habitat and an increase in predator perches. Transmission lines impact greater sage-grouse through collision mortality and by providing perches for potential predators. Manier et al. (2013) found that frequency of golden eagle interactions with greater sage-grouse increased 47% in an area after transmission line construction. The Petition also states that roads associated with transmission lines contribute to habitat fragmentation. Greater sage-grouse are less likely to select brood-rearing and summer habitats near wind turbines and associated structures (LeBeau et al. 2017). Utility-scale solar energy development has potential impacts to greater sage-grouse through direct mortality and habitat loss (Gerringer et al. 2022).

The Petition addresses mining and the effects on habitat loss and fragmentation, and the associated invasion of cheatgrass, noise, and dust. The Petition states that sagebrush restoration is unlikely to be successful following mineral extraction. The Petition specifically addresses mining exploration in a portion of the Bi-State area and the impacts on the greater sage-grouse population. Finally, the Petition states that noise associated with mineral and energy development disrupts the habitat and life-cycle requirements of sage-grouse.

Other Relevant Scientific Information

The Department is aware of additional information on this topic and would further evaluate the factor if a status review is conducted.

Climate Change

Scientific Information in the Petition

The Petition discusses the direct and indirect impacts of climate change on greater sage-grouse reproduction and survival. The Petition states that climate models predict large increases in spring temperature across most of the California range of greater sage-grouse. The Petition notes that most precipitation models predict decreased precipitation between May and October, during important times for brood rearing. Changes in temperature and precipitation patterns and the availability of water have implications for lek utilization, nest site selection, and can lead to an overall reduction in fitness in the case of prolonged drought conditions (Wright 2020). Such changes will increase plant evapotranspiration, cause soil dryness, and may reduce availability and quality of important wetland habitats. The drying of features that make up a small but essential portion of greater sage-grouse habitat, including riparian areas, wet meadows, seeps, and springs, would impact certain life stages of greater sage-grouse.

Off-Highway Vehicles

Scientific Information in the Petition

The Petition states that the "impacts on sage-grouse from motorized recreation are well documented, with habitat impacts ranging from habitat loss, habitat fragmentation, invasive plant spread, induced displacement or avoidance behavior by sage-grouse, creation of movement barriers, noise, and direct encounters." (Knick et al. 2011).

Other Relevant Scientific Information

Additional information is available on efforts to restrict access by off-highway vehicles through seasonal or permanent road closures (e.g., Bi-State Technical Advisory Committee 2022). This factor would be evaluated in more detail if the Department conducts a status review.

Genetic Diversity

Scientific Information in the Petition

The Petition discusses the effects of population declines, geographic isolation, and habitat fragmentation on loss of genetic diversity in greater sage-grouse populations. It states that populations in small, disjunct areas of a species' occupied range may be at higher risk for extirpation, such as in the Northeastern California and Bi-State populations distributed along the periphery of the greater sage-grouse range (Wisdom et al. 2011).

The Petition also describes genetic diversity and structure within the greater sage-grouse populations in California. Within the Bi-State area, populations are isolated on a north-south gradient into three subpopulations, likely due to habitat loss and fragmentation (Oyler-McCance et al. 2014). Loss of diversity may have led to deleterious effects on demographic rates for some populations. Leks sampled in the Northeastern California population show a lack of genetic differentiation, suggesting gene flow across the regions with females dispersing widely among the leks (Davis et al. 2015). Genetic diversity of the Northeastern California population is higher than the Bi-State population and is comparable to other areas within the core of the species' range across Western North America.

The Petition states that the Parker Meadow translocation in the Bi-State population was deemed necessary due to a lack of genetic diversity that resulted in increasingly low numbers, coupled with infertility issues, resulting in inbreeding and few successful hatchings. More than 200 birds were translocated from the Bodie area in 2017–2019 and 2021–2022, but the resulting effect on genetic diversity has not been thoroughly evaluated. Similarly, the Petition suggests that the 2005–2015 translocations from Oregon and Nevada to the Clear Lake National Wildlife Refuge lek may have increased genetic diversity in that portion of northeastern California, but no evaluation of potential genetic effects has been published.

Disease

Scientific Information in the Petition

The Petition discusses the impacts of West Nile virus, which has been shown to reduce late summer survival of greater sage-grouse (Naugle et al. 2005, Shuford et al. 2008), and the virus has been previously detected in the Bi-State population (Hall et al. 2008, n=3 birds in 2004). However, the overall negative effect of disease on greater-sage grouse populations is relatively low compared to other current threats (Bi-State Technical Advisory Committee 2012).

Other Relevant Scientific Information

The Petition did not address potential impacts of other pathogens to which greater sage-grouse have been exposed. Antibodies against avian leukosis virus, *Pasteurella multocida*, and avian influenza virus were detected in samples collected across northern Nevada in 2014 (Sinai et al. 2017).

Conclusion

The Petition provides sufficient information regarding factors affecting the ability of the greater sage-grouse to survive and reproduce, including habitat modification and destruction, predation, wildfire, invasive annual grasses, conifer expansion, resource extraction, climate change, off-highway vehicles, loss of genetic diversity, and disease. The magnitude and relative importance of these factors are addressed in the Degree and Immediacy of Threat section.

Degree and Immediacy of Threat

Scientific Information in the Petition

The Petition discusses the degree and immediacy of threat to the greater sage-grouse throughout section 5 "Factors Affecting Successful Reproduction & Survival" starting on page 23.

Habitat Loss, Modification, and Fragmentation

The Petition states that habitat loss is the most significant threat to greater sage-grouse in California and describes substantial contraction in sagebrush habitat availability. Most of the described range contraction has occurred within the range of the Northeastern California population, presumably due to a large amount of habitat loss in that portion of the range. In addition, the Petition describes that the current spatial structure of the greater sage-grouse in northeastern California threatens long-term persistence, as the distance between some leks exceeds dispersal capability and invasive grasses and juniper expansion alter functional connectivity between leks (Davis 2012). The Petition states that it is unclear how many acres of greater sage-grouse habitat have been converted to agriculture or urbanization in California.

However, it states that at least 50% of all western sagebrush landscapes have been negatively impacted by at least one factor (Braun 1995), often by efforts to increase herbaceous forage for domestic livestock. It elaborates that depending on the degree of impact, these habitats can remain degraded for 2–30 years.

The Petition provides Appropriate Management Levels (AML) for wild horses and burros as set by federal agencies and describes that most populations are currently 3–20 times higher than the maximum AML. It cites modeling within greater sage-grouse range that indicates 76%, 97%, and >99% probability of greater sage-grouse population declines relative to controls when horse numbers are 2, 2.5, and ≥3 times over maximum AML, respectively (Coates et al. 2021). The Petition states and provides maps showing that nearly all greater sage-grouse habitat in California overlaps with domestic livestock grazing allotments and/or free-roaming equid herd management areas.

Wildfire has been a particularly significant threat to the Northeastern California population due to its adverse impact on habitat, functionally reducing the species' range. Between 2012 and 2018, wildfires burned nearly 30% (390,000 acres) of the greater sage-grouse range in California. This demonstrates the ability for wildfire to have substantial impacts on greater sage-grouse habitat. It further states that nearly the same number of acres have burned in the last 10 years as in the prior 100 years; following historical fire suppression and in response to climate change, wildfires are becoming larger and more frequent. The interactions of non-native invasive annual grasses and conifer expansion associated with variable wildfire return intervals result in compounding negative effects on greater sage-grouse habitat.

Predation

While predators are a natural part of the environment, the Petition states that greater sage-grouse have become more susceptible to predation due to loss of the adequate cover in degraded sagebrush habitat and increased availability of predator perch structures associated with anthropogenic features (e.g., fence posts, powerlines, increased conifer density). In addition, it states that raven populations have increased substantially in the last 20 years and represent the most common predator threatening greater sage-grouse nest success.

Other Threats

Extractive threats, climate change, and off-highway vehicles also contribute to a complex set of threats to greater sage-grouse. Reduced genetic diversity and disease may present a threat to greater sage-grouse in California, especially within the Bi-State population which is isolated by distance into three subpopulations and has geographic proximity to known pathogens.

Other Relevant Scientific Information

In the Executive Summary only, the Petition references extirpation probabilities for Bi-State subpopulations over the next 10 years from Coates et al. (2021); the Department located the additional following information.

Coates et al. (2021) calculated extirpation probabilities describing future risk at short, medium, and long temporal scales. Coates et al. (2021) predicted extirpation probabilities between 41% and 67% for neighborhood clusters and between 55% and 72% for leks in the Bi-State population of greater sage-grouse (Table 1); these values represent the highest extirpation probabilities across the species' range at the neighborhood cluster scale. Extirpation probabilities for the Northeastern California population were calculated based on data from the entire Great Basin Climate Cluster, which has a very broad spatial scope and are therefore not highlighted here.

Table 1. From Table 8 in Coates et al. (2021). Model predictions of extirpation probabilities for greater sage-grouse (*Centrocercus urophasianus*) leks and neighborhood clusters (NC), summarized in terms of mean and standard error, at different temporal scales (Short [approximately 19 years], Medium [approximately 38 years], and Long [approximately 56 years]).

CC	Temporal scales					
	Short (two oscillations)		Medium (four oscillations)		Long (six oscillations)	
	Lek	NC	Lek	NC	Lek	NC
A	0.5480 (0.0322)	0.4149 (0.1194)	0.6534 (0.0226)	0.5602 (0.1051)	0.7176 (0.0174)	0.6650 (0.0865)
B	0.6742 (0.0313)	0.1038 (0.0914)	0.7664 (0.0197)	0.2806 (0.1546)	0.8187 (0.0141)	0.4379 (0.1553)
C	0.6021 (0.0587)	0.1585 (0.1165)	0.6974 (0.0387)	0.3708 (0.1582)	0.7447 (0.0311)	0.5285 (0.1358)
D	0.5284 (0.00615)	0.2258 (0.0258)	0.6203 (0.00445)	0.3397 (0.0246)	0.6797 (0.0035)	0.4465 (0.0221)
E	0.4721 (0.00545)	0.1290 (0.0148)	0.5712 (0.00396)	0.2415 (0.0156)	0.6300 (0.00312)	0.3463 (0.0148)
F	0.4107 (0.00857)	0.0846 (0.0255)	0.5058 (0.00654)	0.1503 (0.0297)	0.5668 (0.00526)	0.2246 (0.0302)

CC, climate cluster; A, Bi-state area; B, Washington area; C, Jackson Hole, Wyoming area; D, eastern area; E, Great Basin area; F, Wyoming

Conclusion

Cumulative effects from threats described in the Petition have resulted in substantial loss and degradation of sagebrush habitat, including impacts from wildfire, livestock and free-roaming equids, and expansion of conifers and non-native invasive annual grasses. In addition, the Petition describes threats that directly and indirectly reduce greater sage-grouse survival, including increased predation and loss of genetic diversity. Finally, the Petition relies heavily upon a recent population trend analysis which suggests extirpation probabilities exceed 50% at most temporal scales, especially within the Bi-State population. Therefore, the Petition and

other information available to the Department suggests a high degree and immediacy of threats to greater sage-grouse populations in California.

Impact of Existing Management Efforts

Scientific Information in the Petition

The Petition discusses existing management and regulatory mechanisms for the greater sage-grouse in Section 6, "Inadequacy of Existing Regulatory Mechanisms" on pages 53–115.

State Regulation and Management

The greater sage-grouse is designated as a California Species of Special Concern and as such, the Petition concludes that the species and its habitat should be considered during environmental review under the California Environmental Quality Act (CEQA). However, the Petition notes that CEQA allows lead agencies to approve a project regardless of significant impacts to Species of Special Concern when other factors outweigh the environmental impact or when mitigation is infeasible (CCR 14, §15093(b); Cal. Pub. Res. Code § 21081). The Petition states that protection of greater sage-grouse and its habitat in California is not included in any existing or planned Natural Community Conservation Plan (NCCP), a broad-based ecosystem approach to plan for the protection of biological diversity.

The greater sage-grouse is also designated as a Species of Greatest Conservation Need in the State Wildlife Action Plan, and the Petition notes that this designation makes it eligible for State Wildlife Grants; since 2014, greater sage-grouse have been included in 13 State Wildlife Grants totaling $601,499.

The Petition describes the history and recent changes in hunting practices for greater sage-grouse. While hunting is currently prohibited due to low population estimates, the Petition addresses future threats to greater sage-grouse if hunting resumes due to increasing populations. Specifically, the Petition emphasizes the importance of a comprehensive population assessment before reinstating hunting practices.

Regional and Local Plans and Policies

The Petition lists regional and local plans and policies, including those from Lassen County, Lassen County Fish and Game Commission, Modoc County, Mono County, the Bi-State Action Plan, and the Los Angeles Department of Water and Power (LADWP). The Petition states that while each plan includes greater sage-grouse or sagebrush environments as a concern, enforceable protections are limited. Several actions that have been implemented to address threats in the Bi-State area are described in the greater sage-grouse 10-year accomplishment report (Bi-State Technical Advisory Committee 2022).

The Petition notes that fences are important for restricting equid and livestock access to water sources intended for wildlife, but that fences also pose a collision risk and provide perches for predators. Although not mentioned in the Petition, in both the Northeastern California and the Bi-State population areas, local groups have installed some fencing to restrict livestock and equid access to water sources while marking or converting fences to minimize risk to greater sage-grouse. Stevens et al. (2012) found that marking fences could reduce collision rates by 83%. The Buffalo-Skedaddle Local Area Working Group (LAWG) is marking all fences within 1.93 km (1.2 miles) of active leks, as collisions often occur when birds fly into lek areas in early morning (Stevens et al. 2012). As of 2021, more than 161 km (100 miles) of fences have been marked or removed in the range of the Bi-State population (Bi-State Technical Advisory Committee 2022).

Federal Regulation and Management

The Petition states that greater sage-grouse are considered a Sensitive Species on BLM administered lands and describes specific resource management plans (RMPs) including the Bishop RMP, Eagle Lake RMP, and Surprise RMP.

In 2015, the USFWS found that listing greater sage-grouse as threatened or endangered was not warranted because the primary threats to the species had been ameliorated by conservation efforts on federal, state, and private lands. These efforts included BLM and U.S. Forest Service land use plans for conserving, enhancing, and restoring sagebrush ecosystems. Many of those land use management plans included habitat management areas and sagebrush focal areas, though notably, the BLM did not establish sagebrush focal areas for California.

The Petition states that between 2018 and 2020, the U.S. Department of the Interior called on states to take the responsibility for protecting greater sage-grouse within their state borders, while initiating new BLM land-use plan amendments that would change federal regulations protecting the greater sage-grouse. Some of these regulations have been found unlawful (Western Watersheds versus Schneider, Idaho 2019). As part of a court order related to the USFWS listing process, the BLM is reviewing its 2015 management plan and 2019 plan amendment.

The Petition notes that the BLM's *Greater Sage-grouse Plan Implementation – Rangewide Monitoring Report 2015-2020* (Herren et al. 2021) described both habitat evaluation and surface disturbance within sage-grouse habitat. The report states that 80% of plots were not meeting the 20% shrub cover standard for nesting, 50% of plots were not meeting 10–25% sagebrush cover and >15% forb grass cover standards for late brood rearing, and 80% of plots were not meeting winter sagebrush cover standards.

Non-regulatory Planning and Management

The Petition describes nonregulatory conservation plans, such as the Partners in Flight Sagebrush Conservation Plan. The Petition also notes that the Nevada Governor's Sage-Grouse Conservation Team's *Greater Sage-Grouse Conservation Plan for Nevada and Eastern California* describes greater sage-grouse as a Special Status Species, describes the habitat, and lists several land use activities that have affects to greater sage-grouse. Finally, the plan addresses mitigation for impacts on Nevada BLM land.

The Petition describes three non-regulatory planning entities, known as Local Area Working Groups (LAWG), including Devil's Garden/Clear Lake, Bi-State, and Buffalo-Skedaddle. Each LAWG has developed a conservation plan over the past decade.

The Petition also refers to the Devil's Garden/Clear Lake and Buffalo-Skedaddle Population Management Units (PMUs). The Petition includes a map (Figure 11, page 106) of the Bi-State PMUs and attempts to outline notable differences between the Neighborhood Clusters and the PMUs in California.

The Petition describes the Sage-grouse Initiative (SGI) that uses federal conservation program funding, with initiatives offered in the 11 western states with high greater sage-grouse populations, including California. The goals of the SGI are to: prevent working ranches from being subdivided, implement sustainable grazing systems to improve hiding cover for birds, remove invasive conifers from grasslands, and mark or remove high risk fences. The Petition provides an estimate of work achieved in California at 8,810 acres under four contracts totaling $1.4 million.

The Petition describes the efforts of the Western Association of Fish and Wildlife Agencies (WAFWA), which is comprised of 23 states and provincial agencies (including the Department) that are charged with protection and management of fish and wildlife resources in the western United States and Canada. Participating state and federal agencies meet quarterly to work toward achieving shared conservation goals, with greater sage-grouse a focal WAFWA species. The Petition describes the *Greater Sage-Grouse Comprehensive Conservation Strategy*, developed by WAFWA in 2006 as a framework for long-term conservation of the greater sage-grouse and the sagebrush ecosystem.

Translocations

The Petition states that to date, there are limited state level protections in place for the conservation of the greater sage-grouse despite population numbers that continue to decline and on-going translocations. The Petition states that translocations have bolstered populations in the Parker Meadows region of the Bi-State population. Coates et al. (2021) indicates that the rate of change for this neighborhood cluster, represented only by Parker Meadows, has increased in the recent temporal period (approximately the last 10 years). The first count at

Parker Meadows (2002) was 17 males. In 2018, the first year after translocations began, the lek count was 18 males, but in more recent years (2019–2021), the count again declined to 10–12 males. Evaluation of the effect of translocation on population trends and genetic diversity has not yet been published.

Private Lands

The Petition states that there is still a need for greater sage-grouse protections on private land, which comprises a significant portion of the greater sage-grouse range in California, especially in the Northeastern California population. As an example, the Petition states that in the Buffalo-Skedaddle PMU, 8 of 21 leks and most of the late brood-rearing and forb-rich summer habitats are on or adjacent to private lands. Therefore, the Petition states that any meaningful conservation strategy for greater sage-grouse must include conservation measures that apply to private land. The Petition states that without economic incentives for landowners, it is unlikely that conservation measures would be consistently applied on private lands. Finally, the Petition states that the protections provided by a CESA listing would facilitate conservation of the species.

Although not mentioned in the Petition, private lands have been acquired in the Bi-State area via conservation easements. The Department recently acquired 469 hectares (1,160 acres) near a state wildlife area. An additional conservation easement acquired 1,659 hectares (4,100 acres) and 9.7 km (6 miles) of riparian corridors in the Bodie Hills area (Bi-State Technical Advisory Committee 2022).

Conclusion

The Petition describes a variety of regulatory and non-regulatory mechanisms that could provide protection for the greater sage-grouse but concludes that existing state, local, and federal regulations have not been successful or sufficient in protecting the greater sage-grouse in California from population declines. As described above, most populations have experienced long-term declines but there have been recent population increases in a few localized areas; the degree to which localized increases are due to management action is unclear. The Petition states that threats to greater sage-grouse in California are multifaceted and numerous, and therefore require greater state protections than are currently in place.

Suggestions for Future Management

Scientific Information in the Petition

The Petition discusses suggestions for future management in Section 7, "CESA protection is warranted for California's greater sage-grouse" on page 116. The Petition states that listing the greater sage-grouse under CESA will further efforts to stabilize populations and move towards

recovery. It concludes that managing threats to greater sage-grouse will require enforceable measures in a cohesive and legally mandated strategy. Specifically, the Petition recommends the following:

1. The Department prepare a recovery plan for greater sage-grouse in California pursuant to Cal. Fish & Game Code § 2079.1.
2. The Department recommend to the Commission to change the hunting regulations to preclude hunting of greater sage-grouse in California until recovery goals have been met.
3. The Department work with local jurisdictions within the range of sage-grouse to develop NCCPs that protect all sage-grouse habitat from development on private lands.
4. The California Department of Parks and Recreation (CDPR) develop and implement management plans (including fire management plans) focused on greater sage-grouse protection for state park units within their range.
5. The CDPR seek to acquire habitat to establish new parks/natural reserves for protection and restoration of greater sage-grouse habitat and opportunities to expand and connect existing state parks and natural reserves for protection and restoration of greater sage-grouse habitat as part of California's 30x30 conservation goals.
6. The Department expand its cooperative work with relevant federal agencies (NPS, BLM, USFS, USFWS) to protect greater sage-grouse in California and its habitat on federal land.
7. The Department work with CAL-FIRE to develop protocols for appropriate fire suppression activities within the range of greater sage-grouse that maximize protection of the species, while minimizing ground disturbance that may foster the spread of non-native grasses and other invasive species.
8. The Department work with relevant agencies and entities to identify potential sites for assisted migration/translocation and develop protocols for successfully carrying out such activities.

Other Relevant Scientific Information

The Department is engaged in several of the Petition's suggested future management activities, and would more fully assess management needs if a status review is conducted.

Regarding the Petition's recommended management action #8, translocation is one of many possible management techniques, and may not be the most effective conservation action in any particular situation. The Department is committed to maintaining a high level of scientific quality in its management of natural resources. Part of maintaining such quality is assuring that translocations conducted or approved by the Department for conservation purposes significantly contribute to species and ecosystem conservation, and are planned, executed, and supported in a manner consistent with best scientific practices.

In addition to suggestions given in the Petition, other valuable management actions include state-issued Voluntary Local Programs or Safe Harbor Agreements, which could be implemented to conserve greater sage-grouse on private lands. Safe Harbor Agreements are required to provide a net conservation benefit to species covered by the agreement.

Conclusion

The Petition provides adequate suggestions for future management actions for the greater sage-grouse and its habitat.

Availability and Sources of Information

Scientific Information in the Petition

The Petition cites an extensive list of sources on pages 117–138.

Other Relevant Scientific Information

The Department referenced additional information and sources when developing this Petition Evaluation. These sources can be found in the Literature Cited section of this document.

Conclusion

The Petition provides sufficient sources of information and has made them available to the Department along with the Petition.

RECOMMENDATION TO THE COMMISSION

Pursuant to section 2073.5 of the Fish and Game Code, the Department has evaluated the Petition on its face and in relation to other relevant information the Department possesses. In completing its Petition Evaluation, the Department has determined that the Petition and other relevant information provides sufficient scientific information to indicate that the petitioned action to list the greater sage-grouse as threatened or endangered may be warranted. Therefore, the Department recommends the Commission accept the Petition for further consideration under CESA.

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