STAFF SUMMARY FOR FEBURARY 21, 2020

7. MOUNTAIN LION (CONSENT)

Today's Item **Information ☒** **Action ☐**

Receive petition evaluation report from DFW for the petition to list certain populations of mountain lion (*Puma concolor*) as a threatened or endangered species under the California Engangered Species Act (CESA).

Summary of Previous/Future Actions

• Received petition	Jun 25, 2019
• FGC transmitted petition to DFW	Jul 5, 2019
• Published notice of receipt of petition	Jul 26, 2019
• Public receipt of petition and approval of DFW's's request for 30-day extension	Aug 7-8, 2019; Sacramento
• **Today receive DFW's petition evaluation**	**Feb 21, 2020; Sacramento**
• Determine if the petitioned action may be warranted	Apr 15-16, 2020; Sacramento

Background

A petition to list one or more evolutionarily significant units (ESU) of mountain lion in southern and central coastal California as threatened or endangered under CESA was submitted by the Center for Biological Diversity and the Mountain Lion Foundation (petitioners) on Jun 25, 2019. On Jul 5, 2019, FGC transmitted the petition to DFW for review. A notice of receipt of petition was published in the California Regulatory Notice Register on Jul 26, 2019.

California Fish and Game Code Section 2073.5 requires that DFW evaluate the petition and submit to FGC a written evaluation with a recommendation. DFW has completed its petition evaluation report, which delineates each of the categories of information required for a petition, evaluates the sufficiency of the available scientific information for each of the required components, and incorporates additional relevant information that DFW possessed or received during the review period. DFW transmitted its report with a cover memo to FGC on Feb 6, 2020 (exhibits 1 and 2).

Based on the petition and other information provided, possessed or received, DFW has determined that there is sufficient scientific information available to indicate that the petitioned action may be warranted and recommends that the petition be accepted and considered. However, this meeting is not intended for FGC discussion and FGC cannot consider the petition at this meeting. Fish and Game Code Section 2074 requires that consideration of the petition be scheduled not sooner than 30 days after receipt of the petition and public release of the evaluation report; however, under the Bagley-Keene Open Meeting Act, FGC must allow public comment on this item if requested.

FGC is scheduled to determine if listing may be warranted at its Apr 15-16, 2020 meeting. If FGC determines in Apr that listing may be warranted, DFW will review the status of the species and provide FGC a written, peer-reviewed report before FGC makes a final determination about whether to list the species.

Significant Public Comments

1. A letter of support asserts that the proposed Southern/Central Coast ESU is in need of protection because in that area: (1) mountain lions are rare and the loss of one individual can harm the population; (2) threats to mountain lions are increasing; (3) protecting mountain lions protects ecosystem integrity; (4) there is no conflict between a CESA listing and Proposition 117; and (5) FGC is obligated to list the ESU if science shows that listing is warranted (Exhibit 3).
2. Over 4,500 members of the public submitted emails in support of listing mountain lion, citing habitat loss and fragmentation, genetic isolation, development, and other threats, and explaining the ecological benefits of mountain lion as an apex predator (see Exhibit 4 for a sample).
3. One letter of opposition urges FGC not to list mountain lion, stating that legislation already protects the species (Exhibit 5).

Recommendation

FGC staff: Receive the DFW petition evaluation under a motion to adopt the consent calendar, accept any public comment, and consider DFW's recommendation at the Apr 2020 FGC meeting.
DFW: Accept and consider the petition.

Exhibits

1. DFW memo, received Feb 6, 2020
2. DFW evaluation report, received Feb 6, 2020
3. Letter from the Humane Society of the United States, received Jan 16, 2020
4. Sample email from Kevin McAlister, received Feb 6, 2020
5. Email from Wendy Tochihara, received Feb 7, 2020

Motion/Direction

Moved by _____ and seconded by _____ that the Commission adopts the staff recommendations for items 5-11 on the consent calendar.

State of California
Department of Fish and Wildlife

Received on February 6, 2020
Signed copy on file.

Memorandum

Date: January 31, 2020

To: Melissa Miller-Henson
Executive Director
Fish and Game Commission

From: Charlton H. Bonham
Director

Subject: Evaluation of a Petition to List the Southern California/Central Coast Evolutionarily Significant Unit (ESU) of Mountain Lion as Threatened under the California Endangered Species Act

The California Department of Fish and Wildlife (Department) has completed its evaluation of a Petition to list the proposed Southern California/Central Coast Evolutionarily Significant Unit (ESU) of Mountain Lion as a threatened species under the California Endangered Species Act, Fish and Game Code section 2050 et seq. The California Fish and Game Commission (Commission) received the Petition from The Center for Biological Diversity and The Mountain Lion Foundation on June 25, 2019. Pursuant to Fish and Game Code section 2073, the Commission referred the Petition to the Department on July 5, 2019. In accordance with Fish and Game Code section 2073.5, subdivision (b), in August 2019 the Department requested, and the Commission approved, a 30-day extension to complete its evaluation report.

The Department completed the attached Petition Evaluation report pursuant to Fish and Game Code section 2073.5. (See also Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1).). The Department's evaluation report delineates the categories of information required in a petition, evaluates the sufficiency of the available scientific information regarding each of the Petition components, and incorporates additional relevant information the Department possessed or received during the review period. Based upon information contained in the petition and other relevant information in the Department's possession, the Department has determined there is sufficient scientific information available at this time to indicate the petitioned action may be warranted. The Department recommends the Petition be accepted and considered.

If you have any questions or need additional information, please contact Ms. Kari Lewis, Wildlife Branch Chief, at (916) 445-3789 or by email at Kari.Lewis@wildlife.ca.gov.

Attachment

ec: **California Department of Fish and Wildlife**

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State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

EVALUATION OF A PETITION FROM THE CENTER FOR BIOLOGICAL DIVERSITY AND THE MOUNTAIN LION FOUNDATION TO LIST THE SOUTHERN CALIFORNIA/CENTRAL COAST EVOLUTIONARILY SIGNIFICANT UNIT (ESU) OF MOUNTAIN LIONS AS THREATENED UNDER THE CALIFORNIA ENDANGERED SPECIES ACT

Photo: Donna Krucki

Prepared by
California Department of Fish and Wildlife

Final Review Draft January 31, 2020

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I. Executive Summary

The Center for Biological Diversity and the Mountain Lion Foundation (Petitioners) submitted a Petition (Petition) to the Fish and Game Commission (Commission) to list a Southern California/Central Coast Evolutionarily Significant Unit (ESU) of mountain lions (Puma concolor), or one or more of the six subpopulations, singularly or in combination within the proposed ESU as threatened or endangered pursuant to the California Endangered Species Act (CESA), Fish and Game Code Section 2050 et seq.

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 2019, No. 30-Z, p. 1086). 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) of the Petition. The purpose of the Petition Evaluation is to assess the scientific information discussed and cited in the Petition in relation to other relevant and available scientific information possessed or received by the Department during the evaluation period and to recommend to the Commission whether the scientific information in the Petition is sufficient under the criteria prescribed by CESA to accept and consider the Petition to list the mountain lions within the proposed ESU as threatened or endangered.

After reviewing the Petition and other relevant information, the Department determined the following:

- Population Trend. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition indicated the overall population trend for the proposed ESU of mountain lions has declined, and continues to decline, with six genetically distinct subpopulations identified within the proposed ESU.

- Range. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition contains a detailed description and maps of the geographic range of mountain lions within the proposed ESU.

- Distribution. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition discusses the distribution of mountain lions within the proposed ESU and

demonstrates a reduction in their distribution due to habitat loss, conversion, and fragmentation throughout much of the historical range, along with habitat degradation and near isolation for some subpopulations due to major highways.

- Abundance. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition contains a description of abundance estimates for mountain lions in the proposed ESU based on several recent tracking and genetic studies. Scientific publications from these studies indicate small subpopulation sizes.

- Life History. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition describes life history of the mountain lion, including taxonomy, biology, reproduction, diet, foraging ecology, habitat requirements, survivorship, and home range size. Additionally, evidence of potential inbreeding depression for some subpopulations is described.

- Kind of Habitat Necessary for Survival. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition describes habitat types, home range requirements, prey resources, and other conditions necessary for viable mountain lion populations. The importance of functional movement corridors between habitat patches, preservation of existing habitat, and adequate buffers from effects of human development, roads, and highways are described.

- Factors Affecting the Ability to Survive and Reproduce. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition presents information to indicate that mountain lions within the proposed ESU have experienced habitat loss and habitat fragmentation leading to small, isolated subpopulations with a lack of adequate gene flow between them. The genetic diversity of some small subpopulations in the proposed ESU is nearly as low as a federally endangered subspecies, the Florida panther (*Puma concolor coryi*). Additionally, other sources of human-caused mortality, such as vehicle strikes, and deterioration or destruction of movement corridors may affect the ability of mountain lions to

survive and reproduce.

- Degree and Immediacy of Threat. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition discusses the threats to long-term survival of mountain lions within the proposed ESU and states the threats will continue to worsen due to development, coupled with associated roads and other infrastructure that reduces habitat size and quality, and leads to a decrease in habitat connectivity. These threats may contribute to the loss of genetic diversity and further increase the risk of inbreeding depression, which can compromise long term population viability.

- Impact of Existing Management Efforts. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition discusses how existing regulatory mechanisms and management efforts do not adequately protect mountain lions within the proposed ESU from impacts that threaten their long-term survival. In particular, the Petition indicates that land use planning and habitat conservation needs to occur at a larger scale and include habitat connectivity for mountain lions and their prey, while also lessening human-caused mortality factors such as vehicle strikes, and depredation take.

- Suggestions for Future Management. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition includes potential management actions that would benefit mountain lions (e.g., wildlife crossing structures over or under freeways and major roads), and cites studies that contain a number of suggestions for future management (e.g., better land use planning for sufficient habitat connectivity and gene flow, and for conservation of prey species).

- A Detailed Distribution Map. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition contains a detailed distribution map of mountain lion populations within the proposed ESU and adjacent populations in California and Nevada.

- Availability and Sources of Information. The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that

it include sufficient scientific information to indicate the petitioned action may be warranted. More than 140 references were cited in the Petition and the Petitioner provided portable document file (.pdf) copies of the majority of the referenced documents to the Commission.

The Department's Petition Evaluation focuses on analyses of the scientific information provided in the Petition, as well as additional scientific information the Department possesses, or has knowledge of, regarding mountain lion populations including populations within the proposed ESU.

In completing its Petition Evaluation, the Department has determined the Petition provides sufficient scientific information to indicate the petitioned action may be warranted. Therefore, the Department recommends the Commission accept the Petition for further consideration pursuant to Fish and Game Code section 2074.2.

II. Introduction

A. 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 advises the Commission 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, then 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; see also Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1).) The

range of a species for the Department's petition evaluation and recommendation is the species' California range. (Cal. Forestry Assn. v. Cal. Fish and Game Com. (2007) 156 Cal. App. 4th 1535, 1551.)

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 receipt of the 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 submit to the Commission a written evaluation report with one of the following recommendations:

- 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.

(Fish & G. Code, § 2073.5, subds. (a)-(b).) 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 listed 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.)

B. Petition History

The Petitioner is soliciting review for a threatened or endangered species determination of a proposed Southern California/Central Coast Evolutionarily Significant Unit (ESU) of mountain lions (Puma concolor), or one or more of the six subpopulations, singularly or in combination within the proposed ESU as threatened or endangered pursuant to the California Endangered Species Act (CESA), Fish and Game Code Section 2050 et seq.

On June 25, 2019, the Commission received a petition to list the Southern California/Central Coast ESU of mountain lions under CESA. On July 5, 2019, the Commission referred the Petition to the Department for evaluation. In August 2019, the Department requested, and the Commission granted, a 30-day extension of the 90-day Petition evaluation period. The Department submitted this Petition Evaluation report to the Commission on January 31, 2020.

The Department evaluated the scientific information presented in the Petition as well as other relevant information the Department possessed at the time of review. The Commission did not receive new scientific information from the public during the Petition Evaluation period pursuant to Fish and Game Code section 2073.4. 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 threat.
- Impact of existing management efforts.
- Suggestions for future management.
- A detailed distribution maps.
- Availability and sources of information; and

C. Overview of Mountain Lion Ecology

Mountain lions (Puma concolor) belong to the order Carnivora and are members of the cat family Felidae. Common names are many and include puma, cougar, or panther. In California, mountain lions can range from near sea level to the higher mountain slopes and some desert areas (Grinnell et al. 1937, Young and Goldman 1946). Although they occur at low densities, they were once widespread in North America (Pierce and Bleich 2003). Adults are large and slender with short muscular limbs and a long black-tipped tail that is about one third of the animal's total length. Males are typically larger than females. Male mountain lions generally weigh 121 to 143 pounds (55 to 65kg) with a length of 7.2 to 7.5 feet (2.2 to 2.3m) from nose to tail tip, and female lions generally weigh 77 to 99 pounds (35 to 45kg) with a length of 6.6 to 6.9 feet (2.0 to 2.1m) (Currier 1983).

Mountain lions reach sexual maturity at two to four years of age, and females care for their young for one to two years. They have a polygynous social structure, and males do not contribute to rearing young. Mates likely locate each other with auditory and olfactory signals (Currier 1983). Gestation lasts 82 to 96 days (Young and Goldman 1946, Currier 1983). Litter size ranges from one to six, though two to four kittens per litter are typical (Pierce and Bleich 2003, Beier et al 2010, Riley et al. 2014). Denning mountain lions have been found to avoid roads and stay at a distance from human disturbance four times greater than non-reproductive mountain lions (Wilmers et al. 2013).

Large ungulates, especially deer, are the preferred prey of mountain lions, making up about 70% of their diet. However, mountain lions are opportunistic predators, and they have been documented eating a wide variety of other large and smaller prey, including moose, elk, wild horses, burros, pronghorn antelope, bighorn sheep, mountain goats,

wild pigs, coyotes, bobcats, porcupines, fishers, badgers, rabbits, raccoons, rodents, turkeys, and livestock (Currier 1983, Iriarte et al. 1990, Wengert et al. 2014, Allen et al. 2015, Garcelon unpublished data).

Mountain lions are primarily solitary, territorial, and occur in low density. They require large areas of relatively undisturbed habitat with adequate prey abundance, and habitat connectivity to allow for successful dispersal and gene flow. They have large home ranges that include heterogenous habitats including riparian, chaparral, oak woodlands, coniferous forests, grasslands, and occasionally in rocky desert uplands (Grinnell 1914, Grinnell et al. 1937, Williams 1986, Dickson et al. 2005, McClanahan et al. 2017).

As a top carnivore with no natural predators, predation by other mountain lions and death due to human activity, such as vehicle strikes and depredation take, are the main drivers of mountain lion mortality (Grinnell et al. 1937, Beier and Barrett 1993, Wilmers et al. 2013, Riley et al. 2014, Vickers et al. 2015). Weaver (1982) also noted the gradual reduction of mountain lion habitat over time as a concern.

III. Sufficiency of Scientific Information to Indicate the Petitioned Action May Be Warranted

The Petition components are evaluated below, with respect to Fish and Game Code section 2072.3 and California Code of Regulations, title 14, section 670.1, subdivision (d)(1).

A. Population Trend

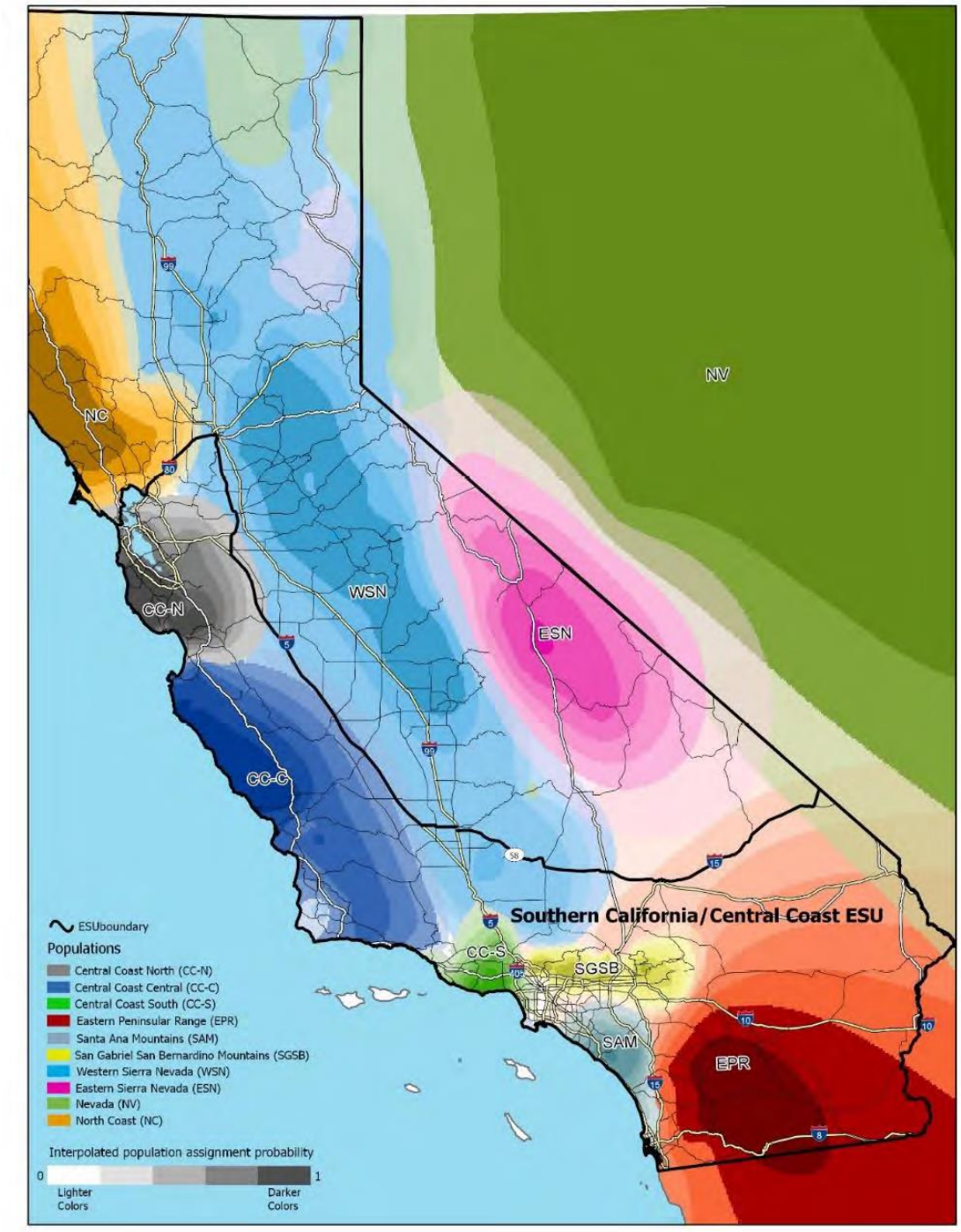
1. Scientific Information in the Petition

The Petition discusses mountain lion population status and trend on pages 34 through 40 and presents past population estimates made by the Department (see Abundance section below). Population trend is difficult to determine without estimates of population size for various years. The Petition acknowledges a lack of population trend data and therefore relies upon habitat mapping coupled with known distribution of mountain lions, along with estimated population sizes for the six subpopulations within the proposed ESU. The estimated mountain lion population sizes are based on field studies and recent genetic information which suggest a negative population trend (Ernest et al. 2003, Ernest et al. 2014, Benson et al. 2016, Gustafson et al. 2017, Gustafson et al. 2018, Benson et al. 2019).

The proposed ESU, as described in the Petition, includes six genetic subpopulations of mountain lions: 1) Central Coast North (CC-N), which includes the Santa Cruz Mountains; 2) Central Coast Central (CC-C), generally from southern Monterey Bay to the Ventura area; 3) Central Coast South (CC-S), which includes the Santa Monica

Mountains; 4) San Gabriel/San Bernardino Mountains (SGSB); 5) Santa Ana Mountains (SAM); and 6) Eastern Peninsular Range (EPR), which includes eastern San Diego County to the Colorado River and is bounded on the north by Interstate 15 (Petition Figure ES 1). The heavy black line surrounding the six genetic subpopulations outlines the proposed ESU boundary. Interstate freeways and major highways are utilized to define the proposed ESU boundary from a habitat and management perspective while also factoring in known distribution of mountain lions, and recognizing the need to maintain gene flow between the relatively large Western Sierra Nevada population of mountain lions and the smaller genetic subpopulations in the proposed ESU.

The Petition notes mountain lion populations in the Western Sierra Nevada (WSN) and Eastern Sierra Nevada (ESN) were the greatest genetic source populations, but exhibited limited gene flow with lion subpopulations along the central coast of California (CC-N, CC-C, CC-S), and neither Nevada (NV) or the North Coast (NC) mountain lions exhibited appreciable gene flow with central coast populations (Petition Figure ES 1). The SAM population exhibited gene flow only with the EPR population, and the EPR population had low connectivity with the SGSB population. The mountain lion population in the Transverse Ranges (SGSB) was the largest genetic sink but exchanged some genetic material with the WSN, CC-C, and EPR populations. Populations in the southern mountain ranges (SAM, EPR) were largely disconnected from all other populations (Gustafson et al. 2018).



Petition Figure ES 1.
Map of genetically distinct mountain lion populations and major roadways in California based on data collected from 1992-2016 (the division and status of these populations could change over time and with further research). The black lines show the proposed Southern California/Central Coast ESU boundary. Derived from Gustafson et al. (2018). Genetics data source: Kyle Gustafson, PhD, Department of Biology and Environmental Health, Missouri Southern State University, and Holly Ernest, DVM, PhD, Department of Veterinary Sciences, Program in Ecology, University of Wyoming, Laramie. Roads data source: ESRI.

As discussed earlier, genetic samples of mountain lions have allowed population size estimates to be made for the proposed ESU subpopulations by using current genetic analysis techniques (Ernest et al. 2003, Ernest et al. 2014, Gustafson et al. 2017, Gustafson et al. 2018). The results of the analyses are presented below for the six mountain lion subpopulations in the proposed ESU (Petition Table 1). Mountain lion population estimates in the table depict the ratio of effective population size (Ne) to total adult population size (Ne/N). Effective population size generally refers to the breeding adults in a population, in recognition of the fact that all adult animals in a population may not breed.

Petition Table 1.

Table 1. Effective population size and estimated total adult population of Central Coast and Southern California Mountain Lion Populations from Gustafson et al. (2018).

Population	Effective Population Size (N_e)	Estimated Total (Adult) Population (N)[1]
Central Coast North (CC-N)	16.6	33-66
Central Coast Central (CC-C)	56.6	113-226
Central Coast South (CC-S)	2.7[2]	5-10
Santa Ana Mountains (SAM)	15.6[3]	31-62
San Gabriel/ San Bernardino Mountains (SGSB)	5	10-20
Eastern Peninsular Range (EPR)	31.6	63-126
Total		255-510

[1]Calculations are based on the estimated ratio of effective to total adult population size (Ne/N) of Florida panthers being 0.25 to 0.5 (Ballou et al. 1989). This ratio was used in the U.S. Fish and Wildlife Service Florida Panther Recovery Plan (USFWS 2008). Petitioners recognize that these derived population estimates, while informative, are not definitive and will likely be superseded by new population estimates being developed by the Department (CDFW 2018a).

[2]Benson et al. (2019) calculated an Ne of 4 for the Santa Monica Mountains population within the CC-S. Applying the Ballou et al. (1989) factors would lead to an estimate of 8-16 mountain lions in this area, which is roughly consistent with current estimates of this well-monitored population.

[3]Several studies provide Ne calculation for the SAM population. Ernest et al. (2014) calculated an Ne of 5.1 and Benson et al. (2019) calculated an Ne of 6. Applying the Ballou et al. (1989) factors to the most recent calculation would lead to an estimate of 12-24 mountain lions in the SAM, which is roughly consistent with current estimates.

The Petitioners also acknowledged the Ne/N methodology has limitations and is but one method of generating an overall abundance estimate. Studies are needed to more accurately determine regional and statewide mountain lion population size and trend, but most of the genetic subpopulations within the proposed ESU are struggling with low population sizes, and genetic near-isolation leading to low genetic diversity which puts them at increased risk of extinction (Beier 1993, Beier 1995, Dickson et al. 2005, Ernest et al. 2014, Riley et al. 2014, Vickers et al. 2015, Benson et al. 2016, Gustafson et al. 2018, Benson et al. 2019).

The Petition noted that due to extreme isolation caused by roads and development, the SAM and CC-S populations exhibit high levels of inbreeding, and with the exception of the endangered Florida panther, have the lowest genetic diversity observed for the species globally (Ernest et al. 2014, Riley et al. 2014, Gustafson et al. 2018, Benson et al. 2019). The SGSB and CC-N similarly have low observed genetic diversity and effective population sizes, and the mountain lions occupy areas of significant isolation and habitat fragmentation, which also increases their risk for inbreeding depression (Gustafson et al. 2018).

Two long-term studies on radio-collared mountain lions in the SAM provide some insight into population trend for that small population (Beier 1993, Vickers et al. 2015). In a study that consisted of 32 radio-collared lions in the SAM from 1988 to 1993, researchers found a 75% adult survival rate (Beier and Barrett 1993), which is similar to adult survival rates in other populations, e.g., the CC-S population (Riley et al. 2014). However, in a second, more recent study conducted in the SAM, 31 mountain lions were marked from 2001 to 2013 and researchers found a reduced survival rate of 56.5% across all sexes and age groups (Vickers et al. 2015).

2. Conclusion

The petition includes a discussion of the available peer reviewed scientific information on mountain lion population trends. The petition on its face includes sufficient information to indicate the petitioned action may be warranted. The population trend information in the petition is based on an emerging methodology that will require further evaluation to assess the population trend of the proposed ESU that is the subject of the petitioned action.

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition provided adequate information to indicate mountain lion populations in the proposed ESU have declined since the historical period based on known habitat loss and fragmentation, loss and reduction of habitat connectivity, and human-caused mortality factors (vehicle strikes, and depredation

take). The Petition also presents results of field and genetic studies that indicate low effective population sizes, low genetic diversity, and evidence of inbreeding.

B. Geographic Range

1. Scientific Information in the Petition

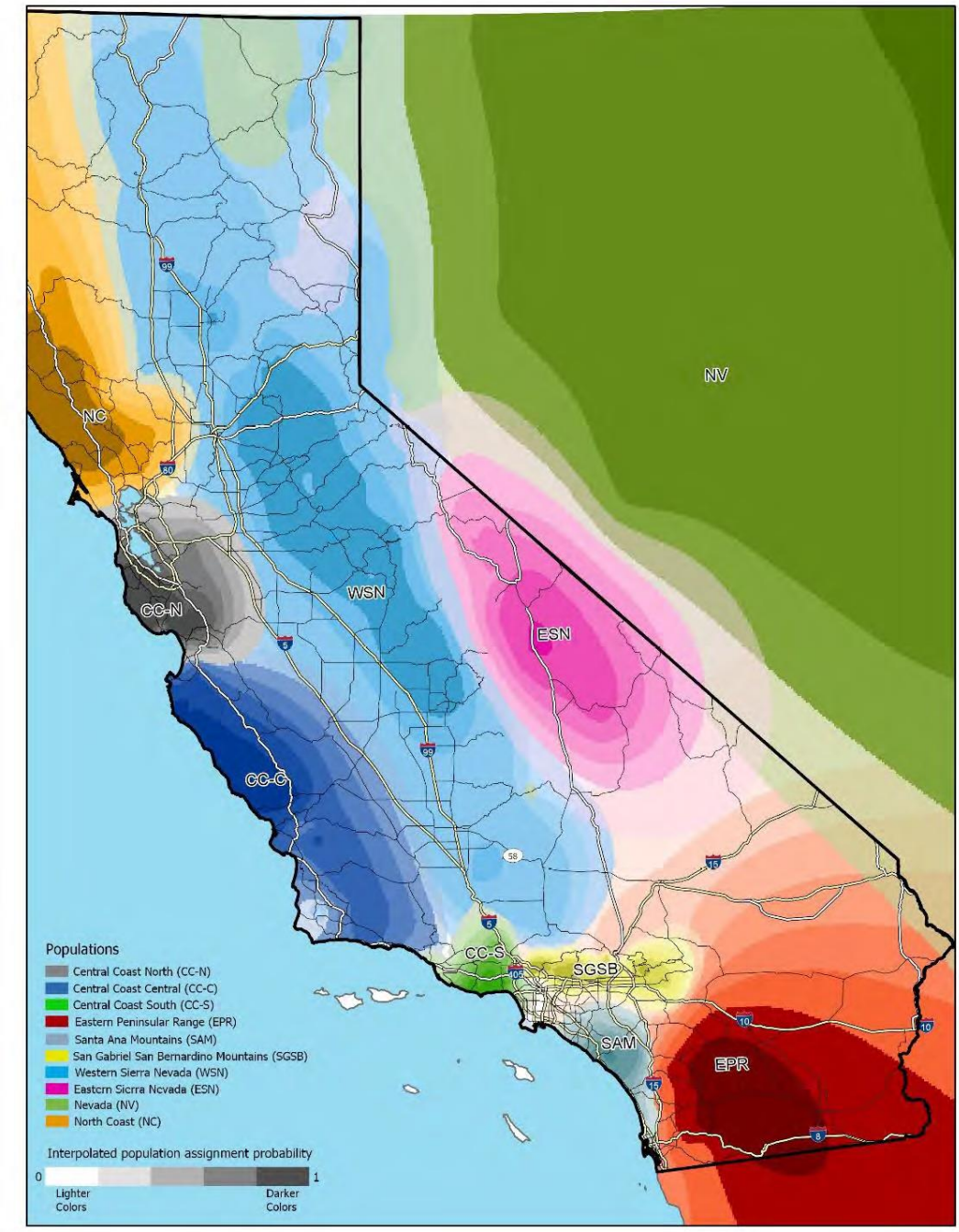
Information regarding geographic range is discussed on pages 30 through 33 of the Petition and indicates a decline in range based on habitat loss and fragmentation due to development. The Petition included a map to depict the constraints on mountain lion dispersal and gene flow between habitat patches within the proposed ESU, and for southern California mountain lion habitat in particular (Petition Figure 8). The Petition describes the major roads and Interstate freeways displayed as obstacles and potential sources of mortality for foraging and dispersing mountain lions that also contribute to reduction in geographic range. The urbanized landscape and highway network may also restrict mountain lion immigration into the southern California mountain lion populations from the more genetically diverse WSN and EPR subpopulations.

The Petition describes that the highly urbanized zone spreading out from the greater Los Angeles area, and generally continuing down the coastal zone to San Diego county demonstrates the habitat isolation problem for the CC-S, SGSB, and SAM mountain lion populations (Vickers et al. 2015, Benson et al. 2016, Gustafson et al. 2018, Benson et al. 2019). The EPR population is also affected by human development and road networks, but to a slightly lesser degree than the aforementioned three smaller populations. CC-N mountain lion populations are likewise losing geographic range and being constricted by development and highways in the Santa Cruz Mountains and the southern San Francisco Bay Area (Wilmers 2014, Wang et al. 2017).

Reduction in geographic range is expected to continue for mountain lions in southern California. A study of geographic range for mountain lions in the SAM and EPR subpopulations showed that nearly half of lion habitat in the study area is on private land, and approximately 1/3 of those lands available in 1970 will be developed by 2030. Additionally, some habitat that is currently adjacent to development may become fragmented, with potential loss of connectivity and increased risk to mountain lions from vehicle strikes and depredation take. Most additional suburban and urban development projected for 2030 will occur in areas that were classified as undeveloped or rural in 2000, but 2% of the current exurban area will be converted to suburban/urban (Burdett et al. 2010).

The Petition notes that although genetic subpopulations have been identified in southern California mountain ranges, mountain lions have been detected outside of the CC-S, SAM, SGSB, and EPR core areas, including transient and resident mountain lions in the Mojave and Colorado deserts and along the lower Colorado River (Grinnell

1914, Grinnell et al. 1937, Young and Goldman 1946, Williams 1986, Kucera 1998, Dellinger et al. 2019 in press). Mountain lions have also been documented within approximately 40 miles of the Colorado River on the Kofa National Wildlife Refuge in Arizona (Smythe 2008).



Petition Figure 8. Map of genetically distinct mountain lion populations and major roads in California. The CC-S (which includes the Santa Monica Mountains), SGSB, and SAM populations are exceptionally constrained. The map is based on data collected from 1992-2016 (the division and status of these

populations could change over time and with further research). Derived from Gustafson et al. (2018). Genetics data source: Kyle Gustafson, PhD, Department of Biology and Environmental Health, Missouri Southern State University, and Holly Ernest, DVM, PhD, Department of Veterinary Sciences, Program in Ecology, University of Wyoming, Laramie. Roads data source: ESRI.

The Yuma mountain lion (Puma concolor browni) is designated by the Department as a subspecies of special concern (Williams 1986, Kucera 1998, CDFW 2019). However, Mclvor et al. (1995) and Culver et al. (2000) detected little morphological or genetic support for retention of the P.c. brownii subspecies. Until the genetic structure of desert lions is analyzed via newer genomic techniques, it is difficult to determine how important these southeastern California lions are to the genetic makeup of the EPR subpopulation, or if the western part of northern Mexico is a primary genetic source for the EPR lions. This unique area of California is discussed further in the Distribution section, below.

The desert lion populations occur in low densities, likely due to lower quality habitat and lower prey abundance. The Petition includes these low-density transients and resident lions within the proposed ESU.

2. Conclusion

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition presented adequate information on habitat loss and fragmentation to demonstrate a decline in the geographic range of mountain lions in the proposed ESU.

C. Distribution

1. Scientific Information in the Petition

The Petition discusses current and historical distribution on pages 30 through 33.

As discussed earlier in this Petition Evaluation, mountain lions occur from near sea level to the higher mountain slopes and some desert areas in California (Grinnell et al. 1937, Young and Goldman 1946). They have large home ranges that include heterogenous habitats including riparian, chaparral, oak woodlands, coniferous forests, grasslands, and occasionally in rocky desert uplands (Grinnell 1914, Grinnell et al. 1937, Williams 1986, Dickson et al. 2005, McClanahan et al. 2017). However, mountain lions have a limited distribution in the Central Valley, which could relate to lower availability of deer, their primary prey source. Early agricultural development and loss of riparian habitat, along with other development and habitat loss in the Central Valley may also be a factor in their scarcity in this region of the state, though dispersing lions have occasionally been documented in the Central Valley. Mountain lions were recently detected via

wildlife cameras in the northern Central Valley near Butte Sink where some riparian habitat is still present (McClanahan et al. 2017).

In regard to the EPR subpopulation in southern California, the Petition states that limited studies have occurred regarding the northern, southern, and eastern extent of the lion population, genetic studies on the Yuma mountain lion are limited, and no samples were obtained from that area for the study conducted by Gustafson et al. (2018). However, movement patterns between 2001 and 2016 suggest that EPR mountain lions generally stay north of the U.S. – Mexico border, along the edge of the desert that borders the east side of the EPR, and south of I-10 (Vickers et al. 2015, Vickers et al. 2017). Although the EPR population has been found to be largely disconnected from all other California populations, some mountain lion movement was documented traversing between the EPR and SGSB (Vickers et al. 2015), and evidence exists of limited genetic exchange between the two populations (Gustafson et al. 2018). In addition, one young male mountain lion was documented to the south using the Parque-to-Park Linkage to cross the U.S. - Mexico border several times (where a border wall is lacking due to the rugged terrain); but that lion was eventually killed in Mexico by a vehicle strike (Vickers et al. 2015; W. Vickers unpublished data). Little is known about the mountain lions south of the border, but the movement patterns of EPR mountain lions suggest they may form a discrete population within the EPR north of the border (Vickers et al. 2015, Vickers et al. 2017).

The Petition highlights that more information on mountain lion abundance, distribution, and dispersal is needed from the Colorado River and eastern desert areas of California, along with that for lion populations in Arizona and Mexico (Williams 1986, Kucera 1998). At this time, there is inadequate information and a lack of genetic samples for these outlying areas of the EPR genetic subpopulation (McIvor et al. 1995, Vickers et al. 2015, Gustafson et al. 2018).

2. Other Relevant Scientific Information

In regard to the former distribution of Yuma mountain lions along the Colorado River in California, Grinnell (1914:page 251) stated: “We were told of the occurrence of cougars at several points along the river from Riverside Mountain south”; and he purchased two cougar skins with skulls from a rancher. At that time, mountain lions in the region were designated as Felis oregonensis browni and found along the lower Colorado River in California. Later, he described the “Yuma mountain lion” (Felis concolor browni) as “Now very rare, perhaps extinct” (Grinnell et al. 1937: page 587).

The swimming ability of mountain lions is described in Bruce (1921) and Young and Goldman (1946:pages 63 and 81), documenting that mountain lions can swim and are able to cross rivers.

One recent publication, not discussed in the Petition, documented mountain lion occurrence in the eastern part of Marin County, where prior information was mostly limited to the western section of the county inside Point Reyes National Seashore (Fifield et al. 2015). North Coast (NC) mountain lions in Marin County are separated from the smaller CC-N population by expansive development and the road and freeway network in the greater San Francisco Bay area.

3. Conclusion

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition discussed information on distribution of the mountain lion and cited published and unpublished studies and reports that indicate a reduction in distribution.

D. Abundance

1. Scientific Information in the Petition

The Petition discusses abundance on pages 34 through 40, and cites Mansfield and Weaver (1989), discussed below. Mountain lions are secretive, making abundance or population trend estimates difficult. Additionally, mountain lion population densities are generally low, which may be driven by prey density, competition between males for access to females, and mutual avoidance (Pierce and Bleich 2003). Other factors contribute to lion abundance, such as habitat quality and quantity, unnatural mortality events due to vehicle strikes and depredation take, and the presence of transient mountain lions within established home ranges of resident lions.

The Petition presents information regarding population densities. In the United States, population densities for mountain lions range from 0.4 to 4.3 resident adults per 38.6 miles^2 (100 km^2), and 0.4 to 7.1 total mountain lions per 38.6 miles^2 (100 km^2), though it varies by population and the presence of human-induced pressures (e.g., hunting) (Pierce and Bleich 2003). In California, where hunting is no longer legal, but other anthropogenic pressures such as roads and development are present, resident adult and total population densities have been found to be 1.1 and 3.6 per 38.6 miles^2 (100 km^2), respectively (Pierce and Bleich 2003).

The Petition noted past efforts by the Department to estimate mountain lion abundance/population size and included the various estimates reported in Mansfield and Weaver (1989). The Petition correctly stated that the Department acknowledges the estimate from 1984 is outdated and relied on density estimates from regional studies to derive a statewide abundance. The Department's estimates were based on field studies

and information available at the time. The estimates reported in Mansfield and Weaver (1989) are as follows:

- 600 in 1920
- 2,400 in 1972
- 2,400-3,000 in 1982
- 4,100-5,700 in 1984
- 5,100 (minimum) in 1988

The 1988 minimum statewide estimate was based on 80,000 square miles of inhabited range. The authors stated the following after presenting these estimates: “However, a statewide population estimate is of limited value. For making management decisions, reasonably accurate population estimates are needed for logical management units”.

The Petition also presents information from the Department’s mountain lion web page (CDFW 2018) which uses a range for a current statewide population estimate of 4,000-6,000 mountain lions. Studies by the Department and other cooperators are in process to update the estimate (Dellinger 2019).

The Petition discusses habitat loss and fragmentation in the Southern California/Central Coast ESU which has negatively affected the abundance of mountain lions. The Petition discusses the six genetic subpopulations in detail and summarizes recent tracking and genetic studies. This information was discussed earlier in the Population Trend section of this Petition Evaluation, given the close relationship between abundance, population size, and population trend.

The Petition notes that new techniques for analyzing wildlife populations through genetic studies are now helping wildlife managers better estimate population size and viability. Because demographic and genetic processes interact, both factors contribute to the probability of extinction for small, isolated populations (Benson et al. 2019).

2. Conclusion

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition describes what is known about the abundance of mountain lions in the proposed ESU.

E. Life History

1. Scientific Information in the Petition

The Petition addresses life history details of the mountain lion on pages 7 through 21. Information on taxonomy, morphology, population genetics, effective population size

and extinction risk, reproductive biology, foraging ecology and diet, habitat requirements, and survivorship and causes of mortality are discussed. Additionally, the six genetic subpopulations within the proposed ESU are discussed.

As noted earlier in the "Overview of Mountain Lion Ecology" section of this Petition Evaluation, mountain lions have a polygynous social structure and males do not contribute to rearing young. The ratio of adult females to males is 2:1 or 3:1, and sub-adult male lions immigrate further from their natal area than sub-adult female lions (Seidensticker et al. 1973, Beier 1993, Beier and Barrett 1993, Santa Cruz Puma Project 2015). The potential for long distance immigration by young male mountain lions has an important demographic influence if the dispersers become breeders and increase the genetic diversity of a population. Generally, as noted in the Petition, population viability is increased by higher genetic diversity in a population and consistent immigration between small populations is required; however, when barriers to dispersal exist, population viability may become compromised (Riley et al. 2014, Benson et al. 2016, Benson et al. 2019).

The Petition describes how territorial adult mountain lions can be constrained in their movements when faced with barriers such as a large freeway, or a narrow corridor between habitat patches. As an example, in 13 years of study on the SAM population, only one radio-collared male lion crossed I-15, the major freeway barrier between the SAM and the EPR, and that lion was killed 25 days after the crossing for depredating domestic sheep (Vickers et al. 2015). Although Gustafson et al. (2017) documented three males immigrating into the SAM from the EPR, and four males emigrating from the SAM to the EPR over a 15-year period, only one of the males (M86, an immigrant to the SAM) is known to have successfully bred. While M86 improved the SAM population's genetic diversity (Gustafson et al. 2017), high levels of mortalities due to vehicle strikes and depredation/illegal killings likely reduce the number of immigrants that can successfully establish as breeding adults (Vickers et al. 2015).

The Petition cites Beier and Barrett (1993) and Benson et al. (2019) which indicate that in a small population with a female-biased adult sex ratio and high levels of adult mortalities due to vehicle strikes, and 3.4 times more male than female lions affected by depredation take, there is potential for occasional male lion extinction in the SAM, which could severely limit the short- and long-term viability of the population.

The Petition states that the divergence of the genetic subpopulations in the proposed ESU is likely the result of habitat fragmentation caused by roads and development (Ernest et al. 2003, Ernest et al. 2014, Riley et al. 2014, Vickers et al. 2015, Benson et al. 2016, Gustafson et al. 2017, Gustafson et al. 2018, Benson et al. 2019). The six small and nearly isolated populations have an increased risk of inbreeding depression and extinction due to limited genetic exchange. The Petition states habitat connectivity

and habitat protection is needed to help assure viable populations (Ernest et al. 2014, Riley et al. 2014, Vickers et al. 2015, Benson et al. 2016, Gustafson et al. 2018, Benson et al. 2019).

2. Conclusion

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition presents scientific information on life history of the mountain lion, and the biological, genetic, and habitat factors of concern for the six subpopulations within the proposed ESU.

F. Kind of Habitat Necessary for Survival

1. Scientific Information in the Petition

The Petition addressed mountain lion habitat requirements on pages 19 through 21. As noted in the Petition, mountain lions are primarily solitary and occur in low density. Exceptions to their solitary nature occur in certain situations, e.g., during breeding activities, when females are rearing kittens, or when sub-adults are dispersing with siblings. Mountain lions are territorial and require sufficient cover in order to stalk, ambush, and cache their prey. Because deer are their main prey, a lion population requires sufficient habitat to sustain a deer population and alternate species to prey upon as needed. The Petition describes how large areas of relatively undisturbed habitat with functional connectivity to other suitable habitat areas are needed to allow for successful foraging, resting, breeding, denning, and dispersal. Dispersal includes emigration and immigration (allowing for two-way gene flow), which is essential to maintain exchange of genetic traits between populations, decrease the risk of inbreeding depression, and help assure long term population viability.

As presented in the Petition, mountain lions have large home ranges that may include heterogenous habitats including riparian, chaparral, oak woodlands, coniferous forests, grasslands, and occasionally rocky desert uplands (Grinnell 1914, Grinnell et al. 1937, Williams 1986, Beier and Barrett 1993, Dickson et al. 2005, McClanahan et al. 2017). As a result of their mountain lion study in the SAM population, Dickson and Beier (2002) advised protection of riparian areas from development, road building, and habitat alteration as crucially important to the lion population. They added that habitat adjacent to the riparian zone should also be maintained to help support native prey for mountain lions. Riparian areas provide important stalking and feeding cover for the SAM mountain lion population, and prey kill sites and prey caches were most often associated with this vegetation type (Beier et al. 1995).

Although mountain lions will use moderately disturbed areas as they travel and hunt

(Wilmers et al. 2013, Gray et al. 2016), occupancy is lower in developed areas and lions are more likely to use developed areas if they border open spaces (Wang et al. 2015). Mountain lions require a habitat mosaic that provides sufficient space to move away from human-disturbed areas, and connect to expansive, intact, heterogeneous habitats (Beier 1995, Dickson and Beier 2002, Dickson et al. 2005, Zeller et al. 2017).

Research on mountain lions in the SAM suggested that an area of less than 425 miles^2 (1,100 km^2) was unlikely to support a lion population without some immigration (Beier 1996), and the Santa Monica Mountains (CC-S) are approximately 255 miles^2 (660 km^2). In highly developed areas, the conservation of natural habitat on both sides of freeways and effective corridors across them are needed (Ng et al. 2004), or translocations may be necessary if large carnivores are to persist in proximity to the megacities (metropolitan areas of >10,000,000 people). of the future (Riley et al. 2014).

2. Conclusion

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition presents scientific information regarding the kind of habitat necessary for the mountain lion's survival, including the importance of functional movement and dispersal corridors between habitat areas, preservation of existing diverse habitat, and adequate buffers from effects of human development, roads, and highways.

G. Factors Affecting the Ability to Survive and Reproduce

1. Scientific Information in the Petition

The Petition discusses factors affecting the mountain lion's ability to survive and reproduce on pages 40 through 53. These factors include low genetic diversity and inbreeding depression, vehicle strikes, depredation and illegal take, mortality from intraspecific strife (i.e., aggression between lions), orphaned kittens and kitten abandonment, poisoning from rodenticides and other environmental toxicants, increased human-caused wildfires, and climate change. Further, the Petition summarizes the primary threats to population viability of mountain lions in the proposed ESU as the direct impacts of past and present habitat modification and destruction. These factors, as described in the Petition, are briefly summarized below.

Most factors affecting the ability of mountain lions to survive and reproduce in the proposed ESU are caused by humans. Lack of adequate habitat and functional connectivity between the mountain lion subpopulations is the primary driver of declining

mountain lion populations. Habitat loss and fragmentation due to development, roads, and highways has resulted in low effective population size, low genetic diversity, extreme levels of isolation, and high mortality rates, which collectively drive the genetic subpopulations within the proposed ESU toward extinction. Ongoing and future planned development in suitable mountain lion habitat further threatens the subpopulations.

As described earlier in the Population Trend section, the Petitioners noted that the CC-N, CC-S, SGSB, and SAM populations are found to have low genetic diversity, and the SAM population's genetic variation is nearly as low as the endangered Florida panther population (Ernest et al. 2014, Riley et al. 2014, Gustafson et al. 2017). Additionally, effective population sizes of the CC-N, CC-S, SGSB, SAM, and EPR populations are well below the older and less conservative scientific threshold of 50, and the CC-C effective population size is just barely above that threshold at Ne = 56.6 (Ernest et al. 2014, Riley et al. 2014, Benson et al. 2016, Gustafson et al. 2018, Benson et al. 2019). These low effective population sizes suggest inbreeding depression could occur within the short-term (over the duration of five generations) and these populations are at increased risk of extinction.

Vehicle strikes are a known mortality factor for mountain lions, and in California, an estimated 100 mountain lions are killed every year by vehicle strikes (Pollard 2016). From 1981 to 2013, vehicle strikes accounted for 53% (50/94) of mountain lion deaths in the SAM, and 30% in the EPR (46/154) (Vickers et al. 2015). Although the CC-N population is less studied, the Petition noted evidence that vehicle strikes are a significant cause of mortalities in this population. At least six mountain lions have been killed by vehicle strikes on Highway 17 in the Santa Cruz Mountains between 2008 and 2018 (Midpeninsula Regional Open Space 2017, Slade 2018) and news outlets reported at least three vehicle strikes killing mountain lions on the I-280 in San Mateo County between 2014 and 2016.

Another factor identified by the Petition to affect mountain lion survival and reproduction is depredation take. Depredation take results in more deaths of male lions compared to females. Statewide, of mountain lions killed for depredation in 2017, 68% were males (CDFW 2018b), and from 1981 to 2013, 3.4 times more male than female mountain lions were killed for depredation purposes in the SAM and EPR (Vickers et al. 2015). Not only do lions killed via depredation permits diminish the total abundance of lions in these populations, but because they consist predominantly of males, the number of primary gene dispersers is also greatly reduced, which further inhibits adequate gene flow (Vickers et al. 2017).

In addition to the reported depredation take, additional mountain lions are illegally killed, and many incidents likely go undocumented (Beier and Barrett 1993, Vickers et al. 2015). Illegal take has been observed in the CC-S, SAM, and EPR (Beier and Barrett

1993, Riley et al. 2014, Vickers et al. 2015) as well as in the CC-N (Yap 2018, pers. observation); and although 80 mountain lions were reported as being killed under depredation permits in 2017, 89 deaths were being investigated (CDFW 2018b).

The Petition describes intraspecific strife as another factor affecting mountain lion populations and the leading cause of mortality for the nearly isolated mountain lions in the Santa Monica Mountains (CC-S) (Riley et al. 2014). Although intraspecific strife is a common source of mortality in mountain lion populations (Beier and Barrett 1993, Logan and Sweanor 2001, Allen 2014), unusually high levels of intraspecific strife have been observed in the CC-S population (Riley et al. 2014). About 41% (9/22) of deaths in radio-collared mountain lions being tracked from 2002 to 2018 were from intraspecific strife, with multiple cases of aggressive adult males killing their siblings, offspring (male and female), and previous mates (Riley et al. 2014). While males are likely to have larger home ranges to protect food resources and access to females, killing of potential mates has no apparent evolutionary benefit, as it reduces chances of future reproduction (Riley et al. 2014). These high levels of intraspecific strife are likely due to limited space in the Santa Monica Mountains caused by dispersal barriers (Riley et al. 2014, Benson et al. 2019).

In the SAM lion population, intraspecific strife was documented on two occasions (one GPS-collared, one previously GPS-collared) since the publication of Vickers et al. (2015), (W. Vickers unpublished data). Enhanced connectivity between populations would facilitate dispersal which would probably reduce and/or prevent high levels of intraspecific strife and improve survival and reproduction rates (Riley et al. 2014, Benson et al. 2019).

The Petition describes mortality of mountain lion kittens (also known as cubs) due to abandonment by their mother, and notes it is fairly common in the Santa Monica Mountains (CC-S), accounting for 23% (5/22) of the known causes of death for marked/collared animals. Mountain lion kittens can also become orphaned if their mother is killed by vehicle strikes or under depredation permit before they have dispersed. If they are too young to fend for themselves, they likely starve to death or are preyed upon by other predators. If the cubs are more mobile, they may approach areas where they are more likely to encounter humans as they search for food. This was seen in November 2017, when a mother mountain lion was killed by a vehicle strike in the SAM and two of her cubs were found roaming near human establishments – one in a backyard and the other along a road (Veklerov 2018). Both cubs, too young to survive on their own, were placed in the Oakland Zoo.

The Petition discusses the emergence of anticoagulant rodenticide (AR) poisoning as a mortality factor for mountain lions in the proposed ESU. These toxicants are used to suppress pest populations in agricultural or urban settings. The potential for direct and

secondary exposure and illicit use of ARs has led to a relatively recent field of study for determining effects of AR poisoning on various carnivore species (McMillin et al. 2008, Gabriel et al. 2012, Serieys et al. 2015), including mountain lions (Riley et al. 2007, Rudd et al. 2018, Rudd et al. 2019).

In southern California, high levels of ARs in bobcats correlated with notoedric mange fatalities causing a local decline in the population (Riley et al. 2007, Serieys et al. 2015). Notoedric manage is caused by a parasitic mite and has been observed in mountain lions (Uzal et al. 2003, Riley et al. 2007, Serieys et al. 2015).

As summarized in Serieys et al. (2015), ARs interrupt the production of vitamin K-dependent blood clotting proteins, leading to the depletion of these proteins over a period of days inducing mortality by internal hemorrhage. Comprised of two classes of compounds, ARs are the primary chemical method used worldwide for the control of rats and mice. First-generation ARs (FGARs), including warfarin, diphacinone, and chlorophacinone, are more readily metabolized, have a shorter half-life in hepatic tissue (2 weeks to several months), and must be consumed in multiple feedings to reach a lethal dose. Second-generation ARs (SGARs) include brodifacoum, bromadiolone, and difethialone, and were developed to target rodents with genetic resistance to warfarin. Due to prolonged action and increased potency with hepatic half-lives ranging from 6-12 months, SGARs may persist in liver tissue for more than a year in some species. Both classes of compounds have delayed onset of action, and death from AR consumption can occur up to 10 days after ingestion. Individual rodents may continue to accumulate the compounds over a period of days, increasing their attractiveness to predators as they become weakened by the toxicant, and easier to capture. Mountain lions become poisoned by ingesting the contaminated rodents, or by eating prey species that have ingested contaminated rodents.

The Petition discusses the Department's Wildlife Investigations Lab (WIL) studies of AR exposure in necropsied mountain lions since 2016. Results of WIL's recent analyses found AR exposure in 241 of the 252 (95.6%) of mountain lion livers tested from 2016 to 2018 (Rudd et al. 2019). SGARs were more commonly detected than FGARs, despite a 2014 regulatory change restricting SGAR use to certified pesticide applicators. Past and ongoing work by WIL demonstrates widespread exposure to both FGARs and SGARs in California's mountain lions. However, during the two-year study, mortalities related to AR poisoning were not observed on postmortem examination and no consistent occurrence of a disease process compatible with immunosuppression was observed (Rudd et al. 2018, Rudd et al. 2019, Rudd unpublished data).

Conversely, in 2004 a study in the CC-S subpopulation documented two adult mountain lions that died directly from anticoagulant toxicity, and both lions also had infestations of notoedric mange (Uzal et al. 2003, Riley et al. 2007). Two other mountain lions that died

in intraspecific fights also exhibited exposure to two to four different anticoagulants. These results indicate AR toxicity can have direct and possibly indirect effects on mortality (Riley et al. 2007). The Petition notes that in the SAM subpopulation, anticoagulant rodenticide residues were detected in the livers of 100% of deceased animals tested, with up to five different compounds detected in some animals (Riley et al. 2007, Riley et al. 2014, W. Vickers, pers comm).

The Petition also notes exposure of mountain lions to dangerously high levels of illegal pesticides, such as carbofuran, used on illegal marijuana grow sites, which, like ARs, can also bioaccumulate in the liver and potentially cause health issues (Rudd et al. 2019). Further research is needed to investigate the lethal and sub-lethal effects of anticoagulants and other toxicants on wildlife in terrestrial environments (Riley et al. 2007, Gabriel et al. 2015, Rudd et al. 2018).

As noted in the Overview of Mountain Lion Ecology section of this Petition Evaluation, the fisher (*Pekania pennanti*) is a forest carnivore and known prey species for mountain lions in some forested areas of California (Wengert et al. 2014), including the southern geographic region of the WSN subpopulation of lions. Fisher have been documented to suffer mortality from AR exposure, and researchers concluded that mortality from and exposure to toxicants appears to be on the rise, and exposure to multiple ARs increases probability of death (Gabriel et al. 2015).

The Petition describes increased frequency of wildfire as another factor affecting mountain lion survival. Although fire is a natural disturbance in California ecosystems, sprawl development with low/intermediate densities extending into habitats prone to fire have led to more frequent wildfires that burn larger areas (Syphard et al. 2007, Syphard et al. 2009). Most wildfires in California are caused by human ignitions, like power lines, arson, improperly disposed cigarette butts, debris burning, fireworks, campfires, or sparks from cars or equipment (Keeley and Fotheringham 2003, Syphard et al. 2007, Syphard et al. 2012, Bistinas et al. 2013, Balch et al. 2017, Radeloff et al. 2018, Syphard et al. 2019). The Petition noted that although mountain lions are highly mobile and generally able to move away from wildfires, in severe weather conditions wind-driven fires can spread quickly (Syphard et al. 2011). If mountain lion movement is constrained by roads and development, and the lions are unable to access escape routes, their chances of surviving wildfires are greatly reduced. Vickers et al. (2015) documented one death of a collared mountain lion in the SAM and one in the EPR due to human-caused wildfires, and the deaths of two collared mountain lions in the CC-S in 2018 have been attributed to the Woolsey Fire. Additionally, increased frequency of fire ignitions can cause shifts in natural fire regimes, potentially leading to large-scale landscape changes, such as vegetation-type conversion and habitat fragmentation, which can impact wide-ranging species like the mountain lion (Jennings et al. 2016).

The Petition also discusses climate change as a factor affecting mountain lion survival and reproduction, and briefly summarizes the scientific consensus on climate change, citing some relevant scientific papers, e.g., Warren et al. (2011) and Wiens (2016). Improving landscape connectivity is a key factor for climate change resilience and adaptation (Heller and Zavaleta 2009), and this holds true for a wide-ranging carnivore like the mountain lion. Without functional connectivity that provides multiple pathways for mountain lion movement, the Central Coast and Southern California mountain lion populations and the prey they depend on may not be able to shift their ranges as available resources shift in response to climate change. Enhanced connectivity that provides multiple corridors for safe passage between suitable habitat areas would improve chances of survival and reproduction by increasing the probability of movement across landscapes by a wider variety of species, and providing alternate escape routes or refugia for animals seeking safety from catastrophic wildfires (Mcrae et al. 2008, Pinto and Keitt 2008, Mcrae et al. 2012, Cushman et al. 2013, Olson and Burnett 2013).

2. Other Relevant Scientific Information

In addition to the limiting factors described above, some diseases contribute to mountain lion mortality, though they are not common at this time. The three diseases reported for mountain lions that were not included in the Petition are described below.

1. Feline infectious peritonitis (FIP) is a fatal immune-mediated vasculitis of felids caused by a mutant form of a common feline enteric virus, feline enteric coronavirus. The virus can attack many organ systems and causes a broad range of signs, commonly including weight loss and fever. Regardless of presentation, FIP is ultimately fatal and often presents a diagnostic challenge. In May 2010, a malnourished young adult male mountain lion (Puma concolor) from Kern County, California, USA was euthanized because of unusual behavior and concern for public safety. A postmortem examination was performed, and a PCR for coronavirus performed on kidney tissue was positive, confirming a diagnosis of FIP. Although coronavirus infection has been documented in mountain lions by serology, this was the first confirmed report of an FIP-related mortality (Stephenson et al. 2013).

2. Feline leukemia virus (FeLV): A young adult male free-ranging mountain lion was removed from a college campus in Sacramento, California, and blood samples taken shortly after capture revealed it to be anemic, lymphopenic, suffering from renal disease, and feline leukemia virus (FeLV) antibody positive (Jessup et al. 1993). The researchers noted that as human populations expand into and utilize wildlife habitats, free-ranging wild animals may come into contact with diseases most commonly associated with domestic animals. Feline leukemia virus (FeLV)

infection had not previously been reported in free-ranging wild felids in North America. FeLV infection is horizontally and vertically transmitted by body fluids, particularly through saliva. In general, transmission of viruses can occur through two pathways: horizontal and vertical transmission. In horizontal transmission, viruses are transmitted among individuals of the same generation, while vertical transmission occurs from mothers to their offspring. Generally, direct contact between cats is required for effective transmission. Although the origin of the cougar's FeLV infection is a matter of speculation, contact with and consumption of domestic cats, particularly feral domestic cats in urban neighborhoods or along the riparian corridor, may have been the source of this animal's FeLV infection.

3. In California, two cases of mountains lions with rabies are known:

    a) On July 5,1909, along Coyote Creek, near Morgan Hill, in Santa Clara County, a young boy and an adult woman were attacked by a mountain lion. Both victims died, and the physician for the woman determined she died of hydrophobia (Storer 1923).

    b) In August 1994, two couples staying at a remote Mendocino County cabin reported killing a mountain lion after it charged them. Tests indicated the mountain lion was rabid (CDFG 2000).

    3. Conclusion

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition discusses results of numerous scientific studies that describe multiple factors affecting the ability of mountain lions to survive and reproduce within the proposed ESU. The direct impacts of past and present habitat modification and destruction combine to threaten the population viability of mountain lions in the proposed ESU

H. <u>Degree and Immediacy of Threat</u>

    1. Scientific Information in the Petition

The Petition discusses the degree and immediacy of threats to mountain lions on pages 53 through 54. As discussed in Section G of this Petition Evaluation, the petition contains sufficient information indicating that habitat loss, habitat fragmentation, and lack of habitat connectivity have led to small, isolated genetic subpopulations of mountain lions with evidence of inbreeding and a lack of adequate gene flow between them. Mountain lions also face human-caused mortality factors from vehicle strikes,

depredation take, poaching, take associated with public safety incidents, and anticoagulant rodenticides, along with the added stressors of increased wildfire risk and vegetation-type conversions that are not likely to favor mountain lions (Jennings et al. 2016). It is important to consider the cumulative effects of these factors in combination with the overarching future effects of climate change, and the ongoing and future planned development in suitable mountain lion habitat.

The Petition describes how roads and development have fractured habitat connectivity for mountain lions in the proposed ESU, leading to the separation of at least six isolated, genetically distinct populations. Benson et al. (2019) predicted loss of genetic heterozygosity in the SAM and CC-S mountain lion populations, which suggests that inbreeding depression is imminent. If inbreeding depression occurs, these two populations will likely go extinct within 50 years, with median times to extinction of 11.7 years and 15.1 years, respectively (Benson et al. 2019). The Petition states the similarly low genetic diversity and effective population size of the SGSB, and CC-N populations will likely result in a similar fate. And, although the CC-C and EPR populations appear slightly healthier with more genetic diversity and a higher effective population size, the effective population sizes of these populations are still well below the most recent recommended threshold to prevent inbreeding depression in the short-term (Frankham et al. 2014, Gustafson et al. 2018).

The Petition states immediate action is needed to protect areas of existing connectivity, and to restore connectivity between the subpopulations. Anthropogenic pressures, especially vehicle strikes, and depredation take, should be minimized to help recover these populations. For the federally endangered Florida panther, translocation of mountain lions from Texas to Florida helped to increase genetic diversity, but researchers have noted that continued habitat loss, persistent inbreeding, infectious agents, and possible habitat saturation pose new dilemmas. They stated that the intensive management program illustrates the challenges of maintaining populations of large predators worldwide (Johnson et al. 2010).

The Petition describes how sustaining recovery programs, such as that for the Florida panther, requires predictable long-term funding, and conservation of habitat before costs escalate or it is lost. In California, any similar potential genetic rescue/translocation efforts need to be compared to the potential value of strategically located corridors and wildlife crossing infrastructure that allows for dispersal and gene flow, along with a reduction in vehicle-strike mortalities. The Petition states that this latter habitat enhancement emphasis would be a more comprehensive, long-term solution to conserve the mountain lion populations within the proposed ESU in perpetuity. The Petition further emphasized that the preservation of intact linkages, especially the Tehachapi and Sierra Pelona Mountains, is essential to maintain statewide genetic connectivity of mountain lions (Gustafson et al. 2018).

2. Conclusion

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition presents scientific information describing multiple threats to the continued existence of mountain lions in the proposed ESU. The Petition concludes that two demographic threats of small effective population sizes and loss of genetic diversity are severe and require immediate attention.

I. Impact of Existing Management Efforts

1. Scientific Information in the Petition

The Petition discussed the impact of existing management efforts on pages 54 through 69, under the “Inadequacy of Existing Regulatory Mechanisms” section.

The Petition noted the following in regard to an inadequacy of the California Environmental Quality Act (Pub. Resources Code, § 21000 et seq.) (CEQA): Even when a lead agency acknowledges that an effect is “significant,” CEQA allows a lead agency to adopt a “statement of overriding considerations” and approve a project if the agency finds that other factors outweigh the environmental costs of the project or that further mitigation is infeasible (Pub. Resources Code, § 21081; Cal. Code Regs., tit. 14, § 15093(b)); Cal. Pub. Res. Code § 21081). The Petition further noted that even if a project may have a significant effect on a “wildlife population” like the CC-S, SAM, SGSB, or EPR mountain lions, an agency could interpret CEQA as still allowing approval of the project. Therefore, the Petitioners conclude that CEQA, in practice, is inadequate to protect the Southern California and Central Coast mountain lions.

Further, the Petition describes how the Northwest Highway 138 EIR contained no analysis of the highway’s impacts on mountain lions, given that they are not presently listed as threatened or endangered. Though the Department has urged lead agencies to consider wildlife connectivity in CEQA planning documents, Los Angeles County’s responses to CDFW’s recommendations indicate that lead agencies have not interpreted CEQA to include a clear legal mechanism for mitigation for impacts on wildlife connectivity, even though such connectivity is critical to the survival of Southern California and Central Coast mountain lions.

The Petition describes multiple projects and human population growth with associated housing developments, and road and highway expansions that could impact mountain lion habitat and movement corridors and contribute to mortality due to vehicle strikes. Planning document inadequacies are also described. Some examples, described in the Petition, are summarized below.

Natural Community Conservation Planning Act (NCCP), and Habitat Conservation Plans (HCPs)

The San Diego Multiple Species Habitat Conservation Program is a joint NCCP and HCP that includes mountain lions as a covered species, but the program readily concedes that mountain lions (as well as deer) "were not a major consideration in linkage design." In addition, the joint Environmental Impact Report/Environmental Impact Statement (EIR/EIS) states that "[d]ue to the limited availability of habitat in the study area, implementation of the MSHCP is not expected to substantially increase or decrease the population viability of the mountain lion." The EIR/EIS likewise concludes no major populations or critical locations exist for the mountain lion within the plan area and concludes the species is "adequately conserved" under the plan.

The San Diego Multiple Species Conservation Program is an NCCP and HCP that covers 900 square miles in the southwestern portion of San Diego County. The Program lists mountain lions as "conserved" and states that mountain lions "will be covered by the MSCP because 81% of the core areas (105,000± acres) that support its habitat will be conserved". While the Program generally notes linkage, areas were designed to accommodate "large animal movement," the Program does not identify linkages designed for mountain lions or specific measures designed to protect them. Likewise, while the Program states that "[s]pecific design criteria for linkages and road crossings/under crossings are included in subarea plans," not all subarea plans are complete. The San Diego North County Multiple Species Conservation Plan is one of the "sub-area" plans anticipated under the San Diego Multiple Species Conservation Program. However, it has not been completed and is still in development.

The Orange County Transportation Authority NCCP/HCP ("OCTA Plan") lists the mountain lion as a covered species for purposes of the federal HCP, but not for purposes of the NCCP permit. The OCTA Plan contains four "Species Goals" for mountain lions, including (1) acquiring 1,013 acres of suitable habitat; (2) realigning fencing near the Highway 241 toll road; (3) funding of the North Coal Canyon Restoration Project; and (4) a "wildlife crossing policy" requiring pre-construction surveys to ensure existing crossings "maintain or improve functionality" if modified by new freeway projects. However, despite allowing the expansion of two highways in mountain lion habitat (Projects G and J), the OCTA Plan does not require the construction of specific wildlife crossings. The OCTA Plan nonetheless claims that impacts on the mountain lion will be offset through these "Species Goals."

A Western Riverside County Multiple Species HCP offers little protection for the SAM mountain lion population. While this HCP identifies linkages designed to ensure connectivity for mountain lions, the Western Riverside County Regional Conservation Authority has failed to enforce the HCP to protect such linkages when permittees such

as the City of Temecula approve development that would severely constrict or impair such linkages.

A Santa Monica Mountains National Recreation Area General Management Plan ("GMP") was prepared pursuant to NEPA and provides a framework for the management of the Santa Monica Mountains National Recreation Area ("SMMNRA"), administered by the National Park Service, California State Parks, and the Santa Monica Mountains Conservancy. The GMP recognizes that the Santa Monica Mountains mountain lion population's ability to survive in the face of large-scale habitat fragmentation and destruction is uncertain. The GMP states, "it is likely that their persistence would depend upon their capability of dispersing to and from other habitat areas beyond the Santa Monica Mountains." The GMP concedes, "the situation is especially serious for mountain lions" and lists mountain lions as a "park species of concern." The GMP agrees that improvements to facilitate wildlife movement across freeways or through developments may be necessary but does not propose or require specific actions to improve wildlife movement across freeways or through development.

A Ventura County Wildlife Connectivity Ordinance was adopted by the Ventura County Board of Supervisors on March 12, 2019 (the "Connectivity Ordinance") to help facilitate wildlife connectivity and minimize habitat fragmentation for mountain lions, mule deer, California gnatcatchers, bobcats, least bell's vireos, California red-legged frogs, and other species. Two of the linkages targeted in the Connectivity Ordinance are the Santa Monica Mountains – Sierra Madre Mountains connection and the Sierra Madre Mountains – Castaic Connection, which connect wildlife habitat in the Santa Monica Mountains, Santa Susana Mountains, Simi Hills, and Los Padres National Forest. While the Connectivity Ordinance should help allow wildlife to move more easily through private lands between core habitat areas, it would do little to ensure connectivity across major roads and highways because Ventura County does not have jurisdiction over these areas. The Petition also states that Caltrans and its road maintenance and improvement activities are not regulated by the Connectivity Ordinance.

A Los Angeles County Significant Ecological Areas Program is currently in the process of updating its Significant Ecological Areas ("SEAs") Ordinance. The draft ordinance is intended to protect biodiversity in SEAs from incompatible development and ensure that projects reduce habitat fragmentation and edge effects by providing technical review of impacts and requiring mitigation. Like the Ventura County ordinance, the SEAs designations can lead to compact development and allow wildlife to more easily move across private lands between core habitat areas. However, the SEA ordinance is not specifically designed to protect mountain lions and would not regulate Caltrans and its road maintenance and expansion activities.

In an environmental review for Southern California national forest land management plans, the U.S. Forest Service found impaired connectivity poses a serious threat to Southern California mountain lions: the "greatest concern for the long-term health of mountain lion populations on the national forests of southern California is loss of landscape connectivity between mountain ranges and large blocks of open space on private land." The review warned that private land development in Southern California is "steadily reducing the habitat linkages that wildlife species need to connect large blocks of national forest land with other public and private natural spaces and habitat reserves."

The Petition notes that there are currently no NCCPs that cover the Central Coast. In addition, no NCCPs cover portions of the Santa Cruz Mountains, except the Santa Clara Valley Habitat Plan; however, that Plan does not cover mountain lions.

Growth is expected to increase in the Monterey Bay Area, leading to further fragmentation of natural habitats by urban or exurban development. The Association of Monterey Bay Area Governments predicts the population in the Monterey Bay Area to rise from 755,403 in 2015 to 883,300 in 2040. In San Luis Obispo County, the population is expected to increase by 41,650 between 2015 and 2045.

The Petition describes numerous other road and highway expansion projects planned for Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara counties. The expansion of existing roads and highways along with increased numbers of automobiles could further impair habitat connectivity for mountain lions in the Central Coast region.

California Wildlife Protection Act of 1990 (Proposition 117) and CESA

The Petition asserts that CESA listing would build upon protections established by Proposition 117 (Fish & G. Code, §§ 4800-4810) by establishing an affirmative duty to ensure the survival and recovery of Southern California and Central Coast mountain lions by, among other things: (1) prohibiting the approval of projects that could jeopardize the continued existence of mountain lions or result in destruction of essential habitat pursuant to Fish and Game Code section 2053, subdivision (a); (2) requiring state agencies such as Caltrans to utilize their authority to conserve listed species pursuant to section 2055); and (3) requiring implementation of appropriate mitigation measures for projects that could destroy mountain lion habitat or impair connectivity pursuant to section 2054. Also consistent with Proposition 117, the Petition notes that section 2052 establishes that it is the policy of the state to conserve and protect listed species and their habitat, including through acquiring lands.

Regarding the different provisions in Proposition 117 and CESA, the Petition states that Proposition 117 is to be "liberally construed to further its purposes." (Prop. 117 § 9); it

also states that because Proposition 117 and CESA both have similar purposes; Proposition 117 should be construed to be consistent with CESA.

2. Conclusion

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition presents information to indicate existing regulatory mechanisms and conservation efforts do not adequately protect mountain lions within the proposed ESU from impacts that threaten their long-term survival. In particular, as stated in the Petition and cited in scientific reports, land use planning and permanent protection of habitat needs to occur at a larger scale across jurisdictional boundaries, and include multiple functional habitat connections/corridors to allow safe movement by mountain lions and their prey, while also lessening the human-caused mortality factor of vehicle strikes.

J. Suggestions for Future Management

1. Scientific Information in the Petition

The Petition suggests future management on pages 70 through 72. The ten suggestions focus primarily on essential habitat conservation and connectivity. They are included here in their entirety for easy reference and to compare to other relevant scientific information provided in subsection J.2. below.

1. Design and build crossing infrastructure in strategic locations to improve wildlife connectivity and permeability at existing roads and highways. Crossing infrastructure should include but is not limited to overcrossings, underpasses, culverts, and exclusionary fencing that guides animals to safer crossing areas. The following crossing locations have been identified by mountain lion experts and should be prioritized for the implementation of crossing infrastructure: 1) I-15 Freeway at Temecula Creek Bridge to enhance the Palomar Linkage and connect the Santa Ana and Eastern Peninsular Mountain Ranges (Gustafson et al. 2017, Zeller et al. 2017, Ernest et al. 2014, Riley et al. 2018); 2) I-15 Freeway at “Site 5” as described in Riley et al. (2018); 3) Hwy 101 at West Liberty Canyon (Riley et al. 2018.)

2. Improve or add large culverts to existing freeways in areas suitable for mountain lion crossing (Vickers [et al.] 2015).

3. Dedicate sufficient Wildlife Conservation Board, Habitat Conservation Fund and other state funding sources towards acquiring key mountain lion habitat and for establishment of highway crossing infrastructure.

4. Ensure that suitable habitat exists (through preservation or restoration/enhancement) on both sides of crossing structures and culverts (South Coast Wildlands 2008). Restrict human activity near crossing structures and relocate foot trails away from these structures (South Coast Wildlands 2008).

5. Fully protect mountain lion habitat, including resource-use patches and corridors (Zeller et al. 2017, Vickers et al. 2015). Prohibit large-scale development in primary travel corridors and habitat linkages, such as in and around the last remaining linkage for statewide genetic connectivity in the Tehachapi and Sierra Pelona Mountains (Gustafson et al. 2018) and in corridor areas between the SAM and EPR (Gustafson et al. 2017).

6. Require analysis of region-wide wildlife connectivity in all new development proposals (Gustafson et al. 2018).

7. Reduce depredation conflicts that precipitate mountain lion deaths (Vickers et al. 2015). Develop and implement outreach and education activities to promote use of predator-proof enclosures for domestic animals (Vickers et al. 2015). Expand CDFW's new three-step depredation permit policy in the CC-S and SAM areas to include all mountain lions across the state, or at a minimum, within the SGSB, EPR, CC-N, and CC-C population areas. Enhance the policy with enforceable implementation of non-lethal protective measures and reporting requirements.

8. Prohibit the use of second-generation anticoagulant rodenticides ("SGARs"), such as brodifacoum, bromadiolone, difenacoum, and difethialone in Southern California and Central Coast mountain lions' core habitat areas and linkages. Limit the use of other pesticides and herbicides that may have negative effects on mountain lion populations in Southern California and the Central Coast.

9. Identify "priority areas" for establishing wildlife passage features for the Southern California and Central Coast mountain lions using the best available science, including data collected by various agencies, academic institutions, and organizations, including but not limited to the National Park Service, the Karen C. Drayer Wildlife Health Center at UC Davis, the Road Ecology Center at UC Davis, and the Santa Cruz Puma Project at UC Santa Cruz.

10. Require Caltrans to analyze how projects in the State Highway Operation Protection Program and State Transportation Improvement Program can be designed to facilitate wildlife connectivity through wildlife passage features such as culverts, under crossings, overcrossings, bridges, directional fencing,

scuppers, barrier breaks, roadside animal detection systems, etc. Require Caltrans to collect and analyze roadkill data to identify hotspots where mountain lions are killed. Require Caltrans to implement wildlife passage features to the greatest extent feasible and as expeditiously as possible.

2. Other Relevant Scientific Information

The Department is aware of policies and guidelines and other suggestions for future management of mountain lions, as noted below.

a. Monitor responses to increasing fire frequency to assess how mountain lions and other carnivores will be affected by large-scale changes that may pose a threat to landscape integrity and persistence of puma populations in southern California (Jennings et al. 2016).

b. Maintain viable mountain lion populations within California; and provide for flexibility in controlling depredation problems (Weaver 1982).

c. Recommend continued AR screening of livers from mountain lion carcasses to further enhance our understanding about the relative contributions they may have on population health. Continued monitoring would also measure the effectiveness of regulatory changes intended to reduce exposure of non-target wildlife to rodenticides (Rudd et al. 2018).

d. From the Department's Mountain Lion Depredation, Public Safety, and Animal Welfare Bulletin Number 2017-07 (amendment to Department Bulletin 2013-02): Fundamental to the Department's conservation, education, and outreach regarding mountain lions, the Department works to (a) maintain genetically diverse and demographically viable populations, (b) minimize conflicts between mountain lions and humans, (c) identify and protect important habitats, (d) improve public awareness, and (e) identify and research emerging management and scientific issues.

e. From the Fish and Game Commission's "Terrestrial Predator Policy", adopted April 19, 2018: It is the policy and practice of the Fish and Game Commission that: existing native terrestrial predator communities and their habitats are monitored, maintained, restored, and/or enhanced using the best available science. The department shall protect and conserve predator populations.

f. Develop reliable maps of cougar habitat quality and landscape linkages; maps should identify potential corridors for population movement and dispersal.

Evaluate trans-highway movements and vehicle-related mortality of cougars (Cougar Research and Management Needs, Chapter 9, by Ted D. McKinney, in Jenks 2011, CMGWG 2005).

g. Assess and map the status of, and threats to, each subpopulation. Identify linkages, assess the quality of each linkage, and conserve and restore linkages. Provide incentives to landowners to protect habitat. Consider augmentation (translocation and reintroduction) as a last resort alternative to natural connectivity (Chapter 3, Cougar Habitat, in CMGWG 2005).

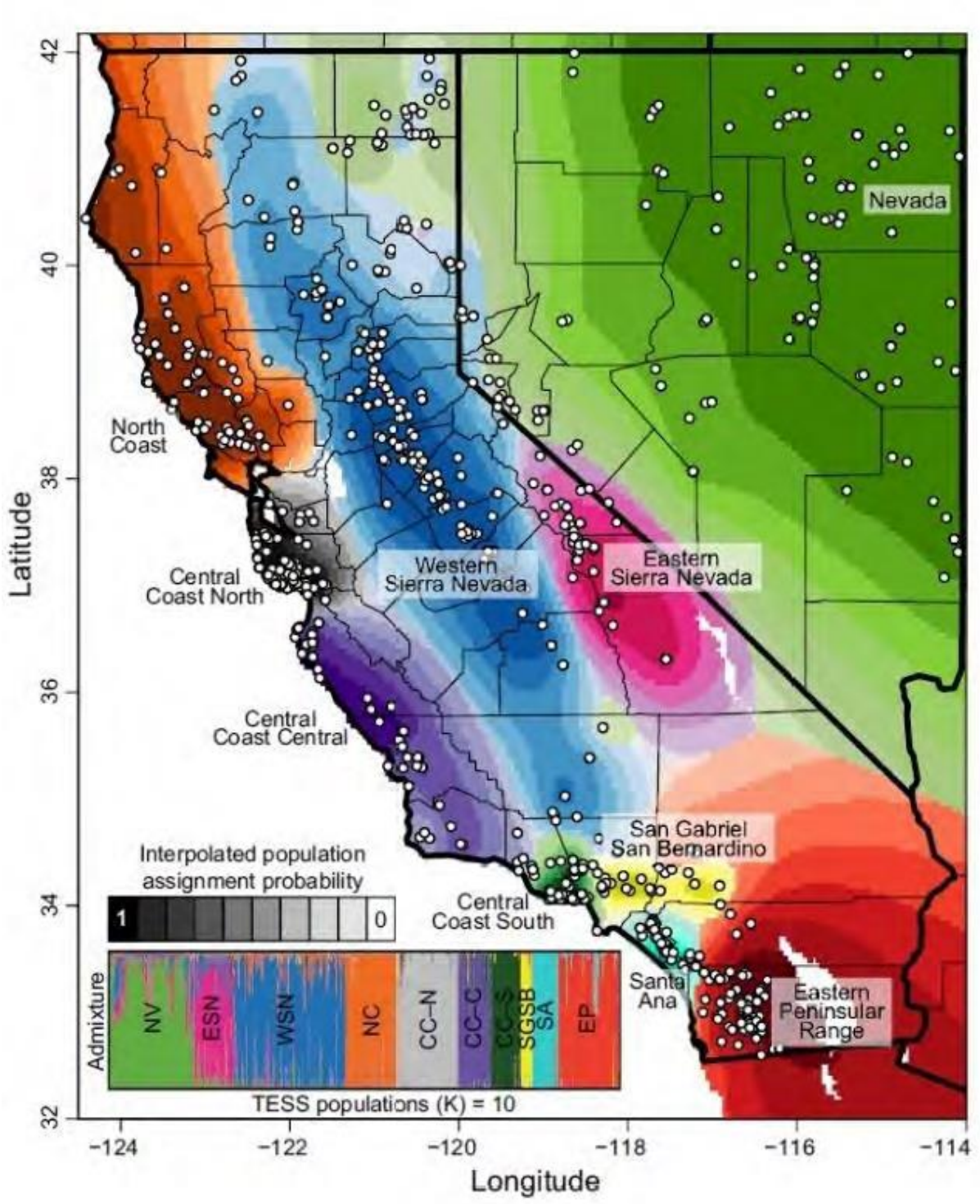
3. Conclusion

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted. The Petition includes information to indicate future management actions would benefit mountain lion populations in the proposed ESU, e.g., wildlife corridors and crossing structures over or under freeways and major roads. The Petition also cites studies containing a number of suggestions for future management e.g., land use planning at a larger scale to promote optimal habitat connectivity and gene flow, and for conservation of mountain lion prey and other wildlife species.

K. Detailed Distribution Map

1. Scientific Information in the Petition

The Petition provided the following map (Petition Figure 1) showing the genetically distinct mountain lion populations in California and Nevada with each color representing a genetic population. The reduced color intensity on the map represents lower probabilities of population assignment and indicates areas with admixture between mountain lion populations (Gustafson et al. 2018).



Petition Figure 1.
Map of genetically distinct mountain lion populations in California. The Central Coast North (CC-N), Central Coast Central (CC-C), Central Coast South (CC-S), San Gabriel/San Bernardino (SGSB), Santa Ana Mountains (SAM), and Eastern Peninsular Range (EPR) mountain lion populations should be considered an evolutionarily significant unit (ESU). Each color represents a genetically distinct mountain lion population. White dots are individual animals sampled. Source: Gustafson et al. (2018).

2. Other Relevant Scientific Information

Petition Figure 1 generally matches the historical and recent distribution of the mountain lion as described in Grinnell (1914), Grinnell et al. (1937), Young and Goldman (1946), Sitton (1977), Weaver (1982), Williams (1986), Mansfield and Weaver (1989), CDFG (1990), Torres et al. (1996), and Torres and Lupo (2000). A detailed map (Figure 221) from Grinnell et al. (1937) is provided below for comparison purposes and for historical context.

Torres and Lupo (2000) used the distribution of deer (Odocoileus hemionus) as an indicator to define the distribution of mountain lions since deer are a primary prey species; additional records and observations of lions were added to complete the distribution map (Figure 1).

Weaver (1982) produced a statewide distribution map that included relative density estimates for populations of mountain lions in California.

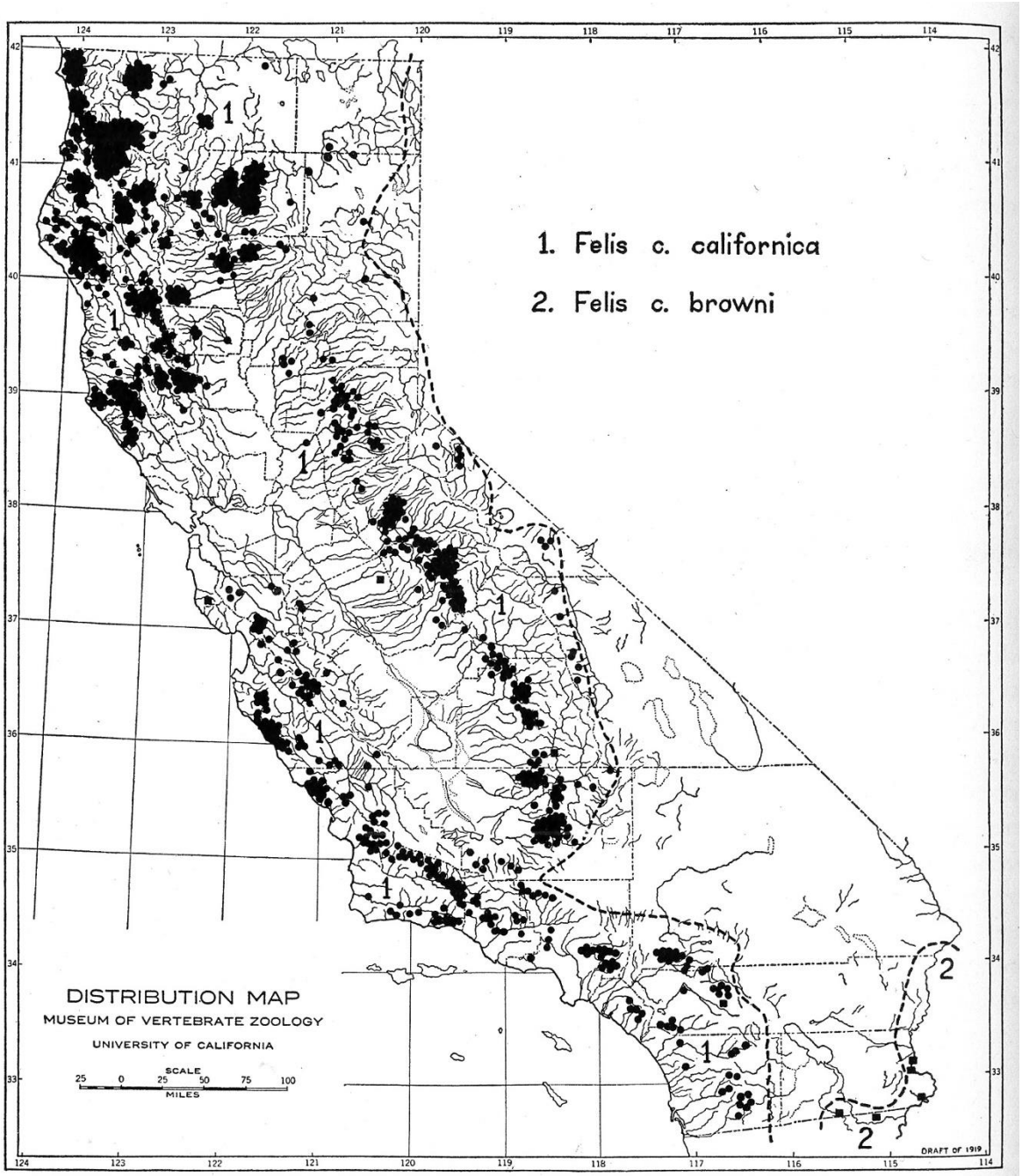


Fig. 221. Distribution of mountain lions in California: Round spots indicate localities of capture as stated in the Fish and Game Commission bounty records for the 7-year period, 1913–1919; square spots indicate some known localities of record otherwise, most of them as represented by specimens preserved. The approximate former limits, in California, of the two races are shown by broken lines; these races are: *1*, California mountain lion; *2*, Yuma mountain lion.

Figure 221. Distribution of mountain lions in California from Grinnell et al. (1937); page 540.

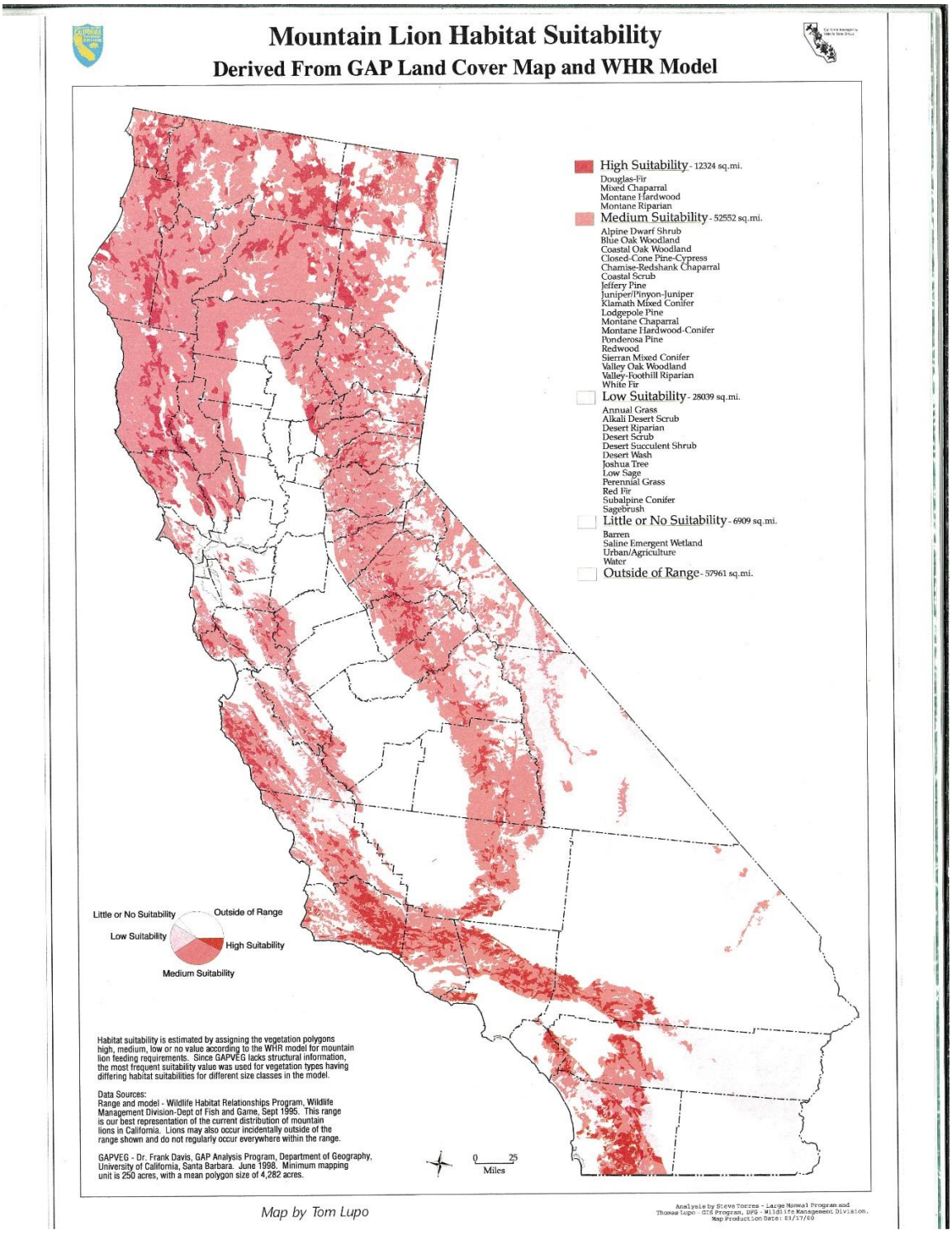


Figure 1. **Mountain Lion Habitat Suitability**. *In* Outdoor California (61) 3:22-23. (Source: Torres and Lupo 2000).

3. Conclusion

The Petition's distribution map (Petition Figure 1) sufficiently illustrates the distribution of genetic subpopulations of mountain lions in California. The Petition included additional maps showing mountain lion distribution in relation to road density, vehicle kill locations, and important landscape features (e.g., key habitat linkages) needed to maintain the distribution and genetic health of mountain lion populations in California (see Figure 3, and Figures 5-9 in the Petition).

L. Sources and Availability of Information

1. Scientific Information in the Petition

The Petition cited more than 140 scientific and administrative documents related to mountain lion biology, ecology, habitat relationships, genetics, and conservation, including geographic and land use factors involved in designating the genetic populations and the Southern California/Central Coast ESU. The Petitioner provided electronic copies of most of these documents.

2. Other Relevant Scientific Information

The Department used additional sources of scientific information cited in this Petition Evaluation document.

3. Conclusion

The Department concludes the Petition meets the requirement in Fish and Game Code section 2072.3 that it include sufficient scientific information to indicate the petitioned action may be warranted.

V. Recommendation to the Commission

Having reviewed and evaluated relevant information, including the material referenced in the Petition and other information in the Department's possession, the Department has determined the Petition provides sufficient scientific information to indicate that the petitioned action may be warranted. Therefore, the Department recommends the Commission accept the Petition for further consideration pursuant to Fish and Game Code section 2074.2.

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January 16, 2020

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RE: Petition to List Mountain Lions (*Puma concolor*) as a Threatened Species under the California Endangered Species Act

Dear President Sklar, Ms. Burkett and Members of the Commission,

On behalf of the Humane Society of the United States and our supporters throughout California, I submit the following comments in support of the petition to list mountain lions (*Puma concolor*) in the Southern and Central Coast region of California as Threatened under the California Endangered Species Act (CESA). We support the petitioners' proposal to list the six identified populations in these regions as an Evolutionarily Significant Unit (ESU).

As we detail below, we believe this Southern/Central Coast mountain lion ESU is in need of protection under CESA because of increasing threats to their survival in the region, and that providing such protection would be entirely consistent with both the text and the intent of Proposition 117The California Fish and Game Commission not only has the authority to list this ESU as Threatened under CESA, but must do so if the best available science shows that listing is warranted.

1. **Mountain lions in the proposed ESU are rare and the loss of one individual can harm the entire population.**

Mountain lions are a rare and cryptic species, even in ideal habitats with limited human influence. This is due not only to their demand for prey availability but also their own territoriality. The best available research suggests that mountain lions live at an average density of two adult per 100km^2, validating the rarity of this species throughout their range in the U.S.[1]

California does not have a reliable population estimate for mountain lions, but an estimate published in 1989 suggested there were between 4,000 to 6,000 cats of all ages.[2] As stated within the petition, the proposed mountain lion populations in the Southern and Central Coast regions of California are quite small and, as well discuss below, are increasingly at risk from multiple threats, most notably from habitat loss and fragmentation which leads to genetic isolation. Such isolation

may result in inbreeding and a genetic bottleneck, which can lead to the extirpation of a population.

The majority of the proposed mountain lion populations maintain effective population sizes under 50 and total population sizes under 100.[3] As stated within the petition, "an effective population size of 50 is assumed sufficient to prevent inbreeding depression in the short term (over the duration of five generations) and an effective population size of 500 is sufficient to retain evolutionary potential in perpetuity."[4] As such, the mountain lion populations residing in the Southern and Central coast region of California are at risk of extirpation due to their low population size and genetic isolation.

2. **Mountain lions in California's Southern and Central Coast region are at risk due to increasing threats.**

The public values mountain lions and views them as an indicator of healthy environments while posing little risk to people living near them.[5] Americans highly value wildlife, including top carnivores such as mountain lions, and are concerned about their welfare and conservation.[6] Yet, these animals remain incredibly rare and require protection from major threats, which are by and large human caused. Threats to California's Southern and Central Coast mountain lion populations include, but are not limited to the following:

***Habitat loss and fragmentation*:** Habitat loss and fragmentation is the largest threat to long-term survival of mountain lion populations in California. The U.S. human population is expected to grow to 60 million by 2050, meaning more development, more deforestation and less wild and open spaces.[7] Even lands remaining undeveloped will become increasingly fragmented by infrastructure developments. Roads, in particular, are a major mortality factor for small populations of mountain lions in fragmented habitat.[8] Not only do lions often die from vehicle collisions when trying to cross roads, they also become separated from prey sources and are not able to disperse, causing intraspecific aggression between individual lions competing for the same resources.

Mountain lions have been pushed to the far reaches of remaining wild spaces as a result of human population growth and development. This is troubling, as mountain lions and their primary prey require large habitats in order to survive. Moreover, as human population and development increase, so too do mountain lion conflicts with humans.[9]

Not only are wildlife habitats getting smaller, they are also increasingly disconnected from one another, reducing the ability for subadults to disperse.[10] This poses a major threat to the long term survival of populations that require dispersal to gain access to natural resources, and increases the potential for inbreeding.[11] The loss of safe passages between suitable habitat is threatening the long-term survival of populations across the U.S. as they become increasingly isolated.[12]

Mountain lions in California's Santa Ana Mountains are a prime example of how habitat loss and fragmentation are threatening the future survival of a lion population. Lions in the mountain range have been forced to live on a small, fragmented landscape with limited prey sources as a result of human development. The result has been increased conflicts with humans, demographic isolation and genetic restriction.[13] A recent study in the area concluded that mountain lions in the region had a very low

survival rate of less than 56 percent, primarily as a result of deaths from vehicle collisions and killing for mountain lion predation on livestock.[14]

Inbreeding: Inbreeding is a threat to mountain lions who are limited by their ability to disperse. Subadult males, the primary dispersers of the species, are vital to the diffusion of genes between lion populations. The loss of genetic variation typically occurs within small populations that become isolated from other populations, causing a genetic bottleneck when closely related individuals breed with one another.[15] Population isolation is frequently attributed to habitat fragmentation and a loss of wildlife corridors that connect populations. This was likely the case with Florida panthers, who showed signs of inbreeding through a high prevalence of cowlicks, kinked tails, sterility and heart murmurs. In order to save the critically endangered Florida panther, wildlife managers released eight female lions from Texas into the Florida population, increasing genetic diversity.[16]

Poisoning: While poisoning of mountain lions is rare, it still occurs, mainly through unintentional poisoning on private lands. The use of anticoagulant rodenticide poison to control rodents, such as in homes and yards, is a common threat to mountain lions.[17] Farmers and licensed pest-control companies regularly use rodenticide. Rodents who consume anticoagulant poisons can take up to 10 days to die through internal bleeding, if they are not eaten by another animal first.[18] Mountain lions and other predators become exposed when they consume animals who have been poisoned.

Research in the Santa Monica Mountains National Recreational Area and surrounding habitats fragmented by human development has detected substantial evidence of the exposure to anticoagulant rodenticide poisons in wild carnivores, including mountain lions, bobcats and coyotes.[19] Test results from the study found 95 percent of bobcats, 83 percent of coyotes and 91 percent of mountain lions—including a three-month-old kitten—were exposed to anticoagulant rodenticides.[20] Rodenticide and other anticoagulants can stress mountain lions so that they become susceptible to mange, resulting in dehydration, starvation and death.[21]

3. **Protecting mountain lions ensures their ability to create trophic cascades in their ecosystems, benefiting a wide range of flora and fauna.**

Mountain lions in the Southern California/Central Coast ESU must be conserved so that other wildlife and wild spaces may continue to receive critical ecosystem benefits. Mountain lions serve important ecological roles, including providing a variety of ecosystem services.[22] Maehr et al. (2001) assert the importance of these cats on the landscape:

> One aspect of cougar ecology that is becoming less debatable is its role in biotic communities . . . . *P. concolor* has the potential to structure the distribution and demography of prey (Logan and Sweanor 2001, Maehr et al. 2001). Browse lines, highway collisions, Lyme disease (Wilson and Childs 1997), loss of biodiversity (Alverson et al. 1988, Waller and Alverson 1997), and other problems associated with overabundant white-tailed deer (*Odocoileus virginianus*) hint at the benefits of returning such a predator . . .[23]

As such, conserving these large cats on the landscape creates a socio-ecological benefit that far offsets any societal costs.[24] Their protection and conservation has ripple effects throughout their natural communities. In Zion National Park, researchers found that by modulating deer populations, mountain lions prevented overgrazing near fragile riparian systems. The result was more cottonwoods, rushes, cattails, wildflowers, amphibians, lizards and butterflies, as well as deeper, but narrower stream channels.[25] Multiple recent studies have found that mountain lions leave more carrion--even more than wolves--which is significantly beneficial to ecosystems and further enhances biodiversity.[26]

Biologists consider mountain lions an "umbrella" species—by protecting these cats and their large habitat, a wide array of additional plants and animals in this habitat will also be protected.[27] Mountain lions, as with most large carnivores, are also considered a keystone species because they help drive the ecosystems in which they live.[28] As a large predator, mountain lions regulate many of the other species in their communities, including herbivores, who then regulate the plant community.[29] Importantly, mountain lions limit competition by killing smaller carnivores, such as coyotes, which increases biological diversity.

Mountain lions reduce deadly deer-vehicle collisions[30] and help maintain the health and viability of ungulate populations by preying on sick individuals, reducing the spread of disease.[31] This ecosystem benefit is increasingly important as ungulate diseases, such as chronic wasting disease and brucellosis, continue to spread throughout the country.[32]

4. There is no conflict between CESA listing and Proposition 117.

Contrary to arguments submitted by the California Cattlemen's Association (CCA) and California Farm Bureau Federation (CFBF), there is no conflict between the petitioned CESA listing and Proposition 117. CCA and CFBF assert that CESA listing would functionally override Proposition 117's allowance for take of mountain lions in certain limited circumstances, including take pursuant to permits issued by Department personnel in cases of confirmed livestock or property damage. Cal. Fish and Game Code §§ 4800(b)(1) (take prohibition); 4801-07 (exceptions to take prohibition). They contend that CESA listing would impose additional preconditions to the issuance of mountain lion take permits beyond what is required by Proposition 117.

CCA and CFBF's arguments miss the mark because Proposition117's take permit provisions could be accommodated without conflict by a parallel CESA provision, such that any mountain lion take permit currently issuable under Proposition 117 would likely remain so even after CESA listing. CESA expressly authorizes the Department to issue take permits allowing non-governmental "individuals" to take listed species "for...management purposes." Cal. Fish and Game Code § 2081(a). The depredation-related Proposition 117 take allowances that CCA and CFBF point to as the source of irresolvable conflict would, in fact, likely qualify as the issuance of permits "for...management purposes" and thus would also fall into an exception under CESA's take prohibition. This is true even as to Proposition 117's verbal authorization and in-the-moment immediate take provisions, since in both cases the Department is still required to issue a permit promptly thereafter. Cal Fish and Game Code §§ 4803, 4807. As such, there is no conflict between the depredation permit allowances contained within Proposition 117 and the management take permits allowable under Section 2801(a) of CESA. Finally, we note that CCA and

CFBF's focus on the more burdensome CESA "incidental take" permit process under Section 2081(b) is a red herring – the take permit provision that would actually operate to harmonize CESA with Proposition 117 is the "management purposes" take permit under Section 2081(a).

Furthermore, Proposition 117 must be liberally interpreted to further its purposes, which are consistent with CESA listing. As noted by petitioners in their initial CESA petition, it was the express intent of California voters that Proposition 117 "be liberally construed to further its purposes," Prop. 117 § 9, which are strengthening protections for this "specially protected mammal." Cal. Fish and Game Code § 4800(a). The petitioned CESA listing is entirely consistent with this goal; indeed, the best available science shows that it is *necessary* to the achievement of this goal. To the extent that there is any tension or ambiguity as between the interactions between CESA listing and Proposition 117, they must be resolved in favor of the underlying conservation purpose of both laws. Prop. 117 § 9. Interpreting Proposition 117 to preclude the grant of additional state law protections under CESA would defy both common sense and the will of the voters.

5. The Commission is obligated to list this ESU if science shows that listing is warranted.

The Commission is legally obligated to list this ESU pursuant to CESA, even if potential tension with other state law exists. CESA listing is not discretionary. Rather, the Commission is required to add a species to the list if the best available science shows that listing is warranted. Cal. Fish and Game Code § 2070 ("The commission *shall* add or remove species from either list if it finds, upon the receipt of sufficient scientific information pursuant to this article, and based solely upon the best available scientific information, that the action is warranted.") (emphasis added). To deny the listing petition on the basis of an ill-founded fear of conflict with other provisions of state law would violate the Commission's clear statutory duty to add the petitioned ESU to California's list of Threatened and Endangered Species. Neither Proposition 117 nor any other state law operates to override this clear statutory directive.

6. Conclusion.

California's mountain lions are an iconic symbol of the state and are highly valued among its residents and visitors alike. These large carnivores hold immense intrinsic value as well as play a vital role in supporting other wildlife as well as ecosystem functions. We must ensure that mountain lion populations are given the best opportunity possible to maintain their range throughout the state, including in the Southern and Central Coast regions. Therefore, we request this Commission list mountain lions in this ESU as Threatened under CESA, protecting them from unnecessary harm and ensuring their continued existence in their current range.

Sincerely,

Sabrina Ashjian
California State Director
The Humane Society of the United States

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-----Original Message-----
From: KevinWMcAl[redacted]
Sent: Thursday, February 6, 2020 11:16 AM
To: FGC <FGC@fgc.ca.gov>
Subject: Protect California's Struggling Mountain Lions

Dear California Fish and Game Commission,

I'm writing to urge you to list Southern California and Central Coast mountain lions as "threatened" under the state's Endangered Species Act.

As you know these mountain lions face multiple threats to their survival. Over the past century, habitat loss and fragmentation have led to severe genetic isolation and inbreeding. These big cats are also victims of vehicle collisions, rat poisons and depredation kills, among other threats.

We're in the middle of an extinction crisis, and we simply can't afford to wait to protect keystone species like the mountain lion. As the last remaining large carnivore in Southern California and the Central Coast, mountain lions are vital to maintaining biodiversity. Without them, increased deer populations would overgraze and cause stream banks to erode. And many scavengers, like California condors and numerous insects, that feed on mountain lion prey, would lose a reliable food source. In fact mountain lions exert such a great impact on the environment that songbirds, fish, amphibians, reptiles, rare native plants and butterflies would all potentially diminish if this apex predator were lost.

Please — move forward quickly to protect these struggling mountain lion populations knowing you have my full support.

Sincerely,
Kevin W. McAlister
[redacted]

From: [redacted]

Sent: Friday, February 7, 2020 10:48 AM

To: FGC <FGC@fgc.ca.gov>

Subject: Do Not Protect California's Mountain Lions

Dear California Fish and Game Commission,

I'm writing to urge you to NOT list Southern California and Central Coast mountain lions as "threatened" under the state's Endangered Species Act.

As you know the Center for Biodiversity is using emotion not science stating, “We're in the middle of an extinction crisis, and we simply can't afford to wait to protect keystone species like the mountain lion”.

There is no need for CDFW to protect mountain lions, there is already legislation that protects them. CDFW should do what other states do, have a draw or license to hunt mountain lions, especially near cities where the negative impacts could be extreme.

Sincerely,

Wendy Tochihara

[redacted]

[redacted]