State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

EVALUATION OF A PETITION FROM THE ENDANGERED HABITATS LEAGUE TO LIST THE SAN BERNARDINO KANGAROO RAT AS ENDANGERED UNDER THE CALIFORNIA ENDANGERED SPECIES ACT

Photo: Thea Wang

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I. Executive Summary

The Endangered Habitats League (Petitioner) submitted a Petition (Petition) to the Fish and Game Commission (Commission) to list the San Bernardino kangaroo rat (*Dipodomys merriami parvus*) as 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*.* 15-Z, p. 575.) Pursuant to Fish and Game Code Section 2073.5 and Section 670.1 of Title 14 of the California Code of Regulations, the Department prepared this evaluation report (Petition Evaluation) of the Petition. The Petition Evaluation assesses 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. The Department's recommendation as to whether to make the San Bernardino kangaroo rat a candidate for listing under CESA is based on an assessment of whether the scientific information in the Petition is sufficient under the criteria prescribed by CESA to consider listing the species as endangered or threatened.

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

- Population Trend. The Petition contains sufficient information to suggest the overall population trend for San Bernardino kangaroo rat (which only occurs in California) has declined, and continues to decline, with only three subpopulations remaining.

- Range. The Petition contains a sufficient description of the San Bernardino kangaroo rat's geographic range.

- Distribution. The Petition contains a sufficient description of the historical and recent distribution of San Bernardino kangaroo rat populations and demonstrates a reduction in their distribution due to habitat conversion throughout much of the historical range, habitat degradation from altered hydrological regimes, and other anthropogenic factors.

- Abundance. Although the Petition acknowledges it is difficult to estimate abundance for the San Bernardino kangaroo rat, it provides a sufficient description of abundance by relying on patterns of density in habitat areas of different quality to suggest current population abundance is low.

- Life History. The Petition sufficiently describes the life history characteristics of

the San Bernardino kangaroo rat, including factors related to habitat selection that make it vulnerable to ongoing hydrologic and vegetation changes occurring in its geographic range.

- Kind of Habitat Necessary for Survival. The Petition contains a sufficient description of the habitat types and conditions necessary for the survival of the San Bernardino kangaroo rat.

- Factors Affecting the Ability to Survive and Reproduce. The Petition contains sufficient information to suggest the San Bernardino kangaroo rat has historically been, and continues to be, adversely affected by habitat loss and degradation due to land cover conversion, altered or lost hydrological function in streams, and disconnection of floodplain and upland refugia habitat areas.

- Degree and Immediacy of Threat. The Petition contains sufficient information to indicate threats to the long-term survival of the San Bernardino kangaroo rat will continue or likely worsen in the future. Further, the Petition cites recent genetic information indicating the species has a low effective population size, low genetic diversity, and is at risk of inbreeding depression, all of which are immediate threats to persistence of the species.

- Impact of Existing Management Efforts. The Petition contains sufficient information to suggest that existing regulatory mechanisms and management efforts do not adequately protect the San Bernardino kangaroo rat from impacts that threaten its long-term survival.

- Suggestions for Future Management. The Petition includes sufficient information to indicate there are known and potential management actions that could benefit the San Bernardino kangaroo rat.

- Availability and Sources of Information. The Petition cites more than 50 references and the Petitioner provided pdf copies of these referenced documents to the Commission. The Petition contains sufficient available sources of information to inform whether the petitioned action may be warranted.

- A Detailed Distribution Map. The Petition contains a sufficiently detailed map of the historical distribution of the San Bernardino kangaroo rat.

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 San Bernardino kangaroo

rat populations.

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 under CESA.

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 an endangered species determination of San Bernardino kangaroo rat. The San Bernardino kangaroo rat is currently listed as endangered under the Federal Endangered Species Act (ESA) (U.S. Fish and Wildlife Service (USFWS) 1998 Fed. Reg. 63:51005). The listing includes this California endemic species wherever it is found.

On March 15, 2019, the Commission received this Petition to list the San Bernardino kangaroo rat as endangered under CESA. On March 22, 2019, the Commission referred the Petition to the Department for evaluation. The Department submitted this Petition Evaluation report to the Commission on May 30, 2019.

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 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 Section 670.1, subdivision (d)(1), of Title 14 of the California Code of Regulations, 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;

- Availability and sources of information; and
- A detailed distribution map.

C. Overview of San Bernardino Kangaroo Rat Ecology

Kangaroo rats, genus *Dipodomys*, are members of the New World rodent family Heteromyidae, which also includes pocket mice and kangaroo mice. Kangaroo rats are distributed widely in the arid and mesic open habitats of western North America, including northern Mexico. They are notable for their bipedal locomotion, ability to subsist in dry habitats without drinking water, and external fur-lined cheek pouches used to carry seeds from foraging areas to cache locations. Kangaroo rats have relatively large heads, large hind feet, and long tufted tails, which help provide balance and agility while hopping. There are 19 species of kangaroo rat (Wilson and Reeder 2005).

The San Bernardino Merriam's kangaroo rat (more commonly known as and referred to herein as the San Bernardino kangaroo rat) is one of 19 subspecies of *D. merriami* and one of three occurring in southern California (*D. m. merriami* and *D. m. collinus*). The San Bernardino kangaroo rat is endemic to California. It is dusky brown, with tail stripes and foot pads that are dark brown (McKernan 1997). It is highly differentiated from the two other southern California *D. merriami* subspecies by its darker, smaller body.

The San Bernardino kangaroo rat is a solitary, primarily nocturnal rodent that is active year-round. It inhabits alluvial floodplains and adjacent upland habitats. Like other Merriam's kangaroo rats, the San Bernardino kangaroo rat prefers open habitats with low shrub canopy cover and rarely occurs in dense vegetation (McKernan 1997). It prefers sandy loam substrates, which are characteristic of alluvial fans and floodplains, where it is easy to dig shallow burrows and cache food supplies (USFWS 1998 Fed. Reg. 63:51005).

Other subspecies of Merriam's kangaroo rat forage primarily for seeds, often burying small clumps of seeds in numerous shallow holes dug in the soil (Jenkins et al. 1995), and this is likely also true for the San Bernardino kangaroo rat subspecies. Merriam's kangaroo rat is generally known for its ability to live indefinitely without drinking water while subsisting primarily on dry seeds (USFWS 1998 Fed. Reg. 63:51005). It also eats herbaceous vegetation and insects in the spring during the reproductive season. When available, insects may comprise up to half of the diet (USFWS 1998 Fed. Reg. 63:51005). Females increase ingestion of foods with higher water content during lactation (USFWS 2009).

Reproduction appears to be timed to coincide with high food-availability (USFWS 2009). Pregnancy occurs between January through late November, with the peak number of pregnant or lactating females occurring during late June (McKernan 1997). Females can have more than one litter per year, with litter sizes ranging from two to three young

(USFWS 2009). Females care for the young and, at least in another Merriam's kangaroo rat subspecies, may sometimes shift the young between day burrows, possibly to minimize parasite infestations or to avoid attracting predators (Behrends et al. 1986).

Potential predators include owl, fox, coyote, bobcat, weasel, badger, and snakes (USFWS 2002 Fed. Reg. 67:19811). Burrow systems are occupied by a single adult and clustered in a given area (USFWS 2009). In a radio-telemetry study of another Merriam's kangaroo rat subspecies, home range sizes of males and females were similar (about 0.8 acres); occasional long-distance movements of 100 meters (330 feet) or more were observed (Behrends et al. 1986).

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 Section 670.1, subdivision (d)(1), of Title 14 of the California Code of Regulations.

A. Population Trend

1. Scientific Information in the Petition

The Petition discusses population trend for the San Bernardino kangaroo rat on page 5. The Petition acknowledges a lack of population trend data and therefore relies upon information on habitat availability and population density to suggest a population decline. The San Bernardino kangaroo rat historically inhabited alluvial fan scrub in active floodplains in the San Bernardino and San Jacinto/Perris valleys (McKernan 1997). The Petition notes urban and agricultural development and water management projects implemented in this area in the 20th Century have significantly diminished the availability of this habitat, suggesting a San Bernardino kangaroo rat population decline. The Petition cites a USFWS (2009) estimate that less than 5% of the San Bernardino kangaroo rat's historical habitat remains and that much of the remaining habitat is fragmented, degraded, and non-functional (USFWS 2018). The Petition cites studies (e.g., McKernan 1997) indicating higher San Bernardino kangaroo rat population densities in areas with naturally-functioning floodplains to suggest a likely decline in densities throughout much of the species' currently occupied range due to the loss of this type of habitat. According to the Petition, a loss of occupancy combined with a decline in density throughout most of the San Bernardino kangaroo rat's geographic range indicates a negative population trend.

2. Conclusion

The information provided in the Petition indicates San Bernardino kangaroo rat populations have significantly declined since the historical period.

B. Geographic Range

1. Scientific Information in the Petition

Information regarding geographic range appears on pages 5 through 21 of the Petition. The San Bernardino kangaroo rat is endemic to California, historically ranging along alluvial fan habitats in floodplain terraces of the northern San Bernardino Valley and at the northern bases of the San Jacinto Mountains (McKernan 1997). The Petition indicates a substantial decline in the occupied geographic range based on loss of habitat and lack of recent observations of the species throughout most of its historical range.

The Petition presents additional information related to recent trends in habitat suitability on pages 15 through 21. The Petition bases its summary of habitat availability upon a variety of sources, including USFWS documents and reports related to the federal ESA listing as endangered in 1998, designation of Critical Habitat in 2002, a five-year status review in 2009, and an unpublished analysis conducted in 2018. The resulting information appears in Petition Table 1, excerpted below.

Petition Table 1. U.S. Fish and Wildlife Service's estimates of area of SBKR habitat (acres) at time of federal listing (1998), area of Designated Critical Habitat (2002), and functioning habitat remaining in 2018.

Subpopulation Land Unit	Potential Habitat Estimated at Listing (1998[1])	Designated Critical Habitat (2002[2])	Estimated Functioning Habitat (2018[3])
Etiwanda Alluvial Fan	Extant	4,820	Extirpated[3]
Lytle Creek/Cajon Wash	6,967	13,970	6,471
Santa Ana River	5,224	8,935	7,426
San Jacinto River	1,002	5,565	2,403
Bautista Creek	Part of San Jacinto R.	Part of San Jacinto R.	Extirpated[3]
Cable Creek	Part of Lytle/Cajon	Part of Lytle/Cajon	Extirpated[3]
Devil's Canyon	Part of Lytle/Cajon	Part of Lytle/Cajon	Extirpated[3]
City Creek (upstream of Highland Ave.)	Extant	Part of Santa Ana R.	Extirpated[3]
Reche Canyon	Extant	Not designated	Extirpated[4]
South Bloomington	Extant	Not designated	Extirpated[4]
Estimated Totals	**13,193[5]**	**33,295 (10,969[6])**	**16,300[7]**

The Petition concludes the information summarized in Table 1 indicates: 1) the kangaroo rat has been extirpated from several areas occupied at the time of ESA listing, including five areas included in the Critical Habitat designation of 2002, and 2) the USFWS estimates functioning habitat in the three remaining subpopulation areas is limited to about 16,000 acres.

Additionally, the Petitioner used aerial images and unpublished surveys to estimate the change in total suitable San Bernardino kangaroo rat habitat between ESA listing in 1998 and the present (2018). Unlike USFWS's "functioning" habitat outlined in Table 1, the Petitioner's estimate of suitable habitat does not account for functionality or occupancy. Instead, it more broadly estimates the maximum possible potential habitat based solely on land cover. The Petition states this approach documents the magnitude and rate of irreversible loss of potential San Bernardino kangaroo rat habitat since the species was federally listed in 1998. The results of this analysis are excerpted in Petition Table 2, below.

[1] USFWS 1998
[2] USFWS 2002a
[3] USFWS 2018
[4] Extirpated by 2008 (USFWS 2009)
[5] A total of 3,396 acres of the 13,193 acres of the potential habitat was considered to "have too much cover or is otherwise degraded" to support SBKR.
[6] A total of 33,295 acres have been designated as Critical Habitat for SBKR (USFWS 2002a), but the Service (USFWS 2009) considered 10,969 acres of this to be "much of the remaining occupied habitat" at the time.
[7] Habitat considered currently "functioning" may not necessarily be occupied by SBKR.

Petition Table 2.[8] Acreages of potential, suitable and unsuitable SBKR habitat in 1998 and 2018.

Subpopulation Land Unit	1998 Unsuitable	1998 Suitable	2018 Unsuitable	2018 Suitable	% Loss Suitable 1998-2018	% Increase Unsuitable 1998-2018
Inside Critical Habitat						
Etiwanda Alluvial Fan	248	4,570	1,327	3,491	24%	435%
Lytle Creek/Cajon Wash	1,285	12,686	3,693	10,278	19%	187%
Santa Ana River	1,004	7,932	1,764	7,172	10%	76%
San Jacinto River/Bautista Creek	664	4,901	838	4,727	4%	26%
Outside Critical Habitat						
Etiwanda Alluvial Fan	0	1,075	1,075	0	100%	-
Lytle Creek/Cajon Wash	0	3,205	3,205	0	100%	-
Santa Ana River	0	897	897	0	100%	-
San Jacinto River/Bautista Creek	0	1,198	1,198	0	100%	-
Estimated Totals	**3,201**	**36,464**	**13,997**	**25,668**	**30%**	**337%**

Based on the information in Table 2, the Petition suggests during the 20 years since ESA listing: 1) all formerly suitable habitat outside designated Critical Habitat areas (6,375 acres) has been lost, 2) the total area of suitable habitat within the Critical Habitat areas has declined by almost 11,000 acres, 3) the individual Critical Habitat areas have lost between 4% and 24% of their suitable habitat area, and 4) combined across all four habitat areas, about 30% of all suitable habitat for the San Bernardino kangaroo rat has been lost since 1998.

2. Conclusion

The Petition sufficiently demonstrates a decline in the San Bernardino kangaroo rats' geographic range.

[8] In reviewing the Petition, the Department discovered discrepancies between the acreages and percent loss provided in Table 2 of the Petition. The Department contacted Petitioner, and Petitioner acknowledged that they accidently input the incorrect numbers for the 1998 suitable and 2018 unsuitable acreages inside critical habitat, and made one typo for the percent increase in unsuitable habitat. Petitioner provided the Department the correct data, and Table 2 as reproduced here has been updated with the correct numbers. The numbers that were updated are underlined in the table above. The Department has determined that Petitioner's error did not affect the estimated total loss of habitat or impact Petitioner's overall conclusions.

C. Distribution

1. Scientific Information in the Petition

The Petition discusses current and historical distribution on pages 5 through 21. The Petition cites information from USFWS (1998) indicating the current distribution of the San Bernardino kangaroo rat is limited to three disjunct geographic areas: Lytle Creek/Cajon Wash, Santa Ana River, and San Jacinto River/Bautista Creek (USFWS 1998). The Petition also summarizes subsequent information (USFWS 2018) and the Petitioner's own analyses and concludes the San Bernardino kangaroo rat's distribution within these three areas has contracted since 1998.

The Petition presents mapped locations for all known detections of San Bernardino kangaroo rat in the species' historical range on page 6 (Petition Figure 1, which is reproduced on page 10 of this Petition Evaluation). The Petition suggests the map, which depicts sparse records throughout most of the historical geographic range, indicates much of the species' habitat was lost as the region was settled in the early 20th Century.

2. Other Relevant Scientific Information

The Petition's distribution map closely matches the occurrence information in CDFW's California Natural Diversity Database (CNDDB), though a few additional old records appear on the Petition map that do not appear in CNDDB. Recent records (2008 and later) match exactly.

3. Conclusion

The information provided by the Petition on distribution of the San Bernardino kangaroo rat indicates a decline and appears consistent with other information available to CDFW from occurrence records and information contained in USFWS and gray literature documents. The slight differences between the Petition's distribution map and CDFW's CNDDB occurrence data do not change the depiction of historical and current range and distribution.

D. Abundance

1. Scientific Information in the Petition

The Petition discusses abundance on page 22. The Petition acknowledges limited data exist on abundance of the San Bernardino kangaroo rat, citing studies (McKernan 1997, Root 2008, Root 2010) that estimate densities of 1 to 30 individuals per occupied hectare (2.5 acres). The Petition indicates studies have shown local habitat conditions affect abundance, with hydrologically functional habitat areas supporting greater

population densities than degraded or hydrologically disconnected areas. The Petition suggests habitat degradation and fragmentation in the San Bernardino kangaroo rat's range have therefore likely negatively impacted abundance.

2. Conclusion

The Petition sufficiently addresses what little is known about the abundance of the San Bernardino kangaroo rat.

E. Life History

1. Scientific Information in the Petition

The Petition addresses life history on pages 22 through 24. The Petition describes the San Bernardino kangaroo rat in relation to the other two Merriam's kangaroo rat subspecies in California, including its morphological, geographic, and likely genetic differentiation, suggesting the San Bernardino kangaroo rat may be a distinct species instead of merely a subspecies (Lidicker 1960). The petition briefly presents information about home range, reproductive biology, foraging ecology and diet, energetics physiology, and causes of mortality.

2. Conclusion

The Petition presents sufficient information on the life history and ecology of the San Bernardino kangaroo rat.

F. Kind of Habitat Necessary for Survival

1. Scientific Information in the Petition

The Petition addresses the San Bernardino kangaroo rat's habitat requirements on pages 24 and 25. The Petition cites USFWS's Critical Habitat designation notice and other sources that describe habitat characteristics as including "sandy or gravelly soils and substrates, generally supporting open-structured alluvial fan scrub vegetation, in floodplains with active fluvial processes and nearby upland and/or less frequently inundated terraces" (USFWS 2002). The Petition highlights the importance of active hydrologic conditions (with periodic flood events within the floodplain) to maintain the relatively open vegetation preferred by the kangaroo rat (McKernan 1977, Smith 1980). Connectivity of floodplain to adjacent naturally-vegetated terraces is necessary as flood refugia (USFWS 2002). Large undisturbed blocks of habitat are necessary to minimize edge effects of artificial lighting (Wang and Shier 2017).

2. Conclusion

The Petition presents sufficient information regarding the kind of habitat necessary for the San Bernardino kangaroo rat's survival.

G. Factors Affecting the Ability to Survive and Reproduce

1. Scientific Information in the Petition

The Petition discusses factors affecting the San Bernardino kangaroo rat's ability to survive and reproduce on pages 25 through 28. The Petition states the primary threat to the San Bernardino kangaroo rat is the direct impact of past and present habitat modification and destruction. McKernan (1997) documented the loss of more than 95% of the species' historically available habitat, as well as fragmentation and degradation of the remaining habitat. This work led to the emergency listing of the species in 1998 under the federal Endangered Species Act. The Petition provides information indicating the loss of an estimated 11,000 acres of San Bernardino kangaroo rat habitat since the species was federally listed in 1998, with additional impacts occurring due to habitat fragmentation and degradation. In addition to direct impacts of habitat loss and degradation, the Petition states the hydrologic function of the major stream systems in the species' range has been impaired. The Petition describes adverse impacts to the species from channelization, flood control, and water management operations, and indicates disconnection of upland stream terraces from floodplains has adversely impacted the ecology of the species through effects on movement between and within foraging areas, dispersal of young, access to flood refugia, and predator avoidance.

As described in the Petition, recent range-wide genetic information indicates low genetic variability and effective population size in remaining San Bernardino kangaroo rat populations. Effective population sizes are an order of magnitude lower than recommendations for maintenance of genetic diversity in populations (Shier et al. 2018). Two of the three extant subpopulations (Santa Ana River and San Jacinto River) fall below the levels necessary to prevent inbreeding depression (Shier et al. 2018).

As outlined in the Petition, unnaturally long succession periods between flood events now occur due to water management in some of the stream systems occupied by the San Bernardino kangaroo rat. According to the Petition, long flood intervals have resulted in a preponderance of late-mature vegetation stages in the floodplain scrub habitat. In addition, non-native grasses and other plants have invaded much of the available habitat. The Petition concludes these impacts to the natural vegetation composition of habitat for the San Bernardino kangaroo rat reduces the number of individuals the habitat can support.

Other factors identified in the Petition affecting San Bernardino kangaroo rat survival and reproduction include “edge effects” from development, such as artificial lighting that depresses foraging activity (Wang and Shier 2017) and may increase predation risk (Beier 2006), and exposure to rodenticides.

As stated in the Petition, climate change would likely interact with and amplify many of the above-described factors by impacting native plant species distribution, altering precipitation rates and timing, facilitating invasion of non-native plant species, and increasing predation risk and competition with other species for resources.

2. Conclusion

The Petition sufficiently describes factors affecting the San Bernardino kangaroo rat’s ability to survive and reproduce.

H. Degree and Immediacy of Threat

1. Scientific Information in the Petition

The Petition discusses the degree and immediacy of threats to the San Bernardino kangaroo rat on pages 28 through 32. Threats include substantial reductions in the area, quality, and functionality of habitat due to land cover conversion and modification of hydrologic conditions of streams, both historically (McKernan 1997, USFWS 1998 Fed. Reg. 63:51005) and since the species was listed as endangered under the federal ESA (USFWS 2018). The remaining San Bernardino kangaroo rat populations are small, isolated, and have low genetic diversity, posing additional threats to the species’ persistence (Shier et al. 2018).

The Petition outlines several development projects, currently in the planning, permitting, or implementation stage, that it describes as posing imminent threats to the San Bernardino kangaroo rat. As described in the Petition, these include:

- The Lytle Creek North Master Planning Community, for which the USFWS approved a Biological Opinion (BO), would include approximately 1 mile of revetment on Lytle Creek’s north bank and the loss of 296 acres of suitable habitat. Mitigation included the conservation of 160 acres of floodplain habitat, including a 57-acre higher elevation area proposed as a flood refugium and about 6 acres of upland terrace. Vegetation management of the refugium was intended to maintain the open structure needed by the kangaroo rat. According to the Petition, the refugium island has not functioned as intended in relatively modest floods to date and recent analysis has shown it will likely be inundated and further eroded in larger flood events (USFWS 2017, Chang 2016,

CBEC 2018). According to the Petition, the target San Bernardino kangaroo rat population numbers for the mitigation outlined in the BO have not been achieved.

- The Lytle Creek Ranch Development is advanced in the permitting phase and could be approved for construction in 2019. This project would encompass 2,447 acres, including 1,920 acres within San Bernardino kangaroo rat Critical Habitat, of which an estimated 1,190 acres would be adversely modified (USFWS, as cited in the Petition). According to the Petition, proposed mitigation includes protection of 489 acres of occupied habitat and restoration of an additional 40 acres. Assuming the protected and restored habitat is occupied by the kangaroo rat, a net loss of 171 acres of occupied habitat in the project area would result. The Petition also expresses concern the project would impact fluvial processes and connectivity in the protected habitat areas by placement of revetment, which would constrict the stream channel and increase scour, channelization, and inundation of the floodplain habitat. Upland terrace refugium habitat would be developed and no longer available to the kangaroo rat.

- The CEMEX aggregate mining project in Lytle Creek is in the permitting phase. According to the Petition, the exact configuration of the mining project has not been finalized but would include repair of a levee breached in 2005. The Petition indicates natural processes since the breach have improved habitat conditions, and that the proposed project would reverse these improvements.

- The Seven Oaks Dam on the Santa Ana River, completed in 2000, is operated to reduce the potential for downstream flood damage. According to the Petition, the dam was designed to allow releases that would mimic non-destructive flood events that would maintain floodplain characteristics suitable for the San Bernardino kangaroo rat, among other species. To date, such high-flow releases have not been planned or implemented. Additionally, vegetation management of floodplain habitat has not been successful in maintaining San Bernardino kangaroo rat populations in the area, according to the Petition.

- Two Habitat Conservation Plans (HCPs) in the Santa Ana River portion of the San Bernardino kangaroo rat's range are currently in development. According to the Petition, these HCPs contemplate development of 680 acres of San Bernardino kangaroo rat habitat, to be mitigated by protection of 1,655 acres of medium- to high-suitability habitat.

- The Petition describes the precarious condition of the San Bernardino kangaroo rat population in the San Jacinto River/Bautista Creek area. USFWS considers

the species extirpated from the Bautista Creek drainage and monitoring indicates low levels of occupancy in other areas inhabited by this subpopulation (Biological Monitoring Program 2016). Although the area is included in the Western Riverside Multiple Species Habitat Conservation Plan, which includes the San Bernardino kangaroo rat as a covered species, according to the Petition, conservation goals for the species have consistently not been met during implementation.

- The Petition lists three additional projects in the planning stages that could impact the San Bernardino kangaroo rat subpopulation in the San Jacinto drainage.

2. Conclusion

The Petition presents sufficient information to suggest the threat to the San Bernardino kangaroo rat's continued existence may be both severe and immediate.

I. Impact of Existing Management Efforts

1. Scientific Information in the Petition

The Petition discusses the impact of existing management efforts on pages 32 through 35. As outlined in the Petition, management of San Bernardino kangaroo rat and its habitat is subject to review and approval by the USFWS because the species is listed as endangered under the federal ESA. The USFWS may grant incidental take authorization under either ESA Section 7 (for projects carried out, funded, or permitted by federal agencies) or ESA Section 10 (for non-federal projects, including private landowner projects and local jurisdiction projects). The Petitioner reviewed 45 projects with USFWS incidental take authorization for San Bernardino kangaroo rat, including 40 BOs for federal projects (Section 7) and five HCPs (Section 10). As summarized in the Petition, mitigation for impacts to San Bernardino kangaroo rats of these projects consisted of one or more of three strategies:

- Relocation of kangaroo rats from project impact areas to other sites;
- Habitat restoration; and
- Purchase of mitigation credits from mitigation banks, primarily in the Lytle Creek and Cajon Wash banks.

The Petition states all three strategies have been ineffective in conserving or recovering the San Bernardino kangaroo rat. Relocation has been the most common requirement in the 40 Section 7 projects, but it has only been partially successful in one case according to the Petition. HCPs and BOs commonly include habitat restoration. However, according to the Petition, persistent occupancy of kangaroo rat has not been

confirmed in any restored habitat areas. The Petition states no monitoring of relocation or restoration project success is typically required. As a result, the ultimate outcome of these strategies does not inform subsequent project requirements.

The Petition indicates the third conservation strategy, purchase of mitigation credits, has resulted in protection of some habitat in the mitigation banks. According to the Petition, while such habitat is protected in perpetuity through purchase of credits, it is only protected as mitigation because other habitat is lost during project implementation, leading to a net loss of habitat in many cases. Given the limited amount of habitat available to the species, the Petition suggests that, despite the long-term protection of some habitat, the overall net loss of habitat resulting from this strategy has made the conservation status of the species more precarious. The Petition further notes that the two primary mitigation banks are both in the Lytle Creek/Cajon Wash population area and only encompass some 1,482 acres. Thus, according to the Petition, the banks do not provide insurance against stochastic events (such as disease) that may impact that subpopulation. The Petition also suggests insufficient area exists within the banks to support a viable population.

2. Conclusion

The Petition suggests management efforts implemented since the San Bernardino kangaroo rat was federally listed have been inadequate to stop or reverse the loss of habitat area and habitat quality for the species. The Petition presents sufficient evidence to indicate additional management actions may be necessary to conserve and recover the species.

J. Suggestions for Future Management

1. Scientific Information in the Petition

The Petition suggests future management actions on pages 35 through 38. Suggested management falls into four broad categories: (1) protecting existing suitable habitat, (2) expanding occupied areas, (3) monitoring the status of San Bernardino kangaroo rat throughout its range, and (4) designating the species as endangered under CESA.

Regarding habitat protection and expansion of occupied areas, the Petition recommends the following specific actions:

- Prevent the additional loss of suitable and/or occupied habitat through land cover conversion;
- Revise management requirements for floodplains to reduce stream channelization;

- Develop management actions to reduce habitat degradation caused by altered hydrologic processes, invasion of nonnative plants, habitat fragmentation, and edge effects; and
- Encourage conservation banking of suitable and/or occupied habitat.

The Petition also recommends exploration of other, untested actions that could be used in the future to aid in the species recovery. The Petitioner suggests these actions should not be considered for project mitigation unless or until experimental practice proves their effectiveness. These actions include:

- Actions to enhance habitat quality, such as soil restoration;
- Enhancement of sediment transport during high-water events through installation or modification of crossing structures (large culverts, bridges) that allow downstream passage of sediment;
- Active vegetation management to control non-native plants and to encourage native species;
- Scientifically-based translocation or reintroduction of San Bernardino kangaroo rats into unoccupied or sparsely occupied suitable habitat areas;
- Captive propagation of San Bernardino kangaroo rat to provide a source population for reintroductions, if translocation proves effective; and
- Restoration of more natural hydrological processes in the Santa Ana River and San Jacinto-Bautista Creek systems.

2. Conclusion

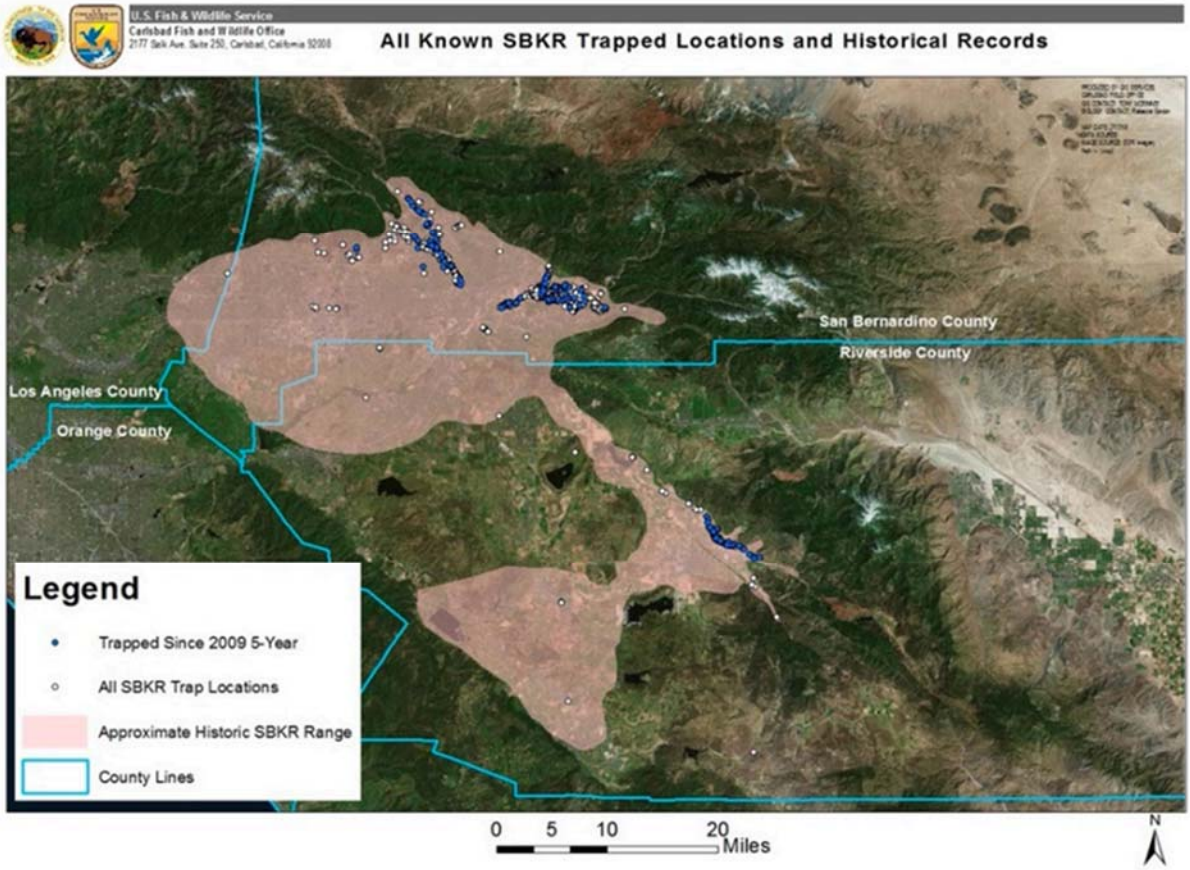
The Petition indicates additional, known management actions may aid in conserving the San Bernardino kangaroo rat. Exploration of additional experimental options may identify possible future conservation tools.

K. Detailed Distribution Map

1. Scientific Information in the Petition

The Petition provides the following map (Figure 1) prepared by USFWS (2018) showing the historical geographic range of San Bernardino kangaroo rat, as well as historical and recent live-trapping locations.

Figure 1. Historical range of San Bernardino kangaroo rat, all known trap locations, and trap locations from 2008-2018 (from USFWS 2018).



2. Other Relevant Scientific Information

The distribution of locations plotted in Figure 1 closely matches occurrences of the San Bernardino kangaroo rat as recorded in the California Natural Diversity Database.

3. Conclusion

The distribution map illustrates the San Bernardino kangaroo rat's historical distribution and highlights the current limited distribution of the species.

L. Sources and Availability of Information

1. Scientific Information in the Petition

The Petition cited more than 50 scientific and administrative documents related to the San Bernardino kangaroo rat. The Petitioner provided electronic copies of these documents, as well as additional, uncited documents, to the Commission.

2. Other Relevant Scientific Information

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

3. Conclusion

The Petition contains sufficient available sources of information to inform whether the petitioned action may be warranted.

V. Recommendation to the Commission

In completing its Petition Evaluation, the Department has determined the Petition provides sufficient scientific information to indicate that the petitioned action may be warranted for the San Bernardino kangaroo rat. Therefore, the Department recommends the Commission accept the Petition for further consideration under CESA.

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