CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

California Endangered Species Act

Petition Evaluation for Western Spadefoot (*Spea hammondii*)

Report to the Fish and Game Commission
January 2026

Cover page photo credit: Chris Brown (U.S. Geological Survey)

Suggested citation: California Department of Fish and Wildlife (CDFW). 2025. Petition Evaluation for Western Spadefoot (*Spea hammondii*). A report to the Fish and Game Commission, California Natural Resources Agency, Sacramento, CA, USA.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS, ACRONYMS, AND TERMS

Aestivation – long-term dormancy during a hot or dry period

Anuran – tailless amphibian of the order *Anura*

BLM – Bureau of Land Management

CESA – California Endangered Species Act

CNDDB – California Natural Diversity Database

Commission – California Fish and Game Commission

Department – California Department of Fish and Wildlife

DPS – Distinct population segment

ESA – Federal Endangered Species Act

HCP – Habitat Conservation Plan

INRMP – Integrated Natural Resource Management Plan

IUCN – International Union for Conservation of Nature and Natural Resources

Metamorph – Amphibian life stage occurring between the aquatic tadpole and terrestrial adult life stages

NCCP – Natural Community Conservation Plan

N_c – Census population size

N_e – Effective population size

N_{eb} – Effective number of breeding individuals

NEPA – National Environmental Policy Act

RCIS – Regional Conservation Investment Strategies

SSC – Species of Special Concern

USFWS – U.S. Fish and Wildlife Service

EXECUTIVE SUMMARY

This petition evaluation for western spadefoot (*Spea hammondii*) has been prepared by the California Department of Fish and Wildlife (Department) in response to the petition to list the northern population of western spadefoot as threatened and list the southern population of western spadefoot as endangered under the California Endangered Species Act (CESA) throughout their respective ranges in California. The purpose of this petition evaluation is to provide a recommendation to the Fish and Game Commission (Commission) on whether the petition provides sufficient information to indicate the petitioned action may be warranted.

Western spadefoot is a small- to medium-sized anuran amphibian which occurs in a variety of wetland and upland habitats within lowland areas of the Central Valley, Sierra Nevada foothills, and coastal California, south of the San Francisco Bay Area. The species requires wetland habitats (e.g., vernal pools) for breeding and early life stages and adjacent upland areas (e.g., grasslands) for adults during the nonbreeding season. The petition states that there are two genetically distinct populations (northern and southern) separated by the Transverse Ranges in southern California. The petition describes population-wide declines in the species between the 1970s and 1990s, with extirpation of some subpopulations in the Central Valley.

The Department has determined that the petition addresses each of the required petition components listed in Fish and Game Code section 2072.3 and California Code of Regulations, title 14, section 670.1, subdivision (d)(1):

- Life history
- Range
- Distribution
- Detailed distribution map
- Kind of habitat necessary for survival
- Abundance
- Population trend
- 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

In completing its petition evaluation, the Department considered the information in the petition and other relevant information the Department possesses. The Department has determined that there is sufficient scientific information to indicate that the petitioned

action to list western spadefoot under CESA may be warranted. Therefore, the Department recommends that the Commission accept the petition for further consideration pursuant to CESA.

1 INTRODUCTION

1.1 Petition Evaluation Overview

This petition evaluation serves as the basis for the California Department of Fish and Wildlife's (Department) recommendation to the California Fish and Game Commission (Commission) on whether the petition to list the northern and southern populations of western spadefoot (*Spea hammondii*) as threatened and endangered species, respectively, under the California Endangered Species Act (CESA) should be accepted and considered. The recommendation is based on the sufficiency of scientific information in the petition, as well as other relevant information that was reviewed by the Department during the evaluation period.

A petition to list a species under CESA must include "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant" (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

Once a petition is submitted to the Commission, the Department has 90 days (120 days with extension) to prepare a petition evaluation that assesses each of the petition components and makes a recommendation to the Commission as to whether there is sufficient scientific information to indicate that the petitioned action to list the species under CESA may be warranted (Fish & G. Code, § 2073.5, subds. (a)-(b)). Once completed by the Department, the petition evaluation is delivered to the Commission and placed on the agenda for receipt at the next available meeting of the Commission. At that time, the petition evaluation will be made available to the public for a 30-day public comment period prior to the Commission taking any action on the petition. The Commission then considers the petition, the Department's petition evaluation and recommendation, written comments received, and oral testimony, and will then make a finding at the next available meeting of the Commission as to whether the petition provides "sufficient information to indicate that the petitioned action may be warranted" (Fish & G. Code, § 2074.2, subd. (e)(2)). The standard for accepting a petition for consideration and assessing sufficiency of information is addressed in *Center for Biological Diversity v. California Fish and Game Commission* (2008) 166 Cal.App.4th 597.

If the Commission determines that the petitioned action may be warranted, the species becomes a candidate for CESA listing and proceeds to the status review stage of the

CESA listing process. The Department then prepares a peer-reviewed report that advises the Commission on whether the petitioned action is warranted, based upon the best scientific information available (Fish & G. Code, § 2074.6). Finally, the Commission determines whether the petitioned action to list the species as threatened or endangered is warranted, based on the Department's status review and other information in the administrative record (Fish & G. Code, § 2075.5).

1.2 CESA Petition History

On September 24, 2025, the Center for Biological Diversity submitted to the Commission a petition to list the northern and southern populations of western spadefoot as threatened and endangered species, respectively, under CESA. On October 6, 2025, the Commission referred the petition to the Department for evaluation. At its meeting on October 8, 2025, the Commission officially acknowledged receipt of the petition. At its meeting on December 10, 2025, the Commission granted the Department's request for a 30-day extension of the period to review the petition and prepare this petition evaluation.

1.3 Federal Endangered Species Act (ESA) Petition History

The western spadefoot was petitioned to be listed under the Endangered Species Act (ESA, 16 U.S.C. § 1531 et seq.) in 2012 (USFWS 2015). The U.S. Fish and Wildlife Service (USFWS) proposed to list the northern and southern distinct population segments (DPS) as threatened in 2023 (USFWS 2023). At the time this CESA petition evaluation was prepared, the USFWS had not published a final determination regarding the federal petition. Furthermore, critical habitats for the northern and southern DPSs were not determined due to lack of sufficient data.

1.4 Additional Species Status Designations

1.4.1 BLM Designated Sensitive Species

The western spadefoot is designated as a Sensitive Species by the Bureau of Land Management (BLM) (CNDDB 2025). BLM identifies Sensitive Species as native species that occur, or are likely to occur, on BLM-administered lands, and are at risk of becoming ESA-listed, thus requiring special management.

1.4.2 California Species of Special Concern

The western spadefoot is designated as a Priority I Species of Special Concern (SSC) by the Department. The Department has assigned the species a Global Rank of G2G3 and a State Rank of S3S4, meaning the species is ranked between vulnerable and apparently

secure, and may be facing a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors (CNDDB 2025).

1.4.3 IUCN Red List

The western spadefoot is listed at Near Threatened on the International Union for Conservation of Nature (IUCN) Red List, meaning the species is likely in significant decline due to widespread habitat loss throughout its range (IUCN 2022).

1.4.4 NatureServe Conservation Status Ranks

The western spadefoot is ranked as G2 by NatureServe, which classifies the species as declining due to impacts of urbanization, with additional threats from habitat fragmentation, exotic species, and climate change (NatureServe 2025).

2 SPECIES DESCRIPTION AND TAXONOMY

2.1 Species Description

The petition describes the western spadefoot as a small- to moderate-sized round anuran, with snout-to-vent length ranging from 3.8 to 6.3 cm (1.5–2.5 in) (Stebbins 2003). Western spadefoots are characterized with having large eyes with pale gold irises and vertical pupils in bright light and round pupils in dark light, teeth on the upper jaw, short and stout limbs, and a wedge-shaped hard black "spade" on each hind foot. Adult and juvenile dorsal coloration may be green, gray, or brown with irregular dark and light stripes and ventrally solid cream or light gray. The skin tubercles on their dorsal side typically have orange or reddish tips. The call of the male western spadefoot can be described as "hoarse" and "snore-like," lasting on average 0.5 to 1 second long with a mean pulse rate of 29.4 to 44.5 pulses per second (Brown 1976).

Western spadefoot eggs are green or gray above and whitish below and form irregular cylindrical clusters of about 10–42 eggs. Eggs are attached to submerged objects such as underwater plant stems in temporary or permanent pools. Tadpoles have a large, round body, a thin, vertically flattened tail, and display similar coloration as the adults. They have a beaked upper mandible, a notched lower mandible, and oral papillae that encircle the mouth.

2.2 Species Taxonomy

The petition describes the taxonomy of the western spadefoot as a member of the family Scaphiopodidae, genus *Spea,* species *S. hammondii.* The petition states that the genus *Spea* was originally considered a subgenus of *Scaphiopus* until phylogenetic analysis determined that *Spea* and *Scaphiopus* were distinct genera. The petition also notes that

the western spadefoot was formerly in the family Pelobatidae; however, phylogenetic analyses has identified divergences in mitochondrial DNA and separated the North American spadefoots into Scaphiopodidae and the spadefoots of Europe, central and western Asia, and northwestern Africa into Pelobatidae.

2.3 Population Structure and Genetics

The petition states that the western spadefoot comprises two distinct populations (northern and southern), which are divided by the Transverse Ranges in Southern California. The petition summarizes a mitochondrial DNA phylogenetic analysis by García-París et al. (2003) that found the Alameda County (northern) and San Diego County (southern) western spadefoots do not form a monophyletic clade (i.e., two western spadefoot samples from San Diego County were more similar to plains spadefoot [*S. bombifrons*] and Great Basin spadefoot [*S. intermontana*] than to a western spadefoot sample from Alameda County), suggesting that the two populations are genetically distinct. Additional ecological niche models suggest that the northern and southern populations dispersed along different corridors during the last glacial age and now may occupy different habitats (Gherghel and Martin 2020). The petition also describes a genetic analysis investigating five nuclear protein-coding genes and a mitochondrial gene that determined that the northern and southern populations are two genetically distinct populations of western spadefoot divided by the Transverse Ranges (Neal et al. 2018). The petition notes that the northern and southern populations of western spadefoot have likely been separated for thousands of years which warrants treatment of the two populations as separate conservation units.

Furthermore, the petition describes two genetic clusters of spadefoots in Orange County, which is one of the last strongholds of western spadefoot in the southern population. Inland and coastal Orange County populations were found to be genetically distinct (Neal et al. 2020). The petition discusses possible reasons for the divergence in Orange County, including limited movement and strong philopatry as well as intensive urban development that has fragmented habitat. The petition states that fragmented populations in Orange County show very low effective population sizes (N_e; 1.2–12.2) and number of effective breeders (N_{eb}; 1.4–19.8) per breeding pond (Neal et al. 2020). The petition argues that these pond specific estimates of N_e and N_{eb} are much lower than the minimum required to prevent inbreeding depression in the short-term (50) or to retain evolutionary potential in the long-term (500). This conservation management benchmark, known as the 50/500 rule, was established to describe theoretical minimum viable effective population sizes (Frankham et al. 2014, Clark et al. 2024). However, the petition notes that more recent conservation recommendations suggest a 100/1000 rule to more accurately reflect the needs of wild populations (i.e., larger effective population sizes are required to prevent inbreeding depression in wild populations; Frankham et al.

2014). As such, the petition argues that the Orange County spadefoots are in danger of severe inbreeding depression due to low population size.

The petition states that population genetic information does not exist for the northern population of western spadefoot. However, the petition hypothesizes that because the northern population faces similar threats of habitat loss and fragmentation as the southern population, it may be facing similar genetic isolation, low genetic diversity, and risk of extirpation.

2.4 Similar Taxa

The petition states that currently, spadefoots west of the Sierra Nevada and in Baja California are considered as western spadefoot (*S. hammondii*). Previously, two closely related species, now known as the Great Basin spadefoot (*S. intermontana*) and the Mexican spadefoot (*S. multiplicata*), were considered subspecies of *S. hammondii*. Differences in morphology, breeding behavior, and reproductive biology now separate these distinct species.

3 SUMMARY OF PETITION COMPONENTS

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 contained information on each of the following petition components:

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

The Department did not receive new information from the public during the petition evaluation period (Fish & G. Code, § 2073.4). Pursuant to Fish and Game Code section 2073.5, the Department evaluated the petition to determine whether there is, or is not, sufficient information to indicate that the petitioned action may be warranted. A summary of the relevant information from the petition for each of the petition

components is presented below. The Department has grouped similar components together and renamed components to create a more cohesive and readable document.

3.1 Life History

This section summarizes the information in the petition regarding the species' life history (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

The petition describes the life history of the western spadefoot on pages 2, 7–11, and 14, providing information on its life cycle, breeding ecology and behavior, diet, foraging ecology, predators, burrowing behavior, movement, home range, and population dynamics. The following is a summary of the information provided.

The petition describes the western spadefoot as a cryptic species with a biphasic life cycle dependent on both terrestrial and aquatic habitats. Adults spend most of their lives in self-made underground burrows, though they may occupy burrows made by small mammals, primarily during the dry season. The dry season triggers aestivation, or long-term dormancy, that may last 125–220 days. Adults emerge during the wet season, from late fall to early spring, at night to forage and breed. The petition notes that the factors determining emergence for western spadefoot are not well understood and provides examples from related species. For example, vibrations from rainfall, flooding, or wet soil around burrows may initiate emergence for Couch's spadefoot (*Scaphiopus couchii*) and Mexican spadefoot. The petition presents recent research that suggests that western spadefoot may be more active outside the burrow year-around, rather than only during the wet season.

The petition describes the breeding season for western spadefoot as generally occurring from January to May, though the species may breed opportunistically year-round depending on environmental conditions. Breeding behaviors for the species have been observed outside the typical period across its range after heavy rains. The petition describes western spadefoots as forming "large (>1000 individuals), highly vocal breeding aggregations" in aquatic environments such as vernal pools, intermittent streams, reservoirs, and irrigation ditches, which may occur multiple times during a season. The petition states that after breeding, females lay a total of 300–500 eggs in multiple irregular cylindrical clusters of 10–42 eggs on submerged objects.

Western spadefoot eggs develop at temperatures of 9 to 30 °C and hatch in 3–4 days. The petition notes that larval development time varies depending on environmental conditions. In some locales, larval development lasted an average of 58 days with a range of 30–79 days, but laboratory experiments accelerated metamorphosis to 14 days when water volume was reduced. However, metamorphs (the life stage between aquatic tadpole and terrestrial adult life states) that develop faster (due to limited availability of standing water) tend to be smaller than metamorphs that have more time to develop

(due to longer-standing water), which could affect survival rates. Upon development of forelimbs, metamorphs venture out of the natal pond and take refuge in moist cracks around the pond. An individual is considered sexually mature when it reaches 4–4.5 cm in snout-vent length. The petition mentions that age at maturity, however, is not well understood, and may depend on environmental conditions and food availability. The petition states that males may reach sexual maturity between one and two years after metamorphosis, whereas females require at least two years based on laboratory studies.

The petition states that limited information is available on the diet of western spadefoots. The petition describes adults and juveniles as likely generalist predators, hunting at night for terrestrial invertebrates. Information on larval diets for western spadefoot is lacking, though tadpoles of the related Mexican spadefoot have both carnivorous and omnivorous morphologies (jaw size), feeding on fairy shrimp or detritus and algae, respectively (Pfennig 1990). The petition posits that western spadefoot tadpoles may have a similar diet and varied jaw morphology.

The petition notes that generally western spadefoots can travel greater than 1 km between burrows and breeding sites, but may be constrained by weather conditions, terrain, and habitat connectivity. In addition, the petition summarizes recent research conducted on movement distance in the southern population of western spadefoot. Rainfall and high relative humidity were found to increase the dispersal distance from breeding pools, though the maximum distance traveled differed between the coastal and inland populations of the southern population, at 601 m and 145 m, respectively (Halstead et al. 2021). The petition notes that the timing and distance of juvenile dispersal from the breeding pool is also unknown. Juveniles have been observed exploring terrestrial habitat immediately around the breeding pool during metamorphosis and after the pool has dried. Home ranges of western spadefoots appear to vary depending on location, weather conditions, and potential resource availability. The petition describes that western spadefoots within the southern population appear to exhibit strong site fidelity. In one study conducted within the southern population, the mean 95% home range area was 0.52 ha, with coastal populations having 3.6 times larger home ranges than the inland populations. The petition notes that the reason for the difference in home range sizes is currently unknown (Halstead et al. 2021).

The petition discusses the general lack of information regarding survivorship for western spadefoot. Adults of the southern population have an estimated 51% annual probability of survival, with the greatest risk during the breeding season compared to aestivation. Larval survival is highly dependent on weather conditions, food availability, and predator presence. The petition notes that although tadpoles may metamorphose faster in pools that dry quicker, they remain at risk of desiccation before metamorphosis is complete and have an increased predation risk. The petition mentions California tiger salamander larvae, adult American bullfrogs, garter snakes, raccoons, and other

mammals and birds as reported predators of western spadefoots. Adult western spadefoots defend against predators by producing an unpalatable skin secretion that causes a burning sensation.

3.2 Range and Distribution

This section summarizes the information in the petition regarding the species' range and distribution and provides a detailed distribution map (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)). A species' range for the purposes of CESA and this petition evaluation is the species' range within California (Cal. Forestry Assn. v. Cal. Fish and Game Com. (2007) 156 Cal.App.4th 1535, 1551). Range describes the general geographical area in which a species occurs. Distribution describes the actual sites where individuals and populations of the species occur within the species' range.

The petition describes the historical range of the western spadefoot as occurring from southern Shasta County to northwestern Baja California (**Figure 1**), making this species nearly endemic to California. The western spadefoot occurred historically in 31 counties, spread across the "Central Valley, Sierra Nevada foothills, and coastal California south of the San Francisco Bay Area" as shown in the range map provided (**Figure 2**). The map (**Figure 2**) also depicts contemporary observations and museum records compiled in the California Natural Diversity Database (CNDDB).

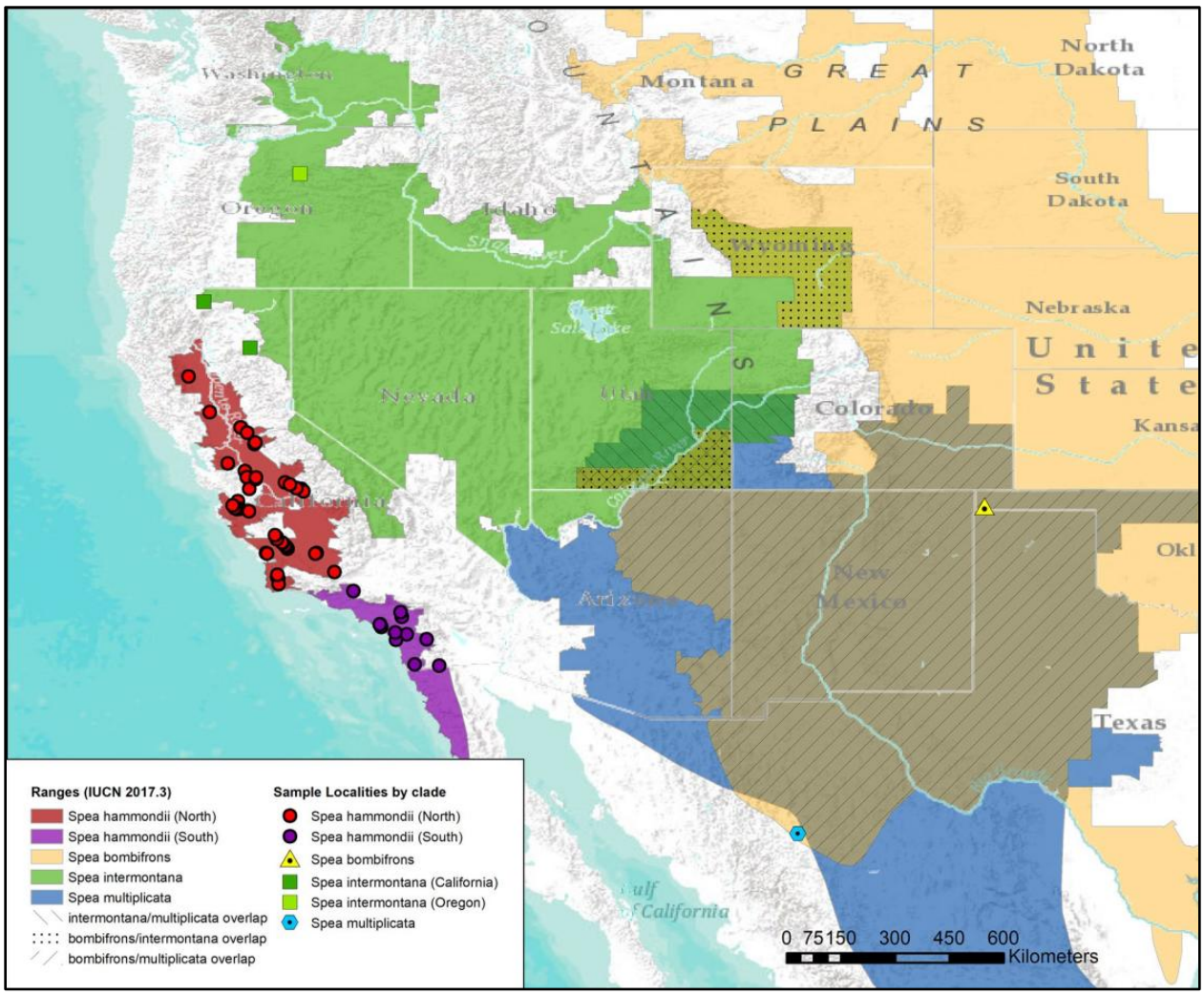

Figure 1. Map depicting northern (red) and southern (purple) distinct genetic populations of western spadefoot (*Spea hammondii*) in California. Other *Spea* species' ranges include the Plains spadefoot (*Spea bombifrons*, yellow); Great Basin spadefoot (*Spea intermontana*, green); and Mexican spadefoot (*Spea multiplicate*, blue). Figure 2 in the petition.

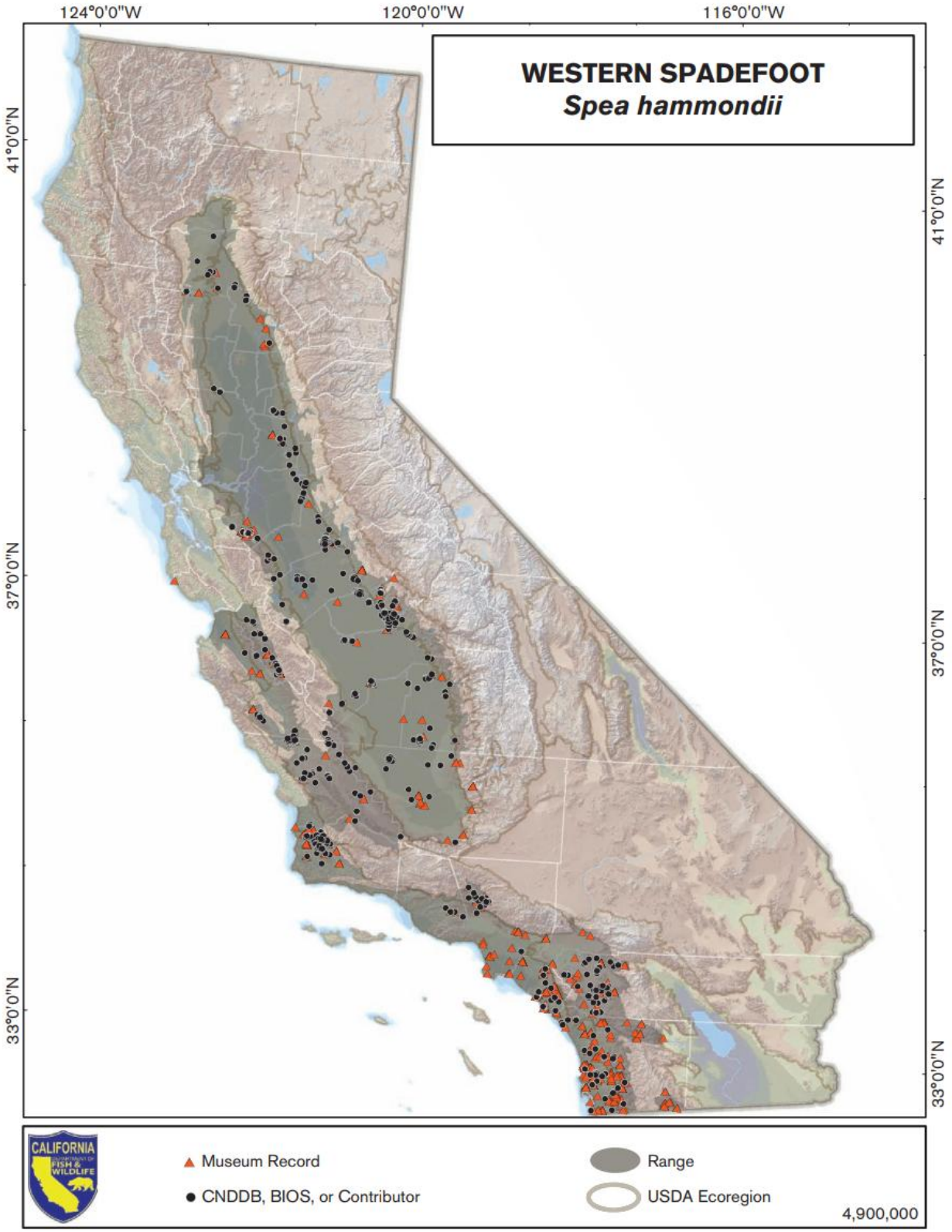

Figure 2. Western spadefoot range, including contemporary observations and museum records from numerous sources. Figure 6 in the petition.

The petition describes the contemporary range and distribution of the western spadefoot on page 14 and pages 18–19. The petition states that the southern population of western spadefoot is now extirpated through much of lowland Southern California, confined to the southern half of that area and to the uplands surrounding the Los Angeles Basin. The petition notes the loss of up to 80% of suitable habitat in Southern California as a factor for the range contraction. The distribution of western spadefoot is driven by availability of suitable breeding pools. For the southern population, researchers predict that coastal populations occur within 486 m of breeding pools and inland populations occur within 187 m of breeding pools. The northern population of western spadefoot has become extirpated in many historical Central Valley locations. Additionally, the petition states that populations persisting in the Central Valley have been observed, on average, at higher elevations than seen in historical, extirpated populations. The petition notes that the northern population has lost an estimated 30% of suitable habitat. The petition describes the loss of vernal pool complexes as a significant driver of western spadefoot extirpation across its historical range.

The department has access to a study (Shedd 2016) which was not included in the petition, and which describes numerous extant populations at localities in Butte, Glenn, Tehama, and Shasta counties despite habitat loss in the region. These detections likely represent the northernmost edges of the species' range.

3.3 Habitat

This section summarizes the information in the petition regarding the kind of habitat necessary for species survival (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

The petition describes the habitat requirements of western spadefoot on pages 7 and 12–16. The petition states that the western spadefoot requires aquatic breeding habitat connected to terrestrial over-summering habitat. The petition discusses that vernal pool complexes are ideal habitat for the species due to their temporary nature, allowing western spadefoots refuge from predators that require permanent waterbodies, such as American bullfrogs (*Lithobates catesbeianus*). Other water bodies such as intermittent streams, reservoirs, irrigation ditches, stock ponds, and artificial mitigation ponds also provide potential breeding habitat.

The petition notes that western spadefoot are most often associated with grasslands, though "coastal sage scrub, chaparral, oak woodland, washes, river floodplains, alluvial fans, playas, lowlands, and foothills" can also provide habitat for western spadefoots. In the northern population, areas with 60% or more grassland cover within 2,000 m of ephemeral pools predict western spadefoot occurrence. Additionally, the northern population of western spadefoots seemingly prefer sandy soil and sloping foothills in the

Central Valley out of the ranges of introduced predators (see 3.5.3 below). Habitat-use within the southern population of western spadefoot was positively related to grassland or shrub/scrub cover and sandy soil within 1000 m of vernal pools. Greater depth to bedrock and lower-angled or flat slopes are also important habitat characteristics for western spadefoots. Western spadefoots mainly occur below 365 m (1,000 ft) elevation. However, the maximum recorded elevation of a western spadefoot occurrence was 1,410 m (4,626 ft) in San Diego County.

Burrow depth of the western spadefoot is not well understood. The petition points out that many reports cite a maximum depth of 1 meter from a study conducted in 1969 on what is now classified as the Mexican spadefoot, before it was recognized as distinct from western spadefoot. A more recent, though limited, study on the southern population of western spadefoots found a range of burrow depths from 1 to 18 cm (Baumberger et al. 2019). Juveniles may burrow between 10 and 20 cm deep (Morey and Reznick 2001). Burrow depths, as well as locations, may vary depending on the season.

The petition states that western spadefoot burrow location preferences may be flexible, likely influenced by total annual rainfall. In the southern population of western spadefoot, animals in coastal sites in dry years preferred to burrow in friable, sandy/loam soils, in grasslands rather than shrubs, and were likely to utilize existing small mammal burrows. During wet years, the coastal western spadefoots avoided grasslands and burrowed under trees or shrubs. The southern inland western spadefoots did not display strong habitat preferences but had a slight inclination towards burrowing in bare ground with shrubs and forbs as cover.

Additionally, the petition notes that because connectivity between aquatic breeding habitat and terrestrial burrowing habitat is also crucial to population persistence, western spadefoots are highly sensitive to habitat fragmentation and are at risk of local extinction.

3.4 Abundance and Population Trend

This section summarizes the information in the petition regarding the species' abundance and population trend (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

The petition discusses the abundance and population trends of western spade foot on pages 12 and 19–20. The petition describes the population dynamics of the western spadefoot as unstable, due to yearly variability in breeding and recruitment depending on the ecological conditions. The petition states that patterns of western spadefoot population-wide decline were observed as early as the 1970s and that by the 1990s, populations in the Sacramento Valley were completely extirpated and densities in the

eastern San Joaquin Valley had decreased. However, the Department has information documenting extant populations in the Sacramento Valley (Shedd 2016). The petition argues that widespread habitat loss indicates a range-wide decline in the species.

The petition does not provide historical abundance data but provides information on current abundance estimates. The petition acknowledges that estimates of abundance across the species' range are scarce, citing a 2016 study at the Mather Airport in Sacramento County that estimated the number of breeding adults at a few dozen. Based on this number of adults, the petition suggests that the effective population size at the Mather Airport is likely less than 10. As discussed in the petition on page 6, the fragmented populations in Orange County had very low estimated effective population sizes (1.2 to 12.2) and number of effective breeders (1.4 to 19.8) at breeding ponds (Neal et al. 2020).

3.5 Threats

This section summarizes the information in the petition regarding the factors affecting the ability of the species to survive and reproduce, and the degree and immediacy of threats (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

The petition discusses threats to western spadefoot in the section titled "Factors Affecting the Ability of the Species to Survive" on pages 20–36 and the section titled "Degree and Immediacy of Threat" on page 36.

The petition discusses four (4) main types of threats:

1. Habitat loss, degradation, and fragmentation
2. Disease
3. Invasive species
4. Climate change

3.5.1 Habitat loss, degradation, and fragmentation

The petition states that habitat loss, degradation, and fragmentation are important threats to amphibians worldwide, and habitat loss and fragmentation due to urban and agricultural development are primary threats to western spadefoot. The petition argues that the species commonly occurs in grassland and shrubland habitats that are at elevated risk of development, conversion to agriculture, or loss to altered fire regimes, and therefore is at continued risk of declining habitat quantity and quality. The petition also states that there has been a 90% loss of vernal pools in California historically, and loss of vernal pool habitat continues due to land conversion. The petition lists five sources of habitat loss, degradation, and fragmentation, which include: urban development, roads, agriculture, extractive development, and off-road vehicle use.

Urban development – The petition states that urban development is the primary cause of population decline and of habitat loss for western spadefoot and predicts urban development rates to increase and continue to negatively affect the species. The petition notes that urban development can occur over all habitat types required for the species and that grassland, shrubland, and vernal pool habitat are especially impacted. The petition estimates that urban development is responsible for up to 80% of suitable western spadefoot habitat destruction in southern California and approximately 30% in northern California. The petition argues that urban development results in "edge effects" to the species. It also discusses that urban development leads to fragmented habitats and to loss of connectivity between populations and creates barriers between breeding and non-breeding habitats. The petition provides six examples of approved or proposed development projects which are likely to directly impact populations and their habitats. The petition states that continued urban development may drive the species to extinction.

Roads – The petition discusses that roads have detrimental impacts to many amphibian species and populations, including western spadefoot which has been ranked at high risk from roads (Brehme et al. 2018). The petition states that roads cause habitat fragmentation and introduce barriers to animal movement and create isolated populations. This loss of connectivity may isolate breeding sites, reduce genetic diversity within the species, and lead to an inability to recolonize suitable habitat when extirpated. The petition notes that roads may cause indirect effects to amphibians and their habitats through the introduction of non-native species and pollutants from run-off and road construction. The petition states direct mortality from vehicle strikes and road construction are also a threat for the western spadefoot. The petition cites a publication (USFWS 2005) which states that vehicle strikes are common and widespread for western spadefoot.

Agriculture – The petition states that "agricultural development and practice have been major contributing factors to the decline of western spadefoot" historically and are of concern for the future conservation of the species. The petition discusses that agricultural development and practices may destroy and degrade habitat through the introduction of invasive plant species, pollutants, and pesticides. The petition notes that agricultural practices can change vernal pool hydrology which may degrade breeding habitat. The petition also notes that even when vernal pools are managed, management practices may be insufficient and lead to inadequate frequency, duration, and timing of water availability. Such management may create unsuitable breeding habitat and encourage the presence of non-native predators such as American bullfrog. The petition cites a study (Davidson et al. 2002), which documented that the impacts of agriculture may reach as far as 5 km from the site of agricultural activity, to argue that agricultural practices may negatively impact areas of presumably unimpacted, suitable western spadefoot habitat. The petition also notes that ranching practices may not directly

destroy habitat but may cause direct mortality. Ranching may also cause habitat degradation via trampling and lead to the introduction of non-native plant species. The petition does provide a caveat that sustainable grazing practices may be of benefit to the species and its habitat, but that more research is needed.

Extractive development – The petition states that while the full impacts are unknown, extractive development (mining or drilling for oil and gas) is likely having negative impacts on the species. The petition mentions that extractive development may cause direct mortality, destruction of habitat, and degradation of habitat which may negatively impact the species. Specifically, the petition notes that because western spadefoot are sensitive to stimuli during the dormant periods (Dimmitt and Ruibal 1980), soil disturbance and activities which create vibration and noise may interrupt spadefoot biology and reduce individual fitness and cause mortality (USFWS 2005).

Off-road vehicle use (ORV) – The petition discusses that ORV use can alter and degrade habitat. While not assessed specifically for western spadefoot, other amphibian species have experienced negative impacts of ORV use via direct mortality from vehicle strikes and habitat degradation. The petition states that ORV use can alter hydrology, cause erosion and sedimentation, and introduce pollutants which degrade habitat suitability for amphibians. The petition also states that, like roads, ORV trails decrease connectivity between amphibian populations. The petition highlights that ORV use near breeding habitats (vernal pools) may have strong impacts on the species; because the species' metamorph life stage can persist within dry vernal pools (Alvarez and Kerss 2023), whole generational cohorts may be injured or destroyed by ORVs driving through dry vernal pools.

3.5.2 Disease

The petition states that diseases such as Chytridiomycosis, caused by the fungus *Batrachochytrium dendrobatidis* (*Bd*), have been linked to declines in amphibians globally. *Bd* infections and Chytridiomycosis have been documented in California and are attributed to the decline of several native amphibian species. The petition argues that while there is no known available data regarding *Bd* infection in western spadefoot, there is risk of infection to the species due to overlap in the species' range and areas of moderate and high *Bd* prevalence in other species. Furthermore, the petition states that *Bd* infection in a related spadefoot species (Mexican spadefoot) suggests that western spadefoot may be susceptible to the disease. The petition also suggests that western spadefoot may become at risk of another Chytrid fungus (*B. salamandrivorans*) if it is ever introduced to California.

The petition also discusses that Ranaviruses may pose a risk to western spadefoot. While Ranaviruses have not been well studied in western spadefoot, the petition describes that

they have been detected in other U.S. native amphibian species, including the plains spadefoot, with detrimental effects on individual fitness and survival, with potential population level effects.

The petition also describes that amphibians in general are susceptible to various pollutants and contaminants from anthropogenic sources which can influence population viability. The petition states that western spadefoot may be exposed to various toxins (e.g., pesticides, heavy metals, air pollutants) across its range from a variety of sources such roads, agriculture, and development. The petition notes that the species' sensitivity to such exposures is understudied, but there is potential for these compounds to cause disease, reduce fitness, and mortality.

3.5.3 Invasive species

The petition states that invasive species have negative impacts on various amphibian species populations due to competition, predation, hybridization, and spread of disease. The petition describes three invasive species which may pose particular threats to western spadefoot. First, the petition discusses that non-native mosquito fish (*Gambusia affinis* and *G. holbrooki*) can prey upon western spadefoot tadpoles (USFWS 2005) and may act as disease vectors (Brenes et al. 2014). Next, the petition states that non-native crayfish prey upon amphibian egg masses and larval life stages, and the petition suggests that this predation may inhibit population growth in some spadefoot populations (Jennings and Hayes 1994; USFWS 2005). Finally, the petition states that American bullfrogs are known to consume other amphibians, including other spadefoot species, and may consume western spadefoot tadpole and metamorph life stages. The petition also notes that American bullfrogs are a known reservoir host for *Bd* and ranaviruses. The petition discusses that because American bullfrogs rely on permanent water bodies as habitat, western spadefoot populations occurring in vernal pools are at lower risk than populations occurring in or near perennial waters where the two species may co-occur.

3.5.4 Climate change

According to the petition, climate change is one of the greatest threats to amphibians worldwide. The petition predicts that climate change is expected to lead to increased temperatures, warmer winters and summers, shifts in precipitation regimes, alterations in phenological timing, and higher drought risks. The petition argues that these effects threaten western spadefoot habitat quantity and quality and the ability for individuals to survive. The petition notes that while the species is adapted to occasional drought, prolonged drought may result in local extirpation and decline of the species. The petition has particular concern for the species because breeding may be triggered by precipitation and sufficient periods of inundation are required for early life stages, and

changes in precipitation patterns and inundation timing may reduce breeding or lead to increased predation by promoting conditions that support invasive predators (e.g., American bullfrog). Finally, changes in ecological conditions can create a mismatch in the timing of resource availability and western spadefoot development (phenological mismatch) which may result in stressors that influence population viability. The petition argues that northern subpopulations may be particularly vulnerable to impacts of climate change.

3.5.5 Synergistic effects

The petition argues that the interaction or cumulative impacts of multiple stressors could present heightened challenges to western spadefoot survival and could result in jeopardy to the species' existence. The petition describes examples of how climate change may interact with habitat loss and how diseases may interact with other stressors (e.g., climate change, invasive species, predation) to increase extinction risk for the species.

3.5.6 Degree and Immediacy of Threats

The petition states that urban and agricultural developments are immediate and ongoing threats to the species. The petition outlines that western spadefoot populations in Southern California are at risk from continued and increasing urbanization in the future and that without protection, southern subpopulations may be extirpated. The petition argues that agriculture development and land conversion to urban and industrial land types are threats to populations in Central and Northern California, and that these threats, combined with the many other threats described, may drive these populations to extirpation.

3.6 Existing Management

This section summarizes the information in the petition regarding the impact of existing management efforts on the species (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

The petition discusses the impact of existing management efforts for western spadefoot in the section titled "The Inadequacy of Existing Regulatory Mechanisms and Impact of Existing Management Efforts" on pages 37–50.

The petition describes the current federal regulatory mechanisms that may provide protection for western spadefoot, including protection provided by the National Environmental Policy Act (NEPA); the previous protection of breeding habitat via the Clean Water Act; indirect protection provided when western spadefoot co-occurs in habitat protected for other species that are listed under the Federal ESA, including

designated critical habitat; protection for populations that occur on seven National Wildlife Refuges via the National Wildlife Refuge System Improvement Act of 1997; resource management on military lands implemented by Integrated Natural Resource Management Plans (INRMP) under the Sikes Act; habitat management on public lands administered by BLM through the Federal Land Policy and Management Act, and natural resource management policy for populations which occur on National Monument lands and on lands conserved under agricultural and conservation easements.

The petition also describes the current state regulatory mechanisms that may provide protection for western spadefoot. These include designation as a Species of Special Concern in California; protections provided by the California Environmental Quality Act; the protection of habitat and populations that occur on 22 state Ecological Reserves, six state Wildlife Areas, one state marine conservation area, and on lands conserved under agricultural and conservation easements; vernal pool and other temporary wetland habitat protection under the Porter-Cologne Water Quality Control Act; and regulation of coastal wetland habitats under the California Coastal Act.

Finally, the petition describes local and regional regulatory mechanisms which may benefit western spadefoot. These include benefits to the species through being protected under 15 conservation plans (Habitat Conservation Plans [HCPs], Natural Community Conservation Plans [NCCPs], joint HCP/NCCPs, and Multiple Species HCPs), either directly by managing for the species or indirectly through the management of vernal pool habitat. The petition also mentions species and habitat management through the implementation of four Regional Conservation Investment Strategies (RCIS) that identify western spadefoot as a focal species and two RCISs which include western spadefoot as a non-focal species. The petition notes that three additional RCISs overlap with western spadefoot range but exclude the species from their strategies.

The petition states that the existing regulatory mechanisms and management efforts are not sufficient to prevent further species decline. The petition states that this insufficiency is due in part to the recent repeal of regulations for implementation of NEPA, insufficient mitigation under the Clean Water Act for projects that impact wetlands, a recent U.S. Supreme Court decision that limits the wetlands that are protected by the Clean Water Act, lack of protection under the federal ESA and proposed changes to the definition of "harm" under the ESA, and because only a small portion of the western spadefoot population occurs on protected lands.

3.7 Future Management

This section summarizes the information in the petition regarding suggestions for future management (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

On pages 51–52, the petition provides the following recommendations for future management of western spadefoot:

- List the northern and southern populations of western spadefoot as threatened and endangered, respectively, under CESA.
- Conduct systematic surveys of historical localities that have not been assessed in the past 20 years, particularly in the Central Valley.
- Permanently protect currently occupied aquatic breeding and upland habitat.
- Protect habitat that connects upland over-summering habitat with aquatic breeding habitat to maintain connectivity and dispersal ability.
- Establish buffer zones around protected habitat to minimize edge effects from human disturbance and shifts in ranges due to climate change.
- Avoid or minimize new road construction in western spadefoot habitat and improve connectivity at existing barriers.
- Restore breeding and upland habitat, including creating artificial ponds and reestablishing native grasslands.
- Fund further monitoring and research of western spadefoot life history, genetics, distribution, disease threats, and potential strategies for adaptive management.
- Investigate translocation and re-introduction in previously occupied areas with suitable habitat.
- Encourage sustainable grazing practices in highly altered rangeland and discourage conversion to row crops or irrigated crops.

3.8 Availability and Sources of Information

This section summarizes the information in the petition regarding availability and sources of information (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

The petition cites an extensive list of sources on pages 57–70. The Department referenced additional literature when developing this petition evaluation (see Literature Cited section).

4 OTHER RELEVANT INFORMATION AVAILABLE TO THE DEPARTMENT

Pursuant to Fish and Game Code section 2073.5, the Department also evaluates petitions in relation to other relevant information the Department possesses or receives.

The Department possesses considerable other relevant information related to western spadefoot. Time constraints do not allow for a comprehensive review of all this other relevant information available at the petition evaluation stage of the CESA process;

however, the Department evaluated a subset of readily available information and expertise relating to the species' distribution and existing management protections.

The Department possesses additional information related to the current distribution of the species in the Sacramento Valley (see Section 3.2 and 3.4 above; Shedd 2016), current distribution in the San Joaquin Valley and Central Coast, and information related to the species' biology and movement patterns in Southern California. This information is included in various survey reports for state owned and managed lands, Scientific Collecting Permit reports, scientific data and reports shared by collaborators, unprocessed CNDDB data sources, GIS spatial data, lists of conservation plans for the species (CDFW 2023), and incidental observations.

To the extent the Department was able to review other relevant information in its possession as it relates to the petition, the Department concluded that none of the additional information constitutes countervailing information that wholly undercuts the conclusions in the petition at this juncture in the listing process. If the Commission accepts the petition for consideration, all reasonable attempts will be made by the Department to notify affected and interested parties and to solicit data and comments on the petitioned action (Fish & G. Code, § 2074.4). At that time, the Department will commence a review of the status of the species and produce a written peer-reviewed report, based upon the best scientific information available to the Department, which indicates whether the petitioned action is warranted (Fish & G. Code, § 2074.6).

5 SUFFICIENCY OF SCIENTIFIC INFORMATION AND RECOMMENDATION TO THE COMMISSION

The Department evaluated the petition components set forth in Fish and Game Code section 2072.3 and California Code of Regulations, title 14, section 670.1, subdivision (d)(1) for sufficiency of information pursuant to Fish and Game Code section 2073.5. Based upon the information contained in the petition and other relevant information, the Department determined there is sufficient information to indicate that the petitioned action may be warranted (Fish & G. Code § 2073.5). Therefore, the Department recommends the Commission accept the petition for further consideration under CESA. If the Commission accepts the petition for further consideration, the Department will commence a review of the status of the species at that time pursuant to Fish and Game Code section 2074.6 and California Code of Regulations, title 14, section 670.1, subdivision (f).

ACKNOWLEDGEMENTS

This petition evaluation was prepared by Austin Roy and Katherine Russell in the Department's Wildlife Branch, CESA Unit and Scientific Collecting Permit Unit.

LITERATURE CITED

Alvarez, J. A., and T. S. Kerss. 2023. Microhabitat use by post-metamorphic western spadefoot (*Spea hammondii*) in Central California. Sonoran Herpetologist 36:13-14.

Baumberger, K. L., M. V. Eitzel, M. E. Kirby, and M. H. Horn. 2019. Movement and habitat selection of the western spadefoot (*Spea hammondii*) in southern California. PLOS ONE 14:1-16.

Brehme, C. S., S. A. Hathaway, and R. N. Fisher. 2018. An objective road risk assessment method for multiple species: Ranking 166 reptiles and amphibians in California. Landscape Ecology 33:911-935.

Brenes, R., M. J. Gray, T. B. Waltzek, R. P. Wilkes, and D. L. Miller. 2014. Transmission of Ranavirus between Ectothermic Vertebrate Hosts. PLOS ONE 9:e92476. 10.1371/journal.pone.0092476: 10.1371/journal.pone.0092476

Brown, H. A. 1976. The status of California and Arizona populations of the western spadefoot toads (genus *Scaphiopus*) Los Angeles County Museum of Natural History Contributions in Science 286:1-15.

California Department of Fish and Wildlife (CDFW). 2023. List of Conservation Plans by Species.

California Natural Diversity Database (CNDDB). 2025. Special Animals List. Sacramento, CA.

Clarke, S. H., E. R. Lawrence, J. Matte., B. K. Gallagher, S. J. Salisbury, S. N. Michaelides, R. Koumrouyan, D. E. Ruzzante, J. W. A. Grant, and D. J. Fraser. 2024. Global assessment of effective population sizes: Consistent taxonomic differences in meeting the 50/500 rule. Molecular Ecology 33:e17353.

Davidson, C., H. B. Shaffer, and M. R. Jennings. 2002. Spatial Tests of the Pesticide Drift, Habitat Destruction, UV-B, and Climate-Change Hypotheses for California Amphibian Declines. Conservation Biology 16:1588-1601. 10.1046/j.1523-1739.2002.01030.x: 10.1046/j.1523-1739.2002.01030.x

Dimmitt, M. A., and R. Ruibal. 1980. Environmental Correlates of Emergence in Spadefoot Toads (*Scaphiopus*). Journal of Herpetology 14:21-29. 10.2307/1563871: 10.2307/1563871

Frankham, R. R., C. J. A. Bradshaw, and B. W. Brook. 2014. Genetics in conservation management: Revised recommendations for the 50/500 rules, Red List criteria and population viability analyses. Biological Conservation 170:56-63.

García-París, M., D. R. Buchholz, and G. Parra-Olea. 2003. Phylogenetic relationships of Pelobatoidea re-examined using mtDNA. Molecular Phylogenetics and Evolution 28:12-23.

Gherghel, I., and R. A. Martin. 2020. Postglacial recolonization of North America by spadefoot toads: Integrating niche and corridor modeling to study species' range dynamics over geologic time. Ecography 43:1499-1509.

Halstead, B. J., K. L. Baumberger, A. R. Backlin, P. M. Kleeman, M. N. Wong, E. A. Gallegos, J. P. Rose, and R. N. Fisher. 2021. Conservation implications of spatiotemporal variation in the terrestrial ecology of western spadefoots. Journal of Wildlife Management 85:1377-1393.

International Union for Conservation of Nature (IUCN). 2022. *Spea hammondii*. in The IUCN Red List of Threatened Species 2022: e.T59045A53972800.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. Pages 260 in California Department of Fish and Game, Rancho Cordova, CA.

Morey, S. R., and D. Reznick. 2001. Effects of larval density on postmetamorphic spadefoot toads (*Spea Hammondii*). Ecology 82:510-522.

NatureServe. 2025. *Spea hammondii*. Available from: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.100387/Spea_hammondii (Accessed: 23 October 2025)

Neal, K. M., R. N. Fisher, M. J. Mitrovich, and H. B. Shaffer. 2020. Conservation Genomics of the Threatened Western Spadefoot, *Spea hammondii*, in Urbanized Southern California. Journal of Heredity 111:613-627.

Neal, K. M., B. B. Johnson, and H. B. Shaffer. 2018. Genetic structure and environmental niche modeling confirm two evolutionary and conservation units within the western spadefoot (*Spea hammondii*). Conservation Genetics 19:937-946.

Pfennig, D. 1990. The adaptive significance of an environmentally-cued developmental switch in an anuran tadpole. Oecologia 85:101-107.

Shedd, J. D. 2016. Distribution of the western spadefoot (*Spea hammondii*) in the Northern Sacramento Valley of California, with comments on status and survey methodology. Pages 19-29 in R. A. Schlising, E. E. Gottschalk Fisher, and C. M. Guilliams, editors. Vernal Pools in Changing Landscapes. California State University, Chico, CA.

Stebbins, R. C. 2003. Western Reptiles and Amphibians. 3rd edition. Houghton Mifflin Company.

U.S. Fish and Wildlife Service (USFWS). 2005. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon. Portland, OR.

U.S. Fish and Wildlife Service (USFWS). 2015. Endangered and Threatened Wildlife and Plants; 90-Day Findings from 31 Petitions. Federal Register 80:37568-37579.

U.S. Fish and Wildlife Service (USFWS). 2023. Endangered and Threatened Wildlife and Plants: Threatened Status with Section 4(d) Rule for the Northern and Southern Distinct Population Segments of the Western Spadefoot. Federal Register 88:84252-84278.