CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

California Endangered Species Act

Petition Evaluation for Quino Checkerspot Butterfly (*Euphydryas editha quino*)

Report to the Fish and Game Commission
FEBRUARY 2025

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LIST OF ABBREVIATIONS, ACRONYMS, AND TERMS

CESA – California Endangered Species Act

CNDDB – California Natural Diversity Database

Commission – California Fish and Game Commission

Department – California Department of Fish and Wildlife

ESA – Federal Endangered Species Act

HCP – Habitat Conservation Plan

MSHCP – Multiple Species Habitat Conservation Plan

NCCP – Natural Community Conservation Plan

ORV – off-road vehicle

Petitioners – Center for Biological Diversity and Endangered Habitats League

USFWS – United States Fish and Wildlife Service

EXECUTIVE SUMMARY

This petition evaluation for the Quino checkerspot butterfly (*Euphydryas editha quino*) (petition evaluation) has been prepared by the California Department of Fish and Wildlife (Department) in response to the petition to list the Quino checkerspot butterfly as endangered under the California Endangered Species Act (CESA) (petition). The purpose of this petition evaluation is to provide a recommendation to the California Fish and Game Commission (Commission) on whether the petition provides sufficient information to indicate the petitioned action may be warranted.

The Quino checkerspot butterfly is a medium-sized butterfly in the brush-footed butterfly family (Nymphalidae) that lives in topographically diverse native grasslands or open-canopy woody plant communities such as coastal sage scrub, open chaparral, or open juniper woodland up to 5,000 feet in San Diego and Riverside counties and in northern Baja California, Mexico. The species has historically experienced large fluctuations in population size at the local level. Persistence on the landscape requires connected habitat patches that support butterfly metapopulations—connectivity between patches allows reestablishment when local subpopulations disappear.

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 information the Department possesses. The Department has determined that there is sufficient scientific information to indicate that the petitioned action to list Quino checkerspot butterfly as endangered 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 Quino checkerspot butterfly (*Euphydryas editha quino*) as endangered 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 possessed or received 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 prepares a petition evaluation that evaluates 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) through (b)). The petition evaluation is placed on the agenda for receipt at the next available meeting of the Commission after delivery. 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, written comments received, and oral testimony to make a finding 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, it accepts the petition, and the species becomes a candidate for CESA listing and proceeds to the status review stage of the CESA 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 June 29, 2020, the Center for Biological Diversity and Endangered Habitats League (Petitioners) submitted a petition to the Commission to list the Quino checkerspot butterfly as endangered under CESA (Cal. Reg. Notice Register 2020, No. 30-Z, p. 1073).

On March 17, 2021, the Petitioners withdrew the petition.

On December 18, 2024, the Petitioners submitted a new petition to the Commission to list the Quino checkerspot butterfly as endangered under CESA (Cal. Reg. Notice Register 2025, No. 4-Z, p. 128). On December 30, 2024, the Commission referred the petition to the Department for evaluation. At its meeting on February 12–13, 2025, the Commission officially acknowledged receipt of the petition.

1.3 Federal Status

The Quino checkerspot butterfly was listed as endangered under the federal Endangered Species Act (ESA) on January 16, 1997 (USFWS 1997). A total of approximately 171,605 acres (69,440 hectares) in Riverside and San Diego counties, California were designated as critical habitat on April 15, 2002 (USFWS 2002); this was reduced to 62,125 acres (25,141 hectares) in the same counties on June 17, 2009 (USFWS 2009a). The U.S. Fish and Wildlife Service (USFWS) published a recovery plan for the species in 2003 (USFWS 2003), which was amended in 2020 (USFWS 2020b).

1.4 Additional Species Status Designations

The Quino checkerspot butterfly is ranked as T1 and S1 by NatureServe, a network of over 60 government and non-government organizations that uses a standardized approach to assess the conservation status of species. This means it is a critically imperiled subspecies at both the global and state levels. The Department has included the subspecies on its California Terrestrial and Vernal Pool Invertebrates of Conservation Priority list, and it is a Species of Greatest Conservation Need under the California State Wildlife Action Plan. The subspecies' conservation status has not been evaluated by the International Union for the Conservation of Nature.

2 SPECIES DESCRIPTION AND TAXONOMY

The Commission has the authority to list certain species or subspecies as endangered or threatened 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 defines the "species" eligible for listing to include "species or subspecies" (Fish & G. Code, §§ 2062, 2067, 2068).

2.1 Species Description

The petition describes the Quino checkerspot butterfly as having "a 1.5 inch (4 cm) wingspan and checkered wings alternating in red, black, and cream colors on top and red and cream on the underside, the adult butterfly's abdomen has a dorsal red strip (USFWS 2003 p. 6)… Larvae of the Quino checkerspot hatch with a yellow coloration but after the first molt are gray with black markings, and after the second molt take on a characteristic dark-black coloration with eight to nine orange tubercles…; pupae are mottled black on a gray background (USFWS 2003 p. 6)."

2.2 Species Taxonomy

The petition describes the taxonomy of the Quino checkerspot butterfly as belonging to the family Nymphalidae (brush-footed butterflies), subfamily Nymphalinae, tribe Melitaeniae, genus *Euphydryas*, species *editha*, and subspecies *quino*, and notes that the subspecies is recognized as valid by the Integrated Taxonomic Information System.

2.3 Population Structure and Genetics

The petition mentioned that genetic diversity of current wild populations is likely to be lower than historical levels, due to "extreme reduction in population abundances and connectivity". The petition also referred to a genetic study completed to inform Quino checkerspot butterfly recovery efforts. The study found that the Quino checkerspot butterfly is a genetically distinct entity within the species and there is a strong isolation by distance genetic relationship among populations (USFWS 2009b).

2.4 Similar Taxa

The petition describes distinguishing characteristics of two similar taxa: "Adult Quino checkerspot butterflies are larger than the parapatric subspecies *E. editha agustina*. Compared to the nominotypical *E. editha*, Quino has increased orange/red scaling and larger cream-colored spots."

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
- Availability and sources of information

The Commission 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. In some instances, 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 Quino checkerspot butterfly on pages 8 through 11, providing information on the life cycle and behavior, including details on larval diapause and adult dispersal that are important for the metapopulation dynamics characteristic of the species. The following is a summary of the information presented.

The petition states that Quino checkerspot butterfly lives through four life stages: egg, larva, pupa and adult, with one generation of adults per year being typical. Adults live for approximately two weeks, but pupal emergence is staggered, so the flight period for the species lasts four to six weeks from late February to May. Females lay 400 to 800 eggs over their lifetime, depending on availability of nectar resources. Eggs are laid on host plants, most commonly one of two annual species of plantain (*Plantago*) native to California; see Section 3.3. The larvae feed on host plants and enter an extended period of obligate diapause in their third or fourth instar (larval molt), when host plants are senescing. They emerge in response to winter rains when host plants are germinating.

Post-diapause larvae continue feeding on germinated host plants and can molt through up to seven total instars, then pupate for approximately ten days before eclosing as adults. Quino checkerspot butterflies spend the majority of their lifespan as a caterpillar, and only approximately 5% of their lives as adults, 5% as a pupa, and 5% in the egg stage.

The petition states that obligate larval diapause is likely an evolutionary adaptation to survive the hot, dry summers of southern California's Mediterranean climate. Larvae can remain in, or leave and re-enter, this state for multiple years if adverse environmental conditions reduce the availability of host food plants. This allows Quino checkerspot butterflies to "hedge their bets" and take advantage of ideal environmental conditions; it also means the species may be present but undetected using typical survey protocols that focus on detection of adults. Pre-diapause larvae are the most vulnerable life stage, as they depend on host plant species that are maturing and may quickly dry up before winter rains. Low host plant density can affect butterfly population dynamics by reducing larval survival through diapause or size at pupation, which in turn reduces female size and fecundity.

According to the petition, adult butterflies are highly active and their dispersal varies from short to long distance depending on host and nectar plant availability and on population size. Warm, dry years may stimulate longer distance dispersal in response to host plants senescing earlier and becoming unsuitable for oviposition. Alternatively, long distance dispersal can occur during wet years when adult abundance is high and competition for oviposition sites and host plants increases. Gravid females have been found as far as several kilometers away from population centers in unsuitable habitat. Within a habitat patch, adults have been found to move up to 656 feet, and they generally avoid flying over objects taller than seven or eight feet tall.

The petition states that mating behavior also varies with population size and resource availability. When populations are dense, males actively fly in search of females, who rest on the ground or on low plants near where they pupated. In areas with topographic relief and sparse nectar and host plants, the butterflies may exhibit hill-topping behavior, where both sexes fly to a local high point where males defend perches and patrol a territory while awaiting females.

According to the petition, Quino checkerspot butterfly populations occur in a network of isolated patches of suitable habitat, and they are maintained through metapopulation dynamics of colonization and extirpation between habitat patches. Metapopulations vary in size and growth rate depending on habitat quality and patch size. Population survival within a given patch depends on both local habitat resources and movement of individuals between patches. Populations within larger "core" patches will survive years with low rainfall and host plant availability, providing individuals to recolonize patches

that were extirpated in these sub-optimal conditions and allowing the species to persist regionally. The petition states that persistence of the species thus depends on both within-patch habitat quality and maintenance of landscape connectivity between patches. Core patch populations are defined by USFWS as those having positive growth rates and serving as sources of individuals to repopulate other (satellite) patches; according to the petition, the presence of core patches is critical for regional persistence.

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 in several sections in the context of illustrating the general trend of range contraction over time. On page 4 the petition states that the Quino checkerspot butterfly was once widespread from coastal Los Angeles and Orange counties east to Riverside and southwestern San Bernardino counties and south to San Diego County. On page 13, the petition specifies that the butterfly was present in those five counties as well as in northern Baja California, Mexico, prior to 1990. According to the petition, the locations where butterfly specimens were collected, along with maps of historical vegetation types, suggest the subspecies may have historically been continuously distributed from Point Dume in Los Angeles County to Ensenada, Mexico, and inland up to 60 miles.

The petition provides a detailed distribution map of Quino checkerspot observations from 1890 to 2020, using data from the California Natural Diversity Data Base (CNDDB) and the USFWS GIS species occurrence database (Figure 1). The observation data show the extirpation of the subspecies from Los Angeles, Orange, and San Bernardino counties over time. The current distribution has contracted southward and eastward and is limited to several disjunct areas in southwestern Riverside County and southern San Diego County. The Department created a map using the same data sources, but with updated data through 2024 (USFWS 2024; CDFW 2025; Figure 2).

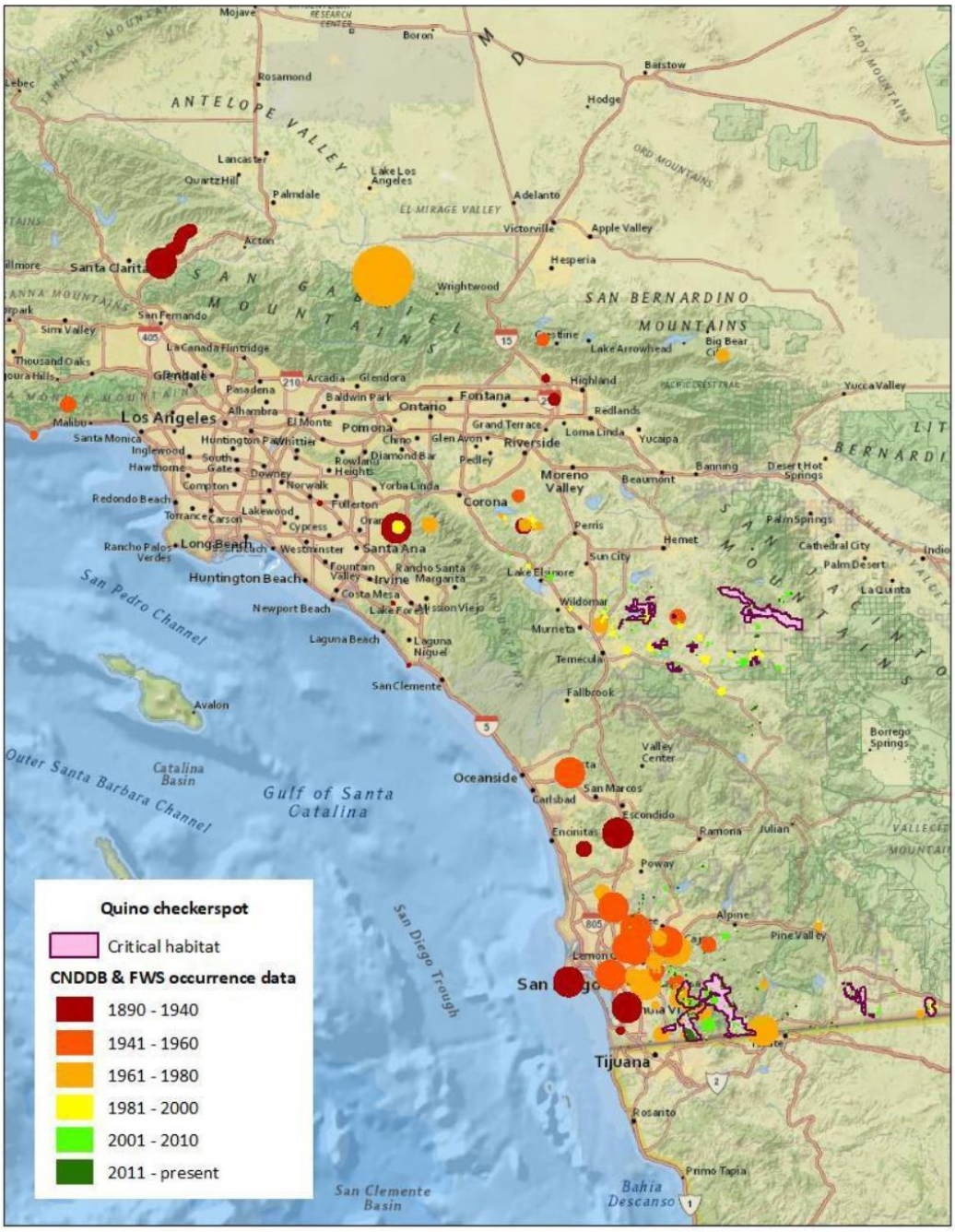

Figure 1. Distribution map showing occurrences of the Quino checkerspot butterfly from 1890 to 2020, with current USFWS critical habitat. Data are from USFWS and CNDDB. This map was included in the petition as Figure 3. Note larger circular polygons indicate higher uncertainty in the accuracy of the location, rather than larger population size.

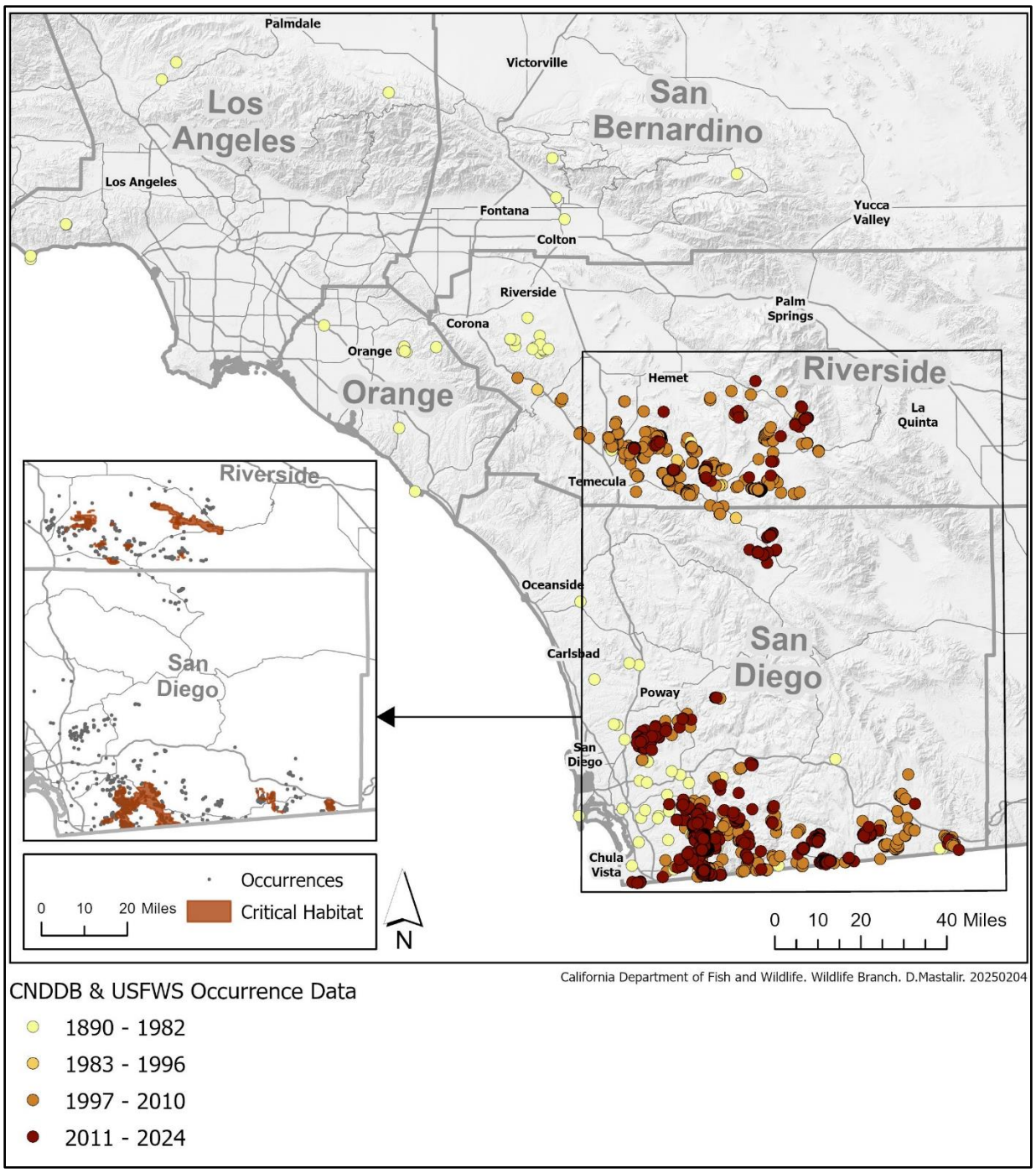

Figure 2. Distribution map showing occurrences of the Quino checkerspot butterfly from 1890 to 2024, with current USFWS critical habitat. Data are from USFWS and CNDDB.

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 discusses the habitat of the Quino checkerspot butterfly in the "Habitat and Host Plants" section on pages 6–8. In general, the Quino checkerspot butterfly is found in "grasslands, open chaparral, and coastal shrublands with sparse vegetation surrounded by bare patches up to 5,000 feet in elevation." Periodic disturbance, including wildfire, is important for maintaining the open-canopy woody plant communities where Quino checkerspot is found. Key features include larval host plants, nectar resources for adults, topographic variation for hill-topping behavior, cryptobiotic crusts which influence the thermal micro-environment of larvae and adults, a mixture of open and shaded areas so larvae can optimize microclimate for diapause and pupation, and dispersal habitat free of barriers for adults to fly between patches.

The petition states that primary host plants include the annual native forbs dwarf plantain (*Plantago erecta*) and woolly plantain (*P. patagonica*), as well as Coulter's snapdragon (*Antirrhinum coulterianum*), and possibly Nuttall's snapdragon (*A. nuttallianum*). Larvae have also been observed feeding on Chinese houses (*Collinsia concolor*) and may use owl's clover (*Castilleja exserta*) and stiff branch bird's beak (*Cordylanthus rigidus*) as secondary host plants if primary species are not available or senesce early.

According to the petition, adults prefer to forage for nectar on small flowers with landing platforms. They have been documented visiting flowers in the following genera: *Cryptantha, Eriodictyon, Gilia, Lasthenia, Lomatium, Muilla,* and *Plagiobothrys*. Prominent topographic features such as hills or ridges, with open woody or herbaceous vegetation at the top, are important for supporting the hill-topping mating behavior.

The petition states that both the butterfly and its host plants are associated with cryptobiotic crusts. These crusts are formed by blue-green algae, lichens, mosses, fungi, and bacteria. They hold in moisture and are known to improve the availability of minerals to plants, limit invasive plants, and reduce soil erosion in arid environments. The petition suggests cryptobiotic crusts may play a role in thermoregulation for both larvae and adults as they are relatively dark and thus warmer than surrounding soils.

The petition states that larvae have been documented in diapause in or near the base of native shrubs, under logs or rocks, under bark, in leaf litter and in cracks in the soil. Post-diapause larvae complete development into the pupal stage where their host plant is present and in microclimates with low shade, bare ground, and low grass and shrub cover. Pupation occurs in leaf litter or within native vegetation such as California buckwheat (*Eriogonum fasciculatum*).

The majority of the Quino checkerspot butterfly lifespan is spent as a larva, and the petition states that this stage requires "heterogeneous habitat consisting of sunny southern facing slopes with shaded areas as well as both open areas with food plants and

nearby areas with larger vegetation." These requirements are met in a "dynamic mosaic of fire climax communities in which host plants are initially dominant following a periodic wildfire but over time replaced by perennial shrubs until the next fire." According to the petition, fire plays an important role in determining the spatio-temporal distribution of Quino checkerspot butterfly resources.

In addition to the above characteristics of habitat that support Quino checkerspot butterfly populations, the petition states that undeveloped grasslands and other open areas surrounding habitat patches are important for mating, basking, and dispersal between habitat patches. According to the petition, these areas are critical for maintaining metapopulation dynamics, and it is important that connectivity between habitat patches is not interrupted by barriers to dispersal such as high walls or highways. The petition notes that when designating critical habitat for the species, the USFWS recognized that the Quino checkerspot butterfly requires multiple occupied and unoccupied areas as well as connectivity for conservation and recovery.

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 trend of the Quino checkerspot butterfly on pages 11–23. According to the petition, Quino checkerspot butterfly populations have historically fluctuated dramatically following interannual variation in rainfall patterns and host plant density, with abundance changing as much as an order of magnitude every 5–20 years. As a result, the USFWS monitors population trends by characterizing shifts in the distribution of occupied patches on the landscape, rather than by monitoring population size (i.e., the number of butterflies in the population). For the most part, the petition uses this same approach, characterizing abundance and population trend by describing changes in occupancy of habitat patches on the landscape.

In lieu of conducting focused studies on population size and detailed population distributions, the USFWS tracks population distributions over time using "occurrence complexes." Occurrence complexes are delineated by buffering each confirmed observation or collection of an individual butterfly by a 0.6 mile (1 km) radius, which is the area within which the habitat associated with that butterfly is expected to occur. These occurrence complexes "may be based on the observation of a single individual" (USFWS 2009a). Detections within approximately 1.2 miles (2 km) of each other are considered to be within the same occurrence complex because they are close enough together to have come from the same population. The USFWS expects that true

"population distributions … may include more than one occurrence complex, and metapopulation distributions are likely to be greater than the distribution of most occurrence complexes."

The USFWS defines "core occurrence complexes" as "those that appear to be centers of population density based on geographic size, number of reported individuals, repeated observations, and evidence of reproduction" (USFWS 2009a). Core occurrence complexes are likely to contain "source" subpopulations, which provide emigrants to repopulate unoccupied habitat patches because the emigration rate exceeds the immigration rate. For the purpose of critical habitat delineation, the USFWS defined core occurrence complexes) as areas where at least two of the following criteria apply: "50 or more adults reported in a single survey; presence of immatures; or the geographic area within 1 km (0.6 mi) of butterfly occurrences is greater than 522 hectares (1,290 acres)."(USFWS 2009a)

Although dramatic fluctuations are characteristic of Quino checkerspot butterfly populations, the petition describes a general downward trend in both population size and distribution, with 'boom' years becoming less frequent and of lower magnitude, and with the species extirpated from much of its range. Accounts from the 1950s describe the ubiquitous presence of the butterfly in San Diego County and coastal northern Baja California. According to the petition, hundreds to thousands of adults were observed in 1977 at several locations in southern San Diego County, and the species was widely distributed across southern California from Point Dume to Ensenada, Mexico. The petition describes the Quino checkerspot butterfly as still being widespread in Los Angeles, San Bernardino, Riverside, Orange, and San Diego counties in 1990. However, the petition states that by the time the species was federally listed in 1997, it had been extirpated from Los Angeles, Orange, and San Bernardino counties, and since then has been observed only in Riverside and San Diego counties. The 2003 USFWS Recovery Plan reported that more than 75% of the Quino checkerspot butterfly's historical range had been lost, including more than 90% of its coastal mesa and bluff distribution (USFWS 2003)

The petition describes further declines in the last 20 years, as well as the current status of populations in recovery units designated by the USFWS. By 2012, the distribution had contracted to the foothills of southwestern Riverside County and southern San Diego County. Of four USFWS recovery units in Riverside County, the species has now been extirpated from one (Northwest Riverside Recovery Unit), and all but one occurrence complex has been extirpated in another (Southwest Riverside Recovery Unit). Several occurrence complexes in the other two recovery units have not been occupied in recent years or have experienced declines in number of adults. In San Diego County, only four of nine core occurrence complexes have been occupied in the last nine years. According to the petition, loss of core occurrence complexes has a proportionally

larger effect on regional persistence than loss of satellite occurrences, and the USFWS suggests that loss of core occurrence complexes resulted in loss of the entire Northwest Riverside Recovery Unit. The petition notes that the most recent USFWS five-year review documents losses, expansions, merging, and appearance of new occurrence complexes, but suggests that extirpations are likely permanent, and the historical range has contracted significantly eastward.

The petition refers to surveys conducted by USFWS and the Biological Monitoring Program of the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP) for counts of adult butterflies at several locations. During the most recent five years (2018–2022) of annual MSHCP surveys at six core complexes and 2–3 satellite occurrences in Riverside County, the total count across all sites has averaged 182 adult individuals (range 77–441). The petition states that there are few remaining large, stable populations that can act as sources to surrounding areas.

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 the Quino checkerspot butterfly in the section titled "Factors Affecting the Ability of the Species to Survive and Reproduce," on pages 23–42 and under "Degree and Immediacy of Threats," on page 53.

The petition discusses three main types of threats:

1. The present or threatened destruction, modification, or curtailment of habitat due to:
    a. Development
    b. Habitat fragmentation and barriers to dispersal (including the U.S. border wall and loss of genetic diversity)
    c. Invasive species
    d. Nitrogen deposition
    e. Cannabis cultivation
    f. Livestock grazing
    g. Recreation
2. Overutilization for commercial, recreational, scientific or educational purposes
3. Climate change, including increased drought, fire frequency, and phenological mismatch

The petition cites the USFWS listing rule and Recovery Plan (USFWS 1997,2003) suggesting habitat loss due to development is a primary threat to the Quino checkerspot

butterfly. The petition notes that a recent analysis of extinction drivers for the species (Preston et al. 2012) found that human population growth and increased development in the butterfly's habitat has been a major contributor to extirpation and extinction risk since 1998, and specifically, significant development within a 1 km radius of a population was a strong predictor of extirpation. According to the petition, the extirpation of the Quino checkerspot butterfly from Los Angeles, Orange, and western Riverside counties followed the spread of urbanization. The petition states that development is a "current, ongoing and imminent threat" to the species given the rapid growth rates and increased housing pressure in Riverside and San Diego counties. The petition provides details of seven development projects (one in Riverside County and six in San Diego County) proposed over the next few years with anticipated impacts to three core populations, over 600 acres of federally designated critical habitat, 105 acres of occupied habitat, and about 580 acres in an area that the USFWS and CDFW deemed "the only suitable location in the coastal metapopulation's distribution available and expected to support the species." Given the importance of core populations and connectivity between sites for metapopulation dynamics, the petition suggests that impacts of just these seven development projects puts the butterfly at risk of extinction.

The petition suggests that habitat fragmentation and barriers to dispersal may be as important a stressor as habitat loss. Persistence of metapopulations on the landscape depends on connectivity between occupied patches, so that when local patches die out during poor years, they can be repopulated by emigrants from core populations. The Preston et al. (2012) analysis of extinction drivers found that isolation of Quino checkerspot butterfly populations is historically associated with population extirpation. Lack of connectivity between populations reduces gene flow, which can lower genetic diversity. This in turn can lower the capacity for adaptation to changing environments, or lower fitness through inbreeding depression when mating between relatives increases the frequency of deleterious genes.

The petition states that, in addition to impacts on metapopulation dynamics from barriers between habitat patches, discontinuous habitat resulting from fragmentation can influence population success. For example, habitat discontinuities could separate larval host plants from nectar sources, meaning female adults would need to fly further to forage between bouts of egg-laying, which could lower reproductive output. According to the petition, walls higher than seven to eight feet, extensive patches of housing and development, and large highways are barriers to dispersing Quino checkerspot butterfly adults. The petition details the previous and potential future impacts of the existing border wall and proposed construction of a secondary wall on the Quino checkerspot butterfly. According to the petition, wall prototypes have been previously built within the butterfly's critical habitat, and a double-layer border wall is currently under construction which will result in cleared land and disturbance to critical habitat. The proposed 30-foot tall secondary wall is likely to interfere with Quino

checkerspot flight patterns because the butterflies generally avoid flying over objects taller than seven or eight feet.

According to the petition, several other factors can cause habitat loss or degradation. Invasive plants threaten Quino checkerspot habitat by outcompeting and replacing host plants, which have been severely reduced in abundance and extent by the proliferation of non-native Mediterranean grasses and forbs. Nitrogen pollution from urban traffic exacerbates this by stimulating growth and dominance of invasive grasses that are otherwise nutrient-limited in many California landscapes. Cultivation of cannabis may be an increasing threat through direct habitat destruction, introduction of pesticides and chemical fertilizers, and water extraction that exacerbates drought. While light grazing may promote Quino's preferred early successional habitat, heavy grazing promotes invasive species, which can reduce abundance and diversity of host and nectar plants. Grazing can directly trample and kill diapausing larvae and pupae, impact the diapause phase by compacting soils and decreasing soil surface stability, and disturb or eliminate the cryptogamic crusts. Increased recreational activities, such as off-road vehicle (ORV) use, can increase erosion, fire frequency, and invasion of non-native plants and can damage cryptogamic crusts. ORV trails can become ecological traps because females prefer to lay eggs on host plants bordering the trails in full sun, where eggs, larvae and adults can be crushed by ORVs; this phenomenon is thought to have contributed to the extirpation of the butterfly at least two sites.

Overcollection was considered a potential threat at the time of federal listing because of potential value to collectors, and this may still be true, although the petition noted there are no studies documenting impacts of collection to Quino checkerspot butterfly populations.

According to the petition, climate change is expected to produce more extreme precipitation patterns of heavy rainfall and drought, increased annual temperatures, and warmer nights in the Quino checkerspot butterfly range in southern California. The petition notes that population extinction has historically been associated with increased frequency of extreme rainfall events on the 10–20 year time scale (Preston et al. 2012). At the same time, extended drought may have contributed to declines in abundance. According to the petition, Quino populations have been found at higher elevation and outside delineated critical habitat since 2010, suggesting a distribution shift. Habitat suitability models under future climate scenarios predict the future climatic range would be approximately 400 km north of current populations, suggesting conservation of the subspecies may require assisted migration northward (Parmesan et al. 2014). Increased fire frequency and phenological mismatch between the butterfly and its host and nectar plants are potential indirect effects of climate change.

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 on the Quino checkerspot butterfly in the section titled "The Inadequacy of Existing Regulatory Mechanisms and Impact of Existing Management Efforts" on pages 42–52.

The petition describes the current regulatory mechanisms that may provide protections for the Quino checkerspot butterfly, including its status as an endangered species under the federal Endangered Species Act, designation of critical habitat, consideration of the effects of Federal agency actions under the National Environmental Policy Act, potential management of U.S. Forest Service lands consistent with the National Forest Management Act (although the Act only addresses management of vertebrate species), potential management of U.S. Bureau of Land Management lands consistent with the Federal Land Policy and Management Act, protection of habitat in a portion of the San Diego National Wildlife Refuge, incorporation of conservation measures into the Naval Base Coronado Integrated Natural Resource Management Plan, protection from trade or sale under the Lacey Act, pesticide regulation by the U.S. Environmental Protection Agency, and mitigation of environmental impacts under the California Environmental Quality Act.

The petition also describes the current management efforts for Quino checkerspot butterflies, including the federal Recovery Plan and Amendment, four approved joint federal Habitat Conservation Plans (HCPs)/state Natural Community Conservation Plans (NCCPs) that include Quino checkerspot butterfly as a covered species, and two HCPs (including a San Diego Butterflies HCP) that are in the planning phase and will include Quino checkerspot butterfly as a covered species. Other management efforts include a captive breeding and reintroduction project to augment the population at the San Diego National Wildlife Refuge.

The petition states that the current regulatory mechanisms and management efforts for the Quino checkerspot butterfly are inadequate for preventing extinction of the species, as evidenced by the continued decline of the species and persistence of the same threats that were impacting the species at the time of listing. The petition states that "despite acknowledged uncertainties and need for widespread habitat conservation, FWS has permitted continued development and habitat destruction/modification even in its few remaining core habitats." The petition notes that the 2009 amendment to the USFWS critical habitat designation reduced the extent of critical habitat by over 100,000 acres (the area of critical habitat was reduced from 171,605 acres to 62,125 acres). The

petitioners state that although the initial critical habitat designation considered core habitat and connectivity requirements for population viability and recovery, the 2009 revision reduced but also fragmented critical habitat. The petition states that the species is still threatened by development in areas formally protected as critical habitat despite some of the areas being included in HCPs. The petition also mentions one approved HCP/NCCP that does not include Quino checkerspot butterfly, despite the existence of a major core occurrence complex in the plan area.

The petition states that recovery efforts have included some habitat protection, population monitoring, completion of a genetic study, and captive breeding and reintroduction to the San Diego National Wildlife Refuge, with limited success. Captive rearing and reintroduction have been shown to be possible, but the impact on Quino checkerspot butterfly populations is not clear. The petition states that USFWS Recovery Plan criteria have not been met, including protection of core complexes, and states that the USFWS permits development projects that remove core populations. The petitioners state that the minimize and mitigate process under an HCP may produce "deficient and non-compensatory mitigation" because project designs cater to what is financially feasible rather than the population needs of the butterfly. The petition states that development projects permitted by HCPs will lead to continued increases in fragmentation of core areas.

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)).

The petition makes suggestions for future management in the section titled "Suggestions for Future Management and Recovery Actions" on pages 53–55.

The petition summarizes seven management and recovery actions recommended for Quino checkerspot butterfly.

1. List the subspecies under CESA and prepare a recovery plan.
2. Acquire and protect areas with suitable habitat that promote connectivity within and between metapopulation complexes.
3. Protect habitat and connectivity at extirpated Quino checkerspot butterfly occurrence complexes for possible reintroduction.
4. Continue currently experimental efforts to restore/enhance degraded habitat, including remediation of artificially elevated soil nitrogen; continue reintroductions.
5. Buffer habitat from nitrogen pollution and enforce ORV rules.
6. Protect habitat with all known and potential host plants, not just *P. erecta*.

7. For climate change adaptation, acquire and protect higher elevation habitats such as near Tule Peak and Bautista Road and their connections to other habitat areas. Prioritize the conservation of known Quino populations near water bodies.

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 56–65. 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 information related to the Quino checkerspot butterfly that was not mentioned or cited in the petition. Time constraints do not allow for a comprehensive review of all information available at the petition evaluation stage of the CESA process; however, the Department evaluated readily available information and expertise. Additional sources in the Department's possession include:

- USFWS range map for Quino checkerspot butterfly (USFWS 2020a).
- USFWS GIS species occurrence data (upated through December, 2024; USFWS 2024). The petition includes these data through 2020.
- USFWS Quino checkerspot butterfly survey area range map (USFWS 2014).
- Draft planning documents related to the San Diego County Butterfly HCP; the conservation strategy for Quino checkerspot butterfly is still in development and not public.
- Documents related to the Sweetwater Authority NCCP/HCP that is in development and includes Quino checkerspot butterfly on the list for proposed covered species; there is not yet any publicly available information about the draft plan.
- Twenty years of Quino checkerspot monitoring data from CDFW Ecological Reserves, Wildlife Areas, and conservation banks in southern California (some of these data are available in the CNDDB and USFWS databases and are likely addressed in the petition).

- More than 500 unprocessed sources submitted to the CNDDB, with observations in the vicinity of observations reported in the petition.
- Four occurrences submitted by the California Academy of Sciences and included in the 2020 petition evaluation. These points are rejected because the location information is too vague.
- 2023 data from the Biological Monitoring Program of the Western Riverside MSHCP (the petition cited reports through survey year 2022), the Chula Vista Multiple Species Conservation Program Subarea Plan, and the San Diego County Water Authority Subregional NCCP/HCP.
- The USFWS 5-year review (USFWS 2009b), which mentions ongoing research showing the Quino checkerspot butterfly subspecies is a distinct genetic entity within the species.

To the extent the Department was able to review additional 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

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