Western Riverside County
Multiple Species Habitat Conservation Plan
Biological Monitoring Program

2024 Quino Checkerspot Butterfly
(Euphydryas editha quino) Survey Report

Quino Checkerspot Butterfly
Photo by Esperanza Sandoval

June 2025

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NOTE TO READER:

This report is an account of survey activities conducted by the Biological Monitoring Program (BMP) for the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). The MSHCP was permitted in June 2004. Reserve assembly is ongoing and is expected to take 20 or more years to complete. The Conservation Area includes lands acquired under the terms of the MSHCP and other lands that have conservation value in the Plan Area (called Public/Quasi-Public lands in the MSHCP) within the boundary of the MSHCP (Plan Area). In this report, the term "Conservation Area" refers to these lands as they were understood by the BMP at the time the surveys were conducted.

The BMP monitors the status and distribution of the 146 species covered by the MSHCP within the Conservation Area to provide information to Permittees, land managers, the public, and the Wildlife Agencies [i.e., the California Department of Fish and Wildlife (CDFW, formerly California Department of Fish and Game) and the U.S. Fish and Wildlife Service]. BMP activities are guided by defined conservation objectives for each Covered Species, other information needs identified in MSHCP Section 5.3 or elsewhere in the document (Dudek & Associates 2003), and the information needs of the Permittees. A list of the lands where data collection activities were conducted in 2024 is included in Section 8.0 of the Western Riverside County Regional Conservation Authority (RCA) Annual Report (https://www.wrc-rca.org/document-library/annual-reports/).

The primary author of this report was the 2024 Quino Checkerspot Butterfly Survey Lead, Esperanza Sandoval. This report should be cited as: Biological Monitoring Program. 2025. Western Riverside County MSHCP Biological Monitoring Program 2024 Quino Checkerspot Butterfly (*Euphydryas editha quino*) Survey Report. Prepared for the Western Riverside County Multiple Species Habitat Conservation Plan. Riverside, CA. Available online: https://www.wrc-rca.org/species-surveys/.

While we have made every effort to accurately represent our data and results, it should be recognized that data management and analysis are ongoing activities. Readers wishing to make further use of the information or data provided in this report should contact the BMP to ensure that they have access to the best available or most current data.

Please contact the BMP Administrator with questions about the information provided in this report. Questions about the MSHCP should be directed to the Executive Director of the RCA. Further information on the MSHCP and the RCA can be found at www.wrc-rca.org.

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INTRODUCTION

The Quino Checkerspot Butterfly (*Euphydryas editha quino*; Quino) is federally listed as endangered (DOI 1997) and sparsely distributed within the south and southeastern section of the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) Area. Quino is a member of the checkerspot *Euphydryas* complex within the Brush-Foot Butterfly (*Nymphalidae*) family. The term "checkerspot" refers to the repeated pattern of black, cream-colored, and orange spots on the wings (Ehrlich and Hanski 2004). A diagnostic characteristic of the adult Quino is the orange stripes (rather than white) across the top of the abdomen and the absence of white spots. Quino larvae can be recognized after their second molt by their black coloration and a row of nine orange tubercles on their back (USFWS 2003).

The Quino life cycle usually includes one generation of adults per year, with a four to six-week flight period (Emmel and Emmel 1973). As larvae, they emerge from diapause (post-diapause larvae) after winter rains, around February. Post-diapausal Quino larvae are solitary, and will feed, bask, and molt into larger instars until they are ready to pupate (Mattoni et al. 1997). Quino larvae feed on six specific plant species, referred to as host plants. The most typical host plant is Dotseed Plantain (*Plantago erecta*). Other host plants include Woolly Plantain (*Plantago patagonica*), Chinese Houses (*Collinsia concolor*), Coulter Snapdragon (*Sairocarpus coulterianus*), Purple Owl's Clover (*Castilleja exserta*), and Stiffbranch Bird's Beak (*Cordylanthus rigidus*; Pratt and Pierce 2010).

Once Quino completes their development as larvae, they search for a secure space low to the ground with vegetation cover and remain in this stage for about 10 days (Mattoni et al. 1997). Males emerge 2-3 days before the females and once females emerge, mating immediately follows. Mating occurs in early to mid-spring, generally in February (low elevation areas) and March (higher elevations) in western Riverside County. As adults, Quino feed by flying to flowering plant species (referred to as nectaring plants), such as Sugar Bush (*Rhus ovata*), Suncups (*Camissoniopsis* spp.), and Goldfields (*Lasthenia* spp.) and sip nectar (Biological Monitoring Program 2021). Females then lay masses of eggs in small clusters at the base of their host plants (Pratt and Emmel 2010). One or two egg clusters per day are produced for most of the butterfly's 10 to 14-day adult life (Labine 1968).

The egg clusters hatch in about two weeks and the newly emerged larvae (pre-diapause larvae) seek shelter on their host plant creating a web-like protective cover around them and begin feeding (Pratt and Emmel 2010). These social pre-diapausal Quino larvae will continue feeding until they molt two to three times (Mattoni et al. 1997). As summer drought commences and their host plants senesce, the pre-diapausal larvae molt into a fourth instar, seek shelter in nearby vegetation, such as California Buckwheat (*Eriogonum fasciculatum*), and enter a summer diapause (Ehrlich and Hanski 2004; Pratt and Emmel 2010). The pre-diapausal larvae that successfully enter diapause will remain in this dormant state for nearly nine months. When host plants germinate next spring in response to late autumn or winter rains, larvae break diapause and, if rains were sufficient, they feed to maturity as solitary individuals (Murphy and White 1984). If

rainfall is meager, it is believed many of the larvae feed for a few days and re-enter diapause (Singer and Parmesan 2010).

The grass- and shrub- lands that support Quino and its larval host plants dry rapidly in late spring, but drying may occur earlier in the absence of sufficient autumn or winter precipitation, which is why the pre-diapause phase is the most vulnerable, and larval mortality commonly exceeds 99% (White 1974). In Riverside County, the largest Quino populations are found in coastal sage scrub habitat and openings in redshank chaparral vegetation communities.

The distribution of Quino once spanned from the Santa Monica Mountains south to the northern parts of Baja California (USFWS 2003). However, nearly all the butterflies' former range in California's native grasslands has been converted into a landscape dominated by human habitation or non-native plant species. Non-native plants, particularly Mediterranean grasses and forbs, provide better forage for livestock and rapidly outcompete and replace most native grassland vegetation (Seabloom et al. 2003). The increased growth of non-native grass in Quino habitat can have a negative impact on Quino, as it may lead to a decrease in basking sites and host plant population size (Osborne and Redak 2000). Thus, this butterfly's native grassland-associated larval host plants have been reduced in population size and are now restricted to a few localized areas. If climate change causes increased drought or increased variability of rainfall patterns, as has been predicted for southern California (Seager et al. 2007; Diffenbaugh et al. 2008), it may lead to an asynchronous relationship between larvae and host plant and contribute to further declines in Quino populations (Weiss et al. 1988).

The primary purpose of our Quino surveys is to monitor the persistence of known populations and to ascertain the distribution of the species within apparently suitable habitat in the MSHCP Conservation Area, with the goal of verifying occupancy at ≥75% of known locations (Dudek & Associates 2003, Table 5-8). Species-specific Conservation Objective 4 states that "within the MSHCP Conservation Area, Reserve Managers will document the distribution of Quino checkerspot butterflies [throughout the Plan Area] on an annual basis" (Dudek & Associates 2003). In 2024, Biological Monitoring Program (BMP) biologists attempted to meet this objective by focusing surveys within six out of the seven Core Areas identified in Conservation Objective 1: Lake Mathews/Estelle Mountain/Harford Springs, Warm Springs Creek, Johnson Ranch/Lake Skinner, Oak Mountain, Wilson Valley, Sage, and Silverado/Tule Peak (Dudek & Associates 2003). Quino historically occupied the Lake Mathews/Estelle Mountain/Harford Springs Core Area, but the species is now considered extirpated at this location (Dudek & Associates 2003). The Harford Springs area was surveyed in 2010-2012 and in 2020 with no Quino detections (Biological Monitoring Program 2021). Conservation Objective 2 states to "include within the MSHCP Conservation Area the 12 known satellite (non-core) occurrence complexes within" six areas where Quino are known to occur currently or historically (Dudek & Associates 2003). BMP biologists surveyed two of the six identified areas: Brown Canyon/Cactus Valley and Aguanga (Figure 1). We did not survey the remaining four areas because their exact location needs to be evaluated. Since there is a possibility that Quino are inhabiting areas at higher elevations, surveys were conducted in an additional location, the San Bernardino National Forest (SBNF).

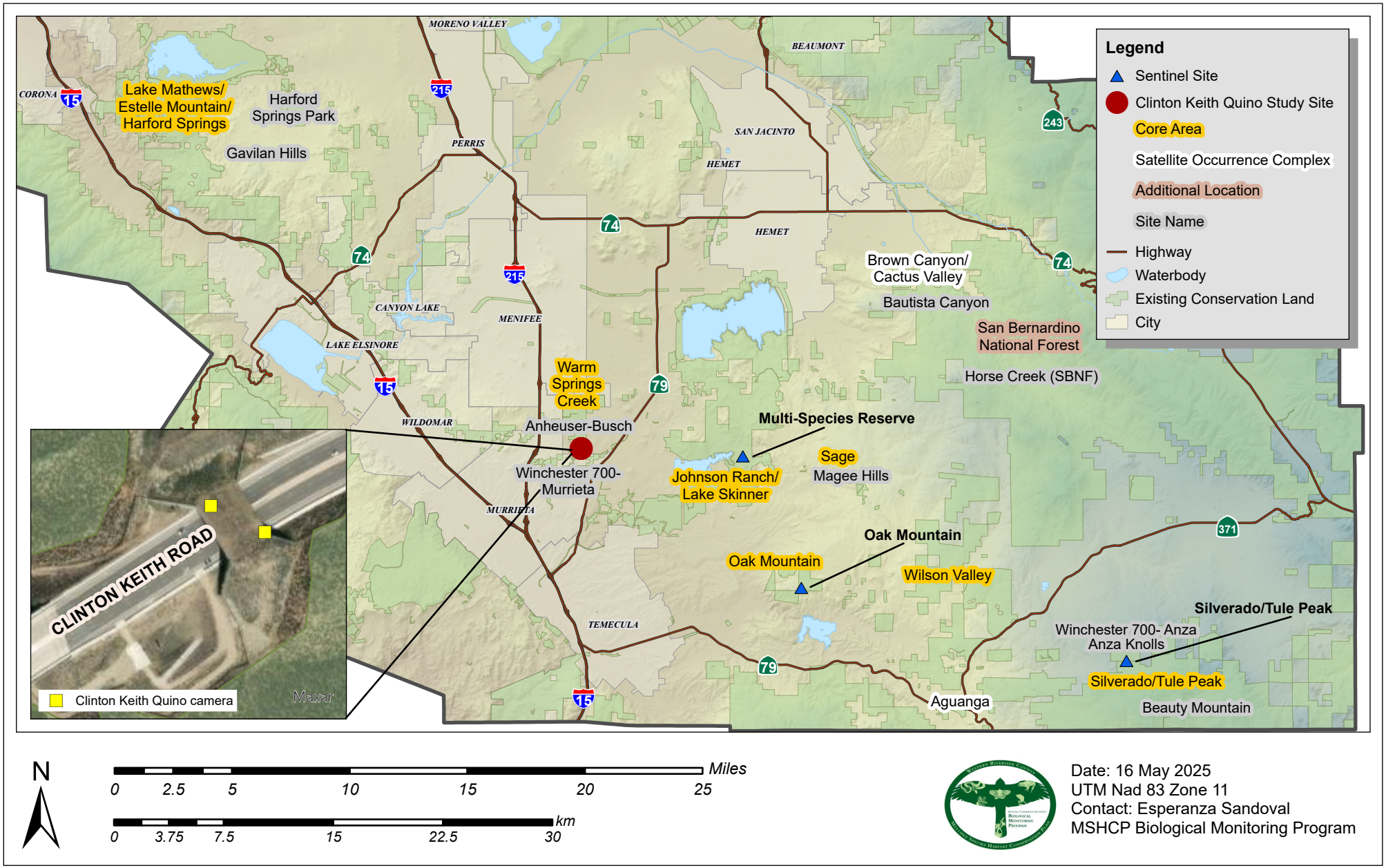

Figure 1. Quino Checkerspot Butterfly Core Areas, Satellite Occurrence Complex Areas, Sentinel Sites, additional survey location, and camera location in 2024.

Although we are not able to do an exhaustive search of the entire Plan Area, we endeavor to document the status of Quino at all our established sites, and as time and personnel allow, expand our search to include other potentially suitable habitats.

To identify the start of the Quino flight season, three specific sites (referred to as Sentinel Sites) in the Johnson Ranch/Lake Skinner, Oak Mountain, and Silverado/Tule Peak Core Areas were surveyed weekly for any sign of Quino presence (Figure 1). As a result of annual surveys across years we have gained a better understanding of the overall distribution of Quino in our Conservation Area, as well as the relative stability of Quino populations (i.e., distinguishing between locations that consistently support adult Quino and those where populations fluctuate).

Since the development of a wildlife overcrossing in the Warm Springs Creek Core Area in 2018, we have surveyed the area on and around the overcrossing. In 2021, two wildlife cameras were installed at the overcrossing and remained active until 27 March 2024 (Figure 1). The use of cameras has been effective in other studies when detecting lepidopteran species (McElveen and Meyer 2020) and in foraging butterfly behavior (Dell'Aglio et al. 2024). Having the availability of cameras on the wildlife overcrossing provides a non-invasive way to observe lepidopteran species with minimal disturbance and in their natural habitat (Besson et al. 2022).

Survey Goals

1. Monitor Quino populations at Sentinel Sites.
   a. Determine the timing of the Quino flight season by surveying Sentinel Sites within 250 m × 250 m sampling station(s) to confirm presence/absence of Quino larvae and/or adults and their abundance.
   b. Track habitat conditions and species-specific resources on site.

2. Monitor Quino populations in the MSHCP listed Core Areas and Satellite Occurrence Complex Areas with suitable habitat, with priority given to locations that were recently occupied.
   a. Conduct presence/absence surveys within 250 m × 250 m sampling stations at survey sites identified as having suitable habitat.
   b. Survey areas with known Quino populations to determine if sites are still occupied and the extent of occupation.
   c. Survey new areas with suitable habitat within designated critical habitat for Quino and surrounding areas.

3. Map current observations to track distribution of Quino within the Conservation Area.

METHODS

Protocol Development

The BMP began developing a survey protocol in 2005 to determine the distribution of Quino across the Conservation Area. Survey goals in 2024 included monitoring the locations with documented Quino populations and the sites with historical Quino sightings and/or good potential for Quino occupancy in Core Areas. Throughout

the survey years, survey effort and available surveyors have differed from year to year. Annual survey reports for Quino are available from the BMP at: https://www.wrc-rca.org/species_surveys. The survey protocol used in 2024 is described more completely in the *Western Riverside County MSHCP Biological Monitoring Program Protocol for Quino Checkerspot Butterfly Surveys*, available from the BMP at https://www.wrc-rca.org/survey_protocols/.

Since 2021, the protocol has included the addition of two wildlife cameras within the Warm Spring Creek Core Area. Camera traps have shown to be effective in detecting butterflies and other insects (Edwards et al. 2015, McElveen and Meyer 2020). The cameras have become an additional tool in detecting butterfly species (The survey protocol used in 2024 is described more completely in the *Western Riverside County MSHCP Biological Monitoring Program Protocol for Clinton Keith Overcrossing and Undercrossing Monitoring*, available from the BMP at https://www.wrc-rca.org/survey_protocols/).

Study Site Selection

We conducted this study within western Riverside County, California in 2024. The BMP surveyed a mosaic of habitats that includes coastal sage scrub, chaparral, montane coniferous forest, desert scrub, grassland, and Riversidean alluvial fan sage scrub. We used climate data collected from the Riverside area station during the 2024 calendar year and monthly summarized data during this time indicated mean daily maximum and minimum temperatures of 26.5 degrees Celsius (°C) and 11.9 °C, respectively. Total annual precipitation between 01 October 2023 and 30 September 2024 was 31.24 centimeters (cm; National Weather Service 2025).

Sentinel Sites

At the inception of our Quino monitoring effort in 2005, we chose potential study sites using GIS layers of United States Fish and Wildlife (USFWS)-designated critical habitat for Quino and lands accessible to the BMP. Sentinel Site surveys occurred at sites which were geographically representative of the current distribution of Quino within the existing Conservation Area. To define our Sentinel Sites, we used ArcGIS (ESRI 2009) to delineate a 250 m x 250 m sampling station at three Core Areas with an existing Quino population: Southwestern Riverside County Multi-Species Reserve (MSR; elevation of 480 meters [m]) in the Johnson Ranch/Lake Skinner Core Area; Oak Mountain (elevation of 820 m) in the Oak Mountain Core Area; and a site near Tule Peak Road (elevation of 1275 m) in the Silverado/Tule Peak Core Area (Figure 1).

Quino Larvae and Adult Survey Sites

In addition to the Sentinel Sites, we conducted surveys for both larvae and adult Quino throughout six Core Areas: Warm Springs Creek, Sage, Johnson Ranch/Lake Skinner, Oak Mountain, Wilson Valley, and Silverado/Tule Peak (Figure 1). We did not survey the Lake Mathews/Estelle Mountain/Harford Springs Core Area since Quino does not currently occupy this core. Using ArcGIS (ESRI 2009) we overlaid a grid of 250 m × 250 m sampling stations upon potentially suitable habitat in each Core Area. The elevation in the six Core Areas surveyed ranged from approximately 400 m in the Warm Springs Creek Core Area to 1500 m in the Silverado/Tule Peak Core Area.

Aside from the Core Areas surveyed, there were two non-core Satellite Occurrence Complex Areas (Dudek & Associates 2003) in 2024: Brown Canyon/Cactus Valley, with an elevation range of 600-800 m, and Aguanga, with an elevation range of 570 m to 860 m. One additional site surveyed was SBNF, with an elevation range of 800 m to 1900 m (Figure 1).

Scouting Surveys

The primary purpose of scouting surveys is to assess new areas, which have not been previously surveyed, in existing Quino Core Areas and Satellite Occurrence Complex Areas.

Scouting surveys have low priority and are assigned if there is extra available time during the Quino season. Scouting surveys can take place throughout the six Core Areas (Warm Springs Creek, Sage, Johnson Ranch/Lake Skinner, Oak Mountain, Wilson Valley, and Silverado/Tule Peak), the two Satellite Occurrence Complex Areas, (Brown Canyon/Cactus Valley and Aguanga), and the additional site at SBNF (Figure 2).

We use Google Earth as well as information of newly acquired conserved lands received from the Regional Conservation Authority (RCA) to determine what areas to scout. In 2024 we scouted the Johnson Ranch/Lake Skinner Core Area, the Wilson Valley Core Area, the Silverado/Tule Peak Core Area, the Aguanga Satellite Occurrence Complex Area, and the SBNF site (Figure 2).

Quino Adult Camera Stations

The two cameras, located on the wildlife overcrossing in the Warm Springs Creek Core Area, were removed on 27 March 2024 (Figure 1). We will no longer be monitoring the wildlife overcrossing. The Quino adult camera stations survey effort is described more completely in the *Western Riverside County MSHCP Biological Monitoring Program 2024 Clinton Keith Survey Report*, available from the BMP at https://www.wrc-rca.org/survey_protocols/.

Survey Methods

Sentinel Site Visits

The primary purpose of Sentinel Site monitoring is to determine the timing of the Quino flight season at their most productive sites, which helps efficiently direct overall survey efforts. The secondary purpose is to track Quino habitat conditions on-site, including host plant presence and abundance, and the third purpose is to document the presence of Quino larvae, thus confirming Quino reproduction.

We conducted surveys when temperatures in the shade at ground level were >12°C on a clear, sunny day or >16°C on an overcast or cloudy day, and with sustained wind speeds ≤ 24 kilometers (km) /hour (h) as measured 1.2–1.8 m above ground level (approximately chest height), generally between the hours of 0930 and 1600. Sustained wind was determined by averaging observed values over a 1-minute period. We did not conduct surveys during foggy or rainy conditions. Before departing to the field, surveyors uploaded waypoints into their handheld GPS units delineating the center of each sampling station at an assigned Sentinel Site.

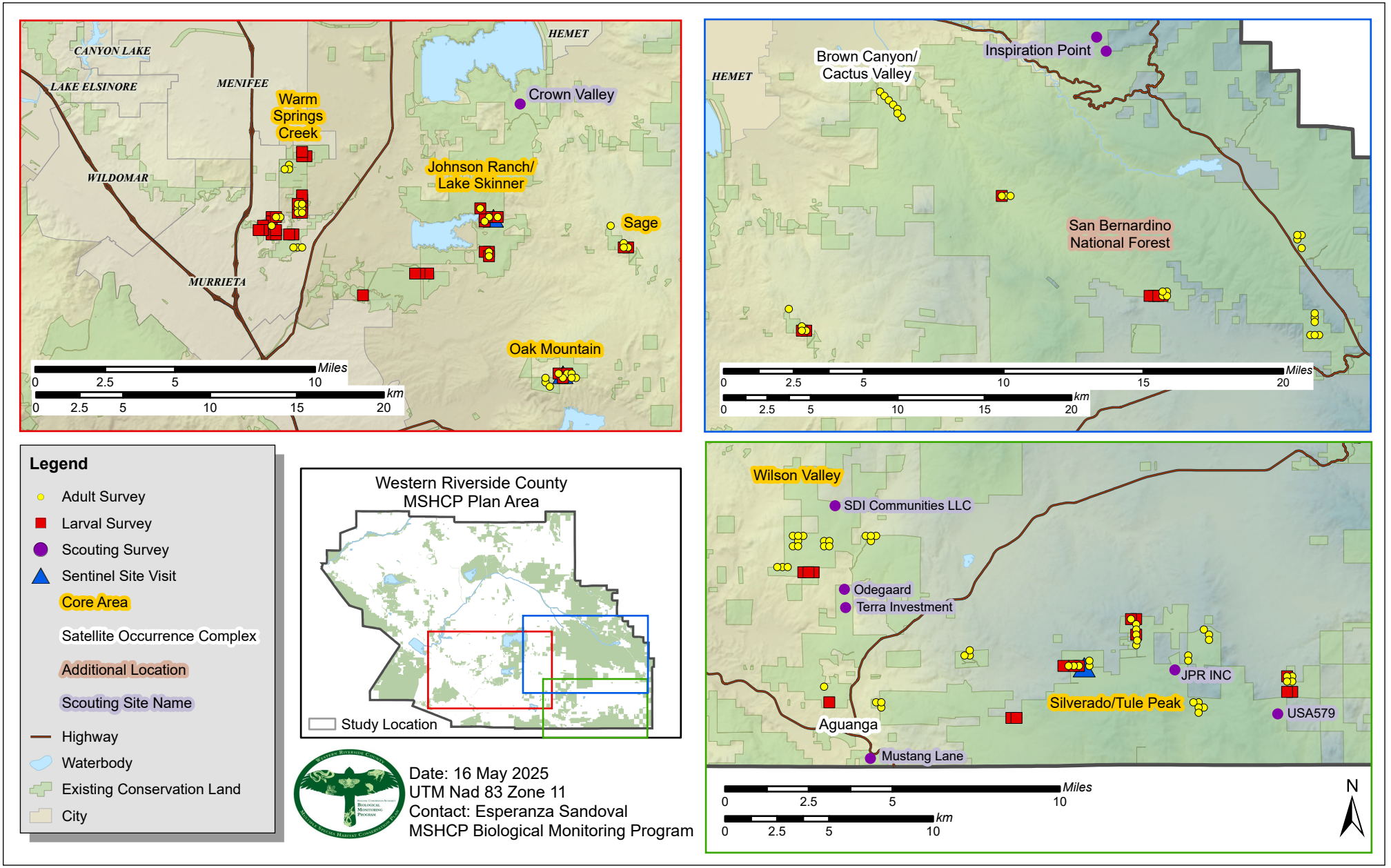

Figure 2. Quino Checkerspot Butterfly Sentinel Sites, larvae surveys, scouting surveys, and adult Quino survey locations in 2024.

Sentinel Site visits commenced on 29 January and concluded on 07 June 2024. Surveys generally begin in the last two weeks of January after the host plant, Dotseed Plantain, emerges. We aim to document Quino larvae and adults, throughout their four to six-week flight period.

Unless the weather conditions describe above precluded a Sentinel Site survey, the surveyor spent at least one hour searching the sampling station. Surveyors recorded the number and behavior of Quino larvae and/or adults detected, available nectar sources, co-occurring butterflies, weather conditions, survey start and end time, and available host plant. Quino adult behavior includes flying, perching, basking, nectaring, ovipositing, mating, and/or exhibiting agonistic behavior. When two butterflies display aggressive or combative behavior, such as flying up in the air and chasing each other out of one's territory, it is referred to as agonistic behavior. For each species of host plant detected at any given time, the number of individual plants was approximated and placed in one of three categories: 1-100, 101-1000, and >1000. Surveyors thoroughly covered each Sentinel Site using their knowledge of Quino ecology to maximize opportunities for detection. For instance, they spent time visiting hilltops and sandy washes, looking through patches of host plants, and scanning areas of flowering plants as part of the search effort.

Because Quino is a federally listed endangered species and because these Sentinel Sites represent good remaining habitat, surveyors were instructed to be extremely careful to avoid trampling larvae or host plants, disturbing cryptogamic soil crusts, or otherwise adversely impacting the resources at the site. We continued to survey the Sentinel Sites until Quino was not detected for two consecutive visits.

Quino Larvae Surveys

The primary purpose of the larvae Quino surveys is to monitor the start of the Quino flight season. Once the Quino larvae stage is detected at a site, we continue to survey the area weekly until Quino adults are detected. If the Quino larvae stage is not detected, we continue to survey intermittently (depending on personnel availability) as much area as we can cover until Quino adults are detected. The secondary purpose is to collect sufficient environmental data that may contribute to a better understanding of any additional factors that influence the distribution, occurrence, and detectability of the species.

Quino larvae surveys commenced on 26 January and ended on 13 May 2024. Surveyors navigated with their GPS to each sampling station at an assigned survey site. All other necessary survey conditions identified for Sentinel Site surveys (e.g., temperature, time of day, host plant availability) applied to these surveys. Surveyors methodically searched for Quino larvae within sampling stations, giving preference to those portions that appeared more likely to support Quino larvae (e.g., occurrence of host plants and open areas). The surveyor spent at least one hour searching the sampling station. If Quino larvae were observed, we recorded a waypoint using a Garmin GPS unit, measured larvae length in millimeters (if possible), and documented behavior of Quino larvae (e.g., feeding, crawling) and substrate used (i.e., species of plant where the behavior was observed). With a few exceptions, most survey sites were visited once or twice. The number of sampling stations surveyed was variable depending on such factors

as the degree of difficulty traversing the terrain, extent of suitable habitat, and the density of Quino in each sampling station. Quino larvae surveys were concluded once the first Quino adults were detected.

Quino Adult Surveys

The primary purpose of adult Quino surveys is to monitor the persistence of known populations and to ascertain the distribution of the species within suitable habitat in the Conservation Area. The secondary purpose is to collect sufficient environmental data that may contribute to a better understanding of any additional factors that influence the distribution, occurrence, and detectability of the species.

The Quino adult surveys commenced on 19 March and concluded on 14 June 2024. Surveyors navigated to each sampling station at an assigned survey site, being free to select sampling stations that they considered to be more likely to be occupied by Quino based on a visual overview of habitat and previous knowledge of the area. All the other necessary survey conditions identified for Sentinel Site surveys (e.g., temperature, time of day, host plant availability) also applied to these surveys. Surveyors methodically searched for Quino adults within sampling stations, giving preference to those portions that appeared more likely to support Quino (e.g., occurrence of host plants; suitable nectar sources; open areas, such as trails or washes; hilltops where Quino are known to congregate). These surveys were time-constrained to 45 minutes per sampling station to increase the amount of area surveyed per day. If Quino were observed, we recorded a waypoint using a Garmin GPS unit, documented Quino behavior (e.g., nectaring, ovipositing), and substrate used (i.e., species of plant where the behavior was observed). With a few exceptions, most survey sites were visited once or twice. Not all sampling stations at survey sites were visited due to the large spatial extent of some sites or the lack of suitable habitat. Sampling stations were not resurveyed once we confirmed the presence of Quino adults.

Scouting Surveys

Scouting surveys to assess Quino habitat suitability commenced on 19 April and concluded on 10 June 2024, without being restricted to the protocol climatic limitations. Surveyors navigated to the assigned area to scout using maps and GPS, and they freely explored the habitat collecting useful data. The allotted time for scouting surveys depended on the size of the area, ranging from one to four hours. Surveyors recorded date, area being scouted, survey start and end time, weather conditions, habitat type and other relevant information, such as presence of host plants, Quino and co-occurring butterflies, hilltops, clay soils, sandy washes, and cryptogamic soil crust.

Training

In 2024, four biologists who previously passed the USFWS Quino identification exam surveyed for Quino. One surveyor had 14 years of experience, the second surveyor had six years, and two surveyors had two years of experience. All surveyors received training both in the office and in the field. In addition, they demonstrated their ability to identify co-occurring butterflies, and the six plant species currently recognized as Quino host plants: Dotseed Plantain, Woolly Plantain, Purple Owl's Clover, Coulter Snapdragon, Chinese Houses, and Stiffbranch Bird's Beak (USFWS 2003; Pratt and Pierce 2010). Data Analysis

Data resulting from 2024 surveys were mapped and will be used to track distribution trends over time with the objective of understanding spatial and temporal fluctuations in the Quino population within the Conservation Area.

RESULTS

The MSHCP requires ≥75% of known locations of Quino to be confirmed occupied each year. The MSHCP identifies seven Core Areas and 12 Satellite Occurrence Complex Areas within six areas, for Quino occupation. BMP has been able to locate two of the six areas with Satellite Occurrence Complex Areas since the inception of the program in 2005. In 2024, we documented Quino at two Core Areas and no Satellite Occurrence Complex Areas, thus not meeting the MSHCP minimum level of occupancy of ≥75% for the species (Table 1; Figure 3). In 2024, occupation was documented at the Johnson Ranch/Lake Skinner and Oak Mountain Core Areas, as well as in SBNF.

Between 26 January and 14 June 2024, we surveyed for Quino in 235 sampling stations (32 Sentinel Site surveys, 60 larvae surveys, 113 adult surveys, and 30 repeated surveys where Quino were not detected on the first visit) and detected a total of 136 Quino adults (includes incidental observations; Figure 3). Out of the 235 sampling stations surveyed, Quino larvae and adults were detected during 19 surveys (13 Sentinel Site surveys and 6 adult surveys; 8.1%). Quino larvae were detected at two sampling stations and adults at nine sampling stations (two sampling stations had both Quino larvae and adults during separate surveys; Table 1).

In 2024, Quino adult observations occurred between the hours of 0958 – 1415, with temperatures ranging between 17.3 – 28.2°C. We recorded wind speeds at the start and end of successful surveys to be between 0.9 – 7.1 km/h (average at start of survey = 2.1 km/h, average at end of survey = 2.54 km/h). Out of the 235 sampling stations surveyed, 177 (75.3%) had clear skies from the start to the end of each survey. Out of the nine sampling stations surveyed that were occupied by Quino adults, nine (100%) had clear skies from the start to the end of each survey.

The first host plants to be detected while surveying Sentinel Sites and conducting Quino larvae surveys were Dotseed Plantain and Purple Owl's Clover. The remaining four host plants were detected during Sentinel Sites, Quino larvae, and Quino adult surveys (Table 2).

Sentinel Site Surveys

In 2024, Quino adults were detected in two out of three Sentinel Sites and in 10 (not including Quino detections recorded during non-Quino surveys) out of 32 total visits (31.3%; Table 3).

MSR Sentinel Site (in the Johnson Ranch/Lake Skinner Core Area): The BMP visited this site 13 times between 30 January and 01 May and observed 23 Quino adults during five visits (38.5%), including the two incidental Quino adult observations detected on 20 March 2024 (Table 3).

Table 1. 2024 Quino Checkerspot Butterfly survey summary by location.

Core Areas	Number of Visits	Sampling Stations		Survey Date		Date of Detections		Quino Detections	
		Surveyed	Occupied	First	Last	First	Last	Larvae	Adults
Warm Springs Creek *	13	47	0	29-Jan	10-Apr	n/a	n/a	0	0
Sage*	3	6	0	29-Jan	02-Apr	n/a	n/a	0	0
Johnson Ranch/ Lake Skinner (MSR)*	27	36	4	26-Jan	01-May	23-Feb[1]	10-Apr	3	29
Oak Mountain*	21	26	4	29-Jan	01-May	16-Feb[1]	16-Apr	31	106
Wilson Valley*	8	25	0	19-Mar	06-May	n/a	n/a	0	0
Silverado/ Tule Peak*	29	51	0	03-Apr	07-Jun	n/a	n/a	0	0
Lake Matthews/Estelle Mt/Harford Springs**	n/s	-	-	-	-	-	-	-	-
Satellite Occurrence Complex Areas									
Brown Canyon/ Cactus Valley*	2	8	0	03-Apr	17-Apr	n/a	n/a	0	0
Aguanga	3	5	0	11-Mar	03-May	n/a	n/a	0	0
Additional Location Surveyed									
SBNF*	11	31	1	12-Mar	14-Jun	22-May	22-May	0	1
Total	**117**	**235**	**9**	**26-Jan**	**14-Jun**	**17-Feb**	**22-May**	**34**	**136**

*Sampling stations in these areas were surveyed more than once.
**The Lake Mathews/Estelle Mtn/Harford Springs Core Area was not surveyed (n/s) and therefore, no data (-) was collected.
[1] Larvae were the first life stage observed at Johnson Ranch/Lake Skinner and Oak Mountain Core Area.
Note: n/a = not applicable.

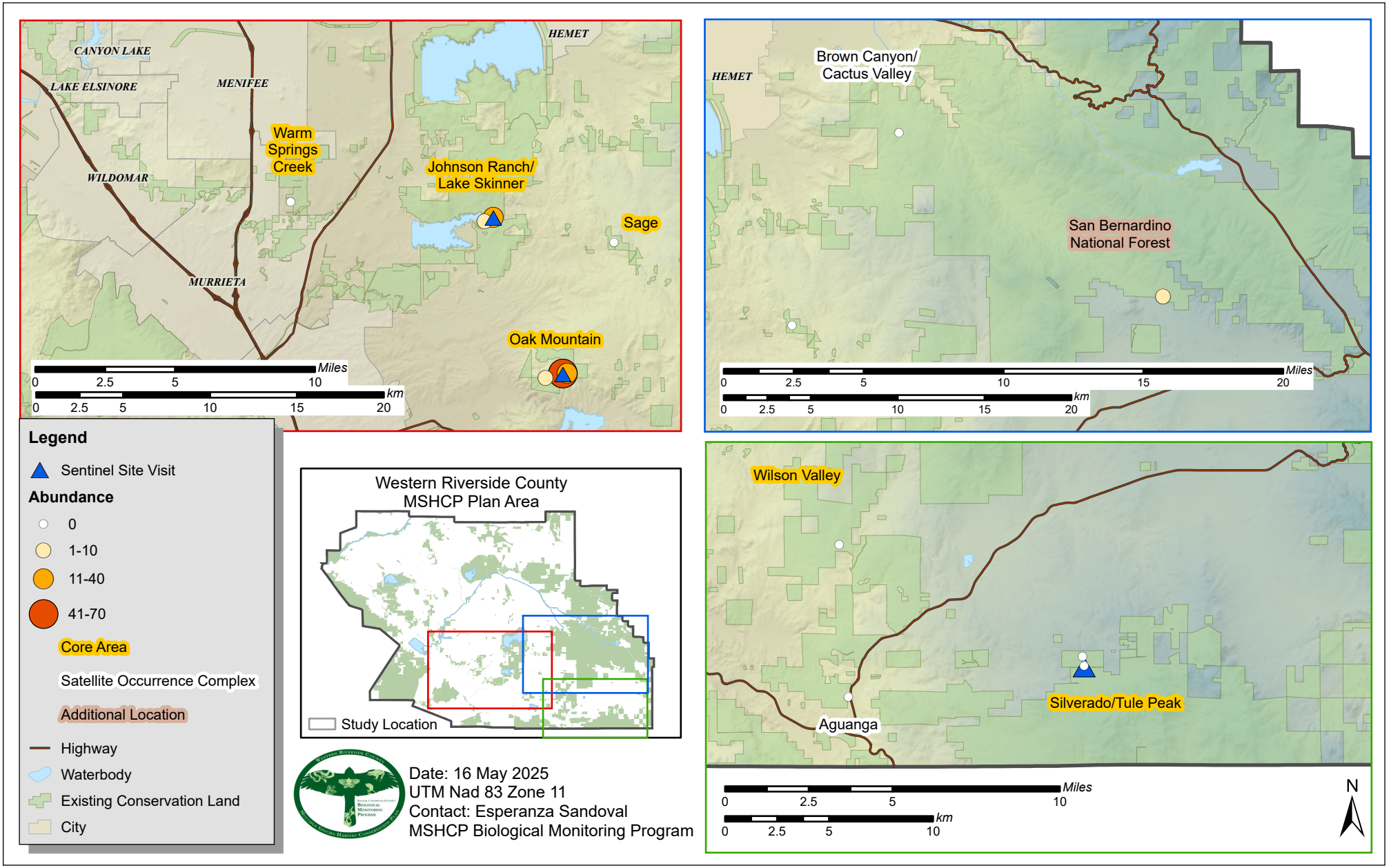

Figure 3. Quino Checkerspot Butterfly occupied survey sites and sentinel sites in 2024.

Table 2. Quino Checkerspot Butterfly host plant species detected in Core Areas, Satellite Occurrence Complex Areas, and an additional location surveyed during Sentinel Sites, larvae, and adult surveys in 2024. The three Sentinel Sites are in the Johnson Ranch/Lake Skinner, Oak Mountain, and Silverado/Tule Peak Core Areas.

Core Areas	Survey Type	Survey Dates		Host Plant	Quino Presence/ Absence
		First	Last	Species Detected	
Warm Springs Creek	Larvae	29-Jan	08-Mar	Dotseed Plantain	Absent
	Adult	25-Mar	10-Apr	Dotseed Plantain and Purple Owl's Clover	Absent
Sage	Larvae	29-Jan	18-Mar	Dotseed Plantain	Absent
	Adult	02-Apr	02-Apr	Dotseed Plantain	Absent
Johnson Ranch/ Lake Skinner	Sentinel Site	30-Jan	01-May	Dotseed Plantain and Purple Owl's Clover	Present
	Larvae	26-Jan	13-Mar	Dotseed Plantain	Absent
	Adult	20-Mar	01-May	Dotseed Plantain and Purple Owl's Clover	Present
Oak Mountain	Sentinel Site	29-Jan	08-May	Dotseed Plantain and Chinese Houses	Present
	Larvae	29-Jan	08-Mar	Dotseed Plantain	Absent
	Adult	19-Mar	01-May	Dotseed Plantain and Purple Owl's Clover	Present
Wilson Valley	Larvae	19-Mar	19-Mar	Dotseed Plantain	Absent
	Adult	20-Mar	06-May	Dotseed Plantain, Purple Owl's Clover, and Coulter Snapdragon	Absent
Silverado/ Tule Peak	Sentinel Site	12-Apr	07-Jun	Purple Owl's Clover, Chinese Houses, and Coulter Snapdragon	Absent
	Larvae	03-Apr	08-May	Dotseed Plantain, Purple Owl's Clover, and Chinese Houses	Absent
	Adult	29-Apr	07-Jun	Plantago erecta, Purple Owl's Clover, Chinese Houses, Coulter Snapdragon, Woolly Plantain	Absent
Satellite Occurrence Complex Area					
Brown Canyon/ Cactus Valley	Larvae	n/s	n/s	n/s	n/s
	Adult	03-Apr	17-Apr	Dotseed Plantain, Purple Owl's Clover, and Chinese Houses	Absent
Aguanga	Larvae	11-Mar	11-Mar	None	Absent
	Adult	19-Apr	03-May	Purple Owl's Clover, and Chinese Houses	Absent
Additional Location Surveyed					
San Bernardino National Forest	Larvae	12-Mar	13-May	Chinese Houses and Coulter Snapdragon	Absent
	Adult	12-Apr	14-Jun	Purple Owl's Clover, Chinese Houses, Coulter Snapdragon, Woolly Plantain, and Stiffbranch Bird's Beak	Present

Note: n/s = not surveyed.

Table 3. Quino Checkerspot Butterfly larvae and adult detections during the 2024 Sentinel Site visits (includes number of visits, first and last survey date, dates of Quino detections, and number of Quino larvae and adults detected).

Sentinel Site	Number of Visits	Survey Date		Dates Quino were Detected	Number of Quino Detections	
		First	Last		Larvae	Adults
MSR[1]	13	30-Jan	01-May	23-Feb	2	0
				29-Feb	1	0
				13-Mar	0	2
				20-Mar	0	6*
				27-Mar	0	6
				03-Apr	0	7
				10-Apr	0	2
Oak Mountain	11	29-Jan	08-May	16-Feb	31	0
				19-Mar	0	7
				20-Mar¥	0	2*
				27-Mar	0	20
				02-Apr	0	12
				09-Apr	0	17
				16-Apr	0	10
Silverado/Tule Peak	8	12-Apr	07-Jun	n/a	0	0
Totals	**32**	**29-Jan**	**07-Jun**	**n/a**	**34**	**91**

*Both MSR and Oak Mountain had two incidental observations of adult Quino by Monitoring Program staff.

¥Detections were incidental observations by Monitoring Program staff, not recorded during Quino surveys.

[1] MSR is in the Johnson Ranch/ Lake Skinner Core Area

Note: n/a = not applicable

Observers found the following behaviors when encountering Quino adults in the field: two were mating while perched on Dotseed Plantain, one was ovipositing on Dotseed Plantain, three were flying, six were exhibiting agonistic behavior, five were nectaring on Sugar Bush, and four were perched and/or basking on bare ground and California Buckwheat. Quino adult behavior was not recorded for the two incidental sightings at the MSR Sentinel Site. A total of three Quino larvae were detected at MSR Sentinel Site during two visits (Table 3). Two of the larvae were resting or basking and one was feeding on Dotseed Plantain. The time frame between the last Quino larvae observation, on 29 February, and the first Quino adult, on 19 March, was 19 days. Two species of Quino host plants were detected at this site: Dotseed Plantain and Purple Owl's Clover (Table 2). Large numbers (>1000 plants) of Dotseed Plantain were detected at every visit to the Sentinel Site. Purple Owl's Clover was detected twice (within the 1-100 range) during surveys on 17 and 23 April 2024.

Oak Mountain Sentinel Site: The BMP visited this site 11 times between 29 January and 08 May and observed 68 Quino adults during six visits (54.5%), including the two incidentals detected on 20 March 2024 (Table 3). Observers found the following behaviors when encountering Quino adults in the field: 19 were flying, eight were exhibiting agonistic behavior, one was nectaring on Goldfields, one on California Buckwheat, and 14 on Sugar Bush, and 25 were perched and/or basking on either bare ground, plant litter, rock, Dotseed Plantain, Yellow Yarrow (*Eriophyllum confertiflorum*), unidentified annual grass, and unidentified forb. Two species of Quino host plants were found at this site: Dotseed Plantain and Chinese Houses. Large numbers of Dotseed Plantain (>1000) were detected at every visit to this Sentinel Site. Chinese Houses were detected twice, 1-100 on 16 April and 101-1000 on 01 May 2024 (Table 2).

Silverado/Tule Peak Sentinel Site: We visited this site eight times between 12 April and 07 June and did not detect Quino larvae or adults. In 2024, three species of Quino host plants were detected at this site: Chinese Houses, Purple Owl's Clover, and Coulter Snapdragon (Table 2). Chinese Houses were detected during the first visit, 12 April, in small numbers (1-100) then increased to 101-1000 during the second to seventh visit, from 18 April to 31 May. Purple Owl's Clover were detected in small numbers (1-100) during the third to seventh visit, from 02 May to 31 May. Coulter Snapdragon was first detected during the third visit, 02 May, and again during the fifth to seventh visit, 16 to 31 May.

Overall, in 2024, nectaring Quinos were detected at two out of the three Sentinel Sites, specifically at Oak Mountain (n = 16) and MSR (n = 5). Plants utilized as nectar sources by Quino adults, in order of frequency of utilization, were Sugar Bush (n = 19), California Buckwheat (n = 1), and Goldfields (n = 1). Aside from Quino there were other adult co-occurring butterflies observed throughout the Sentinel Site visits, including one other checkerspot species (Appendix A). At MSR we observed larvae, pupa, and the adult stage of the Chalcedon Checkerspot Butterfly (*Euphydryas chalcedona chalcedona*), and the larvae and adult stage of the Common Buckeye Butterfly (*Junonia coenia*), whose larvae feed on plants from the Snapdragon family, Plantain family, and others (Brock and Kaufman 2003).

Quino Larvae Surveys

In 2024, we surveyed for Quino larvae at six Core Areas (Warm Springs Creek, Sage, Johnson Ranch/Lake Skinner, Oak Mountain, Wilson Valley, and Silverado/Tule Peak), one Satellite Occurrence Complex Area (Aguanga), and one additional location (SBNF) between 26 January and 08 May, and no Quino larvae was detected (Table 4). We did not conduct Quino larvae surveys at one Satellite Occurrence Complex Areas (Brown Canyon/Cactus Valley) because the Quino flight season had already begun by the time we surveyed these areas (Figure 1).

Larvae Surveys by Site

Warm Springs Creek Core Area: We visited this area eight times between 29 January and 08 March (n = 26 sampling stations surveyed; Table 4) and no Quino larvae were detected. The host plant, Dotseed Plantain, was found in 11 sampling stations surveyed with a recorded range size of 1-100, 101-1000, and >1000 plants.

Table 4. Quino Checkerspot Butterfly detections during larvae surveys by location in 2024.

Core Area	Number of Visits	Sampling Stations		Survey Date		Dates of Detections	Larvae Detected
		Surveyed	Occupied	First	Last		
Warm Springs Creek*	8	26	0	29-Jan	08-Mar	n/a	0
Sage*	2	3	0	29-Jan	18-Mar	n/a	0
Johnson Ranch/ Lake Skinner (MSR)*	9	14	0	26-Jan	13-Mar	n/a	0
Oak Mountain*	4	5	0	29-Jan	08-Mar	n/a	0
Wilson Valley	1	3	0	19-Mar	19-Mar	n/a	0
Silverado/ Tule Peak	7	12	0	03-Apr	08-May	n/a	0
Satellite Occurrence Complex Area							
Brown Canyon/ Cactus Valley	n/s	-	-	-	-	-	-
Aguanga	1	1	0	11-Mar	11-Mar	n/a	0
Additional Location Surveyed							
San Bernardino National Forest*	4	9	0	12-Mar	13-May	n/a	0
Total	**36**	**73**	**0**	**26-Jan**	**13-May**	**-**	**0**

Note: : n/a = not applicable; n/s = not surveyed, (-) = no data was collected.
* Sampling stations in these areas were surveyed more than once.

Sage Core Area: We visited this area twice on 29 January and 18 March (n = 3 sampling station surveyed; Table 4) and no Quino larvae was detected. The host plant Dotseed Plantain was detected in all three sampling stations surveyed with a recorded range size of >1000 plants.

Johnson Ranch/Lake Skinner Core Area: We visited this area nine times between 26 January and 13 March (n = 14 sampling stations surveyed; Table 4) and no Quino larvae were detected. The host plant, Dotseed Plantain, was detected in 11 sampling stations surveyed with a recorded range of 1-100, 101-1000, and >1000 plants. With most observations being in large patches (>1000 plants).

Oak Mountain Core Area: We visited this area four times (n = 5 sampling stations surveyed; Table 4) between 29 January and 08 March, and no Quino larvae were

detected. Large patches (>1000 plants) of Dotseed Plantain were detected in four sampling stations surveyed.

Wilson Valley Core Area: We visited this area on 19 March (*n* = 3 sampling stations surveyed), and no Quino larvae were detected (Table 4). The host plant Dotseed Plantain was detected in one sampling station surveyed with a recorded range size of >1000 plants.

Silverado/Tule Peak Core Area: We visited this area seven times (*n* = 12 sampling stations surveyed; Table 4) between 03 April and 08 May, and no Quino larvae was detected. Three species of host plants were detected in eight sampling stations surveyed: Chinese Houses were detected in five, Purple Owl's Clover were detected in three, and Dotseed Plantain was detected in one (Table 2). Chinese Houses and Purple Owl's Clover were recorded in range sizes of 1-100 and 101-1000 and Dotseed Plantain was recorded in amounts of >1000 plants.

Aguanga Satellite Occurrence Complex Area: We visited this area on 11 March (*n* = 1sampling station surveyed; Table 4) and no Quino larvae were detected. Host plants were not detected in this Core Area during larvae surveys (Table 2).

SBNF (Additional Location Surveyed): We visited this location four times (*n* = 9 sampling station surveyed) between 12 March and 13 May, and no Quino larvae were detected (Table 4). Two host plants were detected during surveys in two sampling stations, Chinese houses, and Coulter Snapdragon (Table 2). Both host plant species were recorded in lesser amounts (1-100).

During the Quino Larvae surveys, the host plant Dotseed Plantain, was detected in six out of the eight Core Areas surveyed, Chinese Houses was detected in two, and Purple Owl's Clover and Coulter Snapdragon was detected in one (Table 2). Three species of larvae were detected during Quino larvae surveys: the Erebid Moth (Family: Erebidae), Electra Buckmoth (*Hemileuca electra*), and the Common Buckeye Butterfly (*Junonia coenia*). Other adult co-occurring butterflies were observed, including the Chalcedon Checkerspot Butterfly and the Common Buckeye Butterfly (Appendix A).

Quino Adult Surveys

The Quino flight season is determined by the first and last Quino adult observation detected in any given survey year. Between 2008 and 2024 Quino adults have been detected as early as 26 January (2011) and as late as 15 June (2010). In 2024, the Quino flight season began with the first Quino sighting of two adults on 13 March at the Johnson Ranch/Lake Skinner Core Area during a Sentinel Site survey at MSR (Figure 4; Figure 1, respectively). The Quino flight season ended with the sighting of one Quino adult on 22 May at SBNF during an adult survey. In 2024, the Quino flight season was 71 days in length (Figure 4).

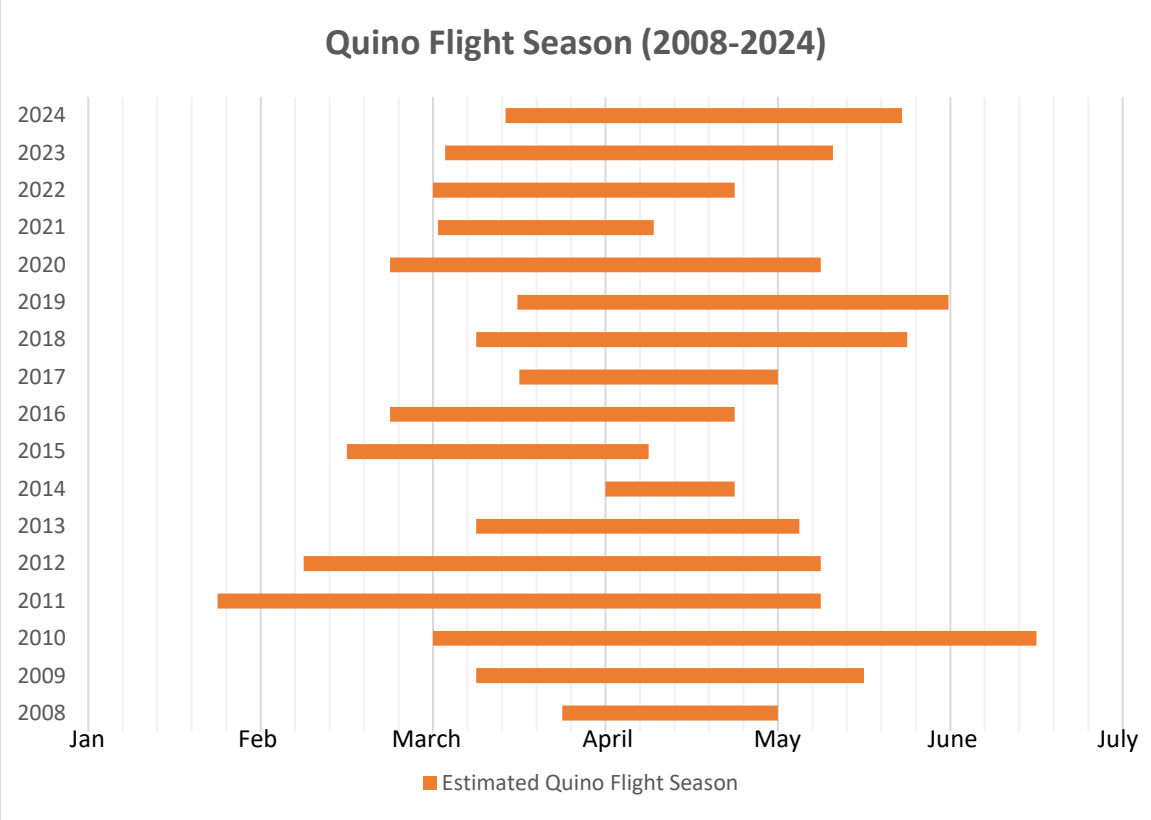

Figure 4. Quino Checkerspot Butterfly observed flight season from 2008-2024.

During the Quino adult surveys (19 March-14 June), we observed Quino at two of the six Core Areas surveyed, at the additional location (SBNF), and none at the Satellite Occurrence Complex Areas (Figure 3; Table 5). Of the 45 Quino adult detections, 27 were observed during surveys and 18 were incidental observations (Table 5). The Oak Mountain Core Area had more Quino adult detections (n = 38, includes 16 incidentals) than the Johnson Ranch/Lake Skinner Core Area (n = 6; includes 2 incidentals).

Adult Surveys by Site

Warm Springs Creek Core Area: We visited this area five times between 25 March and 10 April (n = 21 sampling stations surveyed; Table 5) with no Quino detections, but we did find two host plants species, Dotseed Plantain and Purple Owl's Clover (Table 2). Dotseed Plantain was found in 16 sampling stations surveyed and were recorded in range sizes of 1-100, 101-1000, and >1000. Purple Owl's Clover was found in three sampling stations surveyed and were recorded in ranges of 1-100 and 101-1000.

Sage Core Area: We visited this area once on 02 April (n = 3 sampling stations surveyed; Table 5) with no Quino detections, but we did find one host plant species, Dotseed Plantain (Table 2). Dotseed Plantain continues to be present at this location and was detected in all sampling stations surveyed with a recorded range size of >1000 plants.

Table 5. Quino Checkerspot Butterfly detections during adult surveys by location in 2024.

Core Area	Number of Visits	Sampling Stations		Survey Date		Dates Detected	Adults Detected
		Surveyed	Occupied	First	Last		
Warm Springs Creek[Ω]	5	21	0	25-Mar	10-Apr	n/a	0
Sage	1	3	0	02-Apr	02-Apr	n/a	0
Johnson Ranch/ Lake Skinner (MSR)[Ω]	5	9	3	20-Mar	01-May	20-Mar 27-Mar 03-Apr	1 2* 3
Oak Mountain	6	10	3	19-Mar	01-May	19-Mar 27-Mar 02-Apr 09-Apr 16-Apr	4[¥] 5 21[§] 6* 2*
Wilson Valley[Ω]	7	22	0	20-Mar	06-May	n/a	0
Silverado/ Tule Peak[Ω]	14	31	0	29-Apr	07-Jun	n/a	0
Satellite Occurrence Complex Area							
Brown Canyon/ Cactus Valley[Ω]	2	8	0	03-Apr	17-Apr	n/a	0
Aguanga	2	4	0	19-Apr	03-May	n/a	0
Additional Location Surveyed							
San Bernardino National Forest[Ω]	7	22	1	12-Apr	14-Jun	22-May	1
Total	**49**	**130**	**7**	**19-Mar**	**14-Jun**	**n/a**	**45**

*Detections were incidental observations by Monitoring Program staff, not recorded during adult Quino surveys.
[¥]Two incidental observations are included in the 19 March detections.
[§]Six incidental observations are included in the 02 April detections.
[Ω] Sampling stations in these areas were surveyed more than once.
Note: n/a = not applicable.

Johnson Ranch/Lake Skinner Core Area: We visited this area five times between 20 March and 01 May and detected four Quino adults in three out of nine sampling stations surveyed (33.3%). Two additional Quino adults were detected as incidental

sightings by BMP staff, bringing the total to six (Table 5). Observed Quino behaviors included two flying, one exhibiting agonistic behavior with a Chalcedon Checkerspot Butterfly, and two perched and/or basking on either bare ground or Rancher's Fiddleneck (*Amsinckia menziesii*). The behavior of the other incidental observation was not recorded. Two host plant species were detected in this Core Area during surveys at five sampling stations (Table 2). Dotseed Plantain was detected in all five sampling stations surveyed in large quantities of >1000 and Purple Owl's Clover. was found in two sampling stations surveyed with a recorded range size of 1-100.

Oak Mountain Core Area: We visited this area six times between 19 March and 01 May and detected 22 Quino adults in three out of the 10 sampling stations surveyed (30%; Table 5). The BMP staff detected 16 additional Quino adults as incidental sightings, bringing the total to 38 (Table 5). Observed Quino behaviors included 14 flying, 15 exhibiting agonistic behavior, two nectaring on Onion (*Allium* spp.), one nectaring on Sugar Bush, one nectaring on Black Sage (*Salvia mellifera*), and three perched and/or basking on either plant litter, bare ground, or Mustard (*Brassica* spp.). The behavior of two incidental observations was not recorded. Two host plants species were detected in this Core Area during surveys at 10 sampling stations (Table 2). Dotseed Plantain was detected in all 10 sampling stations surveyed with recorded range sizes of 101-1000 and >1000 plants. Purple Owl's Clover was detected in one sampling station with a recorded range size of 101-1000 plants.

Wilson Valley Core Area: We visited this area seven times between 20 March and 6 May (n = 22 sampling stations surveyed; Table 5) with no Quino detections. Three host plant species were detected in this Core Area during surveys at eight sampling stations (Table 2). Dotseed Plantain was detected in four sampling stations surveyed with recorded range sizes of 1-100, 101-1000, and >1000 plants. Both Purple Owl's Clover, detected in four sampling stations, and Coulter Snapdragon, detected in one, were recorded in a range size of 1-100 plants.

Silverado/Tule Peak Core Area: We visited this area 14 times between 29 April and 07 June (n = 31 sampling stations surveyed; Table 5) with no Quino detections. Five host plants were detected in this Core Area during surveys at 27 sampling stations (Table 2). Coulter Snapdragon was detected in 21sampling stations surveyed with recorded range sizes of 1-100 and 101-1000. Both Chinese Houses and Purple Owl's Clover were detected in 15 sampling stations surveyed with recorded range sizes of 1-100, 101-1000, and >1000. Both Dotseed Plantain, detected in two sampling stations, and Woolly Plantain, detected in one, were recorded in a range size of 1-100 plants.

Brown Canyon/Cactus Valley Satellite Occurrence Complex Area: We visited this area twice on 03 and 17 April (n = 8 sampling stations surveyed; Table 5) with no Quino adults detected. Three host plant species were detected in this Satellite Occurrence Complex Area during surveys at six sampling stations (Table 2). Purple Owl's Clover, found in six sampling stations, and Chinese Houses, found in two, were recorded in range sizes of 1-100 and 101-1000 plants. Dotseed Plantain was detected in four sampling stations with a recorded range size of 101-1000 and >1000 plants.

Aguanga Satellite Occurrence Complex Area: We visited this area twice on 19 April and 03 May (n = 4 sampling stations surveyed; Table 5) with no Quino adults detected. Two species of host plants, Chinese Houses and Purple Owl's Clover, were detected in one out of four sampling stations surveyed (Table 2). Both host plants were recorded with a range of 1-100 plants.

SBNF (Additional Location Surveyed): We visited this location seven times between 12 April and 14 June and detected one Quino adult in one out of 22 sampling stations surveyed (4.5%; Table 5). Five host plants were detected in this additional location during surveys at 17 sampling stations (Table 2). Both Stiffbranch Bird's Beak, found in 13 sampling stations, and Woolly Plantain, found in four, were recorded in range sizes of 1-100, 101-1000, and >1000 plants. Purple Owl's Clover was found in four sampling stations with a recorded range size of 1-100 and 101-1000. Both Chinese Houses, found in one sampling station, and Coulter Snapdragon, found in five, were recorded with a range of 1-100 plants.

During the Quino adult surveys, Quino was only observed nectaring in the Oak Mountain Core Area (Figure 1). Aside from Quino, there were other co-occurring adult butterflies observed throughout the Core Areas, including two species of checkerspot butterfly (Appendix A). Both species, the Chalcedon Checkerspot Butterfly and the Gabb's Checkerspot Butterfly, were observed in the Silverado/Tule Peak Core Area. The Chalcedon Checkerspot Butterfly was also observed at the Wilson Valley Core Area, the Warm Springs Creek Core Area, the Johnson Ranch/Lake Skinner Core Area, and the Aguanga Satellite Occurrence Complex Area. The Common Buckeye, whose larvae also feed on Dotseed Plantain, was detected in all six Core Areas, in both Satellite Occurrence Complex Areas, and the SBNF additional location. The larval stage of the Chalcedon Checkerspot Butterfly and the Common Buckeye was detected in the Warm Springs Creek Core Area (Figure 1).

Scouting Surveys

In 2024, ten scouting surveys were completed during the Quino season. The surveys took place at the Johnson Ranch/Lake Skinner Core Area, Wilson Valley Core Area, Silverado/Tule Peak Core Area, the Aguanga Satellite Occurrence Complex Area, and the SBNF site. Quino was not detected during the scouting surveys.

Results by Site

Johnson Ranch/Lake Skinner Core Area: On 23 April 2024 we scouted Crown Valley, which is adjacent to the northernmost sampling stations in this Core Area (Figure 2). The area scouted consisted of a coastal sage scrub and grassland habitat, clay soils, cryptogamic soil crust, hilltops, bare ground, openings in canopy and grassland, and two host plant species. Large patches (>1000 individuals) of Dotseed Plantain and small patches (1-100) of Purple Owl's Clover, were detected.

Wilson Valley Core Area: Three RCA properties in this Core Area were scouted during the 2024 Quino survey season. On 22 April we scouted the Odegaard property which consisted of a coastal sage scrub habitat, bare ground, hilltops, openings in canopy and between forbs, and two host plant species (Figure 2). Dotseed Plantain was detected

along the property in patches of 1-100 or 101-1000 plants and Coulter's Snapdragon was detected twice in patches consisting of 1-100 plants. On 06 May we scouted the RCA property just south of Odegaard called Terra Investment, which consisted of coastal sage scrub, riparian, and grassland habitat, bare ground, sandy washes, and openings in grassland and between forbs (Figure 2). No hosts plants were detected. On 22 April we scouted the RCA property SDI Communities LLC which consisted of Coastal sage scrub and grassland habitat, bare ground, hilltops, sandy washes, openings in canopy, grassland, and between forbs (Figure 2). One host plant was detected, Purple Owl's Clover, mostly in small quantities (1-100 plants) along the property and one large patch of 101-1000 plants.

Silverado/Tule Peak Core Area: Two properties were scouted in this Core Area during the 2024 Quino survey season. On 05 June we scouted the Bureau of Land Management (BLM) property, USA 579, near the southeastern corner of the Plan Area (Figure 2). The property consisted of a chaparral habitat, bare ground, hilltops, clay soils, cryptogamic soil crust, sandy washes, and openings under canopy. On 10 June we scouted JPR Inc RCA property, located approximately four kilometers east of the Silverado/Tule Peak sentinel site (Figure 2). The property consisted of chaparral and grassland habitat, bare ground, openings in grassland and between forbs, and was affected by fire in July of 2023 (RCFD 2025a). No host plants were detected on either of the properties scouted.

Aguanga Satellite Occurrence Complex Area: On 19 April 2024 we scouted the RCA property named Mustang Lane (Figure 2). The area consisted of a coastal sage brush and chaparral habitat, bare ground, hilltops, sandy washes, cryptogamic soil crust, openings in canopy and grassland, and three host plant species. Small numbers (1-100) of all three host plants, Chinese Houses, Dotseed Plantain, and Woolly Plantain were present throughout the area scouted.

SBNF (Additional Location Surveyed): Two locations in this area were scouted during the 2024 Quino survey season. On 10 and 28 May we scouted just south and west of Inspiration Point, since Quino was reported to be seen by a local lepidopterist just 25 meters from Conservation Area on 01 May (*Kim Boss, District Wildlife Biologist, Forest Service San Bernardino National Forest San Jacinto Ranger District, personal communication*; Figure 2). No Quino was detected. The area scouted consisted of chaparral, montane, and grassland habitat, bare ground, hilltops, sandy washes, openings in canopy and grassland, and two host plant species. Coulter's Snapdragon and Stiffbranch Bird's Beak were found in quantities of 101-1000 plants. On 28 May we also scouted an area about 800 meters north of Inspiration Point (Figure 2). The area scouted consisted of a chaparral and grassland habitat, bare ground, sandy washes, hilltops, cryptogamic soil crust, openings in canopy and grassland, and four host plant species. Several large patches of Purple Owl's Clover (101-1000 plants), Chinese Houses (101-1000 and >1000 plants), and a few small patches (1-100 plants) of Coulter Snapdragon and Stiffbranch Bird's Beak were found throughout the area scouted.

DISCUSSION

In 2024, we detected Quino in two (<75%) MSHCP-listed Core Areas and Satellite Occurrence Complex Areas, detecting 135 Quino adults (Table 1). One Quino adult was detected at the SBNF location bringing the total to 136. Survey effort has been variable since surveys began in 2005, mainly due to changes in protocol and staff, but has been comparable from 2021-2024. Throughout the last four survey years the number of Quino has fluctuated, with the highest Quino detections being in 2024 (n = 136) and the lowest Quino detections being in 2021 (n = 77; Biological Monitoring Program 2022). Both the Oak Mountain and Johnson Ranch/Lake Skinner Core Areas where occupied from 2021-2024 (Appendix B). The Silverado/Tule Peak Core Area was occupied in 2022 and 2023 (Appendix B).

Warm Springs Creek Core Area: Over the past 17 flight seasons (2008-2024), we have not detected Quino in this Core Area (Appendix B) despite the presence of Dotseed Plantain. The Anheuser-Busch RCA property, Phases 1-5 and Phase 9 have been surveyed for 11 years (2013 and 2015-2024; Figure 2) with no success. Even though this property contains patches of Quino host plants, grassland dominates the northern portion of the property and non-native grasses appeared to be covering up the nectaring sources (*Esperanza Sandoval, personal observation*). We surveyed the Clinton Keith overcrossing (completed Fall 2018) and surrounding sampling stations from 2019-2024 and did not detect Quino (Biological Monitoring Program 2025). During the 2024 Quino season, California Buckwheat, Common Deerweed (*Acmispon glabrus*), Dotseed Plantain, Purple Owl's Clover, and Quino nectaring sources were recorded on the overpass. Near the overcrossing, we detected Stinknet (*Oncosiphon pilulifer*), an invasive non-native plant (*Esperanza Sandoval and Tara Grahm, personal observation)*. It is important for management to continue at the overcrossing and surrounding area to improve the habitat suitability for Quino. Our closest occupied Quino site is situated at the Southwestern Riverside County Multi-Species Reserve in the Johnson Ranch/Lake Skinner Core Area. For Quino to naturally disperse, connectivity and the absence of large structures and roads are necessary (Thomas 1994; USFWS 2003). It has been suggested that the development and construction of State Route 79 have hindered connectivity potentially blocking the species from dispersal (USFWS 2003).

Sage Core Area: In 2024, we did not detect Quino in Magee Hills. We continue to detect non-native vegetation. Encroachment of non-native grasses has contributed to the collapse of native wildflowers (Minnich 2008). Invasive grasses take over open ground which leads to a reduction in larvae host plants and nectaring plants (Osborne and Redak 2000, Preston et al. 2012). Cape Marigold (*Dimorphoteca sinuate*) is currently growing on a hilltop where both Dotseed Plantain and adult Quino were detected in the past. Over 17 years of surveying this site, we have been successful at detecting a small but persistent population of Quino 35.3% of the time (Appendix B).

Johnson Ranch/Lake Skinner Core Area: In 2024, the most productive site in this Core Area was the Sentinel Site located at MSR (Figure 1). The presence of clay soil, cryptogamic soils, and large patches of the Quino host plant Dotseed Plantain found throughout openings in coastal sage scrub are all evidence of good Quino habitat. The Sentinel Site, as well as other sampling stations surveyed in this Core Area, held patches

of one additional Quino host plant, Purple Owl's Clover (Table 2). Having positive Quino habitat attributes at MSR has supported a reliable Quino population. It would be beneficial to keep track of the non-native grass growth in the MSR area that could potentially take over areas where wildflowers currently grow and thus slowly decrease their habitat suitability (Preston et al. 2012). The Johnson Ranch/Lake Skinner Core Area continues to be one of the best areas to find Quino in Western Riverside County. During the 17 years surveying this site, we have been successful at detecting Quino 94.1% of the time (Appendix B).

Oak Mountain Core Area: In 2024, we detected 106 adult Quino at this Core Area (Table 1), which includes detections at the Sentinel Sites (n = 68) and adult survey sites (n =38). Quino adult detection numbers were higher in 2024 compared to 2023 (n = 31; Biological Monitoring Program 2024), 2022 (n = 10; Biological Monitoring Program 2023) and 2021 (n = 4; Biological Monitoring Program 2022). This area continues to house large patches of Dotseed Plantain, clay soil, cryptogamic soil, and openings in coastal sage scrub which are evidence of good Quino habitat. During the 16 years surveying this site, we have been successful at detecting Quino 100% of the time (Appendix B).

Wilson Valley Core Area: We did not find Quino in 2024. The last Quino detected in this Core Area was in 2013 (Appendix B). During our search, we detected large patches of Dotseed Plantain, including in one of the scouted properties. Additionally, in a few sites, surveyors recorded the presence of non-native grasses growing in open areas between shrubs. We will continue to survey historical sites and expand the search for Quino in the Wilson Valley Core Area. During the 17 years surveying this site, we have been successful at detecting Quino 23.5% of the time (Appendix B).

Silverado/Tule Peak Core Area: This location has been dependable for Quino presence in the past. We detected Quino 13 consecutive years, from 2008-2020, and again in 2022 and 2023. Despite our survey efforts, we did not detect Quino in 2021 and 2024 (Appendix B). In July of 2023, the Silverado/Tule Peak Core Area was affected by a fire that burned 939.7 hectares (2323 acres; RCFD 2025a). The fire affected Quino habitat in this Core Area. The habitat may require additional seasons for the shrub layer to recover (Keeley and Keeley 1981). During the 17 years surveying this site, we have been successful at detecting Quino 88.2% of the time (Appendix B).

Brown Canyon/Cactus Valley Satellite Occurrence Complex Area: We did not find Quino in 2024. We did detect them in 2010, 2018, and 2022 (Appendix B). This has been the second Quino survey year after the fire of September 2022 that burned 11,455 hectares (28,307 acres; RCFD 2025b). The plant community in this area needs additional time to recover. In January of 2023, RCA land managers seeded selected areas of the Brown Canyon/Cactus Valley Satellite Occurrence Complex with Dotseed Plantain. They continued to monitor the area throughout the 2023 and 2024 Quino seasons (*Taylor Zagelbaum, Natural Resource Specialist-MSHCP, Riverside County Regional Park and Open-Space District, personal communication*). This is a positive step towards restoring Quino habitat. Over 14 years surveying this site (the area was not surveyed from 2014-2016), we have been successful at detecting Quino 21.4% of the time (Appendix B).

Aguanga Satellite Occurrence Complex Area: Despite our survey efforts we did not detect Quino in this area. In October of 2023, the Aguanga Satellite Occurrence Complex Area was affected by a fire that burned 1,006 hectares (2487 acres, RCFD 2025c). Since it is possible Quino is present in areas with potential habitat outside the survey area, we have been slowly scouting additional areas within this Satellite Occurrence Complex Area. During the six years (2008 and 2020-2024) surveying this site, we have not been successful at detecting Quino (Appendix B).

SBNF (Additional Location Surveyed): In 2024, we did find Quino at SBNF in an area unaffected by the September 2022 fire, which was responsible for burning east of Bautista Road, along Baisley Creek, and a portion of the Brown Canyon/Cactus Valley Satellite Occurrence Complex Area. It has been suggested Quino is going through an elevational range expansion in response to climate change (Parmesan 1996). In the SBNF location, the BMP detected one Quino adult in 2017 (at an approximate elevation of 1831 meters) and another in 2022 (at an approximate elevation of 1526 meters). We continue to expand our search at SBNF to cover areas where Quino had been detected in the past (from 2003-2011) by SBNF staff (*Kim Boss, District Wildlife Biologist, Forest Service San Bernardino National Forest San Jacinto Ranger District, personal communication*). Throughout the survey years, we have been intermittently successful in detecting Quino at this location. Over 17 years surveying this site, we have been successful at detecting Quino 70.6% of the time (Appendix B).

In the past three seasons (2022-2024), fires have affected the Silverado/Tule Peak Core Area (in 2023), the Brown Canyon/Cactus Valley Satellite Occurrence Complex Area (in 2022), Aguanga Satellite Occurrence Complex Area (in 2023), and the SBNF additional location (in 2022). Changes in the habitat due to fire have the potential of affecting butterfly abundance and diversity (Kwon et al. 2013). The level of impact may depend on fire intensity, frequency, and time of year (van Mantgem et al. 2015) Frequent fires can lead to an increase in non-native plant species and cause a risk to Quino survival (USFWS 2003).

According to the MSHCP Species Account (Dudek & Associates 2003), Quino has been extirpated from the Lake Mathews/Estelle Mountain/Harford Springs Core Area. Quino was historically abundant in the Harford Springs subunit but were last documented in Harford Springs Park in 1998 (USFWS 2003, Krofta and Anderson 2002) and local experts noted the decline of Quino colonies in the Gavilan Hills, last detected in 1984, and near Lake Mathews, last detected in 1985 (Mattoni et a1. 1997; Figure 1). Surveys were conducted between 2010 and 2012 in this Core Area with no success, leading to the termination of surveys in this Core Area beginning in 2013 (Appendix B). In 2020, we visited the northern area of Hartford Springs Park for training purposes and did not detect any Quino or Quino host plants (Biological Monitoring Program 2021). We did detect non-native grass throughout the area.

In 2024, we were able to detect two stages of the Quino life cycle (larval and adult form) in two Core Areas, Johnson Ranch/Lake Skinner and Oak Mountain. In the SBNF location, we only detected one QCB adult during one survey on 22 May 2024. Even though we surveyed the same area twice prior, 29 April and 13 May 2024. For most

sites at higher elevation (e.g., SBNF additional location), we perform surveys later in the season.

As discussed, and illustrated in Figure 4 above, the Quino flight season as detected by the BMP differs from year to year. Although the BMP strives to fully document the flight season for the species, the applied survey effort and survey methods may play a role in some of the variations seen across years. Drought and rainfall, which is not fully addressed in this report, has also been discussed in research papers as an additional factor affecting a butterfly's life cycle. Winter precipitation triggers the growth of host plants, which represents the only food source for post-diapausal Quino larvae (USFWS 2001). The right timing between Quino larvae and host plants is crucial for Quino survival (Parmesan 2005). Phenological asynchrony between Quino and its host plants has been witnessed on more than one occasion, when pre-diapausal Quino larvae were seen on senesced host plants, possibly decreasing larvae survival rate (Weiss et al. 1988, USFWS 2003). Drought conditions, with low rainfall and increased sunlight, can increase the rate of larval growth and cause the host plants to senesce (Ehrlich et al. 1980). If host plants are stressed, they may not flower and persist as a seed bank or they may go to seed early, limiting the food source for the post-diapausal Quino larvae (Ehrlich et al. 1980). In such circumstances, the post-diapausal Quino larvae may need to decimate most of the host plant population to have enough nourishment. This can be problematic once the larvae pupate into adults and the female Quino will attempt to locate host plants to oviposit. In this case, adult Quino have been seen dispersing greater distances to find suitable host plants (Murphy and White 1984). In the past, many of the population extinctions of Edith's Checkerspot Butterflies (*Euphydryas editha*) have been attributed to rare weather events (Ehrlich et al. 1980, McLaughlin et al. 2002, Parmesan 2005).

Distribution of Quino in 2024 was within the southern half of the Plan Area, bounded by the Johnson Ranch/Lake Skinner and Oak Mountain Core Area to the west and SBNF additional location to the east. Overall, the Quino sites in the western portion of the Plan Area are lower in elevation (400 m – 850 m) than the southeastern and eastern sites (925 m – 2000 m). Of the sites surveyed in 2024, Anheuser-Busch and Winchester 700 Murrieta (in the Warm Springs Creek Core Area) were the lowest in elevation (approximately 400 m), and the highest elevation site (approximately 1525 m) was in the southeastern corner of SBNF. Quino had previously been documented in SBNF at approximately 1707 meters in elevation on 17 April 2011 (*James Gannon, Fuels Program Manager, Bureau of Land Management, personal communication*) and as high as 1855 meters in elevation in 2017 by the BMP. If Quino shifts to higher elevations, then these areas could support new Quino populations in the future. We will continue to document the elevations at which Quino is detected within the Plan Area as a hypothesis by Parmesan (1996) suggests that Quino may shift north and to higher elevations in response to climate change.

Recommendations

Future Surveys: The extent of occupied area within each survey site and the number of occupied sites across the Conservation Area vary from year to year. Therefore, it is important to continue mapping the distribution of Quino within the Conservation

Area. We should continue to prioritize monitoring of recently occupied sites, areas with suitable habitat, and areas adjacent to known occupied habitat.

We recommend expanding our survey efforts to areas with suitable habitat within the Warm Springs Creek Core Area, Wilson Valley Core Area, and Aguanga Satellite Occurrence Complex Area, as we have been unsuccessful in detecting Quino at these Areas (Appendix B).

Due to recent fire activity, we recommend scouting additional areas of Bautista Canyon, including the original Horse Creek site in SBNF, which was occupied in 2006 and 2010 (Figure 1, Appendix B). The Horse Creek site has not been accessible since 2010 due to a fence restricting access to the creek. We are currently working on obtaining access to commence surveys at this location.

We recommend continuing surveying higher elevation areas, such as Rouse Hill Road (ranges in elevation between 1600-1900 m), as it has been hypothesized that these areas may be occupied by Quino populations no longer occupying habitats at lower elevations (Parmesan 1996). We would like to increase our survey efforts at our Beauty Mountain site in the Silverado/Tule Peak Core Area, which is at approximately 1400 m in elevation (Figure 1).

In the past three years, fires have impacted Quino habitat in the Brown Canyon/Cactus Valley Satellite Occurrence Complex Area (September of 2022), SBNF (September of 2022), and the Silverado/Tule Peak Core Area (July of 2023; Figure 1). It may be beneficial to monitor fire affected areas more closely for increased colonization of non-native grasses and plants that could potentially negatively impact the areas with habitat previously suitable for Quino. At the RCA-owned Bautista Canyon property, the Winchester 700 Anza property, and the Anza Knolls property, the Reserve Management Unit has taken an active role in managing the re-establishment of native forbs (including seeding at Bautista Canyon) to ensure this Quino habitat persists post-fire (Figure 1).

Conservation and Management: Stinknet (*Oncosiphon pilulifer*) was detected in the Warm Springs Creek Core Area, including the Anheuser-Busch RCA property near the overcrossing (*Esperanza Sandoval and Tara Grahm, personal observation;* Figure 1). In the Sage Core Area, non-native grass and other invasive plant species have been detected in Quino habitat. We recommend encroaching non-native grasses and herbs to be removed from the Warm Springs Creek and Sage Core Area.

Core Area Definitions and Species Objectives: We recommend adding SBNF to the MSHCP Core Areas designation for this species since it has been detected here 12 out of 17 survey seasons, including in 2024 (Appendix B). In the Oak Mountain Core Area, we recommend acquiring land 315 m west of the Quino-occupied sentinel site. It is not currently in conservation, but it is described as conservation by the MSHCP. The RCA has reached out to landowners whose lands support high quality Quino habitat to discuss possible acquisition(s).

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Appendix A. Butterfly and Moth Species, Listed by Family, Observed During the 2024 Quino Survey Effort.

Swallowtails (Papilionidae)
- Western Tiger Swallowtail (*Papilio rutulus*)
- Pale Swallowtail (*Papilio eurymedon*)
- Unidentified Swallowtail (*Papilio* spp.)

Whites and Sulphurs (Pieridae)
- Checkered White (*Pontia protodice*)
- Cabbage White (*Pieris rapae*)
- Spring White (*Pieris sisymbrii*)
- Unidentified White **(***Pontia* spp**.)**
- Orange Sulphur (*Colias eurytheme*)
- Harford's Sulphur (*Colias harfordii*)
- Dainty Sulphur (*Nathalis iole*)
- Unidentified Orangetip (*Anthocharis* spp.)
- Desert Orangetip (*Anthocharis cethura*)
- Sara Orangetip (*Anthocharis sara*)
- Sleepy Orange (*Abaeis nicippe*)

Coopers, Hairstreaks, & Blues (Lycaenidae)
- Gray Hairstreak (*Strymon melinus*)
- California Hairstreak (*Satyrium californica*)
- Hedgerow Hairstreak (*Satyrium saepium*)
- Mountain Mahogany Hairstreak (*Satyrium tetra*)
- Brown Elfin (*Callophrys augustinus*)
- Perplexing Hairstreak (*Callophrys perplexa*)
- Silvery Blue (*Glaucopsyche lygdamus*)
- Marine Blue (*Leptotes marina*)
- Acmon Blue (*Plebejus acmon*)
- Echo Azure (*Calastrina echo*)
- Melissa Blue (*Plebejus melissa*)
- Unidentified Blue Butterfly

Metalmarks (Riodinidae)
- Behr's Metalmark (*Apodemia virgulti*)

Brushfoots (Nymphalidae)
- Gulf Fritillary (*Agraulis venillae*)
- Mylitta Crescent (*Phyciodes mylitta*)
- Gabb's Checkerspot Butterfly (*Chlosyne gabbii*)
- Chalcedon Checkerspot (*Euphydryas chalcedona chalcedona*)
- Quino Checkerspot (*Euphrydryas editha quino*)
- Unidentified Checkerspot (*Euphydryas* spp.)
- Satyr Comma (*Polygonia satyrus*)
- Painted Lady (*Vanessa cardui*)
- Unidentified Lady Butterfly (*Vanessa* spp.)
- Common Buckeye (*Junonia coenia*)
- Lorquin's Admiral (*Limenitis lorquini*)
- California Sister (*Adelpha bredowii*)
- Queen (*Danaus gilippus*)

Skippers (Hesperiidae)
- Funereal Duskywing (*Erynnis funeralis*)
- Mournful Duskywing (*Erynnis tristis*)
- Sleepy Duskywing (*Erynnis brizo*)
- Unidentified Duskywing (*Erynnis* spp.)
- White Checkered-Skipper *(Pyrgus albescens)*
- Juba Skipper (*Hesperia juba*)
- Unidentified Skipper

Night Moths (Noctuidae)
- Looper Moth (Plusiinae)
- Forester Moth (*Alypia* spp.)
- Unidentified Night Moths

Erebid Moths (Erebidae)
- Unidentified Erebid Moth

Saturniids (Saturniidae)
- Electra Buckmoth (*Hemileuca electra*)

Sphynx Moths (Sphingidae)
- Unidentified Sphynx Moth

Geometer Moths (Geometridae)
- Emerald Moth (*Synchlora* spp.)

Appendix B. Quino Presence or Absence During Surveys in Core Areas, Satellite Occurrence Complex Areas, Additional Location Surveyed, and Annual Water Year (01 October to 30 September) Totals (cm) from 2008-2024. Note: Y= Quino presence, N = Quino absence, n/s = not surveyed.

Survey Year	Core Areas							Satellite Occurrence Complex Areas (Non-Core Area)			Additional Location Surveyed	Water Year Annual Precipitation (cm) *
	Lake Mathews /Estelle/ Harford Springs	Warm Springs Creek	Johnson Ranch/ Lake Skinner	Oak Mountain	Wilson Valley	Sage	Silverado/ Tule Peak	Cactus Valley	Anza Valley	Aguanga	San Bernardino National Forest	
2008	n/s	N	Y	Y	Y	Y	Y	N	n/s	N	Y	7.37
2009	n/s	N	Y	Y	N	N	Y	N	n/s	n/s	N	10.31
2010	N*	N	Y	Y	Y	Y	Y	Y	n/s	n/s	Y	27.53
2011	N*	N	Y	Y	Y	N	Y	N	n/s	n/s	Y	31.12
2012	N	N	Y	Y	N	N	Y	N	n/s	n/s	Y	13.11
2013	n/s	N	Y	Y	Y	Y	Y	N	N	n/s	Y	10.95
2014	n/s	N	N	Y	N	N	Y	n/s	n/s	n/s	N	7.82
2015	n/s	N	Y	Y	N	Y	Y	n/s	n/s	n/s	Y	24.31
2016	n/s	N	Y	Y	N	N	Y	n/s	n/s	n/s	Y	13.85
2017	n/s	N	Y	Y	N	Y	Y	N	n/s	n/s	Y	34.85
2018	n/s	N	Y	Y	N	Y	Y	Y	n/s	n/s	N	10.8
2019	n/s	N	Y	Y	N	N	Y	N	n/s	n/s	Y	33.35
2020	N	N	Y	Y	N	N	Y	N	n/s	N	Y	27.33
2021	n/s	N	Y	Y	N	N	N	N	n/s	N	N	11.53
2022	n/s	N	Y	Y	N	N	Y	Y	n/s	N	Y	12.73
2023	n/s	N	Y	Y	N	N	Y	N	n/s	N	N	39.8
2024	n/s	N	Y	Y	N	N	N	N	n/s	N	Y	31.24

*Annual Water Year Totals (cm) were calculated from the Riverside Area (National Weather Service 2025).