Western Riverside County
Multiple Species Habitat Conservation Plan (MSHCP)
Biological Monitoring Program

Quino Checkerspot Butterfly (*Euphydryas editha quino*) Survey Report 2006

Photo by Angela Hyder – Oak Mountain 2006

April 23, 2007

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NOTE TO READER:

This report is an account of survey activities undertaken by the Biological Monitoring Program for the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). The MSHCP was permitted in June 2004. The Biological Monitoring Program monitors the distribution and status of the 146 covered species 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 Game and the U.S. Fish and Wildlife Service). Monitoring Program activities are guided by the MSHCP species objectives for each covered species, the information needs identified in MSHCP Section 5.3 or elsewhere in the document, and the information needs of the Permittees.

While we have made every effort to accurately represent our data and results, it should be recognized that our database is still under development. Any reader wishing to make further use of the information or data provided in this report should contact the Monitoring Program to ensure that they have access to the best available or most current data.

The primary preparers of this report were Project Lead Angela Hyder and Lead Biologist Adam Malisch. If there are any questions about the information provided in this report, please contact the Monitoring Program Administrator. If you have questions about the MSHCP, please contact the Executive Director of the Western Riverside County Regional Conservation Authority (RCA). For further information on the MSHCP and the RCA, go to www.wrc-rca.org.

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INTRODUCTION

The Quino checkerspot butterfly (*Euphydryas editha quino*; "QCB") is federally listed as endangered and is narrowly distributed at relatively few locations within the MSHCP Plan Area. Seven Core Areas for QCB are identified in the MSHCP and Species Objective 4 for QCB states that "within the MSHCP Conservation Area, Reserve Managers will document the distribution of Quino checkerspot on an annual basis" (Dudek & Associates 2003).

The Monitoring Program began testing a protocol in 2005 to determine the distribution of Quino Checkerspot across the Conservation Area. The protocol was refined and expanded for the 2006 survey season based on the 2005 results. Several survey goals in addition to those specified in the species objectives have been included in the study. The goals of the Quino Checkerspot study are as follows:

Survey Goals

A) Document QCB distribution across the Conservation Area.
B) Refine the 2005 protocol for sampling the distribution of adult QCB within the Conservation Area.
C) Calculate the detectability of adult QCB during flight season and estimate the percentage of surveyed sites that are occupied using repeat visits to plots and analyzing the Proportion of Area Occupied (MacKenzie et al. 2002).
D) Provide data regarding QCB resource selection, important distribution covariates, and important observation covariates.

METHODS

Protocol Development

The protocol used for surveys in 2006 was developed in 2005, and was modified from the USFWS *Quino Checkerspot Butterfly Survey Protocol* dated February 2002. Protocol adjustments were made to specifically address the above survey goals, rather than focusing on the USFWS's goal of providing a credible method for determining QCB presence-absence at a given site (Appendix B). The main adjustments involved resurveying plots with the explicit goal of determining adult QCB detectability across the Conservation Area and collecting additional plot-specific habitat information (e.g., presence of cryptogamic soil crusts, abundance of suitable food plants).

In order to expand the Monitoring Program's QCB survey effort in 2006, we increased the sample size of plots surveyed from 18 to 38. We hoped the expanded study would allow for a more thorough statistical analysis of QCB habitat affinities and environmental covariates of detection. Furthermore, we planned to revise the preliminary QCB detection probabilities and plot occupancy percentages calculated from data collected in 2005 based on the 2006 dataset. With enough data, both observation-level environmental condition data (e.g., temperature during survey) and site-level plot habitat data (e.g., abundance of nectaring plants) can be directly

incorporated into detection probability and plot occupancy analyses using programs such as MARK (White and Burnham 1999) or PRESENCE (MacKenzie et al. 2002).

To optimize the timing of surveys in 2006, we established "sentinel sites" at four locations across the Conservation Area known to support populations of QCB. Sentinel sites were established and monitored at the Southwestern Riverside County Multi-Species Reserve (Lake Skinner; "MSR"), Oak Mountain, Wilson Valley, and Silverado Ranch. When spring conditions began to develop, a Monitoring Program biologist visited each site once per week to monitor the status of QCB at that site. To minimize observer impacts and reduce redundancy, Monitoring Program biologists did not revisit sites when it was known that observers from partnering agencies [e.g., U.S. Fish and Wildlife Service (USFWS)] had already visited a sentinel site in a given week. Observers recorded host plants, available nectar resources, number of QCB adults and larvae seen, co-occurring butterflies, start and end time, and weather during each visit (Appendix A). We did not begin surveys in a given Core Area until we observed QCB adults flying at the closest sentinel site. We visited the sentinel sites until no QCB were observed flying in consecutive weeks.

In 2006, we revised the survey plot selection procedure developed in 2005, which excluded plots containing 100% chaparral vegetation and plots with slopes ≥ 40%. The revised plot selection procedure is described below. We surveyed all plots (n = 38) three times in 2006. The same habitat and environmental covariate data collected in 2005 was collected in 2006, and we added some basic measurements taken at QCB observation locations. For example, we recorded the temperature each time an adult QCB was observed to better describe the range of appropriate QCB survey temperatures.

Personnel and Training

All field observers studied pinned specimens, videotape of live QCB and co-occurring butterfly species, and relevant butterfly field guides before conducting surveys. Observers were also trained to identify QCB and important QCB habitat characteristics including host plants in the field by Dr. Gordon Pratt, an independent consultant and Quino specialist, Dr. Alison Anderson of the USFWS, and Monitoring Program staff Adam Malisch, Angela Hyder, and Karin Cleary-Rose. All field surveyors passed the USFWS Quino Checkerspot Butterfly practical exam before participating in field surveys. Surveyors conducting QCB surveys in 2006 included:

- Adam Malisch, Lead Biologist (Regional Conservation Authority)
- Angela Hyder, Project Lead (Regional Conservation Authority)
- Ryann Loomis (Regional Conservation Authority)
- Rosina Gallego (Regional Conservation Authority)
- Ricardo Escobar III (California Department of Fish and Game)

Study Site Selection

Potential study sites were chosen using GIS layers of USFWS-designated critical habitat for QCB, habitat predicted to be suitable for QCB by Alison Anderson, and lands accessible to

the Monitoring Program in 2006. Five of the 7 QCB Core Areas defined by the MSHCP were surveyed in 2006 (Figure 1). The 2 western-most Core Areas were excluded in 2006 due to access restrictions and a desire to concentrate immediate efforts in areas with recent Quino observations. The 2006 study sites were located in the following Core Areas: Johnson Ranch/Lake Skinner, Oak Mountain, Wilson Valley, Sage, and Silverado/Tule Peak. The Lake Mathews/Estelle Mountain/Harford Springs Core Area was not surveyed in 2006 because there are no recent historic QCB observations in the area. New observer training exercises carried out at Harford Springs Park in 2006 did not result in any QCB observations. This area will be periodically revisited in the future, as long as suitable habitat remains. The Warm Springs Creek Core Area was not surveyed by the Monitoring Program in 2006 due to access restrictions. No QCB were found there during surveys in 2005, but it should also be revisited in the future, pending access. We added study sites this year in the Johnson Ranch/Lake Skinner, and Wilson Valley Core Areas.

Survey Plot Locations

Thirty-eight independent survey plots were selected within the study sites described above. We randomly placed plots within areas either known to support or suspected to support QCB populations, with exceptions due to highly inappropriate habitat, extremely dense vegetation, or very steep slopes.

We first used the most current vegetation map for western Riverside County (CDFG et al. 2005) to exclude obviously inappropriate vegetation types (e.g., urban, open water). We then sought to exclude plots that were primarily covered by dense vegetation of any type because QCB is known to prefer more open habitats (USFWS 2003). Thus, we excluded plots that were dominated by the two highest density categories of any vegetation type (i.e., more than half the plot had greater than 40% cover). Finally, we excluded plots with slopes $\geq$ 40% on any part of the plot, or dominated by slopes $\geq$ 30% because of surveyor safety concerns and because it is not believed that QCB occupy these steep slopes.

Excluded plots were reselected using the following decision rules:

A) One of the 8 adjacent plots (N, NE, E, SE, S, SW, W, NW) was randomly selected to replace the original plot.
B) If none of the 8 adjacent plots were feasible to survey, a new plot was randomly chosen.

After the selection procedures described above were used to identify survey plot locations, the plots (200m x 200m = 4ha) were marked with a wooden stake at each corner. Plots were established and surveyed at the following locations in 2006: 2 in Kabian Park, 1 east of Lake Elsinore, 2 on Oak Mountain, 6 at the MSR, 1 near Mica Butte/Brown Canyon, 2 in the Magee Hills/Sage, 2 off Wilson Valley Road, 2 near Temecula Creek off Highway 371, 1 at Rocky Ridge, 4 near Tule Creek, 3 near Tule Canyon, 6 at Silverado Ranch, 4 just east of Iron Spring Mountain, and 3 at Pine Meadow/Lookout Mountain (Figure 1).

Survey Methods

We conducted 114 QCB surveys at 38 survey plots between 15 March and 23 May 2006. All survey plots were surveyed 3 times to establish a plot-by-plot detection history, as required by the Proportion of Area Occupied study design outlined in MacKenzie et al. 2002 and MacKenzie and Royle 2005 (Table 1). One survey plot at Temecula Creek was excluded for inappropriate habitat after surveying it the first time, and is not included in the above plot number.

We conducted time-constrained visual encounter surveys within plots during appropriate weather conditions, covering an average of 2 – 4 hectares per hour. Observers walked 10 parallel transects during a 90-minute survey of each plot. The established USFWS protocol dictates that surveys be conducted between 1000 hrs and 1400 hrs, to provide some standardization for environmental conditions under which surveys are conducted; however some QCB surveys in 2006 extended beyond this time range. The primary determinants of QCB activity are likely to be environmental factors (temperature, cloud cover, etc.) and the appropriate ranges of these conditions during which to conduct surveys are not satisfactorily understood. The only way to gain further insight into the complete range of environmental conditions under which QCB can be observed is to expand the range of survey conditions. The coordinates of all adult QCB and larvae observed during the survey were recorded with a GPS unit. QCB incidentally detected between surveys were also recorded but were not included in the detectability analysis. Survey methods are more completely described in the *Western Riverside County MSHCP Biological Monitoring Program Protocol for Quino Checkerspot Butterfly Surveys* dated March 2005 (Appendix B).

The same habitat and environmental covariate data collected in 2005 were collected in 2006, but we also recorded the temperature each time an adult QCB was observed (Appendix C). Data collected at the start of a survey included: date, observer, time, and general weather description, temperature in shade at 1m above ground, average wind speed, and cloud cover. Surveyors noted co-occurring butterfly species encountered as the survey progressed. Data collected at the end of a survey included: time, general weather description, temperature in shade at 1m above ground, average wind speed, and cloud cover. The abundance categories of individual host plants and nectar plants as a group within plots were recorded, along with the percent cover category of bare ground, forbs, shrubs, and non-native grasses within plots. The presence of any threat species (e.g., non-native grasses) and the presence of cryptogamic soil crusts on plots were also recorded.

Vegetation Sampling

To supplement the rough vegetation characterization recorded by observers during QCB plot surveys, we sampled the vegetation at a minimum of 4 locations within each of the 38 QCB survey plots, and at all 4 sentinel sites (Appendix D). The vegetation sampling was designed to compare the vegetation in areas with QCB observations to areas without QCB observations.

We sampled vegetation inside QCB survey plots using 100 m^2 quadrats and 4 m^2 quadrats (Appendices E and F). In the 100 m^2 quadrats, the identity and percent cover of all

species occupying greater than 1% of the quadrat was documented. In the 4 m^2 quadrats, the percent cover of all plant species observed was recorded. Because the 4 m^2 quadrats required a greater effort and the utility of these data was unknown, we decided to restrict the number of plots with 4 m^2 quadrats. We documented the vegetation within 4 m^2 quadrats at all plots with QCB observations in 2006, up to a maximum of 10 plots, and at 10 additional randomly selected plots without QCB observations in 2006. At occupied plots, 4 m^2 quadrats nested within 100 m^2 quadrats were centered on QCB observation points, up to a maximum of four per plot, and four-4 m^2 quadrats were nested within each of the four randomly placed 100 m^2 quadrats (Appendix D).

We also sampled the vegetation at sentinel sites, again by centering four-4 m^2 quadrats on QCB observation points and additionally sampling the vegetation within 100 m^2 quadrats surrounding the 4 m^2 quadrats.

Data Analysis

Unfortunately, because of extremely small sample sizes, traditional statistical analyses were not possible for QCB data in 2006. A summary of results and a discussion of potential implications are presented below. Raw data are housed in the MSHCP Biological Monitoring Program QCB Monitoring Access database.

RESULTS

We recorded a total of 90 adult QCB observations in 2006, including focused surveys, sentinel site monitoring, and incidental observations during survey activities for other species (Figure 1). Two adult QCB were observed at 2 individual survey plots during field surveys in 2006 (Table 1). One occupied plot was in the Magee Hills, and the other occupied plot was at Silverado Ranch. No QCB were observed at the remaining 36 survey plots. An additional 83 QCB were observed at sentinel sites in 2006 (Table 2), and there were incidental observations of 5 QCB at Horse Creek, a location previously unknown to support QCB. Twenty-five co-occurring butterfly species were also observed during surveys in 2006.

Of the 2 QCB observed during surveys in 2006, 1 was hill-topping at Silverado Ranch, and the other was flushed out of a *Plantago sp.* patch in the Magee Hills. All QCB observations in 2006 occurred between 0945 and 1500 hrs. QCB were seen as late as 1500 hrs at sentinel sites, and the average time QCB was seen during surveys was 1032 hrs. The detection probability for adult QCB at plots surveyed in 2006 can not be accurately determined because only 2 QCB were detected.

Of the 38 plots surveyed in 2006, 6 were occupied by QCB within the last 2 years (4 plots in 2005 and 2 plots in 2006). Previous research has shown that cryptogamic soil crusts may be a useful indicator of suitable habitat for QCB and that exotic vegetation such as wild mustard (*Brassica spp.*, *Hirshfeldia sp.*), *Erodium spp.*, and non-native grasses may reduce the quality of QCB habitat (*Quino Checkerspot Butterfly (Euphydryas editha quino) Survey Report 2005*; USFWS 2003). Cryptogamic soil crusts were noted during 2006 surveys at 4 of the recently occupied plots (67%) and at 25 of the other 36 plots (66%). Wild mustard., *Erodium spp.*, and

non-native grasses were present on most plots during surveys. Wild mustard was found on 5 recently occupied plots (83%) and on 33 out of 36 survey plots without QCB detections (91%). *Erodium* was found on all recently occupied plots and on 34 of 36 plots without detections (94%). Non-native grasses were also found on all recently occupied plots and on 33 out of 36 plots without detections (91%).

Host plants were recorded at 26 survey plots (68%) by surveyors in 2006. All 6 plots that were occupied by QCB within the past 2 years had at least one host plant species present in 2006, and 5 out of 6 (83%) recently occupied plots had more than one host plant species (Table 3).

Sentinel Site Visits

At the sentinel sites in 2006, we observed QCB as early as 8 March and as late as 12 May (Table 2). The flight season lasted 5 weeks at all sites except Oak Mountain which had an active adult QCB population from 8 March until 11 May. Eighty-three adult QCB were observed during sentinel site monitoring in 2006. QCB were most abundant at Oak Mountain (42 individuals observed) and least abundant at Wilson Valley (2 individuals observed). The only larva observed by Monitoring Biologists during surveys in 2006 was seen at the Multi-Species Reserve sentinel site on 9 March.

Vegetation Surveys

We conducted vegetation surveys on all 38 QCB survey plots and at all 4 sentinel sites, for a total of 42 vegetation survey locations. In addition to the 6 plots occupied by QCB within the last 2 years, all 4 sentinel sites were occupied in 2006. Therefore, 10 locations out of the 42 sites with vegetation surveys were recently occupied by QCB.

At least 1 species of host plant was present at 6 of the 10 (60%) recently occupied locations, while just 2 out of 32 (6%) plots without QCB detections within the last two years had host plants during vegetation surveys (Table 4). *Plantago erecta*, *Castilleja exserta*, and *Antirrhinum coulterianum* were all present at recently occupied locations and not recorded on any other plots during vegetation surveys.

Suitable nectar resources for QCB (USFWS 2003) were found on 9 of the 10 recently occupied sites (90%), and 21 of 32 sites without detections (66%). The nectar resources found were: *Amsinkia intermedia*, *Amsinkia menzizii*, *Cryptantha intermedia*, *Dichelostemma pulchellum*, *Eriodictyon crassifolium*, *Gilia angelensis*, *Lasthenia californica*, *Lasthenia gracilis*, *Muilla maritina*, *Plagiobothrys arizonicas*, *Plagiobothrys collinus*, *Plagiobothrys conescens,* and *Salvia columbariae*.

The absence of *Eriogonum fasciculatum* is believed to be an indicator of poor quality or inappropriate habitat for QCB (USFWS 2003). *Eriogonum fasciculatum* was found on 10 (100%) of the 10 recently occupied sites, and 15 (47%) of the 32 sites without detections. Invasive oats, grasses, and mustard species were found on all occupied sites, and 26 (81%) of the 32 sites without detections.

Additional plant species that frequently co-occur with QCB and its host plants include: *Astragalus douglasii*, *Ceanothus cuneatus*, *Cercocarpus betuloides*, *Filago gallica*, *Festuca myuros*, *Lessingia glandulifora*, *Lotus scoparius*, *Lotus strigosus*, and *Rhamnus ilicifolia* (USFWS 2003). At least 1 of these species was found on all of the recently occupied sites, but just 14 of the 32 sites without detections (44%) had them.

DISCUSSION

The second year of QCB monitoring by the Biological Monitoring Program was expected to produce data that could be directly incorporated into detection probability and plot occupancy analyses using programs such as MARK or PRESENCE. However, with just 2 QCB detected during surveys this year, not enough data was collected to use these programs validly. Even though we surveyed 20 more plots this year, fewer QCB were detected during surveys. A potential factor causing low detection rates could have been the drier weather in 2006 compared to 2005. However, 83 QCB were detected at sentinel sites, showing that QCB were relatively abundant, at least in high quality habitat. The plot occupancy percentage for QCB in 2006 was only 5%, compared to last year's 34%.

The 11-week flight season at the Oak Mountain sentinel site was surprisingly long. QCB were seen at Oak Mountain 2 weeks before they were seen at the MSR to the west, and were last seen just one day before the last QCB were seen at Silverado Ranch to the east. Potential explanations for this include different weather patterns in the different areas, large patches of host plants at Oak Mountain, or elevation differences across sites.

The incidental observations of 5 QCB at Horse Creek were noteworthy because this location was previously unknown to support QCB, according to all data available to the Monitoring Program. Active adult QCB populations have been recently documented in relatively nearby areas of Bautista canyon. We will continue to monitor the Horse Creek population in the future.

Habitat data collected from recently occupied plots and from plots without detections indicated that host plants are important components of suitable QCB habitat, but that the presence of host plants in an area does not assure that QCB will also be present. Data collected both by observers during surveys and by vegetation sampling crews supported these conclusions. Of further interest is that 3 recently (2005) occupied plots around Silverado Ranch did not have *Plantago sp.* on them, which are typically recognized as the most common QCB host plants (USFWS 2003). Two of these plots had *Antirrhinum coulterianum* and *Collinsia concolor*,

while one had just *Collinsia*.

The importance of nectar resources, *Eriogonum fasciculatum*, and the additional plant species listed above that frequently co-occur with QCB was supported, as 90% of recently occupied sites had suitable nectar resources, and all recently occupied sites contained a combination of *Eriogonum* and some of the additional plant species. In comparison, nectar resources were found on 2/3 of plots without detections and more than 1/2 of plots without detections did not have *Eriogonum* or any of the other species typically co-occurring with QCB.

There was no evidence of benefits from cryptogamic soil crusts, or detriments due to the presence of exotic species on survey plots in 2006. These habitat attributes were present in roughly the same percentages on recently occupied plots and plots without detections. It is likely that although the presence of exotic species may detract from QCB habitat suitability, their presence does not preclude QCB from occupying a given area.

Because of the low sample size of QCB detected in 2006, and preliminary nature of survey and vegetation sampling protocols, the analysis and conclusions discussed herein should be taken primarily as indicators of patterns to monitor in the future and not as conclusive evidence of real relationships.

Recommendations for Future Surveys

QCB detectability on survey plots in 2006 was low, while detectability at areas known to support QCB remained high. It is recommended that additional surveys targeting high quality habitat be conducted in 2007 to supplement the typical plot surveys. These "targeted" surveys would primarily serve to increase the number of known locations in a survey season but would not provide the same detectability estimates and standardized search methods among observers that the typical plot surveys afford. Targeted surveys would focus efforts in historically occupied areas, and areas with high quality QCB habitat. Appropriateness of habitat should be evaluated in the field using the best available knowledge, and surveyors should feel free to "high-grade" their efforts in order to attempt to visit the best habitat available.

An abundance category should be added to the invasive species section of the QCB survey datasheet to differentiate between localized patches of exotics and widespread infestations. The possibility of mapping patches of *Plantago sp.* or other host plants in occupied plots should also be considered. The time of day at which survey plots are visited should be taken into consideration, and the visitation times to each plot should vary within the optimal QCB observation window if possible. Observation time and behavior should also be recorded for QCB that are seen at the sentinel sites.

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Table 1. Quino Checkerspot Butterfly survey data in 2006. Values in cells indicate the number of adult Quino observed during a given survey, underscores indicate no survey.

		Date																																
Site Name	Plot Number	3/15	3/16	3/17	3/22	3/23	3/24	3/29	3/30	4/3	4/6	4/7	4/11	4/12	4/13	4/14	4/17	4/19	4/20	4/21	4/24	4/25	4/28	5/2	5/3	5/4	5/5	5/9	5/10	5/11	5/15	5/16	5/17	5/19	5/23
Elsinore	14	_	_	0	_	_	0	_	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Kabian Park	50	_	0	_	_	_	0	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Kabian Park	53	_	0	_	_	_	0	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
MSR	204	_	_	_	_	_	_	_	0	_	_	_	_	0	_	_	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
MSR	230	_	_	_	0	_	_	_	0	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
MSR	308	_	_	_	0	_	_	0	_	_	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
MSR	342	_	_	_	0	_	_	0	_	_	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
MSR	437	_	_	_	_	0	_	_	0	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
MSR	443	_	_	_	0	_	_	0	_	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Highway 371	9553	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	0	_	0	_	_	_	_	_	_	_	_	_	_	_
Highway 371	9697	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	0	_	_	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_
Mica Butte	5548	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	0	_	_	_	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_
Oak Mountain	490	0	_	_	_	_	0	_	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Oak Mountain	8396	0	_	_	_	_	0	_	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Tule Creek	705	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	0	0	_	_	_	_	_	_	_	_	_	_	_
Tule Creek	721	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	0	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_
Temecula Creek	604	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	0	_	0	_	_	_	_	_	_	_	_	_	_	_
Magee Hills	530	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	0	_	_	_	1	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Magee Hills	7266	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	0	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Rocky Ridge	578	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	0	_	_	_	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_
Wilson Valley Rd	622	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	0	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Wilson Valley Rd	626	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	0	_	_	0	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Pine Meadow	998	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	0	_	0	_	_	_	_
Pine Meadow	1009	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	0	_	0	_	_	_	_
Pine Meadow	1088	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	0	_	0
Tule Canyon	955	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	0	_	0
Tule Canyon	977	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	_	_	0	_	_	0	_	_	_	_	0	_	_
Tule Canyon	1036	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	0	_	0
Iron Springs	909	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	_	_	0	_	_	_	_	_	0	_	_	0	_
Iron Springs	942	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	_	0	_	_	_	_	_	0	_	0	_	_	_
Iron Springs	11230	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	0	_	_	_	_	0	_	0	_	_	_
Iron Springs	11335	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	0	_	_	_	_	_	0	_	0	_	_	_
Silverado	8961	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	_	0	_	_	_	_	0	_	0	_	_	_	_
Silverado	845	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	0	_	_	_	_	_	_	0	_	1	_	_	_
Silverado	8779	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	_	_	0	_	0	_	_	_	_	_	_	_
Silverado	8836	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	_	0	_	0	_	_	_	_
Silverado	8879	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	0	_	_	_	_	_	0	_
Silverado	8980	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	0	_	0	_	_	_	_	_	0	_

Table 2. Quino Checkerspot butterfly sentinel site survey results in 2006.

Sentinel Site Location	Date of First Observation	Date of Last Observation	Flight Season Duration	Total QCB Observed
Multi-Species Reserve	3/23/2006	4/20/2006	5 weeks	18
Oak Mountain	3/8/2006	5/11/2006	11 weeks	42
Wilson Valley	4/7/2006	5/5/2006	5 weeks	2
Silverado Ranch	4/8/2006	5/12/2006	5 weeks	21
				Grand Total = 83

Table 3. Quino Checkerspot butterfly host plant abundances during surveys in 2006. If different host plant abundances were recorded during different surveys (each plot was surveyed on three separate dates), the highest abundance is represented here.

	Host Plant Species				
Plot	***Plantago erecta***	***Plantago patigonica***	***Castilleja exserta***	***Antirrhinum coulterianum***	***Collinsia concolor***
***845		U	C		U
8836			U	Sc	Sc
*8961		Sc	Sc		Sc
***530	U		Sc		
1009		Sc	Sc		
1088		C	Sc		
7266	Sc		U		
*8879				U	Sc
*8980				Sc	U
14	U				
50		U			
53	U				
204	U				
230	Sc				
342	Sc				
578	Sc				
604	Sc				
622	Sc				
705					Sc
977	S		Sc		
998		C			
5548	Sc				
*8779					Sc
9553	Sc				
9697					Sc
11335			S		

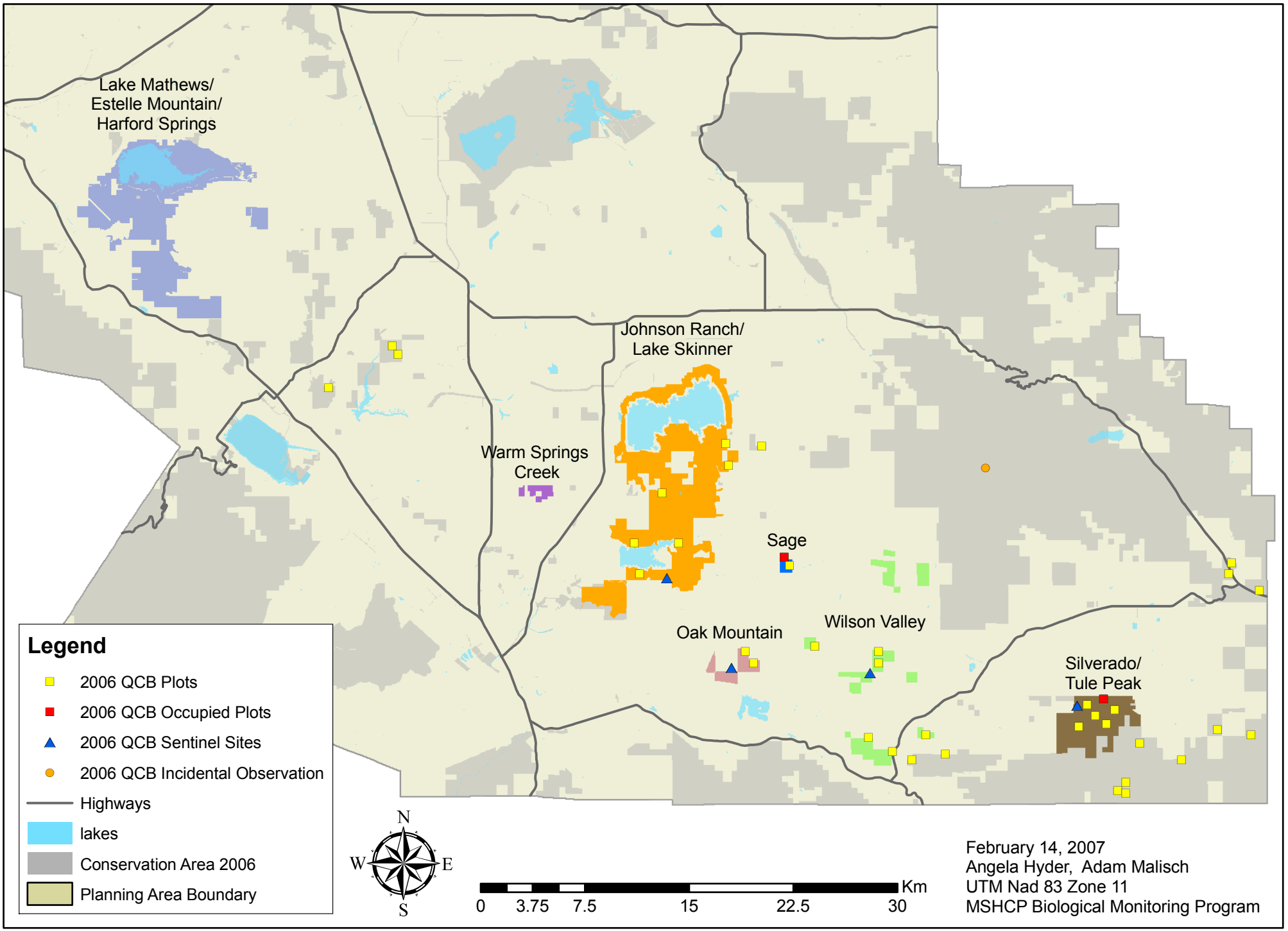
Plots with one host plant
Plots with two host plants
Plots with three host plants
* Plots with QCB detections in 2005
*** Plots with QCB detections in 2006

S-Solitary, Sc-Scarce, U-Uncommon, C-Common

Table 4. Host plants recorded during vegetation surveys in 2006. Recently occupied locations are survey plots or sentinel sites with QCB observations within the last 2 years.

Host Plants	Recently occupied locations (n = 10)	Non-detection plots (n = 32)
Plantago erecta	3 (30%)	0
Plantago patagonica	1 (10%)	2 (6%)
Castilleja exserta	2 (20%)	0
Antirrhinum coulterianum	3 (30%)	0
Collinsia concolor	0	0
Any host plant	6 (60%)	2 (6%)
>1 host plant	2 (20%)	0

Figure 1: Quino Checkerspot Butterfly Survey Plots, Occupied Plots, Sentinel Sites, and Incidental Observations in 2006



Appendix A:

Quino Checkerspot Butterfly Sentinel Site Survey

Date:_____ Site:_____ Monitor and Trainees:_____

Arrival
Time: _____ Temperature:_____ Average Wind Speed:_____
Weather (circle one): Clear, Partly Cloudy, Cloudy, Raining

Departure
Time: _____ Temperature:_____ Average Wind Speed:_____
Weather (circle one): Clear, Partly Cloudy, Cloudy, Raining

Adult Quino Seen (tally how many):_____
Quino Larvae Seen (tally how many):_____
Cryptogamic Crusts (circle one): Y N
Host Plants Seen (circle all that apply):
Plantago erecta, P. patagonica, Castilleja exserta, Antirrhinum coulterianum, Cordylanthus rigidus, Collinsia concolor

Butterflies Detected:	**Nectar Resources Seen Blooming:**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Other Notes: _____
_____
_____
_____

Appendix B:

Western Riverside County MSHCP
Biological Monitoring Program Protocol for
Quino Checkerspot Butterfly Surveys
2006

Goal: Document the distribution of Quino Checkerspot Butterfly (QCB) in the Conservation Area. Provide data regarding QCB resource selection, important distribution covariates, and detectability.

Objectives: To achieve the above goal(s), surveys will be conducted annually in non-excluded areas on randomized plots within the Conservation Area within the range of the species. This protocol is based on the U.S. Fish and Wildlife Service's Quino Checkerspot Butterfly Survey Protocol dated February 2002. Although they are to be recorded if detected, focused surveys for larvae will not be conducted using this protocol.

Timing: Surveys for adult Quino checkerspot butterflies will be conducted annually for approximately five weeks during the flight season, generally from February through March. The beginning of the survey season will be established by biologists from the U.S. Fish and Wildlife Service (USFWS).

Survey Locations: Surveys will be conducted on accessible lands in non-excluded habitat within the portion of the Conservation Area in the range of the species. Accessible lands will be identified by the Lead Field Coordinator prior to surveys. In 2005, we will survey 2 non-randomly selected plots in Hartford Springs Park, 2 non-randomly selected plots west of Highway 79, and 40 randomly selected plots in the eastern part of the Western Riverside County MSHCP area.

Methods:

I. Survey plots will be 200m x 200m (four hectares) and will be staked with visible markers at the four corners prior to surveying. Surveys for QCB will only be conducted in established plots.

During plot establishment, an initial Site Assessment will be conducted to identify excluded areas (areas that are excluded from survey based on habitat characteristics). Survey plots must contain a total aggregate of <5% excluded areas in order to be established. If a plot has >5% excluded areas within it, the plot will be relocated to a randomly chosen adjacent plot of equal size, using a pre-determined plot-relocation order.

The following areas are to be excluded:

- Orchards, developed areas, or small in-fill parcels (plots smaller than an acre completely surrounded by urban development) largely dominated by non-native vegetation;
- Active/in-use agricultural fields without inclusions of native vegetation (*i.e.*, fields completely without fallow sections, unplowed areas, and/or rock outcrops);
- Closed-canopy woodland or riparian areas, dense chaparral, and small openings (less than an acre) completely enclosed within dense chaparral; "Closed-canopy" describes vegetation in which the upper portions of the trees or shrubs converge (overlap) to the extent that the open space between two or more plants is not significantly different than the open space within a single plant. Dense chaparral is defined here as vegetation so thick that it is inaccessible to humans except by destruction of woody vegetation for at least 10m.
- Areas completely covered (>95%) by non-native weedy vegetation.

II. Surveying for adult Quino checkerspot butterflies

Surveyors must be able to identify spring-flying butterflies in the Plan Area and have demonstrated that ability by passing the Quino checkerspot butterfly exam given by the USFWS before conducting surveys. Refer to the Field Training Manual for instructions.

Surveys are to be conducted on all established plots regardless of QCB host plant presence, absence, and/or density. The survey period is from 10:00a.m. to 2:00p.m., but surveys cannot be done:

- **during periods of fog, drizzle, or rain;**
- **sustained winds greater than 15 miles (24 kilometers) per hour measured 4-6 feet (1.2-1.8 meters) above ground level;**
- **temperature in the shade at ground level less than 60° F (15.5°C) on a clear, sunny day; or less than 70°F (21°C) on an overcast or cloudy day.**

Each site is to be surveyed once per week (weather permitting) for a minimum of 5 weeks throughout the flight season. All portions of the site should be thoroughly surveyed for butterflies during each weekly survey, even if QCB is observed on an earlier visit.

Equipment:

Handheld GPS Unit
Thermometer
Anemometer
Binoculars
Camera
Butterfly Identification Aids
Data Sheet(s)
Plant Identification Aids
Field plant press
Red flagging

Surveying:

The survey will consist of walking parallel transects within a plot during appropriate weather conditions between 10:00a.m. and 2:00p.m. at a rate of 5-10 acres per hour. A total of 10 transects will be walked during a 90 minute survey of each plot. Transect width (distance between transects, and surveyor search range) should average 20 meters but may vary slightly depending on visibility.

A scheduled weekly survey should only be missed due to adverse weather. If weather conditions preclude scheduled surveys, get direction from the Monitoring Program Coordinator or Quino Crew Leader regarding rescheduling.

Techniques:

Waypoints for the start and end of each transect within the established plot should be entered into the GPS unit prior to beginning a survey. Set your GPS unit(s) on 'track' so your survey route will be recorded. Data will be recorded in the WGS84 datum; all survey areas are in Zone 11S.

As surveys are conducted, pay attention to the vegetation within the plot. Record host plant (plants on which Quino oviposits) species and nectar plant species as they are observed. Also record the status of these plants (*e.g.* vegetative vs. flowering vs. seed heads vs. senesced). Keep in mind that observers will record rough categories of bare ground, percent cover forbs, percent cover shrubs, and percent cover non-native grasses within the plot at the end of the survey. However, the primary objective is detection of Quino checkerspots within the plot, covariate data collection is secondarily important.

Move carefully to minimize trampling or otherwise harming QCB larvae and their host plants. Walk slowly and stop occasionally to look around – surveyors standing still are more likely to see a moving butterfly. Use binoculars to scan the area ahead and around you, and to help identify butterflies from a distance. Pay special attention to areas with a high potential for QCB use, such as patches of host plants or nectar sources, ridgelines and hilltops, bare or sparsely vegetated areas between shrubs, and areas with cryptobiotic soil crusts.

Follow the movements of other butterflies. QCB males are aggressive, can spot other butterflies from a distance, and will chase them. Resting butterflies can be very difficult to see until another butterfly flies by and they give chase.

When approaching a butterfly for identification purposes, drop a red flag at the transect departure point. Move slowly and keep the movement of your hands, arms, legs, and body to a minimum. If the butterfly is first seen in flight, follow from 5-6 feet away until it lands. Do not make sudden movements. If the butterfly is circling, stand still and wait for it to land – if it perceives your movement, it is less likely to stop. After the individual has been confirmed or disconfirmed as a Quino checkerspot, and necessary coordinates and photos have been taken, return to the transect departure point, pick up the flag, and continue with the survey.

The Quino checkerspot is generally associated with sage scrub, open chaparral, grasslands, and vernal pools. Within these communities they are usually observed in open or sparsely vegetated areas (including trails and dirt roads), and on hilltops and ridgelines. QCB host plants include: (*Plantago erecta, P. patagonica, Castilleja exserta, Antirrhinum coulterianum, Cordylanthus rigidus,* and *Collinsia concolor*). QCB requires relatively shallow open flowers for nectaring. Commonly used nectar plants include: members of the Asteraceae family (e.g. *Lasthenia* spp., *Layia* spp., *Ericameria* spp.), *Amsinkia* spp., *Cryptantha* spp., and *Allium* spp. They cannot nectar on flowers with deep or closed corolla tubes, such as monkey flowers or snapdragons.

Recording Data:

Fill in all the blanks in the Quino checkerspot butterfly survey form; use incidental species sighting forms as needed. **There should be one Quino checkerspot butterfly data sheet per every surveyor for each day of survey activities at each locality surveyed.** QCB observations (larvae and/or adult) are to be recorded on the Quino checkerspot butterfly survey form. If there are no observations of QCB on a particular day, then that should be noted on the data sheet.

The locations of all adult QCB and larvae observed should be recorded with a GPS unit, regardless of whether or not they are observed during a survey or on a plot. Incidental QCB observations (those occurring before survey start time, after survey end time, or outside the survey plot) should be recorded on the incidental species sighting form. Take photos if time permits or you want to document the location of the butterfly.

Data collected at the start of a survey include: date, observer, time, general weather description, temperature in shade at 1m above ground, average wind speed, and cloud cover category (0 - 20%, 21 - 40%, 41 - 60%, 61 - 80%, 81 - 100%).

If Quino checkerspots are observed during a plot survey, record the location coordinates and photograph at least one QCB at each new plot where it is detected. If two or more QCB individuals are observed in the same small area (~10m diameter circle) these can be recorded with the same waypoint, taken near the center of the cluster. Record the number of QCB observed on the datasheet.

Also take waypoints and/or photographs of any other MSHCP Covered Species encountered. Record photographs and waypoints of Covered Species on a waypoint – photo record form.

Record co-occurring butterfly species encountered on the butterfly checklist. Counts of co-occurring species are unnecessary. If a butterfly is observed that you know is **not QCB,** do not waste time attempting to identify the species if it isn't immediately apparent – simply record what you know on the space provided on the datasheet (*e.g.* "Unknown White", "Unknown Blue", "Unknown Lady"). Also record the presence of any threat species encountered in the space provided.

Data collected at the end of a survey include: time, general weather description, temperature in shade at 1m above ground, average wind speed, and cloud cover. Record the abundance category

(solitary, scarce, uncommon, common, abundant) of host plants that were noted during the survey (**So**litary = only one individual plant observed during survey; **Sc**arce = very few plants observed, individuals are hard to find when looking; **U**ncommon = scattered plants observed, but individual plants are seen without actively searching for them; **C**ommon = plants are continuously in view without actively searching for them; **A**bundant = unable to walk through area without brushing against or walking on plants). Additional notes may be necessary to describe patchiness of plant distributions (*e.g.* abundant in 25% of plot, uncommon in 75% of plot). Also record the abundance category of all nectar plants together as a composite (*i.e.* group all shallow, open flowers together and determine which abundance category best describes the density of nectar plants on the plot). Record the percent cover category (0%, 1 - 20%, 21 - 40%, 41 - 60%, 61 - 80%, 81 - 100%) of bare ground, forbs, shrubs, and non-native grasses within the plot. Only record dominant vegetation, such that the four categories can potentially sum to 100%. Finally, record the presence of any threat species listed on the datasheet and the presence of cryptogamic soil crusts on the plot.

Appendix C:

__ Data Entered?
__ Data Proofed?

Quino Checkerspot Butterfly Survey Form

page 1of 3

Date:_____ HMU:_____
Observer(s):_____

Site:_____

Start time: _____
Start weather
general description: _____ Plot:_____
Temp: _____^{o}C Avg. wind speed:_____mph Notes:
Cloud cover circle one: (0, 0-20, 21-40, 41-60, 61-80, 81-100%)

End time:_____
End weather
general description: _____
Temp: _____^{o}C Avg. wind speed:_____mph
Cloud cover circle one: (0, 1-20, 21-40, 41-60, 61-80, 81-100%)

Quino checkerspots detected (If none, write "none")

Coordinates	Waypoint	# Observed	Time	Activity/Behavior*	Substrate**	Photo #

*Activities/ Behaviors
Resting - Perched wings closed
Basking - Perched wings open
Flying -
Chasing - Butterfly observed to pursue another butterfly or flying insect
Nectaring - proboscis probing flowers
Ovaposition- Depositing eggs on host plants
Mating-
Larvae- individual caterpillars
Larval Cluster - Many caterpillars together on same plant
** Substrate
Record substrate animal is perched on: plant species, rock, bare ground, litter, manure, other.
If plant species is unknown, record what you do know e.g. Genus, Family, annual perennial, and take a sample for later identification.

Date: _____ Plot: _____

Quino Checkerspot Butterfly Survey Form

Co-occurring butterfly species:
(Check box if present. Number observed is not necessary)

Butterflies Observed		Butterflies Observed	
Swallowtails:		**Brush-footed Butterflies** (cont.):	
Pale Swallowtail (*Papilo eurymedon)*		Mourning Cloak (*Nymphalis antiopa*)	
Anise Swallowtail (*P. zelicaon*)		California Sister (*Adelpha bredowii*)	
West Tiger Swallowtail (*P. Rutulus*)		Satyr Anglewing (*Polygonia satyrus*)	
Whites Oranges:		Lorquin's Admiral (*Basilarchia lorquini*)	
Sara Orangetip (*Anthocaris sara*)		**Blues, Metal Marks, Coppers:**	
Felder's Orangetip (*A. cethura*)		Western Tailed Blue (*Everes amyntula*)	
Cabbage White (*Artogeia rapae)*		Southern Blue (*Glaucopysche lygdamus australis*)	
Sleepy Orange (*Eurema nicippe*)		Echo Blue (*Celastrina ladon echo*)	
Common White (*Pontia protodice*)		Sonoran Blue (*Philotes sonorensis*)	
California Dogface (Zerene eurydice)		Marine Blue (*Leptotes marina*)	
Alfalfa Butterfly (*Colia eurytheme*)		Acmon Blue (*Icaricia acmon*)	
Harford's Sulfur (*C. Harfordi*)		Pygmy Blue (*Brephidium exilis*)	
Brush-footed Butterflies:		Gray Hairstreak (*Strymon melinus*)	
California Ringlet (*Coenonympha californiaca*)		Brown Elfin (*Incisalia augustinus*)	
Monarch (*Danaus plexipus*)		Perplexing Hairstreak (*Callohyrys perplexa*)	
Queen (*D. gilippus)*		Great Purple Hairstreak (*Atlides halesus*)	
Henne's Checkerspot (Euphydryas chalcedona hennei*)*		Behr's Metalmark (*Apodemia moro virgulti*)	
Chalcedon Checkerspot (*E. chalcedona chalcedona*)		Wright's Metalmark (*Calephelis wrightii*)	
Gabb's Checkerspot (*Charidryas gabbi*)		**Skippers:**	
Leanira Checkerspot (*Thessalia leanira wrighti*)		Firery Skipper (*Hylephila phyleus*)	
Mylitta Cresent (*Phyciodes mylitta*)		Funeral Dusky Wing (*Erynnis funeralis*)	
Painted Lady (*Vannessa cardui*)		**Other:**	
West Coast Lady (*V. annabella*)		Unknown Blue	
Virginia Lady (*V. virginiensis*)		Unknown White	
Red Admiral (*V. atalanta*)		Unknown Yellow/Sulphur	
Buckeye (*Junonia coenia*)			

Date: _____ Plot: _____

Quino Checkerspot Butterfly Survey Form page 3 of 3

Circle appropriate abundance category(s). If not present do not circle any category.

Host Plants Observed: (write in other species if necessary)	**Abundance Category***	**Nectar Plants Observed:***** (combine all species into one category)	**Abundance Category***
Plantago erecta	**So Sc U C A**	Nectar plants	**So Sc U C A**
Plantago patagonica	**So Sc U C A**		
Castilleja exserta	**So Sc U C A**		
Antirrhinum coulterianum	**So Sc U C A**		
Cordylanthus rigidus	**So Sc U C A**		
Collinsia concolor	**So Sc U C A**		

***** Abundance categories are:
So = Solitary = only one individual plant observed during survey
Sc = Scarce = very few plants observed, individuals are hard to find when looking
U = Uncommon = scattered plants observed, but individual plants are seen without actively searching for them
C = Common = plants are continuously in view without actively searching for them
A = Abundant = unable to walk through area without brushing against or walking on plants

******* QCB nectar plants have shallow open flowers (e.g. *Lasthenia* spp, *Layia* spp, *Ericameria* spp, *Amsinkia* spp, *Cryptantha* spp, *Allium* spp, *Dichelostemma pulchellum*). Please combine all appropriate QCB nectar plants together and record one composite abundance category for the surveyed plot.

Vegetation Categories: (categories should total 100%)	**Percent Cover Category:** (circle appropriate category)					
Bare Ground	0%	1-20%	21-40%	41-60%	61-80%	81-100%
Forbs	0%	1-20%	21-40%	41-60%	61-80%	81-100%
Grasses	0%	1-20%	21-40%	41-60%	61-80%	81-100%
Shrubs and trees	0%	1-20%	21-40%	41-60%	61-80%	81-100%

Other (Check if present):

_____ Non-native grasses	_____ Fennel	_____ Earwigs
_____ Erodium sp.	_____ Castor Bean	_____ Sowbugs
_____ Arundo donax	_____ Pampas grass	_____ Argentine ants
_____ Tamarisk sp.	_____ Mustard	_____ Cryptogamic crusts

Appendix D:

Quino Checkerspot Butterfly (*Euphydryas editha quino*) Vegetation Protocol 2006

Introduction:

The purpose of the vegetation component of the Quino Checkerspot study is to enhance our understanding of the vegetation requirements and/or preferences of the butterflies. It is of interest to document and classify the vegetation in terms of cover classes, relative abundance and species diversity. We will be conducting vegetation surveys where Quino are detected and also at random points within the study area.

Background:

Each of the study **sites** where surveys for Quino will be conducted will be divided into a 10m grid (see Figure One). When Quino are detected, a GPS point will be taken. These points will be projected on the grid-overlaid study **site**. The grid squares in which the points fall will constitute our first group of sampling quadrats. We will survey all Quino points up to and including four quadrats per **site**. If there are more than four quadrats selected by Quino sightings, we will randomly select a maximum of four of these. Four additional points will be randomly generated by the GIS software. The next set of sampling quadrats will be placed on these four randomly generated points. The next day (or very soon thereafter), the vegetation surveys will be undertaken. The data from these additional four quadrats will allow for comparison between sites with and without Quino.

The randomly selected points will provide one data set of four surveys per **site**, and the standardization of this number will allow for comparison between sites, with and without documented Quino presence. Another data set will incorporate the surveys undertaken where Quino were encountered. This will be a maximum of four surveys per site and will be used to compare with our random surveys.

Two distinct sets of vegetation data will be taken at all **sites** where Quino is located (up to 10). One data set will be generated from **Vegetation Quadrats** and the other from **Relevé** surveys. Both data sets will be taken at the same point. If there are more than 10 **sites**, we will select a random subset of these to do both **Relevé** and **Vegetation Quadrat** surveys. We will randomly select an equal number of Quino-absent **sites** for a maximum of 20 **sites** (at which Relevé and Vegetation Quadrat surveys will be conducted). If no Quino are found, we will do no Vegetation Quadrats, and will instead focus our efforts on the randomized Relevés within all 48 Quino **sites**.

Vegetation Quadrats: The first survey will involve a 2m square sampling quadrat. The quadrat will be located at the given UTM coordinate (NAD83). This point will be generated either by the GPS point taken by the butterfly surveyor, or a randomly generated point within the site. The quadrat will be placed so that the northwest corner is

on the point. To do this, first locate and mark the point using a GPS unit. Next, use a compass to find due east. Place the quadrat so that one edge aligns with the cardinal directions East and South. Within these quadrats, all species will be documented as well as percent cover.

Relevé: The second set of data will involve a 10m square that is identical to the grid square. This data set will only account for dominant and/or common species and percent cover and will be a relevé survey. Relevés will be conducted at all sites where vegetation quadrats are conducted. The remaining Quino **sites** will be surveyed for vegetation using **only** the relevé method at the 10m grids surrounding four randomly selected points per **site**.

We will conduct relevés on the total number of sites that are actually surveyed for Quino. The planned number of Quino sites to be studied per field season is 48. In the case that less than 48 are surveyed during the field season, we will restrict our vegetation sampling to those sites that are surveyed for Quino.

Methods:

Vegetation surveyors will be given the point coordinates (UTMs) at which the 2m quadrat will be placed. In addition, they will be given four coordinate sets for each of the four corners of the 10m grid square. Navigation to the quadrat site will rely on GIS generated maps and GPS units.

The first step will be to set up the 2m quadrat. Consider the point to be the NORTHWEST corner of the 2m square quadrat. Using a compass and a meter tape, mark the other three corners of the quadrat. Or perhaps assemble the four 1m lengths of PVC, aligning the edges in the cardinal directions.

Record on the **'2m Quino Vegetation Survey'** data sheet (attached):

- Surveyor's name
- Date
- Point ID
- Slope
- Aspect

Survey the area within the quadrat and record all plant species found (rooted in the $2m^2$ quadrat) in the column under 'species.' The column to the right will be for correcting any misidentifications and updating any unknown species. Include cryptogamic crust if it is present. For those plants that are unknown, take a sample and put it in a field press. Mark on the newspaper the collector's initials, the date, the quadrat number and a unique identifier that should also be noted on the data sheet. Don't assume that you will always do your own identification work. Provide the other biologists with enough information to get the correct ID on the data sheet and get the plant filed in the herbarium with your name associated with it.

Once all plants are accounted for, apply percent cover estimations for all species. Please see the CNPS Rapid Assessment Protocol for guidelines regarding cover estimations.

- Next the surveyor will set up the grid.

Stakes can temporarily be inserted in the ground by using the GPS unit and the four coordinates issued for the grid corners. Flagging the stakes may be of assistance during the survey. The data sheet that will be used for this survey is the **California Plant Communities Relevé Field Form**. Once the 10m quadrat is established, the surveyor will walk the area recording the plant species present. Only include species that account for more than 1% (estimated) of the cover. For every species recorded, check a box pertaining to its height class. These classes are based on estimations. There is no need to measure individuals of any species. The classes are:

- Low: herbs and shrubs less than 0.5m in height.
- Medium: 0.5-4.0m in height
- Tall: Greater than 4.0m in height.

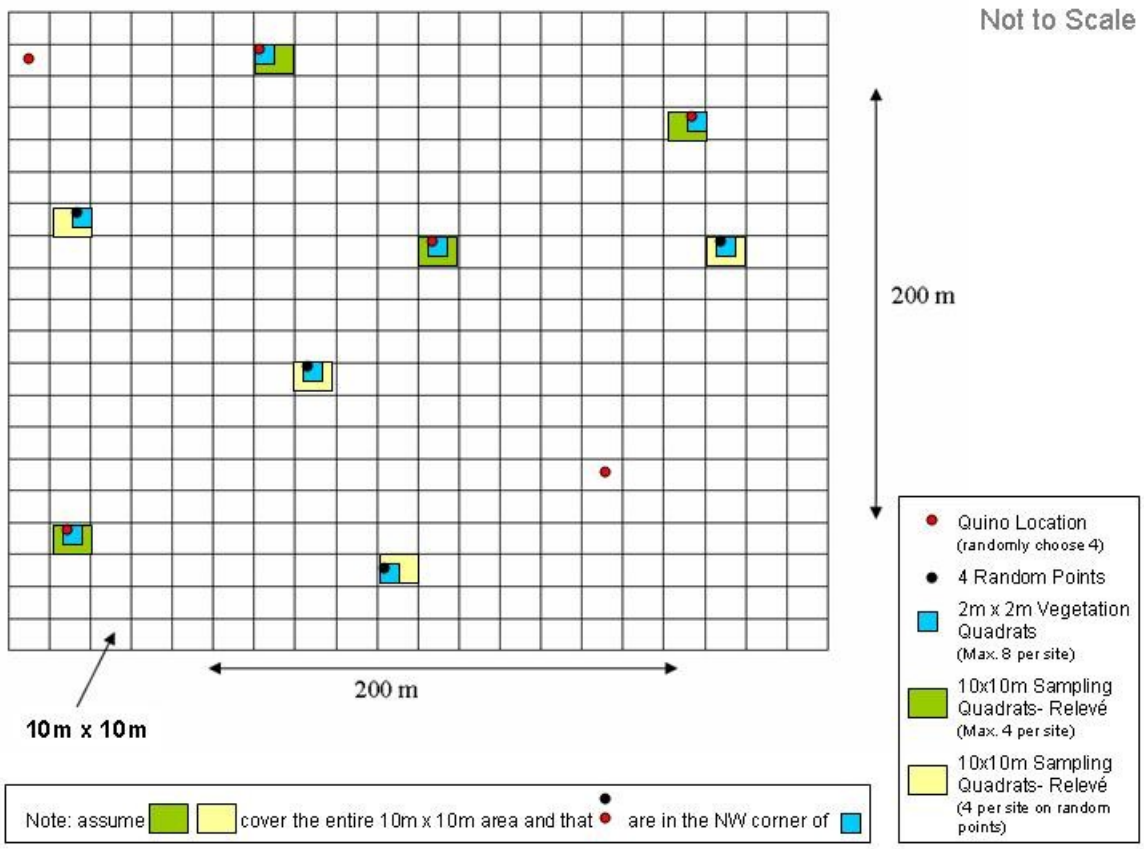
These classifications are included on the data sheet for easy reference. If a species falls in multiple categories, there should be a separate entry for each category.

Apply cover estimates for all species, by height class (low, medium, high). Cover classes as well as numeric estimates should be included. Cover class intervals are included at the top of the data sheet for easy reference.

On the bottom of the data sheet, enter the estimate of the total vegetation cover (cannot be over 100). Enter both a class and a numeric estimate. Estimate the cover of each height class as a whole. Both cover class and numeric estimates should be included. It is possible for the sum of all height class estimations to be over 100 (because there can be overlap between height classes. Finally estimate the total non-native vegetation in terms of both cover class and numeric estimate.

Notes can be included on the back of the Relevé Field Form. Be certain to include a note at the bottom of the front side of the data sheet, indicating that there are notes included on the back. Include in these notes any disturbance information, incidental sightings, and access issues.

Diagrammatic Representation of the Quino Study Site and Vegetation Survey Selection Methods



Appendix E:

Quino 10m x 10m Relevé form

Name(s):_____

Site Name & # (e.g., Oak Mtn 8396)_____ Quadrat ID # R_____

Datum:

Date_____ _____

UTMs E 0 ____ ____ ____ ____ ____ ____ N ____ ____ ____ ____ ____ ____ ____

Slope:_____ Aspect:_____

L = Low herbs and subshrubs (<.5m), M = medium height (.5-4.0m), T = tall height (> 4.0m)

L	M	T	Vascular plant or cryptogramic crust cover (if collected, include collector name and number)	Final determination (leave blank in the field)	%

Total veg. cover (%): _____ Total tall: _____ Total Medium: _____ Total Low: _____ Total Non-Native_____

Appendix F:

Quino Checkerspot Butterfly 2m x 2m Relevé Form		
Name(s):		
Date:		
Site Name & # (ie Oak Mtn 8396)_____ Quadrat ID # Q_____		
UTMs E 0 ____ ____ ____ ____ ____ ____ N ____ ____ ____ ____ ____ ____ ____		
Species	Corrected ID:	%cover

Note: a 20 cm by 20 cm square would be 1% of this quadrat