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

Quino Checkerspot Butterfly (*Euphydryas editha quino*) Survey Report 2005

July 7, 2006
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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 of 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 MSHCP information needs identified in Section 5.3 or elsewhere in the document, and the information needs of the Permittees.

The primary preparer of this report was the Field Crew Leader, 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 & Associates2003). Because no comprehensive survey for QCB has been conducted to date (Mattoni et al. 1997) and because the natural history of QCB is not satisfactorily understood, several additional survey goals have been added by the Biological Monitoring Program.

Survey Goals:

A) Document QCB distribution across the Conservation Area.
B) Develop, test, and refine a protocol for sampling the distribution of adult QCB within the Conservation Area.
C) Develop a measure of adult QCB detectability during the flight season and an estimate of the percentage of surveyed sites that are occupied using repeat visits to plots and analyzing the Proportion of Area Occupied.
D) Provide data regarding QCB resource selection, potentially important distribution covariates, and potentially important observation covariates.

METHODS

Protocol Development

The protocol used for surveys in 2005 was modified from the U.S. Fish and Wildlife Service's (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 (see Appendix A). 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).

Personnel and Training

All field observers studied pinned specimens, a videotape of live QCB and co-occurring butterfly species, and relevant butterfly field guides. Observers were also trained to identify QCB and important QCB habitat characteristics including host plants in the field by USFWS biologists Alison Anderson and Karin Cleary-Rose. All field observers passed the USFWS Quino Checkerspot Butterfly practical exam before participating in field surveys. Surveyors conducting QCB surveys in 2005 included:

- Adam Malisch, Field Crew Leader (Regional Conservation Authority)
- Shirley Bartz (Regional Conservation Authority)

- Debra De La Torre (Regional Conservation Authority)
- Andrew Miller (Regional Conservation Authority)
- Annie Bustamante (California Department of Fish and Game)
- Ricardo Escobar III (California Department of Fish and Game)
- Karin Cleary-Rose (USFWS)

Study Site Selection

Study sites were chosen using a map of QCB critical habitat, as designated by the USFWS, and a map of predicted suitable habitat created by USFWS biologist Alison Anderson using aerial photographs. Eighteen individual survey plots were installed in 2005 (Figure 1). Survey plots were located in five of the seven Core Areas defined by the MSHCP (Lake Mathews/Estelle Mountain/Harford Springs, Warm Springs Creek, Oak Mountain, Sage, and Silverado/Tule Peak). Survey plots in the Johnson Ranch/Lake Skinner and Wilson Valley Core Areas will be established in 2006.

Individual plot locations for 2005 were selected from across the Conservation Area using a stratified random sampling approach. We stratified across Recovery Units identified in the USFWS's Recovery Plan for the Quino Checkerspot Butterfly (USFWS 2003). Only the four Recovery Units located within the MSHCP Plan Area were included in this study. Recovery Units within the Plan Area are located in the following general regions, respective to one another: #1 Northwest Riverside, #2 Southwest Riverside, #3 South Riverside, #4 South Riverside/North San Diego. We wanted to ensure that at least two plots were surveyed in each Recovery Unit, recognizing that Recovery Unit #1 warranted less attention because it contains only two historical QCB observation locations (USFWS 2003). After stratifying across Recovery Units, we randomly placed plots within areas either known to support or suspected to support QCB populations.

The majority of survey locations in 2005 were in Recovery Units #3 and #4 because the adult QCB flight season is believed to begin later in the year in these areas and surveyors were still being hired and trained during the beginning of the flight season. Individual plot locations were non-randomly chosen in Recovery Unit #1 because the accessible target survey areas were relatively small (thus restricting options for plot placement) and historical QCB observation locations (*i.e.*, occurrence complexes) were scarce (making non-random plot placement more sensible). Individual plot locations were non-randomly chosen in Recovery Unit #2 because we wanted to target specific locations within the Warm Springs Creek Core Area and we had already observed QCB within the Johnson Ranch/Lake Skinner Core Area during field training sessions.

Plot locations were randomly selected in Recovery Units #3 and #4, exclusively from areas within USFWS designated critical habitat or predicted suitable habitat, with the exceptions described below. Excluded areas (see Appendix A), were not surveyed because they were not believed to support QCB populations, as per USFWS guidelines. Survey plot locations were randomly selected from a uniquely numbered grid laid over non-excluded areas because the areas with potentially suitable QCB habitat were too large to census entirely. Randomly selecting survey plot locations allows for extrapolation of results to the entire MSHCP Conservation Area.

Although all survey plots in recovery units #3 and #4 would ideally have been chosen randomly from within non-excluded areas, this proved logistically impossible in 2005. Some randomly chosen plots were not feasible to survey due to steep slopes and impassable chaparral either on the plot itself or between the nearest road and the plot. Therefore, randomly chosen plots with slopes ≥ 40% on any part of the plot or with 100% chaparral as defined by the most current GIS vegetation layer for western Riverside County (California Native Plant Society 2005) were not installed and a new survey plot was chosen using the following decision rules:

A) One of the eight adjacent plots (N, NE, E, SE, S, SW, W, NW) was randomly selected to replace the original plot.

B) If none of the eight adjacent plots were feasible to survey, a new randomly chosen plot from the list of locations within non-excluded areas was chosen.

Survey Plot Locations

After the site 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: two in Harford Springs Park, two along Warm Springs Creek near Adobe Spring, two on Oak Mountain, two along Sage Road (one near Mica Butte and one in the Magee Hills), two off Highway 371 approximately two kilometers North of the Hwy 371/79 intersection, four in the Durasno Valley approximately 15 kilometers east of Aguanga, and four just east of Iron Spring Mountain (Figure 1).

Survey Methods

Forty-six QCB surveys were conducted at 18 survey plots between 12 April and 12 May 2005. We conducted time-constrained visual encounter surveys within plots during appropriate weather conditions, covering an average of 2 to 4 hectares per hour. Ten parallel transects were walked 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 2005 extended beyond this time range because 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 A).

Data collected at the start of a survey included: date, observer, time, general weather description, temperature in shade at 1m above ground, average wind speed, and cloud cover (see

Appendix B). 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 category of host plants and nectar plants within the plot was recorded, along with the percent cover category of bare ground, forbs, shrubs, and non-native grasses within the plot. Finally, the presence of any threat species and the presence of cryptogamic soil crusts on the plot were recorded.

Data Analysis

Most survey plots (14 out of 18) were surveyed multiple times (mean ≈ 2.5, range = 1 to 4) 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 & Royle 2005 (Table 1). Program MARK (see White and Burnham 1999) was used to compute an adult QCB detection probability, using the established detection history, and assuming that the detection probability was constant among survey visits. When the detection probability was allowed to vary among surveys, the model output was outside the realm of possibility, indicating model failure due to the small dataset. A larger dataset should allow for more flexibility in modeling QCB's detection probability. Because we wished to calculate an unbiased detection probability, only randomly chosen survey plot results were included in the detectability analysis, including those locations where we *a priori* expected QCB to be found might artificially inflate the calculated detection probability. Surveys prior to 19 April and after 4 May were also removed from this analysis to maintain consistent survey period lengths, and because adult QCB were likely done flying after 4 May based on phenology observed in the field. The final detection history data used to calculate the 2005 adult QCB detection probability came from 26 surveys conducted at 14 survey plots between 19 April and 4 May (mean number of repeat surveys ≈ 1.9, range = 1 to 3).

Program MARK was also used to calculate an occupancy estimate, based on a raw calculation of the number of occupied plots divided by the number of surveyed plots and the calculated detection probability. Using the calculated detection probability and a revised occupancy estimate, simple calculations in Excel allow creation of a matrix describing the necessary number of visits to a survey plot to be 95% confident that we will detect QCB **if** they occupy a plot.

Environmental condition data (*e.g.*, temperature, wind speed) and survey plot habitat data (*e.g.*, percent cover bare ground, presence/absence and abundance category of nectar plants) were explored for effects on QCB detectability and presence using multiple logistic regression in NCSS Statistical System for Windows (NCSS 2001). All survey plots were included in this analysis, although surveys conducted after 4 May again were removed because adult QCB were likely done flying after this date. When the same environmental data were collected at both the beginning and end of a survey, only the start data were analyzed because start and end data proved to be highly correlated. When habitat data representing percent cover varied between surveys on the same plot, data were averaged (50% bare ground reported from survey #1 and 30% bare ground reported from survey #2 became one value of 40% bare ground for that plot). When habitat data representing presence/absence varied, the plot was scored as having a given attribute if that attribute was ever observed on a survey of that plot (no mustard reported from

survey #1 but mustard reported from survey #2 became mustard present for that plot). When habitat data representing abundance varied, the plot was scored as having the highest abundance category recorded (common nectar plants from survey #1 and uncommon nectar plants reported from survey #2 became one score of common for that plot). Scatterplots were used to visually assess whether environmental-condition or habitat-attribute data seemed to have important effects on adult QCB presence or detectability and logistic regression was used to statistically determine if these data were significantly able to predict adult QCB detectability and presence. Because of very limited sample sizes, multiple logistic regression models could not ultimately support analyses of abundance or habitat data representing percent cover.

Raw data are housed in the MSHCP Biological Monitoring Program QCB Monitoring Access database.

RESULTS

A total of 35 adult QCB were observed at four individual survey plots during field surveys in 2005 (Table 1). All occupied locations were in recovery unit #4, with three occupied plots in the Durasno Valley and one occupied plot just east of Iron Spring Mountain. No QCB were observed at the remaining 14 locations. An additional 13 QCB were incidentally observed in 2005, for a total of 48 adult QCB observations (Figure 2). Individual QCB observation coordinates from 2005 are reported in Table 2. Twenty-six (26) co-occurring butterfly species were observed during surveys in 2005.

QCB observed during surveys in 2005 were most commonly seen nectaring on open flowers or flying, at times ranging from 1039 hrs to 1505 hrs (average = 1321 hrs). Typically only single individuals were seen, although multiple QCB were occasionally observed together.

The detection probability for adult QCB at plots surveyed in 2005 was 0.73 (SE = 0.17), meaning that surveyors detected at least one QCB 73% of the time **if** QCB occupied a given plot. The raw plot occupancy percentage was 29% (4 of 14 plots surveyed were occupied) and the adjusted occupancy percentage was 0.34 (34%, SE = 0.15). The adjusted occupancy percentage corrects for plots that were occupied but where surveyors failed to detect QCB. Using these data and assuming that QCB detectability and plot occupancy percentage are relatively stable, plots would need to be surveyed three times in a season to have 95% confidence that plots with no QCB observations are actually unoccupied.

Cryptogamic soil crusts were found at all four of the survey plots with QCB observations and at only one out of the other fourteen plots where no QCB were detected. Cryptogamic soil crusts proved to be the only significant predictor of QCB presence/absence at surveyed plots ($p < 0.05$), although there were some other interesting patterns. Potentially threatening exotic mustard species (*Brassica spp.*) were not found on any plots with QCB, but were found on nine out of fourteen plots (64%) without QCB. Because the presence of mustard was moderately correlated with the absence of cryptogamic soil crusts ($r = -0.62$) and because of the small size of the dataset, the logistic regression did not return mustard as a significant predictor of QCB presence/absence. Although there were not enough data to statistically analyze whether or not

data collected in 2005 show an observer bias, an exploratory viewing of these data do not suggest that this is a serious concern.

DISCUSSION

The first year of QCB monitoring by the Biological Monitoring Program was not expected to fully achieve all long-term goals, but to serve as a starting point for data collection in an adaptive management context. We refined the USFWS's existing QCB protocol, documented several QCB locations within the Conservation Area (though most observations were restricted to a relatively small area), developed preliminary estimates of adult QCB detectability and plot occupancy percentage, and collected QCB resource selection data along with observation covariates. The relatively high detectability estimate (73%) and reasonable adjusted plot occupancy percentage (34%) are encouraging results suggesting that continuing to expand the monitoring effort for QCB using the established protocol will provide increasingly useful data. The small sample sizes of plots surveyed and QCB observations in 2005 coupled with timing logistics that forced us to primarily sample sites in the eastern portion of the Conservation Area near the end of the QCB flight season prohibit decisive conclusions. However, preliminary results regarding QCB detectability, plot occupancy percentage, resource selection, and observation covariates provide largely new quantitative information about this endangered species.

Although host plants seem to play a significant role in defining suitable habitat for QCB (Pratt 2001; USFWS 2003), data collected thus far regarding the presence, diversity, and abundance of host plants on survey plots provided only weak support for this hypothesis. However, it may not be necessary for host plants to be found directly on the survey plot itself in order to observe adult QCB on the plot, as QCB have been known to fly several hundred meters between larval host plants and adult nectar sources (White and Levin 1981). Perhaps the presence and abundance of nectar plants on survey plots will prove to be a better predictor of adult QCB presence, but no such pattern emerged from data collected in 2005. The positive correlation between QCB presence and cryptogamic soil crusts and negative correlation between QCB presence and mustard on survey plots may be an indicator that QCB favor areas with relatively little habitat disturbance. Because of the preliminary nature of data collected in 2005, significant and non-significant results should primarily serve as indicators of patterns to monitor in the future and not as conclusive evidence of real relationships.

It is noteworthy that QCB were observed as late in the day as 1505 hrs and that the average QCB observation time during surveys was 1321 hrs. The average QCB observation time is partially an artifact of a relatively large number of surveys (15 out of 46) continuing beyond the typically recommended end-survey time of 1400 hrs. Although we were interested in expanding the range of survey times beyond the recommended hours of 1000 to 1400 to include surveys that started before 1000 hrs and surveys that continued past 1400 hrs, only the latter was achieved in 2005. Most QCB survey plots in 2005 were approximately 2 hours drive from the Monitoring Program's main office and the time necessary to get on-site and prepare for a survey was underestimated. Furthermore, the difficult terrain of many QCB plots in 2005 caused surveys to last slightly longer than the desired 90 minutes and thus some surveys that started before 1230 hrs extended beyond 1400 hrs. We will make extra efforts to begin some surveys

before 10:00 hr in 2006 to continue to explore the range of possible QCB observation conditions, making sure to collect appropriate environmental covariates.

Recommendations for Future Surveys

QCB survey plots were established with considerable difficulty in 2005. A purely random selection of plots, even within QCB critical habitat or predicted suitable habitat, proved impossible. In 2006, we will continue with the revised plot selection procedure which excludes plots containing 100% chaparral vegetation and plots with slopes ≥ 40%. Data collected in 2005 will be extremely helpful in making decisions about how many plots to survey versus how many times to survey those plots as these preliminary data can be inputted into simulation models that predict the optimal number of repeat visits to make to each plot (see MacKenzie et al. 2002, MacKenzie & Royle 2005). These data can also be used to determine if it might be more efficient to employ a "double sampling design (where repeat surveys are conducted at a subset of sites only)" and if it is, what percentage of sites should be more intensively surveyed (MacKenzie & Royle 2005). We anticipate that either two or three survey plot visits will be optimal in 2006, but simulations as described above are ongoing.

The same habitat and environmental covariate data collected in 2005 should be collected in 2006, while possibly adding some basic measurements directly at QCB observation locations. For example, if we record the temperature each time an adult QCB is observed we could better describe the range of appropriate QCB survey temperatures than we could using just the beginning and end survey temperatures, as collected in 2005. The drawback to gathering additional data is that more time is required for each QCB observation, introducing a potential increased survey time bias for occupied plots. Additionally, it is unclear how to collect environmental condition data from locations without QCB in order to make comparisons between when and where QCB are observed and when and where they are not observed.

Expanding the Monitoring Program's QCB survey effort in 2006 should increase sample sizes both of plots surveyed and QCB observations. These data will hopefully allow a more thorough statistical analysis of QCB habitat affinities and environmental covariates to detection. Furthermore, the preliminary QCB detection probabilities and plot occupancy percentages calculated from data in 2005 will be revised based on the expanded dataset. With enough data, both observation-level environmental condition data and site-level plot habitat data can be directly incorporated into detection probability and plot occupancy analyses using programs such as MARK or PRESENCE.

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Table 1. Quino checkerspot butterfly survey results in 2005.

			Date of Survey																																	
Recovery Unit	Site Name	Plot #	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12
1 (Non-Random)	Harford Springs	2625	**0**	_	_	**0**	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
1 (Non-Random)	Harford Springs	2777	**0**	_	_	**0**	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
2 (Non-Random)	Warm Springs	7347	**0**	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
2 (Non-Random)	Warm Springs	6290	_	_	**0**	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
3	Oak Mountain	8396	_	_	_	_	_	_	_	_	**0**	_	_	_	_	_	**0**	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
3	Oak Mountain	8453	_	_	_	_	_	_	_	_	**0**	_	_	_	_	_	**0**	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
3	Mica Butte	5548	_	_	_	_	_	_	_	_	_	**0**	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
3	Sage Road	7266	_	_	_	_	_	_	_	_	_	**0**	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
3	Highway 371	9553	_	_	**0**	_	_	_	_	**0**	_	_	_	_	_	_	_	_	_	_	_	_	_	**0**	_	_	_	_	_	_	_	**0**	_
3	Highway 371	9697	_	_	**0**	_	_	_	_	**0**	_	_	_	_	_	_	_	_	_	_	_	_	_	**0**	_	_	_	_	_	_	_	**0**	_
4	Silverado	8980	_	_	_	_	_	_	_	_	**9**	_	_	_	_	_	_	**2**	_	_	_	_	_	_	**3**	_	_	_	_	_	_	**0**	_
4	Silverado	8836	_	_	_	_	_	_	_	_	**0**	_	_	_	_	_	_	**0**	_	_	_	_	_	_	**0**	_	_	_	_	_	_	**0**	_
4	Silverado	8879	_	_	_	_	_	_	_	_	**14**	_	_	_	_	_	_	**1**	_	_	_	_	_	_	**0**	_	_	_	_	_	_	**0**	_
4	Silverado	8779	_	_	_	_	_	_	_	_	**3**	_	_	_	_	_	_	**0**	_	_	_	_	_	_	**2**	_	_	_	_	_	_	**0**	_
4	Iron Springs	9029	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	**0**	_	_	_	_	_	_	**0**	_	**0**
4	Iron Springs	8961	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	**1**	_	_	_	_	_	_	**0**	_	**0**
4	Iron Springs	11230	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	**0**	_	_	_	_	_	_	_	_	**0**
4	Iron Springs	11335	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	**0**	_	_	_	_	_	_	_	_	**0**

_ = No survey done

0 = No QCB detected

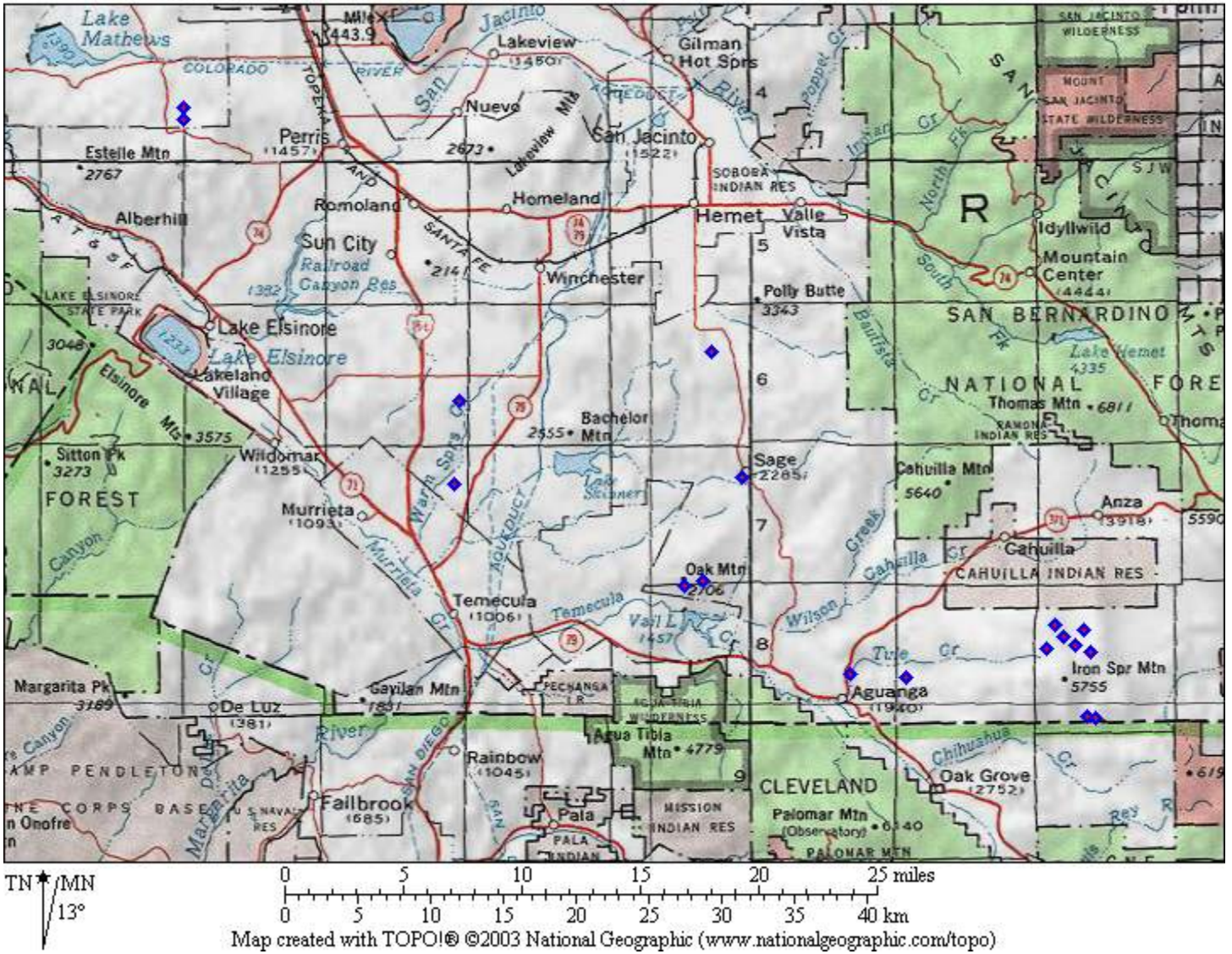
= The number of QCB detected

Table 2. Quino checkerspot butterfly observation coordinates in 2005. Location coordinates are in UTMs, datum = WGS84.

	Zone	Easting	Northing
1	11S	501714	3708296
2	11S	518811	3706837
3	11S	526559	3705052
4	11S	527401	3704811
5	11S	527403	3704802
6	11S	527468	3704940
7	11S	527263	3705047
8	11S	527241	3705048
9	11S	527201	3705048
10	11S	527001	3705116
11	11S	526993	3705169
12	11S	526977	3705240
13	11S	527825	3705148
14	11S	526794	3705794
15	11S	527526	3705050
16	11S	527190	3705045
17	11S	526634	3705051
18	11S	526259	3704194
19	11S	526393	3704002
20	11S	526311	3704168
21	11S	526400	3704057
22	11S	527845	3704029
23	11S	526307	3705065
24	11S	526981	3705612
25	11S	526837	3705727

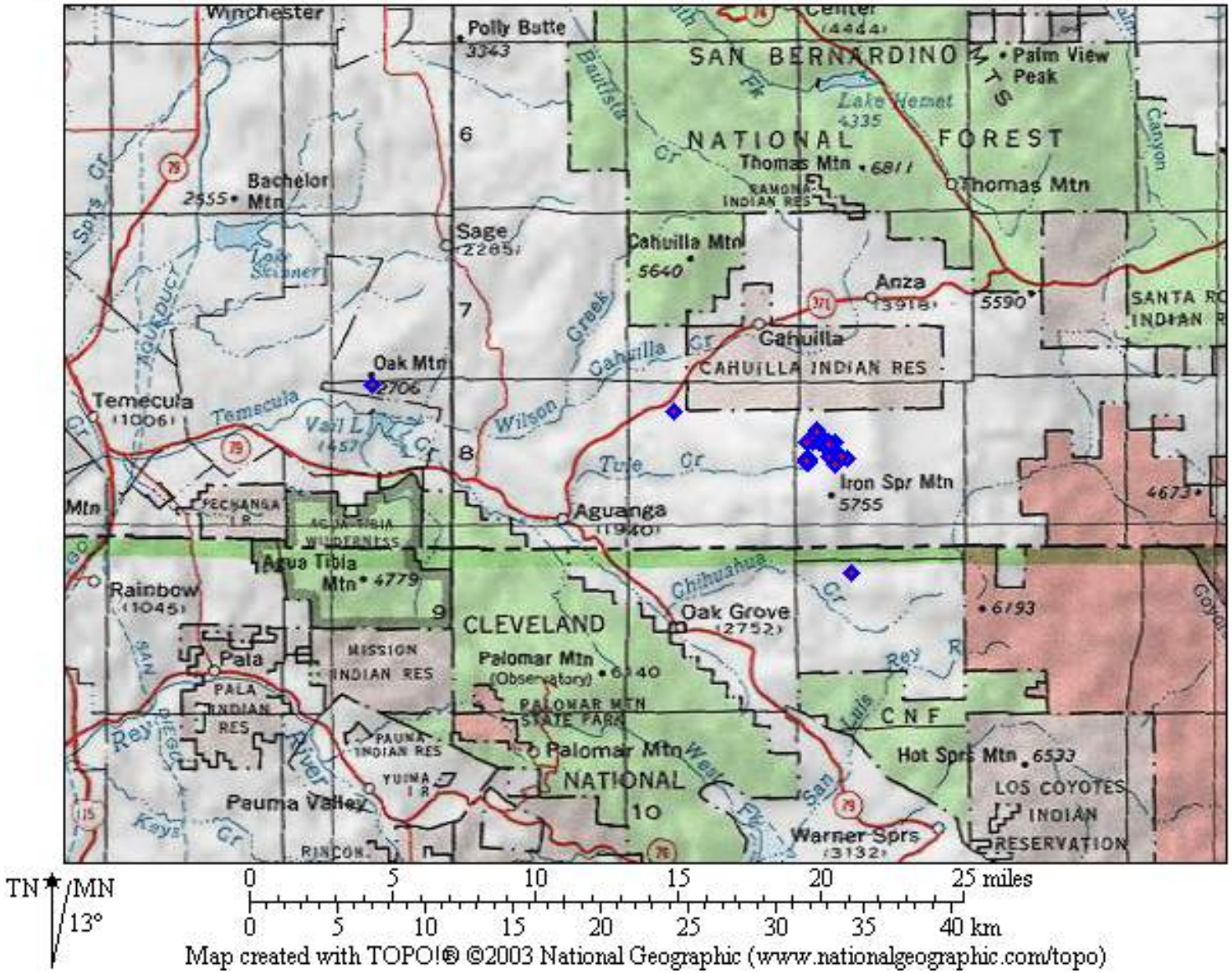
	Zone	Easting	Northing
26	11S	526824	3705706
27	11S	526210	3704199
28	11S	527619	3704790
29	11S	526256	3704228
30	11S	526342	3704106
31	11S	527595	3704837
32	11S	527455	3704864
33	11S	527488	3704874
34	11S	527524	3704950
35	11S	526269	3704017
36	11S	527473	3704937
37	11S	526285	3703992
38	11S	526205	3704003
39	11S	527396	3704915
40	11S	527395	3704921
41	11S	527389	3704934
42	11S	527903	3703885
43	11S	527562	3704291
44	11S	528513	3704197
45	11S	528243	3704323
46	11S	526342	3704193
47	11S	526584	3705411
48	11S	526824	3705707

Figure 1: Quino Checkerspot Butterfly Survey Plots in Western Riverside County in 2005



Map created with TOPO!® ©2003 National Geographic (www.nationalgeographic.com/topo)

Figure 2: Quino Checkerspot Butterfly Observations in Western Riverside County in 2005



Appendix A:

Western Riverside County MSHCP
Biological Monitoring Program Protocol for
Quino Checkerspot Butterfly Surveys
March 2005

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 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 B:

__ Data Entered?
__ Data Proofed?

Quino Checkerspot Butterfly Survey Form

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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: _____

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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 soils