

ATTACHMENT A

MISSION BLUE BUTTERFLY SURVEY
TRA Environmental Sciences

**Results of Mission Blue Butterfly (*Icaricia icarioides missionensis*) Surveys
Harmony @ 1 project site, Roberts Road, Pacifica, California**

Prepared by:
Sara Krier and Patrick Kobernus
TRA Environmental Sciences Inc.

August 2007

Summary

This report presents the results of surveys conducted for the federally endangered mission blue butterfly (*Icaricia icarioides missionensis*) by TRA Environmental Sciences at the Roberts Road/Harmony @ 1 proposed project site. Larval host plants for the mission blue butterfly were identified on site in spring 2007 during biological surveys for the Harmony @ 1 Draft Environmental Impact Report. Larval host plants for mission blue butterfly identified on site include summer lupine (*Lupinus formosus* var. *formosus*) and varied-color lupine (*Lupinus variicolor*). These species were found in separate patches on the southwest and northwest sections of the property, respectively.

After initial biological surveys identified presence of the host plants, TRA conducted mission blue surveys to determine presence/absence of the species in late spring and summer of 2007. The areas with host plants were inspected for presence of the butterfly on ten separate occasions during appropriate weather conditions. No adult mission blue butterflies were detected during the course of surveys. Butterfly eggs were observed on a few summer lupine plants on the southwest portion of the project site; however it was not possible to determine if these eggs were mission blue eggs or those of another species belonging to the Lycaenidae family. Acmon blues, another Lycaenid butterfly, were observed commonly on site including one female acmon blue that was observed hovering over and perching on the summer lupine.

Though adult mission blue butterflies were not observed on site, the southwest section of the property may provide habitat for the mission blue. The summer lupine patches on the southwest portion of the property provide potential habitat for the mission blue due to the high number of plants (over 300), and the robustness of these plants. In contrast, the varied-color lupine located on the northwest portion of the site is highly unlikely to provide suitable habitat for the mission blue butterfly because of the small size and limited number of plants, and because the varied-color lupine is not a preferred host plant for the mission blue. Varied-color lupine is commonly found along the coast, whereas the Mission blue is not.

During the course of surveys, approximately 15% of the summer lupine biomass was pulled and/or dug out of the ground on the southwest portion of the site through an act of vandalism on two separate occasions. Most of the plants removed appeared to be small, but the two largest summer lupine plants on site were also removed. This event occurred

during the first two weeks of June approximately mid-way through the mission blue flight season.

Though mission blue adults were not observed on site during the course of 10 surveys in 2007, and the site is somewhat isolated from other mission blue colonies (1.3 miles from the mission blue colony on Sweeney Ridge), the site does provide potential mission blue habitat. Mission blues are likely capable of reaching the site due to the lack of significant barriers such as urbanization or dense forest between the colony at Sweeney Ridge and host plant habitat on the Harmony @1 project site. It is reasonably possible that mission blues can reach the project site through multiple dispersal flights, and cycle between colonization and local extirpation. Without multiple years of surveys documenting absence of the species, it is difficult to rule out the possibility of mission blue presence on site.

Introduction

The Roberts Road/Harmony @ 1 project is a Planned Development of 13 single family homes on 65 acres and development of an adjoining 2-acre lot with one single family home. The site is located in Pacifica, California (Figure 1).

The project site is dominated by grassland and northern coastal scrub with patches of central coast riparian scrub on the lower south facing ravines. Grassland dominates the south and west-facing slopes of the property. The grassland on site is a mixture of both California annual grassland (comprised of non-native species) and coastal terrace prairie grassland (comprised of native species). Scattered patches of coastal scrub and small shrub to small tree-sized Monterey pine (*Pinus radiata*) trees are also found in the grasslands, especially on the northwest corner of the property. Also included within the grasslands are patches of disturbed ruderal vegetation that includes Pampas grass (*Cortaderia ssp.*), French broom (*Genista monspessulana*) and fennel (*Foeniculum vulgare*).

Biological surveys of the project site were initially conducted in 2005 and 2006 by Wetlands Research Associates (WRA). WRA conducted reconnaissance surveys and follow up rare plant surveys on the northern section of the property on 2/14/06 and 4/21/06. TRA Environmental Sciences, Inc. (TRA) reviewed that work, updated the CNDDDB database search results, and conducted additional surveys in 2006 and 2007. Based on the results of the follow up surveys by TRA, which detected potential of mission blue habitat on site, it was recommended that one season of thorough mission blue surveys be conducted at the project site in late spring and summer of 2007 to determine presence or absence of the species. The results of the mission blue surveys conducted in 2007 are reported herein.

Mission Blue Life History

The mission blue butterfly is a federally listed endangered species. The mission blue utilizes three larval host plants, silver lupine (*Lupinus albifrons var. collinus*), summer

lupine and varied-color lupine. Presence of one or more species of host plants is necessary for mission blue survival; however presence of host plants does not indicate presence of the butterfly. Host plant density, availability of nectar plants, microclimate and distance to existing mission blue populations are determining factors in whether mission blues are present at a given location (TRA 1982).

Mission blue habitat consists of grasslands, rocky outcrops, disturbed roadcuts and landslide areas with abundant host plants and nectar plants. All three host plants are low growing perennials that can be easily overgrown by taller shrubs and/or invasive species and are therefore limited to open habitats such as grasslands or barren areas. Typical host plant patches range from twenty to thirty large, robust plants to several hundred plants. Mission blues use a variety of nectar plants including non-native thistles such as Italian thistle (*Carduus pycnocephalus*), and native herbs such as California phacelia (*Phacelia californica*), coastal buckwheat (*Eriogonum latifolium*), California horkelia (*Horkelia californica*) and golden aster (*Heterotheca bollanderi*), among others. Areas such as roadcuts can often provide important wind-protected habitat for the species. Without control methods and/or disturbance, invasive plant species and coastal scrub succession can eliminate mission blue habitat.

On average mission blues begin adult flight in March, are most abundant in April and May and observations begin to drop off by late May or early June. Early flying mission blues typically fly between March and May and are associated with silver lupine whereas late flying mission blues are associated with summer lupine. Both silver lupine and summer lupine are commonly used by the mission blue butterfly within the range of the species whereas varied-color lupine is used less commonly. Varied-color lupine is typically used by mission blue when in association with either silver lupine and/or summer lupine, though robust patches of varied-color lupine can also support mission blue butterflies.

Female mission blues lay their eggs on their host plant lupines throughout the adult flight period. Larvae hatch in 4 to 10 days and feed on the mesophyll layer within the leaves of the lupines. After about 3 weeks the larvae begin diapause, typically within the leaf litter at the base of the host plant. The following spring, the larvae emerge and begin feeding again for approximately 1 month before pupating. Pupation lasts approximately 3 weeks until the pupae transform into the adult form. Some colonies of mission blues are believed to have a mutualistic relationship with native ants (i.e. facultative myrmecophile), which may increase the survival rate of the butterfly during the larval phase (Arnold 1980).

Mission blues are known to move up to approximately 0.25 miles between habitat patches (TRA 1982), however it is likely that greater distances can be covered by the species if there are no significant barriers (urbanization, forest) between habitat patches. The closest known colony of mission blue butterflies is located to the northeast of the project site on Sweeney Ridge. The nearest mission blue host plants on Sweeney Ridge are located approximately 1.3 miles northeast of the project site (National Park Service

2006), and are currently separated from the project site by coastal scrub and some forest vegetation.

In the past, more grassland likely occurred between the project site and the known mission blue population at Sweeney Ridge. Loss of grassland has occurred over the past two centuries from development, combined with native and nonnative brush expansion throughout the San Francisco Bay Area. The lack of native and/or non-native grazing animals and fire repression for several decades has resulted in the expansion of coastal scrub and woodland communities and a loss of grassland and mission blue habitat on San Bruno Mountain (TRA 2006). It is therefore likely that there were more open grassland areas between the project site and Sweeney Ridge and mission blues were more widely distributed in the surrounding hills of Pacifica.

Project site

Two species of lupine (summer lupine and varied-color lupine) were observed on the project site. Approximately 300 summer lupine plants were found on the project site on the southwestern slope, and approximately 45 varied-color lupine plants were found on the northwestern ridge during field surveys in March, April, and May 2007 by TRA biologists (Figure 2). A variety of nectar sources were also observed on site including California horkelia, coastal buckwheat, beach strawberry (*Fragaria chiloensis*), golden aster and several species of thistles. Both lupine species found on the site are used by the mission blue butterfly as larval host plants; however, the mission blue is found less often on varied-color lupine. Varied-color lupine is commonly found within coastal prairie on the coast side, but mission blues are not. Microclimate may preclude presence of the mission blue butterfly in many areas where varied-color lupine occurs.

Methods

Surveys for the mission blue butterfly were conducted by TRA Senior Biologist Patrick Kobernus and TRA Associate Biologists, Terese Kastner and Sara Krier. Surveys were performed during the mission blue butterfly's flight season in the spring and summer of 2007. Surveys were timed to coincide with the pre-bloom and bloom period of varied-color lupine and summer lupine on site, and with the observed flight period of the mission blues at other local habitats. Because mission blues colonies associated with varied-color lupine and summer lupine occur later in the summer, surveys were timed for this period. All of the mission blue colonies in the Pacifica area are predominately associated with silver lupine, which has an earlier bloom period and the mission blue colonies have a corresponding earlier flight period (March/April/May). San Bruno Mountain is the closest area where mission blues consistently use summer lupine and varied-color lupine and surveys of mission blues using summer lupine and varied-color lupine on San Bruno Mountain were conducted weekly at the same time as surveys at the Harmony at 1 site. Mission blues were consistently detected on San Bruno Mountain during this time period (San Bruno Mountain HCP 2007 Annual Report - *in process*).

During each survey, the project site was walked for a minimum of twenty minutes to a maximum of two hours. Shorter duration surveys were focused on the summer lupine sites, after the varied-color lupine had already gone to seed.

Weather was recorded at the start of each survey (air temperature and average wind speed). Optimum flight weather for mission blue butterflies is above 18°C, with average wind speeds below 5 mph (San Bruno Mountain, HCP Annual Reports). As temperatures decrease below 18°C and/or winds increase above 5 mph average, mission blues stay sedentary and are less likely to be detected. Lupine flowering stage was also recorded, as well as other butterfly species to provide an indication of suitable timing of the surveys and butterfly flight weather.

Results

Due to the cool coastal climate at the project site, the flight window for the mission blue butterfly was limited and surveys were conducted as weather permitted during late morning/early afternoon. Most of the surveys were conducted during weather that was within the optimum range for mission blue detection (Table 1).

Over the course of ten surveys, TRA biologists did not observe adult mission blue butterflies at the site. On two occasions butterfly eggs were observed on the summer lupine plants (Figure 5). These were likely eggs from a Lycaenid butterfly due to their size, color, and shape, however it was undetermined what species they were. Other common Lycaenid butterflies that occur in the area and observed on site include the acmon blue (*Plebejus acmon*) and the echo blue (*Celastrina ladon*). It is possible that the eggs on site were either those of the mission blue or the acmon blue. Though acmon blues utilize coastal buckwheat as their host plant on the San Francisco Peninsula, they have been observed to lay eggs on other species, including lupines (Liam O'Brian, pers. comm.).

In the course of the surveys, it was observed by TRA biologists that multiple summer lupines were pulled and/or dug out from the ground, including the two largest lupines on site (Figures 3 and 4). This was first noticed during the June 8th survey with additional plants removed prior to the survey of June 14. The lupines that were removed shown in Figure 3 were observed to have five Lycaenid eggs on them on the June 4th site visit.

Discussion

No adult mission blue butterflies were observed on site during the course of ten surveys conducted during appropriate flight weather and during the flight season of the species. Though Lycaenid eggs were observed on the lupines, it is not clear if the eggs on the lupines were those of the mission blue butterfly, and presence of the species has not been verified. Though the site has a large number of summer lupine plants that provide suitable habitat for mission blues, there are a variety of factors that diminish the habitat quality on site (e.g., cool winds blowing off the ocean, partial isolation from other mission blue colonies). Habitat quality was also diminished with the observed removal

of some of the summer lupines during the course of surveys. It is estimated that approximately 15% of the lupine biomass on site was removed through an act of vandalism. No other plants on the site were observed to be damaged.

Though surveys did not detect the mission blue butterfly on site, it is possible that the species uses the site but not on a consistent basis and therefore was not detected this year. In some cases, cool weather can inhibit mission blue butterfly observations within cool coastal climates, though the species may still be present (Dick Arnold, pers. comm.). The relative abundance of summer lupine combined with the distance to the nearest colony of mission blues at Sweeney Ridge suggests that the property provides suitable habitat and the species can reach the site. Mission blues may colonize the site and establish small populations that then become extirpated due to a lack of habitat in surrounding areas combined with cool windy conditions that limit available flight and mating windows. This cycle may repeat itself over time. This seems to be the most likely scenario based on the habitats observed on site during this single year survey, and additional multi-year surveys would be necessary to confirm absence of the species.

Table 1 - Mission Blue Butterfly Survey Results, Summer 2007							
Date	Start time	End time	Temperature (°C)	Average wind speed (mph)	Confirmed Mission blue	Other butterfly species observed	Notes
4/27/2007	2:20	3:05	19.1	2	No	anise swallowtail, ringlet, mylitta crescent, buckeye	Most L.variicolor in bloom, only one L. formosus in bloom. clear, sunny, cool wind
5/24/2007	10:55	12:30	15.2	3.5	No	acmon blue, buckeye, American painted lady, ringlet, field crescent, west coast lady	Approx. 50% Lupinus formosus in bloom. Clear, cool day; warm, calm on leeward slopes, multiple Lycaenid eggs found
5/28/2007	11:30	1:00	21.1	2.5	No	field crescent, acmon blue, pale swallowtail, ringlet, American painted lady	Good flight weather.
6/4/2007	10:30	12:30	17.2	2.9	No	field crescent, California ringlet	Multiple Lycaenid eggs found. Cool, calm weather. L. variicolor setting seed.
6/8/2007	10:30	11:15	18.2	3.1	No	Not recorded.	Two Lycaenid eggs found, Cool winds, marginal flight weather. Multiple Lupinus formosus plants had been torn out.
6/11/2007	11:57	12:16	17.3	2.4	No	Not recorded.	Fair butterfly flight weather.
6/14/2007	2:15	3:15	27	3	No	echo blue (AKA spring azure), mylitta crescent, cabbage white, anise swallowtail	Great butterfly weather; additional lupines observed to be removed
6/24/2007	10:50	11:20	18.3	4	No	Not recorded.	Summer lupine in bloom/seed
6/25/2007	9:00	9:30	16.1	3	No	Not recorded.	Summer lupine in bloom/seed
7/8/2007	11:00	11:30	20.1	4	No	echo blue, ringlet, painted lady	perfect weather. MB flight season is likely over for site

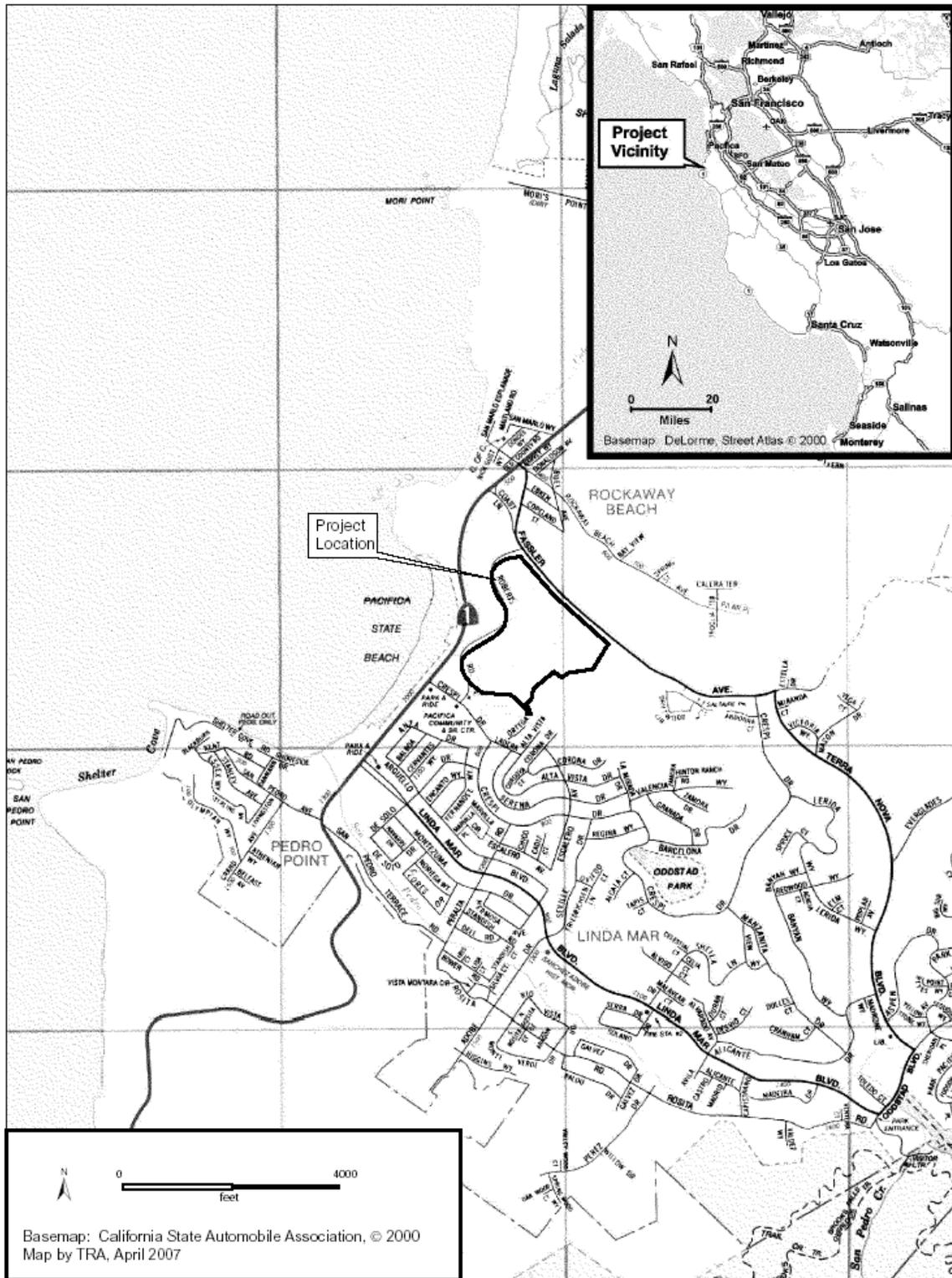


Figure 1 - Regional Map. Location of Harmony @ 1 project site in Pacifica, CA.

Figure 2. Mission Blue Host Plants on Harmony at 1 Project Site.

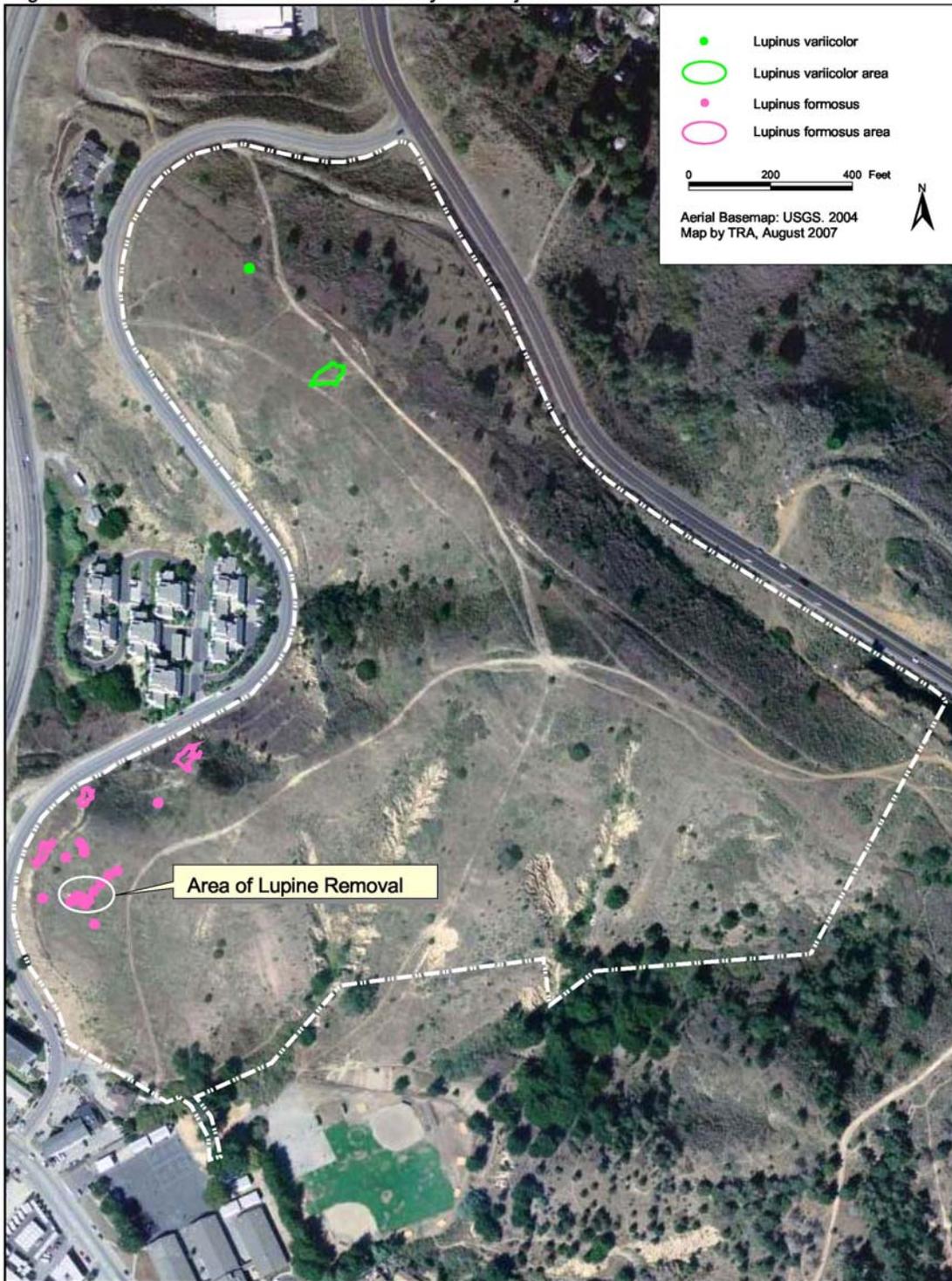




Figure 3 - "Before" photo of *L. formosus* plants. Photo taken May 28, 2007.



Figure 4 - "After" photo of area where lupines were removed. Photo taken June 14, 2007.



Figure 5 - Lycaenid eggs on *L. formosus*. Photo taken May 24, 2007.

References

- Arnold, R. A. 1980. Ecological studies on six endangered butterflies (Lepidoptera: Lycaenidae); island biogeography, patch dynamics, and the design of habitat preserves. Berkeley, CA. Univ. of Calif., Berkeley. Ph.D. dissertation.
- [TRA] Thomas Reid Associates. May 1982. *Endangered Species Survey San Bruno Mountain, Biological Study 1980 – 1981*. Prepared for San Mateo County by Thomas Reid Associates.
- [TRA] Thomas Reid Associates. *San Bruno Mountain Habitat Conservation Plan Annual Reports 1982 – 2006*. Prepared for San Mateo County by Thomas Reid Associates.
- National Park Service. 2006. Mission blue butterfly host plant mapping at Sweeney Ridge by May and Associates.
- California Native Plant Society (CNPS). 2001. *Inventory of Rare and Endangered Plants of California* – sixth edition. Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. California Native Plant Society. Sacramento, CA.

Personal Communications

- Dick Arnold, Entomologist, Entomological Consulting, Pleasant Hill, CA. Telephone conversation, June 2007.
- Liam O’Brian. Lepidopterist, San Francisco, CA. Email and telephone communications, July 2007.