

SAN BRUNO MOUNTAIN HABITAT CONSERVATION PLAN



**Year 2006 Activities Report
For Endangered Species Permit PRT-2-9818
Submitted to the
United States Fish and Wildlife Service**



**by the
County of San Mateo**

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TABLE OF CONTENTS

GLOSSARY..... iii

SUMMARY 1

I. INTRODUCTION 4

II. STATUS OF SPECIES OF CONCERN 4

 A. Mission Blue Butterfly (*Icaricia icarioides missionensis*) 5

 B. Callippe Silverspot Butterfly (*Speyeria callippe callippe*) 5

 C. San Bruno Elfin (*Callophrys mossii bayensis*) 10

 D. Butterfly Monitoring Recommendations for 2006 13

 E. Bay Checkerspot Butterfly (*Euphydryas editha bayensis*) 13

 F. San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*) 14

 G. California Red-legged Frog (*Rana aurora draytonii*) 14

 H. Other Species 14

 I. Plants of Concern 15

 J. San Bruno Mountain Community Resources 16

III. VEGETATION MANAGEMENT AND RESTORATION 16

 A. Invasive Species Control 16

 B. Restoration of Habitat 20

 C. Coastal Scrub Succession 22

 D. Grazing 22

 E. Burning 23

IV. ADMINISTRATION 24

 A. The Habitat Management Plan 24

 B. Technical Advisory Committee 24

V. REFERENCES 25

VI. STUDY PARTICIPANTS 26

TABLES

Table 1. Callippe Silverspot Flight Season: 1998-2006 7

Table 2. Weather data for San Bruno Mountain: 1998-2006 7

Table 3. San Bruno Elfin Larvae 2006 Point Data 8

Table 4. San Bruno Elfin Larvae 2006 Point Data 12

Table 5. Snapshot of SBE Points not included in 2006 Monitoring 12

FIGURES

Figure 1. San Bruno Mountain HCP Management Areas 29

Figure 2. Mission Blue Sightings on Callippe Transects 30

Figure 3. Callippe Silverspot Fixed Transects and Observations: 2006 31

Figure 4. Average Number of CS S/H: 2006 32

Figure 5. Average Number of CS S/H: Transects 1-14, 2000-2006 32

Figure 6. Viola Map for San Bruno Mountain 33

Figure 7. Callippe Silverspot Captures, 1981 Survey	34
Figure 8. 2006 San Bruno Elfin Larvae Data	35
Figure 9. Number of San Bruno Elfin Larvae Recorded	36
Figure 10. Number of San Bruno Elfin Recorded on Transect 13.	36
Figure 11. HCP Invasive Species Control Work in 2006 (West Coast Wildlands)	37
Figure 12. Oxalis Treatment Area	38
Figure 13. Before and After Oxalis Treatment, Photo Point 3A	39
Figure 14. Before and After Oxalis Treatment, Photo Point 2B	40
Figure 15. Comparison Photos Displaying Scrub Succession	41

APPENDICES

- Appendix A. Callippe Silverspot Fixed Transect Survey Analysis
- Appendix B. San Bruno Elfin Point Survey Analysis
- Appendix C. Argentine Ant Survey on San Bruno Mountain
- Appendix D. Memo Regarding 2006 Brisbane Fire

GLOSSARY

ANOVA - A statistical procedure called Analysis of Variance. ANOVA is used to test hypotheses about differences between two or more means without increasing the Type I error rate. ANOVA is employed to test whether the mean (or average) for butterfly abundance for a given year or on a given transect is statistically different than another year or transect.

Correlation - Tests for a relationship between two variables.

Endangered - Any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of the class Insecta determined by the Secretary to constitute a pest whose protection under the provision of this Act would prevent an overwhelming and overriding risk to man (Federal Endangered Species Act, 1973).

Endangered Species Act - The Federal Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. Sections 1531-1543. The State of California also has an endangered species act which is referred to as the California Endangered Species Act (CESA).

Invasive Species - Non-native species of plants or animals that out-compete native species in a specific habitat.

Fixed transects - Permanently marked transects that are surveyed year after year. Fixed transects provide a means to compare butterfly observations from year to year at specific locations using standard statistical procedures.

Fixed points - Permanently marked points that are surveyed year after year.

Habitat Conservation Plan (HCP) - The San Bruno Mountain Area Habitat Conservation Plan as adopted by the County Board of Supervisors on September 14, 1982 (Resolution No. 43770).

Habitat Islands – Small areas of native habitat established in restoration sites. Native plantings are installed in relatively small islands where weeds can be more easily controlled. Planting islands generally range in size from 0.1 - 0.25 acres.

Host plant - Particular species of vegetation on which adult butterflies oviposit, and which provides a required food source for survival in the first stages of development after hatching.

Incidental observation - A butterfly observed outside of the transect (or point survey area) during travel between survey areas.

Management - Treatment afforded portions of San Bruno Mountain to enhance or protect existing habitat or to reclaim habitat invaded by weeds or altered by disturbance.

Monitoring - The task, undertaken by the Plan Operator, of regular observation of biological processes, development and conservation activities on San Bruno Mountain; the purpose is to assure compliance with the HCP, and to measure the success of its implementation.

Prescribed burn - The controlled application of fire to naturally occurring vegetative fuels, under specified environmental conditions and following appropriate precautionary measures, to achieve

specific vegetation management objectives, such as brush and hardwood control, to prepare a site for planting, or reduction of fuel hazards.

Regression - A line of best fit used to define the relationship between two variables.

Section 10a - A section of the Endangered Species Act which authorizes the Secretary of the Interior to permit, under such terms and conditions as he may prescribe, any act otherwise prohibited by Section 9 of the Act. The acts may be permitted for scientific purposes, or to enhance the propagation or survival of the affected species (16 U.S.C. Section 1539).

SUMMARY

In 2006, a variety of habitat and species management work was conducted on San Bruno Mountain to satisfy the requirements of the U.S. Fish and Wildlife Service (USFWS) Incidental Take Permit (PRT 2-9818). This work included monitoring the Callippe silverspot (*Speyeria callippe callippe*, CS) and San Bruno elfin (*Callophrys mossii bayensis*, SBE) butterflies, conducting invasive species control work and habitat restoration, providing planning assistance, and coordinating with volunteer groups and oversight agencies.

Covered Species Population Status

Under the San Bruno Mountain Habitat Conservation Plan (HCP), the primary emphasis of the biological monitoring is to evaluate the population status of the endangered butterflies occurring on the Mountain. Special-status species that are monitored on San Bruno Mountain include the Mission blue (*Icaricia icarioides missionensis*, MB), Callippe silverspot, and San Bruno elfin butterflies.

In 2006, fixed transects were used to assess that status of the Callippe silverspot butterfly on San Bruno Mountain. Point transects were used to monitor San Bruno elfin butterfly larvae. Mission blue butterflies were not monitored, although incidental observations of Mission blues on the CS transects were recorded. Data for CS and SBE were analyzed using Analysis of Variance (ANOVA).

In 2006, a total of 443 CS were observed on all of the fixed transects. This corresponds to a sightings per hour (S/H) of 14.5. This is the same S/H recorded in 2005, and is greater than the annual S/H since 2001. A significant difference was found in S/H between years due to the relative abundance of CS in 2001. When data from 2001 are removed from the analysis, there is no significant difference between years.

A total of 388 SBE larvae were observed at 8 surveyed points. This is similar to the number found at these same eight points in 2003 (336 larvae) and 2002 (330 larvae). No significant difference in larvae numbers at the eight points sampled was found among years 2000, 2001, 2002, 2003 and 2006. However, more years of data may be needed to detect a change in the population if occurring.

Our data at this time suggests that the CS population on San Bruno Mountain exhibits year-to-year fluctuation in population size while maintaining a consistent size over time. As annual fixed transect data are not significantly different from one another (excluding 2001), they do not dictate specific CS management direction aside from what is currently performed. Maintenance of existing CS habitat through weed control and shrub containment is of highest priority in managing CS. Monitoring of habitat quality, Viola distribution and weed control efforts can provide indirect evidence of butterfly status.

Management for SBE should include continued larval monitoring on an every-other year schedule. A preferred method is to repeat larvae counts at least 3 times at each point. Each set of counts should be completed within one to two days to reduce temporal variation between points. This larger data set would allow for comparisons of population abundance to be made among years. The numbers of SBE and the quality of their habitat appears relatively stable at this time, and management may be limited to annual visual monitoring to evaluate habitat status.

Vegetation Management and Restoration

In 2006, 611 acres of invasive plants were treated by hand or with herbicides. Many of these acres were treated many times over for repeat control of various species. The greatest efforts went into treating 1) fennel, gorse, French broom, eucalyptus and cotoneaster in the Saddle, 2) various species on the Northeast Ridge, with most effort spent on fennel and French broom, and 3) various species in Wax Myrtle Ravine and in the vicinity of the water tank.

As part of the 2005/2006 fiscal year budget, special funding was approved for aggressive control of Bermuda buttercup (*Oxalis pes caprae*). Part of this funding was reserved for follow-up work in 2006/2007. Efforts were spent at three locations: above Hoffman Street, along the Ridge Trail, and within select stands at Tank Ravine. Locations were prioritized based on existing butterfly habitat. A total of 47 acres were treated.

Other invasive control work performed in 2006 includes gorse control in the Saddle through a California State Parks Grant managed by the County of San Mateo, invasive species control in Devil's Arroyo, Wax Myrtle Ravine, and Owl and Buckeye Canyons by the volunteer group San Bruno Mountain Watch, and restoration of the Colma Creek headwaters including eucalyptus removal under a State Parks Grant managed by the County of San Mateo and performed by the Watershed Project.

Habitat restoration work conducted by Shelterbelt Builders focused on the maintenance of seven habitat islands in the Colma Creek, Dairy Ravine and the Saddle areas. Other habitat islands, funded by the San Francisco Water Department and Brookfield homes, were maintained.

Since the cessation of cattle grazing in the early 1960's, and the reduction in wildfires and controlled burning, native coastal scrub vegetation has been expanding on San Bruno Mountain and overtaking grasslands. This phenomenon has resulted in approximately 180 acres of grassland being lost to coastal scrub since the inception of the HCP in 1982. Management of expanding scrub communities will require a combination of burning, grazing, and/or mechanical removal to maintain grasslands. Continued monitoring of scrub succession, using land and aerial photography, will aid managers in determine where to prioritize scrub control efforts. The current level of HCP funds however, will limit application of any chosen management regime.

No prescribed burns occurred on San Bruno Mountain in 2006. CDF prison crews conducted non-native shrub removal and piling in early 2006. Work was performed above the Linda Vista Development and west of the terminus of Trinity Road in the Brisbane Acres. Piles were burned under wet conditions by the CDF crews.

A wildfire in the Brisbane Acres area of San Bruno Mountain occurred on August 14th. The fire burned approximately 34 acres of grassland, brush, and woodland. The fire burned through highly diverse native grasslands and native coastal scrub habitat, and burned over habitat areas of MB and CS. The amount of habitat for both of these species was low to moderate within the burn area, and should respond well after the fire. The burn area will require ongoing monitoring and management to prevent the expansion of French broom (a fire-adapted invasive species) and other invasive species that may colonize or expand within the burn area.

Administration

The 5-Year Plan described in last year's annual report has been modified and is now called the Habitat Management Plan. The Habitat Management Plan will provide goals and objectives for the following activities: 1) invasive species control, 2) sensitive species population monitoring, 3) habitat restoration, 4) development activities, and 5) public participation.

A technical advisory committee was formed following the 2006 San Bruno Mountain HCP trustees meeting. The purpose of the committee is to comment and advise on the management of San Bruno Mountain. The committee currently meets on a quarterly basis.

I. INTRODUCTION

This report describes biological and development related activities that took place on San Bruno Mountain under Endangered Species Act Section 10(a)(1)(B) Permit PRT 2-9818 for the 2006 calendar year. It provides information on the status of the butterflies of concern, habitat restoration, work on invasive species control and development activities. Appendices containing data collected in 2006 are located at the end of the report. Anyone interested in reviewing field data or other information collected by TRA Environmental Sciences (formerly Thomas Reid Associates) should contact Autumn Meisel at (650) 327-0429 ext. 86 or Sam Herzberg, Park Planner with the San Mateo County Parks and Recreation Division at (650) 363-1823. Previous annual activities reports and data are also available on-line at: <http://www.traenviro.com/sanbruno>.

With the implementation of the HCP, take of Mission blue butterfly (*Icaricia icarioides missionensis*, MB) habitat on San Bruno Mountain was authorized under the Endangered Species Act Section 10(a)(1)(B) Permit. Approximately 14% of the total MB habitat is allowed to be taken by development. As of 2005, 9% of this take has already occurred. Although take of 8% of Callippe silverspot (*Speyeria callippe callippe*, CS) butterfly habitat on San Bruno Mountain is allowable under the HCP, no take of CS or its habitat (*Viola pedunculata*) has occurred or been authorized since the CS was listed as federally endangered in 1997.

No development occurred in 2006. A total of 310 acres (9%) of San Bruno Mountain have been developed since the start of the HCP. This is approximately 77% of the total development originally allowed under the HCP within the planned parcels. This includes approximately 25 acres that have been graded to reduce the risk of landslides and these slopes are subject to restoration. Within planned parcels, the remaining portion allowed for development is approximately 70 acres, including 23 acres that are to be disturbed temporarily (graded and then restored). Unplanned parcels, which are parcels that do not currently have a development plan, constitute a total of 305 acres. Most of these parcels are located in the Brisbane Acres. To date, the City of Brisbane has set aside 40.64 of these acres as protected open space.

A map of the San Bruno Mountain HCP management units is provided in Figure 1.

II. STATUS OF SPECIES OF CONCERN

Special-status species that are monitored on San Bruno Mountain include the Mission blue, Callippe silverspot, and San Bruno elfin (*Callophrys mossii bayensis*, SBE) butterflies. Special-status plants on the Mountain are not included in the regular monitoring program.

In 2006, fixed transects were used to assess that status of the endangered Callippe silverspot and San Bruno Elfin butterflies on San Bruno Mountain. Mission blue butterflies were not monitored, although incidental observations of MB on the CS transects were recorded. Callippes were last monitored in 2005, and MB in 2004. We anticipated the monitoring of MB, rather than CS in 2006. However, the U.S. Fish and Wildlife Service (USFWS) requested that CS be monitored in 2006. A limitation in funding prohibits the monitoring of all three butterfly species each year. In addition, the USFWS has recommended a decrease in species monitoring to an every-other year schedule. This change was implemented so that a greater proportion of funding resources could be allocated to exotics control, as non-native containment is agreed to be of primary concern in conserving butterfly habitat and the native plant species biodiversity of the Mountain.

A. Mission Blue Butterfly (*Icaricia icarioides missionensis*)

Mission blue butterflies utilize three larval host plants, all of which are present on the Mountain: *Lupinus albifrons* var. *collinus*, *Lupinus formosus* var. *formosus* and *Lupinus variicolor*. Early flying MB (March- April) are associated with *L. albifrons*, and late flying MB (May- June) are associated with *L. formosus*. *Lupinus variicolor* is used less commonly. Typically, MB begin adult flight in March, are most abundant in April, and observations begin to drop off by late May or early June.

Mission Blue butterflies were not monitored in 2006, although incidental observations made on Callippe transects were usually noted. In 2006, a total of 66 MB were recorded on the CS transects between the CS survey dates of May 24 and July 18 (Figure 2). Only MB that were quickly identifiable were logged, as field staff did not use CS monitoring time to follow and identify all blue butterflies. Therefore, it is presumed that more than 66 MB were encountered on the CS transects. In 2004, 84 MB were recorded on CS transects, and in 2005 81 MB were recorded. CS monitoring in both 2004 and 2005 started earlier in May (Table 1) thus capturing more of the MB flight season.

Fixed transect data for MB was last collected in 2004 and can be reviewed in *San Bruno Mountain Habitat Conservation Plan Year 2004 Activities Report for Endangered Species Permit PRT-2-9819* (TRA 2005). It was found in 2004 that MB numbers per transect were high when compared to previous years. Of the seven years that Mission blue transect data has been collected and analyzed (1998-2004), the year 2000, which had the greatest number of MB observations, was found to be nearly significant ($p < 0.1$) from 1998. All other years are not significantly different from one another, and no significant trend across years was found using correlation or regression analysis. For correlations, 8 years is the minimum number before correlations across years would become significant (C Knight, pers. comm.). As of 2004, seven years of MB fixed transect data has been collected and analyzed. Therefore, continued monitoring will be necessary to detect a significant change, if present, in MB observations.

B. Callippe Silverspot Butterfly (*Speyeria callippe callippe*)

Callippe silverspot butterflies use one larval host plant, *Viola pedunculata* (Jonny jump-up). The flight season for adult CS is typically from mid-May to mid-July.

Methods

Fixed transect surveys were monitored to provide a means with which to compare CS observations from year to year at specific locations using standard statistical procedures. Fixed transect locations were not chosen randomly but were placed in habitat areas with higher butterfly densities and that include a variety of slope exposures, nectar plants, and soil conditions (i.e. road cuts, ravines, and natural slopes). Even within high-density habitat locations, it is sometimes difficult to observe enough butterflies for statistical comparison. For this reason, fixed transects were located only in areas where there was a good chance of observing CS under desirable weather conditions. Transects vary in length from approximately 300 to 2100 meters and are permanently marked in the field. A total of 14 fixed transects were monitored in 2006. This includes two new transects that were added in 2005 to the previous 12 CS transects monitored in prior years. Transects 13 and 14 were created east of the terminus of Carter Street at Guadalupe Canyon Parkway. This location was chosen in order to learn more about potential Callippe presence and movement in grasslands north of Guadalupe Canyon Parkway and habitat at the west end of the Northeast Ridge, as residential development is planned within parcels on the Northeast Ridge.

The monitoring program attempts to catch the beginning and end of the flight season and thoroughly document the observations on a weekly or biweekly basis during that period. It is not cost effective for crews to monitor the fixed transects prior to species emergence, or to continue monitoring transects after most of the observations have dropped off. As a result, the actual monitoring period does not precisely correspond to the flight season for each butterfly.

Ideally, each transect is monitored every 7-10 days during warm, calm weather when CS are most active. However, in practice, transects are often surveyed less frequently due to poor weather conditions (fog and/or wind). Efforts are made to complete an observation cycle (a survey of all fourteen transects) within one to two days. All butterflies observed outside of a transect or in the transect vicinity during travel between transects are recorded as incidental observations. It should be noted that because of the steep slopes, various microclimates and limited survey days, it is a challenge to monitor the butterflies on San Bruno Mountain in a consistent manner from year to year.

In 2003, we ran a regression analysis using four years of transect data. The analysis showed that wind speed ($p=0.11$, $F=2.65$) and temperature ($p=0.42$, $F=0.63$) are not significantly correlated with the probability of observing CS in flight (the number of CS sightings per hour). This result corresponds with field observations and therefore we do not limit the data analyzed based on weather parameters. We do however limit survey efforts to days in which the temperature is mild to warm (above mid 60s) and average wind speeds less than 10 miles per hour.

The number of CS sightings per hour is used for statistical analysis. To calculate the sightings per hour, the start and stop time for each transect is recorded, as is every CS observation made within this time. The number of CS observed for a particular transect is divided by the number of minutes to complete the transect survey. For each year, the average CS sightings per hour for all transects is used to compare relative CS abundance between years.

Seven years of CS fixed transect data was analyzed using a one-way ANOVA statistical test. Raw data is presented in Appendix A.

Results

The monitoring period for CS in 2006 lasted from May 24 to July 18. The first CS observations were recorded on May 18 on two transects. The last CS observation was recorded on July 18 on one transect. These dates are typical of those that have been recorded in past years (Table 1). For CS, the timing of the flight season appears to occur fairly consistently across years between mid-May and mid-July. The delay in the initiation of surveys following the first CS observation is generally due to the difficulty in scheduling monitoring days with the typical summertime foggy weather.

In 2006, the transects were surveyed 5 times with a grand total of 443 CS observed (this number does not include incidental observations). Figure 3 shows the locations on the Mountain where these observations were made. This corresponds to a sightings per hour (S/H) of 14.5. This is identical to the S/H figure calculated for 2005. An ANOVA test found a significant difference in S/H between all years surveyed ($F=4.154$, $p<0.0005$, Appendix A). This difference was primarily due to the relative abundance of CS in 2001. When data from 2001 are removed from the analysis, there is no significant difference between years ($F=1.35$, $p<0.24$, Appendix A).

Table 1. Callippe Silverspot Flight Season Start and End Dates: 1998-2006

Year	Date first CS observed	Date fixed transect surveys began	Date of last CS observation	Approximate length of flight season (Days)
1998	May 31	NA	July 15	42
1999	June 3	NA	July 22	49
2000	May 18	June 1	July 14	57
2001	April 4*	May 21	August 4	122
2002	May 8	May 17	July 9	62
2003	May 9	May 12	July 9	61
2004	April 27	April 28	June 15	49
2005	May 11	May 11	July 13	64
2006	May 18	May 24	July 18	62

*Second CS sighting in 2001 occurred on May 8.

In 2006, the greatest number of CS recorded per hour was on transects 11 and 12 (located on the Southeast Ridge), with an average of 37.4 and 34.2 S/H respectively. Transect 7 had 25.4 S/H, and transects 3, 5, 9 and 10 averaged between 12 and 15 S/H. Transect 7 is located along the Ridge Trail, transects 3 and 5 are both on the Northeast Ridge, and transects 9 and 10 are located down ridgelines adjacent to Owl and Buckeye Canyons. The transects with the lowest S/H observations include transect 1 (Dairy Ravine), transect 6 (Northeast Ridge Watertank), and transect 13 (Bay Vista). The average number of CS observed per hour on each transect is presented in Figure 4 and Table 2.

Table 2. 2006 Callippe S/H by Transect

Transect	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CS S/H	0	3	12.1	3.5	14.7	1.4	25.4	4.8	13.7	15.1	37.4	34.2	0	3.75

Relative transect performance is similar to that observed in 2005. The overall number of CS seen in 2006 (443) is less than that in 2005 (577) as the transects were only sampled 5 times this year whereas last year they were sampled 6 times. Fewer sampling visits were feasible this year due to weather and the loss of one field staff after the start of the monitoring season. Figure 5 displays the average S/H at each transect over the past 7 years of monitoring.

In 2005 and 2006, the Mountain's Viola population was mapped (Figure 6), and this map can be cross referenced with Figure 3 to reveal the abundance of Viola on or in the vicinity of the CS transects. Generally, the highest performing transects intersect the larger stands of Viola. Low performing transects, such as 1 and 2 are located in areas where the Viola is sparser in its distribution and/or there is less hilltop topography. Transect 1 is located on Dairy Ravine where scrub has come to dominate over the lower portion of the transect. Transect 2 is in the Saddle and traverses grassland habitat with a significant scrub component. Both transects 1 and 2 support fewer Violas than do transects that chiefly intersect grassland dominated areas. In addition, transects 1 and 2 are located within an area of the mountain that receives increased fog and strong winds.

A summary of weather data since 1999/2000 is provided in Table 3. In 2005, we investigated whether there is a correlation between temperature and the observed CS sightings per hour (TRA 2006). The three highest performing transects of 2005 were analyzed. Sightings per hour on each sample day were plotted against both the average temperature that was recorded by field biologists on the transects and the average daily temperature as recorded at the San Francisco Airport (SFO) weather station.

Table 3. Weather data for San Bruno Mountain: 1999-00 to 2005-06 (NOAA 2006).

Average mean daily temperature and rainfall shown by month. When available, data was recorded at the County park entrance. Data shown is for the weather year recorded from July of one year to June of the next year.

Temp (°F)	99-00	00-01	01-02	*02-03	**03-04	**04-05	**05-06	Rain (inch)	99-00	00-01	01-02	*02-03	**03-04	**04-05	**05-06
July	64.9	62.7	70	72.1	71.3	72.1	64.4	July	0.05	0.23	0.26	0	0	0	0
Aug	65.5	65.7	65	72.4	73.9	74.0	63.4	Aug	0.47	1.80	0.44	0	0	0	0
Sep	66.3	73.7	70	74	76.0	77.2	62.4	Sep	0.50	0.46	0.51	0	0	0.04	0.08
Oct	68.4	61.0	68	69.7	72.4	68.2	61.3	Oct	0.61	3.21	0.56	0	0	3.19	0.08
Nov	59.1	54.7	60	64.8	59.9	61.6	57.2	Nov	2.57	1.40	5.75	2.95	2.12	1.22	1.23
Dec	55.6	56.0	52	57.9	57.1	58.1	53.1	Dec	0.68	1.16	12.55	10.75	7.08	6.42	9.34
Jan	53.8	52	51	57	55.1	49.7	51.6	Jan	7.23	5.01	2.44	2.09	3.32	4.27	2.45
Feb	54.7	53.3	57	56	58	55.0	52.9	Feb	10.7	7.43	3.14	3.16	6.32	5.10	2.3
Mar	57.9	59.2	57	59	68.5	57.2	51.1	Mar	2.92	2.04	2.97	2.37	0.95	3.74	6.13
Apr	60.7	56.5	58	57	68	56.8	55.6	Apr	2.21	2.34	0.72	4.31	0.15	1.70	4.01
May	71.7	67.6	63	64	67.6	61.5	59.8	May	1.81	0.19	1.02	0.66	0	1.15	0.37
Jun	65.7	68.2	67	66	68.9	61.9	63.3	Jun	0.37	0.25	0.27	0.13	0	0.03	0
								Total	30.1	25.5	31	26.4	19.9	26.86	26

Data were not available from the County Park and rainfall data were taken from Lake Merced weather station (*) or SFO weather station (**) for 2002-06. Based on a comparison of years, temperature data from SFO tends to be 2-3° F warmer for the months January through May and 6-7° F warmer for June through December compared to weather recorded at the Park entrance. Rainfall data from SFO tends to be 0.03-1.2 inches lower for the months January through May and 0.13-0.26 inches lower for June through December.

No significant correlation was found between the S/H and temperature recorded either at SFO or by TRA field biologists. However, anecdotal observations over the 20+ years of butterfly monitoring on San Bruno Mountain predict a positive relationship between temperature and sightings. Increasing the data set to include all transects and all years of fixed transect data collection may detect trends not apparent in the chosen data set. For such analysis, it would be preferable to use weather data collected on SBM, as temperatures recorded at SFO may vary significantly from on-site data. Upon approval from San Mateo County, a weather station will be installed on the east side of the Mountain above the Brisbane Acres in the winter of 2006/2007. Therefore, on-site weather data will be available during the 2008 monitoring effort, which is the next time in which we anticipate monitoring CS. Continued collection of weather data on the Mountain will allow for more relevant temperature correlation analyses. Such data may be useful in predicting butterfly emergence and

flight season, as well as investigating the potential impact of global warming on the life cycle of the butterflies and their habitat on San Bruno Mountain.

Rainfall and CS Abundance

Rainfall totals for years 1999-2006 are shown in Table 3. This weather data was collected at three different weather stations. Rainfall varies among station locations, and therefore the yearly rainfall data presented in Table 3 cannot be compared. However, we can look back at total annual rainfall at the SFO weather station, where data has been collected since 1927 (NOAA 2006). The average rainfall at the SFO station over the past 78 years is 20.01 inches. The wet season of 2005/2006, with an average annual rainfall of 26 inches at SFO, was above average. Since the start of CS fixed transect data collection in 2000, other years that exceeded average annual rainfall at SFO include 2001 (26.1 inches) and 2005 (26.9 inches) (NOAA 2006). Rainfall on the mountain in any year is generally greater than that at SFO due to the topographic/rain shadow effect. *Note: Table 3 only displays SFO rainfall data from 2003 on. Rainfall averages displayed in Table 3 for prior years were collected from different weather stations.*

Since the start of CS fixed transect data collection in 2000, CS sightings per hour were highest in 2001, with the next greatest years being both 2005 and 2006. This suggests that perhaps some increase in total rainfall is correlated with a greater abundance in CS in the spring/summer following the rain. This was investigated last year, when a least squares regression analysis was run using CS sightings per hour data and the SFO weather station annual rainfall data. A significant correlation was not found, however a trend of increased CS abundance following wetter years was detected. This trend will be further studied following the construction of a weather station on San Bruno Mountain, which is anticipated in 2007. This would allow for CS abundance to be compared to onsite rainfall data.

Management Implications for Callippe Silverspot

The number of CS sighted per hour in 2006 was similar to that found in 2005 and 2002, and above average for the years when 2001 is excluded. Of the seven years that Callippe silverspot transect data has been collected and analyzed, 2001 was found to be significantly higher than all other years. No significant difference was found between all other years (2000 and 2002-2006). Abundance data from seven consecutive years, although inadequate to detect long-term changes in population dynamics, can suggest trends of population increase or decline. Our data at this time suggests that the CS population on San Bruno Mountain exhibits year-to-year fluctuation in population size while maintaining a consistent size over time. More years of data collection will allow us to determine if this short-term trend is accurate in predicting long-term population status.

Within a single transect, CS abundance varies from year to year (Figure 5). This corresponds to what is known of butterflies' variable use of microhabitats from year to year, influenced by environmental and climatic flux. Consistently higher-yielding transects include those that intersect the greatest amount of hilltop and Viola habitat, including transects 3, 5, 7, 11 and 12. The locations of the original 12 transects (transects 13 and 14 were added in 2005 to address the question of CS abundance with respect to the Northeast Ridge proposed development) were selected based off of information on CS and Viola distribution gathered by TRA since 1981. Figure 7 shows locations on the Mountain where CS were captured during a study conducted in 1981. Current CS distribution on the transects corresponds roughly to CS distribution in these areas in 1981, with the exception of transect 1 (Dairy Ravine). Scrub has displaced much of the grassland on this transect, which is most likely responsible for the decrease in CS observations. Loss of grassland to scrub, discussed in

greater detail in section III.C, threatens CS habitat where grasslands supporting *Viola* are susceptible to scrub invasion. Control of native scrub as well as continued control of non-native vegetation are priority actions for CS conservation.

As annual fixed transect data are not significantly different from one another (excluding 2001), they do not dictate specific CS management direction aside from what is currently performed. Maintenance of existing CS habitat through weed control and shrub containment is of highest priority in managing CS. Monitoring of habitat quality, *Viola* distribution and weed control efforts can provide indirect evidence of butterfly status. Also, a one-time snapshot presence/absence survey of the entire mountain during the peak of the flight season could also generate new or updated information on CS distribution. This is discussed under Recommendations, below.

Callippes have been monitored on an annual basis for the past 7 years. During the CS flight season, Callippes are one of the most commonly encountered butterflies on the Mountain. Given the consistently high number of CS observed, we believe that monitoring every-other year from this point on will be adequate. In 2007, only Mission blue butterflies will be monitored, and it is anticipated that the next time CS will be monitored will be in 2008. Callippes that are incidentally observed on MB transects during the 2007 MB monitoring effort will be recorded. The end of the MB flight season overlaps with the start of the CS flight season, and therefore incidental CS are expected to be observed only in the later MB surveys. Observations of CS on the MB transects would provide information on CS distribution outside of that gathered from CS monitoring.

It should be noted that though the transect data collected thus far may not indicate an upward or downward trend in butterfly abundance, this does not necessarily mean that the monitoring does not generate useful information. In the years since the start of the HCP, new weeds have been identified on San Bruno Mountain and some native grassland habitat has been lost to native scrub succession (see below). However, management of the Mountain has succeeded in protecting approximately 90% of the butterfly habitat on San Bruno Mountain, and habitat management has successfully maintained most habitat areas from being overtaken by weeds. It is possible then that trends in butterfly populations, either negative or positive, are not occurring and therefore would not be detected. The monitoring therefore would need to provide enough statistical power to sufficiently detect trends in butterfly abundance, if occurring. At this point in time, the methodology for monitoring Callippe silverspot appears to provide this function, and with several more years of monitoring, will be able to provide more robust information on population status.

The fixed transect monitoring intercepts a majority of the CS habitat on the Mountain, and these areas appear to be stable. For the areas not monitored with the fixed transect system (typically areas with marginal habitat or located on slopes that are difficult to access) presence/absence monitoring at least on a frequency of once every 5 years should be employed.

C. San Bruno Elfin (*Callophrys mossii bayensis*)

San Bruno elfin are closely associated with their host plant, Pacific stonecrop (*Sedum spathulifolium*), which grows within higher elevation grasslands on northeast to northwest facing slopes. San Bruno elfins occur where there are high densities of *Sedum* and in areas that are protected from strong winds. The adult flight season for SBE typically occurs between early March and mid April. Third and Fourth instar SBE larvae are present and easily identifiable on the *Sedum* flower heads typically for 2-3 weeks occurring in May and/or June.

A total of 21 points for monitoring SBE adults and/or larvae were established in 1998. Adult San Bruno elfin were monitored at fixed monitoring points consecutively from 1998 to 2004. A randomly chosen subset of the points were chosen for monitoring San Bruno elfin larvae, and these were monitored every year from 1999 to 2003. No SBE monitoring of adults or larvae was conducted in 2004 or 2005. In 2006, SBE larvae only were monitored. Therefore, a total of 6 years of larval monitoring has been conducted (1999-2003 and 2006). The value in monitoring larvae over adults is that larvae presence is not affected by daily weather, larvae are easy to identify, and the emergence time of the larvae is easily deduced by the flowering state of the Sedum.

All of the existing SBE butterfly habitat on San Bruno Mountain has been protected as open space within San Bruno Mountain State and County Park since 1975. Development that was approved through the San Bruno Mountain HCP did not affect this species, and therefore monitoring and management for this species and its habitat was not a requirement of the HCP permit. However, this species' habitat partly overlaps with that of the Mission blue and Callippe silverspot, and is composed of some of the most pristine coastal prairie and coastal scrub habitat on the Mountain. Continued monitoring and management of SBE should continue to be a high priority on San Bruno Mountain because of the biological value of this species and its habitat.

Methods

One-time larvae counts were performed at 8 fixed points on May 29 and 30. Counts were conducted after the start of the Sedum bloom, when larvae had been confirmed as present during visits to the points in the days prior to the start of monitoring. Counts were conducted within a 25-meter radius around each point. Every Sedum was searched for larvae. No time limit was placed on the survey effort, due to the high variation in Sedum density at each point. Time was taken at each point to allow for inspection of all Sedum plants within the 25-meter radius.

A single point, point #13, was surveyed three times during the Sedum flowering period (May 30, June 5 and 12). The purpose of this was to capture when the peak larvae abundance occurred and to gauge whether the timing of the one-time counts at all the points intercepted this peak.

In addition to the 8 points monitored for larvae, nine points that were not included in the 2006 SBE monitoring effort were visited once during the Sedum blooming period to assess the state of the habitat. The quantity of Sedum, blooming stage, and potential threats to the habitat were noted. A snapshot check for larval presence was made.

Results

On the dates of May 29 and 30, a total of 388 SBE larvae were observed at 8 surveyed points (Figure 8 and Table 4). This is similar to the number found at these same eight points in 2003 (336 larvae) and 2002 (330 larvae). No significant difference in larvae numbers at the eight points sampled was found among years 2000, 2001, 2002, 2003 and 2006 ($p=0.31$, $F=1.24$; Appendix B). However, more years of data may be needed to detect a change in the population if occurring. A graph displaying the number of larvae recorded in the five years of monitoring is provided in Figure 9.

Table 4. San Bruno Elfin Larvae 2006 Point Data

Point	Date	Temp	Wind	# Larvae
6	5/29	57.5	5.2	47
7	5/29	65.7	7.2	54
8	5/29	59.0	13.1	123
13	5/30	62.3	3.1	38
13	6/5	58.0	5.6	71
13	6/12	73.8	4.0	9
15	5/30	51.7	9.1	41
16	5/30	58.6	8.6	34
17	5/30	71.4	7.1	15
19	5/30	71.4	7.1	3

Nine points not included in the 2006 survey effort were visited to assess the status of the habitat. The abundance of Sedum and the flowering stage at the time of the visit (June 5) varied among points (Table 5). At some points, the plants were just in flower, and at others the flowers had begun to die back. This illustrates the variability in flowering stage, influenced by factors such as site aspect and location. Larvae were seen at seven of the nine points; however, given the short search time (approximately 5 minutes at each point), larvae may have been present but not detected.

Table 5. Snapshot of SBE Points not included in 2006 Monitoring

Point	Sedum stage	Sedum abundance	Larvae present
1.1	3	C	No
2	2/3	A	Yes (2)
3	3/4	A	No
5	2/3	A	Yes (4)
5.1	3	C	Yes (many)
9	3	C	Yes (9+)
12	3	A/C	Yes (2+)
14	1/2	C/R	Yes (2+)
20	1/2	C	Yes (1)

Sedum Stage: 1- Most not yet flowering; 2- Most in flower, some yet to flower; 3- Most in flower, some finishing; 4- Most finished, some still flowering; 5- All finished flowering. Sedum abundance: A- Abundant; C- Common; R- Rare.

The three surveys performed at point 13 suggest that the survey performed on the second date, June 5, most closely coincides with the peak larvae abundance at this location (Figure 10). As the Sedum flowering stage may vary slightly among points, the peak of larvae abundance may also vary among locations. This variation of the Sedum phenology at each of the points can be accounted for by conducting multiple counts (3) that would allow comparison of peak abundance as well as average number of larvae for each point within a single season.

Management Implications for San Bruno Elfin

The number of SBE larvae counted in 2006 does not differ significantly from counts made in prior years. However, the current method of a single larval count at each point is not ideal for an estimate of relative population abundance for comparison between years. Within a season, the abundance of larvae at a point is assumed to resemble a bell-shaped curve, with peak larvae

abundance occurring at some time midway between visibility of the first and last larvae feeding on the Sedum flower heads. A single count does verify SBE presence and distribution, and larvae were found to persist at all points that were sampled. Larvae were also observed at most points that were visited in 2006 (Table 4).

Of critical importance in assessing the status of the SBE population is evaluating the vigor of the habitat. As Sedum grows on rocky outcrops, competition from weeds does not pose a significant threat to the plants. Succession by shrubs is likewise not an evident threat in these areas where Sedum persists. Areas supporting Sedum are within protected areas, and no take of SBE habitat can occur under the HCP. Visits to the 17 larvae monitoring points in 2006 did not uncover any immediate threats to SBE habitat at these locations. Potential future threats include invasion by scrub, quaking grass (*Briza maxima*), Bermuda buttercup (*Oxalis pes caprae*) and ehrharta (*Ehrharta longiflora*).

Monitoring for SBE should include continued larval monitoring on a biannual schedule, and annual assessments of habitat status. A preferred method for biannual larvae counts is to repeat larvae counts at least 3 times at each point, approximately one week apart once larvae are initially detected. Each set of counts should be completed within one to two days to reduce temporal variation between points. This larger data set would allow for better comparisons of population abundance to be made among points and between years. As no immediate threats to SBE habitat is identified at this time, management may be limited to annual visual monitoring to evaluate habitat status, including the status of potential invasives such as scrub and Oxalis.

D. Butterfly Monitoring Recommendations for 2006

1) Recommendations for MB monitoring were provided in the 2004 activities report, which was the last year MB was monitored. Recommendations include lengthening of MB transects to a distance comparable to those established for CS. This will be performed in 2007, followed by MB monitoring.

2) Begin monitoring CS every other year. Continue to complete five rounds of surveys in a season, and make all efforts to complete each survey of all transects within 1 to 2 days.

3) As recommended in the previous year's report, a presence/absence survey for CS over the whole Mountain and timed to correspond with the average peak of the flight season, would provide us with information on CS distribution in areas not intersected by transects (typically areas with marginal habitat or located on slopes that are difficult to access). The purpose of this survey would be to gain presence/absence data on the butterfly over a greater area than currently monitored. During the next CS monitoring year, we will look into the possibility of conducting such a survey. Ideally, a presence/absence survey should be conducted on a frequency of once every 5 years.

4) Increase SBE larvae monitoring to allow for 3 visits per point on a biannual basis. Conduct annual visits to all SBE points to evaluate habitat status.

E. Bay Checkerspot Butterfly (*Euphydryas editha bayensis*)

A small population of the Bay checkerspot butterfly (BCB) was present near the summit of San Bruno Mountain up until the mid-1980's. This species has not been observed on SBM in over 20 years. No BCB larvae or adults were observed on San Bruno Mountain by field crews while conducting biological activities and overseeing development activities in 2006. In October 2000, the

U.S. Fish and Wildlife Service (USFWS) proposed critical habitat for the BCB, followed by a Final Rule issuance on the critical habitat designation in April 2001. The critical habitat designation includes the historic BCB habitat on the main ridge of San Bruno Mountain. This species must be taken into account when planning any activities that could impact BCB habitat.

F. San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*)

The San Francisco garter snake (SFGS) was identified in the San Bruno Mountain HCP (1982) as having potential habitat on San Bruno Mountain. No SFGS were observed on the Mountain by field crew while conducting biological activities and overseeing development activities in 2006. There have been no confirmed observations of SFGS on San Bruno Mountain in the 23 years of the HCP monitoring program. Based on the lack of significant ponds and other aquatic habitats, this species is unlikely to be present.

G. California Red-legged Frog (*Rana aurora draytonii*)

The California red-legged frog (CRLF) shares similar aquatic habitat with SFGS. Though it was not identified as a sensitive species at the time of the HCP, CRLF has since been listed as a Federally Threatened species. No CRLF were observed on San Bruno Mountain by field crews while conducting biological activities and overseeing development activities in 2006. There have been no confirmed observations of CRLF on San Bruno Mountain in the 24 years of the HCP monitoring program. Based on the lack of significant ponds and other aquatic habitats on San Bruno Mountain, it is unlikely this species is present.

H. Other Species

Mammals

Seven to eight confirmed sightings of a mountain lion (*Felis concolor*) have been made in the Saddle area on the Mountain since September 2004. The lion (or lions) may be moving through the Colma cemeteries as a corridor between Crystal Springs and the Mountain. The lion may have been foraging in the Saddle as that is where most of the prey are concentrated (raccoons, skunks, feral cats) due to the incidence of garbage disposal and feral cat feeding in this area. County Park staff has placed signs up to alert park users to the potential presence of a mountain lion in the area.

A dead, juvenile, male lion (road kill) was found on HWY 280 in March of 2006 near the Crystal Springs Reservoir. It is possible that this was the same lion observed on SBM, as no sightings have been reported since. Juvenile males are the most susceptible to incidents with humans and autos as these cats are the most nomadic as they seek out their own territory.

Numerous sightings of other wildlife were made in 2006. A coyote (*Canis latrans*) was seen on Day Camp Road in the Saddle on July 3rd. A dead badger (*Taxidea taxus*) was seen on Guadalupe Canyon Parkway also in July. Red foxes (*Vulpes vulpes*), nonnative species, have been recorded on multiple occasions near the Quarry within the last two years. A grey fox was seen on two occasions on West Peak Road in early April. And in the fall of 2005, one mule deer (*Odocoileus virginianus*) was seen near the Northeast Ridge water tank in the fall of 2005. To our knowledge, this is the first sighting of a deer on San Bruno Mountain since the early 1960s.

Bumblebees

Native bumblebees, important pollinators for 42 percent of flowering plant families in California, are showing a decline in the Bay Area (Kay 2003). San Francisco hosted nine species of bumblebees in the early 1900s. In 2002, Robin Thorp, an entomologist at UC Davis surveyed for bumblebees on San Bruno Mountain and found only four of the expected nine species. Quinn McFrederick, a graduate student at San Francisco State, surveyed for bees on the Mountain in 2003 and 2004. He identified the same four species as did Thorp as well as a fifth species. At the 2006 Wildlife Society conference, Thorp suggested that diseases brought in by non-native bumblebees and competition from these non-natives may have eliminated some of the northern California species, including species on San Bruno Mountain (Patrick Kobernus, pers. comm.).

A loss of bumblebees, either in diversity or abundance, could negatively impact the floral community on the Mountain. Bumblebees visit a greater diversity of flowers and transport more pollen on their bodies than do the non-native honeybees. Attention to research on bumblebee status in the Bay Area, and future surveys on the Mountain to assess diversity, is recommended.

Argentine Ant

The Argentine ant (*Linepthea humile*) is a non-native ant that has proliferated in California, especially in wet areas and near human occupation. Argentine ants have been known to decimate native ant populations through competition and aggressive behavior. This may be a concern for Mission blue and San Bruno elfin butterflies, which are believed to be facultative myrmecophiles. Native ants (*Formica sp.*). The butterfly larvae secrete a honeydew substance from an abdominal gland on which the native ants feed. In return, the ants tend to the larvae by helping to protect them from predators and parasites.

In February 2006, a preliminary study by Jessica Shors, a graduate student at Stanford University, surveyed for Argentine ants along MB transects at San Bruno Mountain. Shors surveyed 14 MB transects and found Argentine ants on 5 of these transects (Appendix C). At two of these transects, native ants were also observed. The dataset from this survey is too small to draw any conclusion from. The survey does reveal that Argentine ants are present within at least some MB habitat, and may potentially be inhibiting the persistence of native ants with whom the butterflies may form a mutualistic relationship. As this was a single season survey, additional surveys would provide a better assessment of ant presence. In addition, summertime surveys may favor increased ant encounters.

I. Plants of Concern

Several rare and listed plant species are found on San Bruno Mountain, although none were mapped in 2006. In previous years, colonies of listed plants or rare plants with a status of CNPS List 1B or higher (i.e. *Arctostaphylos imbricata imbricata*, *Lessingia germanorum*, *Silene verecunda ssp. verecunda*, and *Helianthella castanea*) were mapped using GPS. See previous annual reports (1999-2003) for maps showing the distribution of these rare plants on San Bruno Mountain.

A wildfire occurred above the Brisbane Acres on August 14, 2006 and burned over an area supporting *Helianthella castanea*. Details of this fire are provided in section III.D. below. As the vegetation within the burn area recovers, the *Helianthella* will be mapped and compared with previous mappings to investigate the fire's effect on the plant's distribution.

J. San Bruno Mountain Community Resources

A cooperative website for San Bruno Mountain was developed by TRA in 2001 and is found at <http://www.traenviro.com/sanbruno>. This site was intended to serve as a center for information, contacts, references, and mapping resources for San Bruno Mountain. The site however has not been utilized as much as hoped, and needs to be revised and updated so that it can provide a more useful resource for volunteers, professionals, government employees, and members of the public who are involved in preservation, restoration, biological monitoring, and planning at San Bruno Mountain.

III. VEGETATION MANAGEMENT AND RESTORATION

A. Invasive Species Control

The primary focus of habitat management activities since the inception of the HCP has been control of invasive species infestations through hand removal, mechanical removal, and herbicide treatment. The majority of this work on the Mountain has been performed by West Coast Wildlands (WCW), (under subcontract to TRA), and their work is described in detail below. In addition, other contractors such as Shelterbelt Builders and Restoration Resources, CDF prison crews from the Ben Lomond camp, and numerous volunteers such as San Bruno Mountain Watch, conducted invasive species control in 2006.

Due to the large area of the Mountain that is subject to invasive species control work, (approximately 2,800 acres), and the expanding number of invasive species that require treatment, infestations must be prioritized as follows, based on their threat to sensitive habitat areas:

- Priority 1: Small patches of invasive species within native habitat
- Priority 2: Small patches of invasive species at the periphery of native habitat
- Priority 3: Edges of large invasive species infestations
- Priority 4: Large invasive species infestations

Herbicide treatment has consisted of spraying targeted species with an herbicide solution containing either Garlon 4® (triclopyr ester) or Roundup® (glyphosate). These herbicides are used due to their high effectiveness, low toxicity rating, and short half-life in the soil. Garlon 4® herbicide is the preferred chemical since it does not harm monocots (grasses). Herbicide is applied one to four times per year in suitable weather (low wind, low humidity) for maximum plant uptake. The plants are left to decay in place, a process that takes from one to five years, depending upon the size of the plants. In sensitive areas (near butterfly habitat and within 150 feet of private property) mature stands of invasive plants are removed by hand control, chainsaw or mowing, followed by stump herbicide treatment.

2006 HCP Invasive Plant Treatment Summary

The primary focus of non-native species control has been on invasive shrubs and on the most invasive herbaceous species. Species that pose the greatest threat of displacing butterfly habitat and other native habitats are of highest priority. Woody plants that are treated most aggressively include gorse (*Ulex europaeus*), French broom (*Genista monspessulana*), Portuguese broom (*Cytisus scoparius*), cotoneaster (*Contoneaster sp.*), and eucalyptus (*Eucalyptus globulus*). Herbaceous species that received the greatest amount of control effort include fennel (*Foeniculum vulgare*), radish (*Raphanus raphanistrum*), mustard (*Hirschfeldia incana*), Himalayan blackberry (*Rubus discolor*), pampas grass (*Cortaderia jubata*) and oxalis (*Oxalis pes caprae*). A growing amount of

attention is also being paid to weeds that are not as pervasive as those listed above, but that are capable of altering community composition through competition within their microhabitat. These include species such as red valerian (*Centranthus ruber*), ehrharta (*Ehrharta longiflora*), and pin-cushion plant (*Scabiosa atropurpurea*).

Fennel is treated as one of the highest priority weeds on the Mountain and populations have been significantly decreased in some locations, such as on the slope above Hillside School. However, a high level of follow-up maintenance is required for management of fennel. Stands may require several treatments a year for many years before the plant is eradicated. Hence, significant resources are required for continued treatment of a site, thus limiting the total area that can be adequately treated.

In 2006, 611 acres of invasive plants were treated by hand or with herbicides (Figure 11). Many of these acres were treated 2-4 times for repeat control of various species. West Coast Wildlands maintains daily record sheets for all invasive species work conducted on the Mountain. The following species were recorded as having been treated in 2006:

<i>Acacia</i> sp. (acacia)	<i>Euphorbia lathyris</i> (Caper spurge)
<i>Carduus pycnocephalus</i> (Italian thistle)	<i>Foeniculum vulgare</i> (fennel)
<i>Carpobrotus edulis</i> (hottentot fig, iceplant)	<i>Genista monspessulana</i> (French broom)
<i>Centaurea melitensis</i> (Napa thistle)	<i>Hirschfeldia incana</i> (mustard)
<i>Conium maculatum</i> (poison hemlock)	<i>Lactuca virosa</i> (wild lettuce)
<i>Cortaderia jubata</i> (pampas grass)	<i>Leucanthemum vulgare</i> (ox-eye daisy)
<i>Cotoneaster</i> sp. (cotoneaster)	<i>Oxalis pes caprae</i> (Bermuda buttercup)
<i>Cupressus macrocarpa</i> (Monterey cypress)	<i>Pinus radiata</i> (Monterey pine)
<i>Cytisus scoparius</i> (Scotch Broom)	<i>Picris echioides</i> (bristly ox-tongue)
<i>Cytisus striatus</i> (Portuguese broom)	<i>Raphanus raphanistrum</i> (wild radish)
<i>Delairea odorata</i> (Cape ivy)	<i>Rubus discolor</i> (Himalayan blackberry)
<i>Echium candicans</i> (Pride of Medeira)	<i>Silybum marianum</i> (milk thistle)
<i>Eucalyptus globulus</i> (blue gum tree)	<i>Ulex europaeus</i> (gorse)

This list was created from species that were recorded on WCW daily record sheets. However, additional species that were not the focus of a particular day's control effort are treated by WCW and not recorded. This is especially true when only a few individuals or a small patch are treated. Also, species not included in the above list may be targeted by Shelterbelt Builders during habitat island maintenance (Section B below) or by volunteer groups. Other species which are understood to have received some treatment include the following:

<i>Avena</i> spp. (wild oat)	<i>Hypochaeris radicata</i> (hairy cat's ear)
<i>Briza maxima</i> (quaking grass)	<i>Lactuca serriola</i> (prickly lettuce)
<i>Bromus hordeaceus</i> (soft chess)	<i>Lobularia maritima</i> (lobularia)
<i>Centaurea calcitrapa</i> (purple star thistle)	<i>Lolium multiflorum</i> (Italian wild rye)
<i>Centranthus ruber</i> (red valerian)	<i>Lythrum salicaria</i> (purple loosestrife)
<i>Chenopodium album</i> (lamb's quarter)	<i>Myoporum laetum</i> (myoporum)
<i>Cirsium vulgare</i> (bull thistle)	<i>Phalaris stenoptera</i> (harding grass)
<i>Digitalis</i> sp. (fox-glove)	<i>Plantago lanceolata</i> (plantain)
<i>Ehrharta longiflora</i> (ehrharta)	<i>Pyrocantha crenato-serrata</i> (pyrocantha)
<i>Erechtites arguta</i> (New Zealand fireweed)	<i>Rubus crispus</i> (curly dock)
<i>Erodium cicutarium</i> (filaree)	<i>Rubus discolor</i> (Himalaya blackberry)
<i>Hedera helix</i> (English ivy)	<i>Rumex acetosella</i> (sheep sorrel)
<i>Helichrysum petiolare</i> (licorice plant)	<i>Scabiosa atropurpurea</i> (pin-cushion plant)
<i>Holcus lanatus</i> (velvet grass)	<i>Solanum</i> sp. (nightshade)

In 2006, the greatest efforts went into treating 1) fennel, gorse, French broom, eucalyptus and cotoneaster in the Saddle, 2) various species on the Northeast Ridge, with most effort spent on fennel and French broom, and 3) Oxalis in upper Tank Ravine (treated as part of the Oxalis Control Project, described below). Other work included treating broom and fennel in Owl and Buckeye Canyon, fennel on the South Slope and Juncus Ravine, various species in Wax Myrtle Ravine, gorse, fennel and broom on Old Ranch Road, ox-eyed daisy in Dairy Ravine, and various species including broom, cotoneaster and mustard in the vicinity of the water tank above Wax Myrtle Ravine,

In 2007, emphasis will continue to be placed on those areas and weeds that have been receiving the greatest effort. Only with continued follow-up treatment and maintenance can an invasive infestation be managed. However, when small populations or individuals of particular concern are discovered in an area where they had not previously been seen or treated, it is noted and either WCW diverts funds to treat these if possible, or they are monitored and identified for control in the following year's budget. In addition, recommendations made by the newly established Technical Advisory Committee that meets quarterly (section IV. B below) will help guide weed control efforts.

Oxalis Control Project

As part of the 2005/2006 fiscal year budget, special funding was approved for aggressive control of Oxalis. Oxalis has been proliferating on the Mountain and is of concern as it can form dense mats on the ground, outcompeting native plant species for light and space. Oxalis has also been found to inhibit the germination of native species (Brooks 2001). On San Bruno Mountain, the greatest concentration of Oxalis is found in the Poison Oak Ravine and Hillside management areas (which includes the Tank Ravine management area). Oxalis is also found along the Ridge Trail growing under scrub vegetation, and along a ridge trail from the Ranger's Station to nearby the terminus of Hoffman Street (Daly City). Other, smaller infestations (Dairy Ravine, Radio Road, and below Brisbane Water Tank) are already treated as part of the general budget and work plan.

During the 2005/2006 fiscal year, two thirds of the Oxalis Control Project budget was spent controlling Oxalis above Hoffman Street, along the Ridge Trail, and within select stands at Tank Ravine (Figure 12). The last third of this funding was reserved for follow-up work in the 2006/2007 fiscal year. Herbicide treatment was performed in late 2006. A total of 47 acres was treated. An assessment made by WCW in early 2007 detected a kill rate ranging from 65 to 95%. Figures 13 and 14 display before and after pictures taken at photos stations established for the monitoring of this project. The two years of intensified effort to control Oxalis resulted in a significant reduction of this weed in areas treated. Continued monitoring and additional follow-up work will be required and will be proposed in the 2007-2008 HCP budget.

Weed Control Performed by CDF Prison Crews

CDF Prison Crews from the Ben Lomond Camp performed non-native shrub control and pile burning on SBM in the early spring of 2006. These crews are staffed with approximately 12 non-violent crime inmates per crew, and are supervised by a CDF crew chief. Crews provide their own tools, with the exception of weed wrenches, which were provided by San Mateo County. Autumn Meisel of TRA Environmental Sciences provided onsite project supervision for all work conducted by the crews on San Bruno Mountain in 2006.

Two crews worked for three days west of the terminus of Trinity Road and above Lipman School, adjacent to the Brisbane Acres. The crews worked above and below a small grassland that supports *Viola pedunculata*. For the first two days, crews pulled and piled primarily French Broom.

Occasionally other species including eucalyptus, cotoneaster, coyote brush, and scabiosa, were also pulled and piled. TRA supervision insured that the grassland was not trampled or disturbed in any way. On the third day of work, the piles were burned, with crews not departing the site until the fires were completely out.

Although a significant decrease in French Broom was performed over the three days of work, there remains a great extent of broom in this region. Continued work with crews to remove mature plants, as well as follow up work to control seedlings will be needed. The HCP budget for fiscal year 2006/2007 includes several days work at this site, to be performed in the early spring of 2007.

Two CDF crews also worked for three days removing French broom and other weedy shrubs from behind the Linda Vista development. This was funded by the Linda Vista developer, DR Horton. This work was performed on land still owned by DR Horton, but that is planned for dedication to the County. More vegetation was pulled than was time for burning on the third day of work. Therefore, crews will return to this site for one day in 2007 to complete pile burning. Crews worked above and within an area supporting *Lupinus albifrons*.

Additional Invasive Species Control Work (not funded by the HCP)

Several supplemental invasive species control projects are currently being implemented on San Bruno Mountain in addition to the work funded through the HCP. Some of these projects are very large in scope, and have resulted in a significant reduction in invasive weeds.

1) Through a California State Parks Grant, a four-year project was initiated in 2004 to control gorse in the Saddle. The lead consultant for this work is Shelterbelt Builders, with May and Associates, Restoration Resources and West Coast Wildlands contributing as subconsultants. Twenty-two acres of dense gorse and 26 acres of scattered gorse have been removed. The overall objective of the project is to reduce gorse and Himalayan blackberry cover within treatment areas to 5% by the end of the project, such that only minimal maintenance will be required to keep gorse from returning to the project area. In 2006, a revegetation plan and monitoring plan for wetland restoration were finalized. Gorse removal areas were mowed and seedlings treated. Velvet grass and other target non-natives were also treated within the revegetation area.

2) West Coast Wildlands controls gorse on the slopes above the Carter Street Quarry Development extending to the Saddle Ridge Development owned by Standard Pacific Homes. The Gorse above the Carter Street Quarry storage facility has been treated since 2003 and the property is owned by the PCI Investment Group. The efforts to treat the site were continued in 2006.

3) The volunteer group San Bruno Mountain Watch's 2006 invasive species control program continues to target weeds in Wax Myrtle Ravine, lower Devil's Arroyo, lower Red Tail Canyon, and Owl Canyon extending east to Buckeye Canyon, Lipman School, and the Brisbane Acres. Invasive species removed by San Bruno Mountain Watch include black mustard, poison hemlock, bristly ox-tongue, Italian thistle, bellardia (*Bellardia trixago*), French broom, cotoneaster, pincushion plant, Himalayan blackberry, bull thistle, gorse, fennel, and Cape ivy.

4) Under a State Parks Grant, managed by the County of San Mateo, the Watershed Project is carrying out "Heart of the Mountain" directed by Joe Canon. The goal of Heart of the Mountain is to restore the Colma Creek headwaters. The Heart of the Mountain project leads volunteer groups for weed removal and native planting. Priority plants for removal include Cape ivy, and English ivy, Himalayan blackberry, and eucalyptus. In the fall of 2006, 50 large and 100 small

eucalyptus trees were removed from the channel and chipped on site. The area cleared will be revegetated with plants grown from seeds collected onsite in the winter of 2006/2007.

B. Restoration of Habitat

For purposes of clarity, we use the term “restoration” to refer to areas planted and/or reseeded with native plant species. Restoration sites also receive invasive species control through the use of herbicide, mowing, hand weeding and/or other tools to maintain the planted areas. As areas that are restored will generally require ongoing maintenance, “restored” is understood to mean that the goals and objectives of the restoration project were met, regardless if ongoing maintenance will be required. Restoration is a measurement used by the County of San Mateo for their Outcome Based Management.

Early attempts at large scale restoration on disturbed slopes on San Bruno Mountain were largely unsuccessful due to the difficulty in maintaining areas against a large influx of weeds. As a result, a strategy of creating small habitat islands (up to approximately ½ acre in size) was developed. Since 1997 this approach has been implemented in several areas of the Mountain and has proven to be successful in Eucalyptus cut areas, former gorse patches, and on graded slopes disturbed by development.

It should be noted that the Mission blue’s host plants (lupines) are often patchy in their distribution, and will colonize disturbed roadcuts, landslides, and trails. Mission blues utilize these patches, and can easily move between patches that are 100 meters apart (Arnold 1983), and have been recorded moving distances up to 1/4 mile (TRA 1981) between habitat patches. In contrast, CS utilize much larger areas of habitat due to their larger size and stronger flying ability. Callippes can move several hundred feet within less than a minute when traveling across terrain searching for Viola and appropriate hilltopping habitat (personal observations). The CS host plant, *Viola pedunculata*, typically occurs in much larger, denser patches than lupines do, though Viola can also on occasion be found in small patches and in disturbed areas.

Because the Callippe’s habitat is typically found in much larger patches, and it is these patches that support the population on San Bruno Mountain, it is more important to protect the conserved grassland habitat that contains Viola than to direct significant funds into replanting Viola within restoration areas.

Though restoration is important, the first priority should always be protecting the existing habitat, because that is the best use of funds for ensuring the long-term survival of both MB and CS on San Bruno Mountain (Biological Program, HCP Volume I, 1982). This management approach has been in use since the inception of the HCP, and the effectiveness of this approach has been documented in previous annual reports and is demonstrated through the continued persistence of the endangered species on San Bruno Mountain. It is imperative that this approach be continued in the future to manage the endangered species effectively.

Restoration guidelines for MB and CS

HCP funded restoration work in the form of weed control, erosion control and planting has been ongoing on the mountain since the mid-1980's. The primary goal of the restoration work is the establishment of high quality habitat for the MB and CS butterflies. Because the HCP does not specify what is required for successful restoration, (i.e. number of host plants established, percent cover of natives, etc.) *The Habitat Restoration Guidelines for MB and CS* were produced in

November 2000 by TRA to help define what is needed to provide suitable MB and CS butterfly habitat, and therefore assist restoration professionals with accomplishing the habitat goals of the HCP. The guidelines include suggested methods on how to select appropriate restoration sites, recommended host plant densities to support the endangered butterflies, and propagation methods. They are to be used in conjunction with the *Standards for Acceptance of any Dedicated Lands by the County of San Mateo in Accordance with the San Bruno Mountain Area Habitat Conservation Plan*, prepared by Roman Gankin (in *San Mateo County Parks Draft Master Plan, Appendix 1*).

HCP Habitat Islands

Since 1995, eight habitat restoration islands were created within former eucalyptus and gorse sites within the HCP conservation area, along Guadalupe Canyon Parkway. These sites are located in the Botanic Garden (2 islands), Colma Creek (2 islands), Dairy Ravine (2 islands), and the Saddle (2 islands). The habitat islands have been planted with Mission blue, Callippe silverspot, and/or San Bruno elfin host and nectar plants and were routinely weeded to help the native species establish. A few additional sites near the islands were augmented with Viola, lupines, and/or Sedum. A few of the islands have not had good plant survival due to inappropriate soil conditions and competition from weeds (Botanic Garden 1 and 2, and Saddle 2). Within the remaining five islands, habitat has become established successfully. MB have been recorded at two of the planting islands (Colma Creek 1 and 2).

Shelterbelt Builders, subcontractor to TRA, maintains the restoration islands. In 2006, work at the islands included mowing and hand removal of weeds. There was no further planting. As the planting islands have matured and plants established, the need for maintenance has decreased. Therefore, maintenance funding for the 2006/2007 fiscal year has been reduced. In 2007, the five successful habitat islands will be managed and surveyed for the presence of MB. The friends of San Bruno Mountain and West Coast Wildlands still actively manage the Botanic Garden planting islands.

Status of Restoration on Development Slopes

Butterfly habitat was restored on portions of the Bay Vista/Linda Vista development slopes. This year marks the final year of maintenance work to be performed by the developer's restoration contractor. West Coast Wildlands also performs weed control work within the restoration areas. Dedication of this land to the County is currently under discussion. Continued weed control, particularly control of French broom, will be needed.

Shelterbelt Builders has created seven restoration islands on property currently managed by Brookfield Homes on the Northeast Ridge. Maintenance of these islands was performed in 2006. Of note was the success of Viola establishment from seed on an island north of Mission Blue Drive. Some of these islands will be intersected by Mission blue monitoring in 2007 to look for the presence of butterflies.

Exotics control was performed by WCW for Brookfield Homes on 63 acres and included land previously dedicated to the San Mateo County Parks and Recreation Department. Invasives removal was funded from 2004 to 2006 and focused on fennel, pampas grass and broom species. Other species treated include red valerian, eucalyptus, bristly ox-tongue, radish, mustard and cotoneaster. The project was successful in controlling all mature stands of the targeted species. The seed bank from surrounding seed sources remains and will contribute to re-infestation of these sites in the future. A minimal maintenance effort is needed to control any re-infestation of the sites controlled.

Significant rilling has occurred on slopes above the Brookfield development, north of Mission Blue drive and in the vicinity of the ball field. While native grasses have established well on the upper cut slopes, deep rills have formed on several sections of the cut slopes. These areas require erosion control and hydroseeding to reestablish vegetation and stabilize the slopes.

Shelterbelt has also created two habitat islands along the San Francisco Water Department (SFWD) easement area, near Mission blue transect #3 (HCP Management unit 1-05), to offset impacts to MB from the re-graveling of an SFWD access road. This project was funded by SFWD and has resulted in several hundred lupines (primarily *L. formosus*) and Mission blue nectar plants being successfully installed and monitored.

Disturbed slopes above the Terrabay developments, on the south slope of San Bruno Mountain are co-owned/managed by Myers Development and Sunchase. Weed control work on these slopes was performed by West Coast Wildlands in 2005. No work was performed in 2006 as the remaining funds for control work (\$25,000) are held for use once the property is conveyed to the County for inclusion in the park. Future work will include continued treatment of target invasives, primarily fennel.

C. Coastal Scrub Succession

Since the cessation of cattle grazing in the early 1960's, and the reduction in wildfires and controlled burning, native coastal scrub vegetation has been expanding on San Bruno Mountain and overtaking grasslands. This phenomenon has resulted in approximately 180 acres of grassland being lost to coastal scrub since the inception of the HCP in 1982. A comparison of photographs taken of the Mountain in the early 1980s to recent pictures revealed the extent to which grassland has been replaced by scrub (Figure 15). It should be mentioned that some of these areas where scrub has moved in over the past decades may have supported scrub prior to the intensive grazing of the early part of the 20th century. However, it is clear that in the absence of regulating processes such as fire and grazing, scrub has taken over historical grasslands.

Management of expanding scrub communities will require a combination of burning, grazing, and/or mechanical removal to maintain grasslands. Because the regulatory requirements and liability concerns over prescribed burning have reduced the feasibility of using this tool on the Mountain, grazing and mechanical removal (cutting and brush piling for pile burning and/or biomass disposal) are more likely to be the tools used for scrub removal. Continued monitoring of scrub succession, using land and aerial photography, will aid managers in determining where to prioritize scrub control efforts. The current level of HCP funds however, will limit application of any chosen management regime.

D. Grazing

The use of livestock animals for grazing of open space lands has become a common tool for managing vegetation in recent years. A growing understanding of the historical ecological role that ungulates (such as elk) played in maintaining grasslands has facilitated the use of livestock for vegetation management. Native grazing animals present before European settlement, and cattle brought in post settlement, provided a process by which vegetation was managed. Similar to a top-level predator controlling the abundance of prey species, herbivorous grazing animals maintained vegetation density and even composition.

The most common grazing livestock used for vegetation management include cattle, goats, and to a lesser extent, sheep. Each animal type, as well as the grazing regime (stocking density, duration, rotation of use, etc.) will impact vegetation differently. Goats are most effective for reducing brush, and cattle and sheep are more useful for management grasslands. For the management of non-native grasses and where desirable butterfly host and nectar plants are located, cattle are the preferred livestock.

As some of the Mountain's grassland habitat is being converted to scrub, and as European annual grasses have come to dominate much of the grasslands, both goat and cattle grazing could prove to be vital for the management and conservation of native butterfly habitat. A discussion of potential locations on the Mountain for grazing programs was reviewed in the 2005 annual report (TRA 2006).

In order to establish a grazing program, infrastructure is needed that would allow for gates (when animals are within public trail areas), fencing and water troughs. Although the initial cost is substantial, establishment of permanent infrastructure would reduce long term costs and allow for quicker utilization of grazing when needs dictate. The current funding level for San Bruno Mountain is not adequate for the initiation of a grazing program.

E. Burning

A wildfire in the Brisbane Acres area of San Bruno Mountain occurred on August 14, 2006 (Appendix D). The fire was located just west of the Brisbane Acres water tank, in a steep ravine and hillside area (see Appendix D for map). The fire burned from the base of the ravine near a City of Brisbane water tank to the top of the summit of San Bruno Mountain and burned approximately 34 acres of grassland, brush, and woodland. Most of the acreage burned consisted of north-facing slopes consisting of grasslands and coastal scrub, and to a lesser extent coast live oak woodland. At the base of the ravine, several Monterey pine and blue gum eucalyptus trees were also burned. The fire occurred entirely within the San Bruno Mountain Habitat Conservation Plan area, and burned over portions of San Mateo County Park land and parcels within the City of Brisbane. The fire was extinguished through a combination of aerial water drops, aerial fire retardant drops, and creation of bare ground containment lines around the burn. Erosion control measures were enacted after the burn, within areas of bare, steep ground and in the location of deep cuts created during fire control activities. Areas were seeded with a native grass seed mix.

Following the burn, CDF re-graded and widened the summit trail along the top of the mountain from Radio Road to the east end of the Mountain. Mission blue habitat is abundant on the east end of the summit road, and it is likely that the re-grading of the road impacted portions of mission blue habitat. The mission blues' host plants often colonize disturbed roadcuts, and very dense mission blue habitat had formed on the east end of the summit road over the past 10 years due to a lack of fire road maintenance. Road maintenance work often cannot avoid impacting the Mission blue butterfly, due to the tendency for lupines to colonize fire roads, trails and other disturbed areas. The San Bruno Mountain HCP requires that agencies work with the HCP habitat managers to minimize the impact to Mission blue butterfly as best as possible. Lupines were observed to be resprouting on the road as early as one month after the burn occurred.

The Brisbane Acres fire burned through highly diverse native grasslands and native coastal scrub habitat, and burned over habitat areas of MB and CS. The amount of habitat for both of these species was low to moderate within the burn area, and should respond well after the fire. The fire containment lines created during the burn will need to be monitored and controlled for invasive

species that are likely to colonize the disturbed soils. French broom (*Genista monspessulana*) is a common invasive species along disturbed roadcuts in the Brisbane Acres area, and is likely to invade these areas in the coming year.

IV. ADMINISTRATION

A. The Habitat Management Plan

The 5-Year Plan described in last year's annual report has been modified and is now called the Habitat Management Plan. The Second Administrative Draft of the Habitat Management Plan is near completion. The Habitat Management Plan will provide goals and objectives for the following activities: 1) invasive species control, 2) sensitive species population monitoring, 3) habitat restoration, and 4) public participation.

B. Technical Advisory Committee

A technical advisory committee was formed following the 2006 San Bruno Mountain HCP trustees meeting. The purpose of the committee is to comment and advise on the management of San Bruno Mountain. The committee meets quarterly and discussions have been focused on habitat management. Participants include staff from the County and TRA, weed control and restoration sub-contractors, and volunteers who have been working on the Mountain and are familiar with management needs. Current management is reviewed, and the committee discusses future needs and strategies. To date, TAC meetings have been held on September 6, 2006, January 10 and February 13, 2007.

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Personal Communications:

Forbert, Mike. West Coast Wildlands. Communications re: Invasives control

Kobernus, Patrick. Senior Biologist. TRA Environmental Sciences. Communications re: TWS conference and bumblebee status.

Knight, Charley. California Polytechnic State University, and Wendy Knight. Communications re: MB, CS, SBE data analysis.

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Michael Murphy (County Counsel)

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Angela Peterson

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San Bruno Mountain Watch
Ken McIntire and SBMW volunteers

Watershed Project, Heart of the Mountain
Joe Cannon and CNPS volunteers

FIGURES

Figure 1. San Bruno Mountain HCP Management Areas29

Figure 2. Mission Blue Sightings on Callippe Transects30

Figure 3. Callippe Silverspot Fixed Transects and Observations: 200631

Figure 4. Average Number of CS S/H: 200632

Figure 5. Average Number of CS S/H: Transects 1-14, 2000-200632

Figure 6. Viola Map for San Bruno Mountain33

Figure 7. Callippe Silverspot Captures, 1981 Survey34

Figure 8. 2006 San Bruno Elfin Larvae Data35

Figure 9. Number of San Bruno Elfin Larvae Recorded36

Figure 10. Number of San Bruno Elfin Recorded on Transect 13.36

Figure 11. HCP Invasive Species Control Work in 2006 (West Coast Wildlands)37

Figure 12. Oxalis Treatment Area38

Figure 13. Before and After Oxalis Treatment, Photo Point 3A39

Figure 14. Before and After Oxalis Treatment, Photo Point 2B40

Figure 15. Comparison Photos Displaying Scrub Succession41

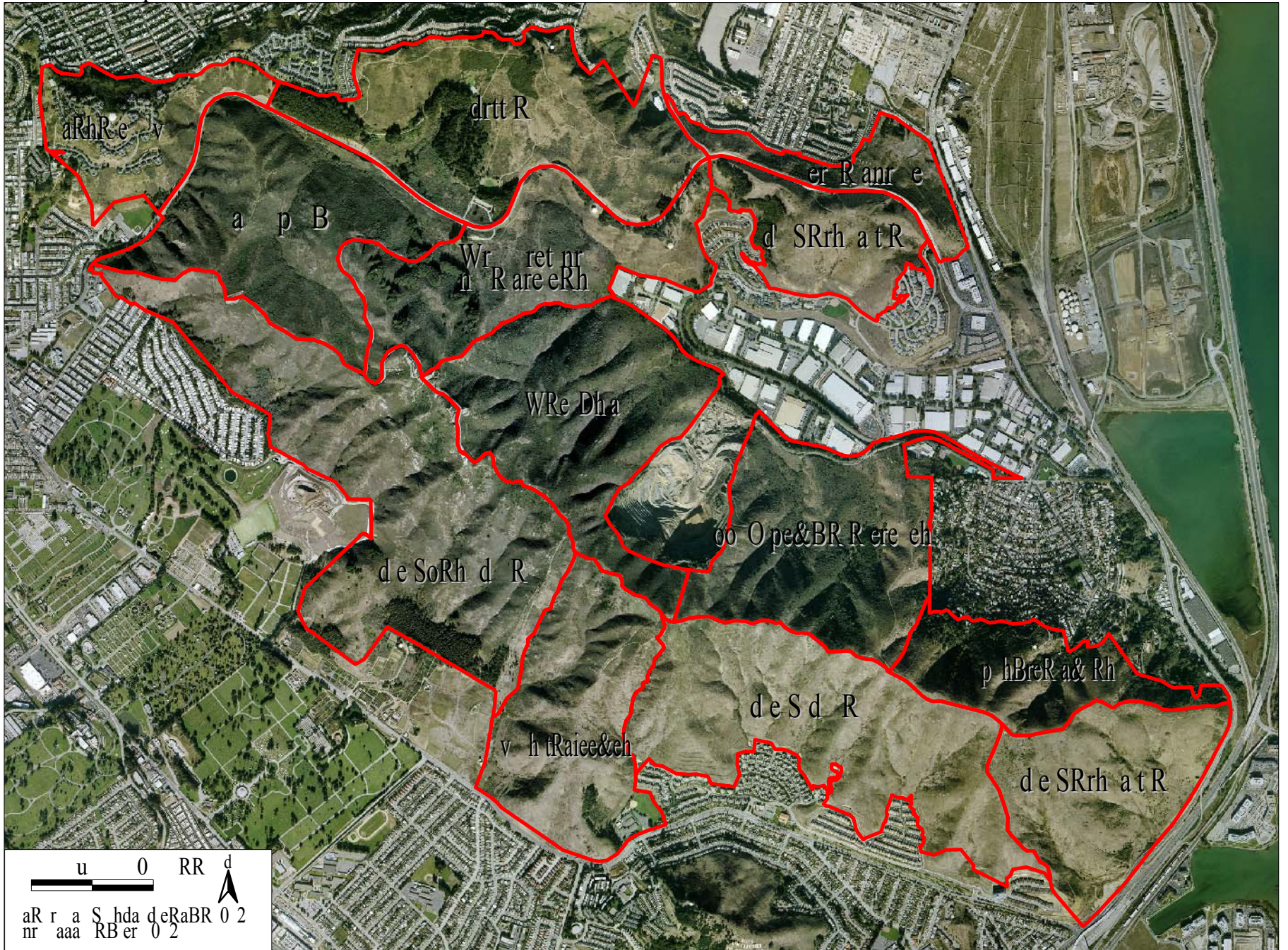
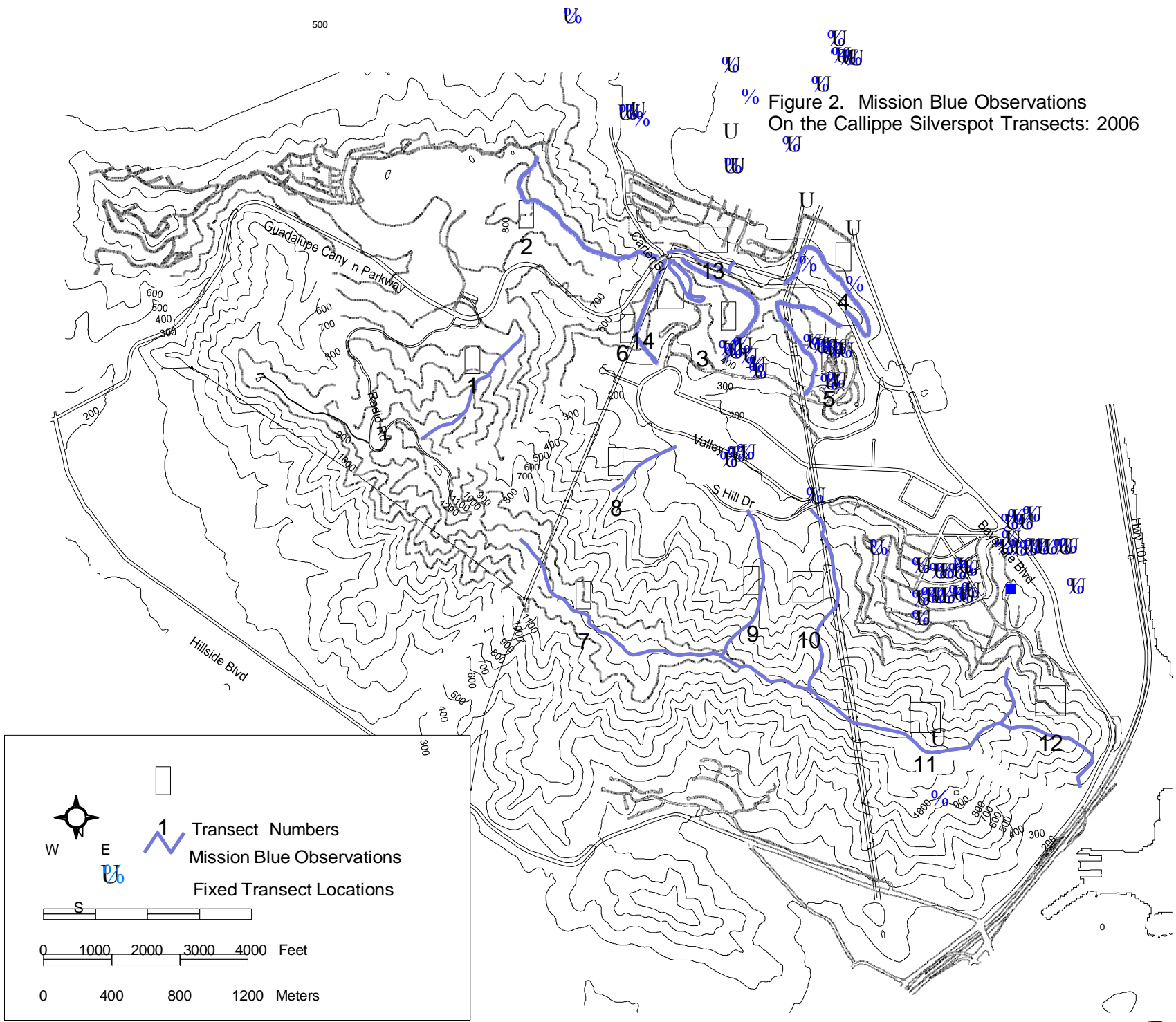
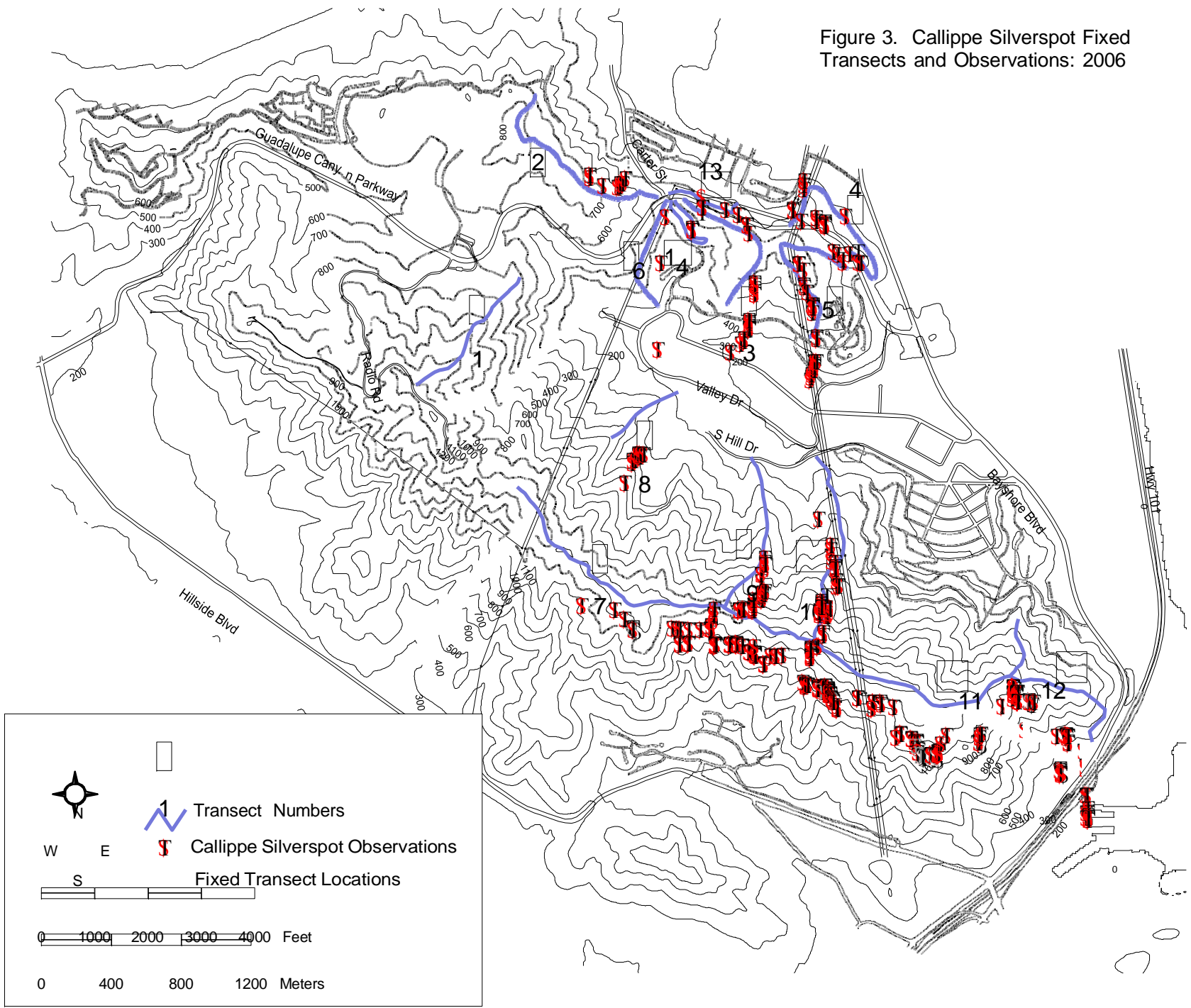


Figure 2. Mission Blue Observations On the Callippe Silverspot Transects: 2006



Source: TRA Field Work, 2006

Figure 3. Callippe Silverspot Fixed Transects and Observations: 2006



Source: TRA Field Work, 2006

Figure 4. 2006 Average CS Sightings per Hour, Transects 1-14

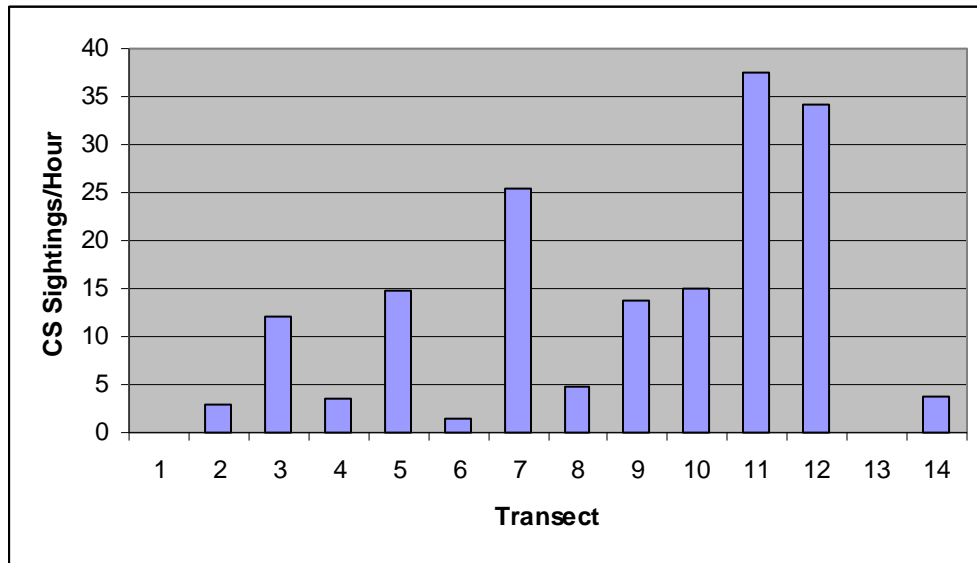
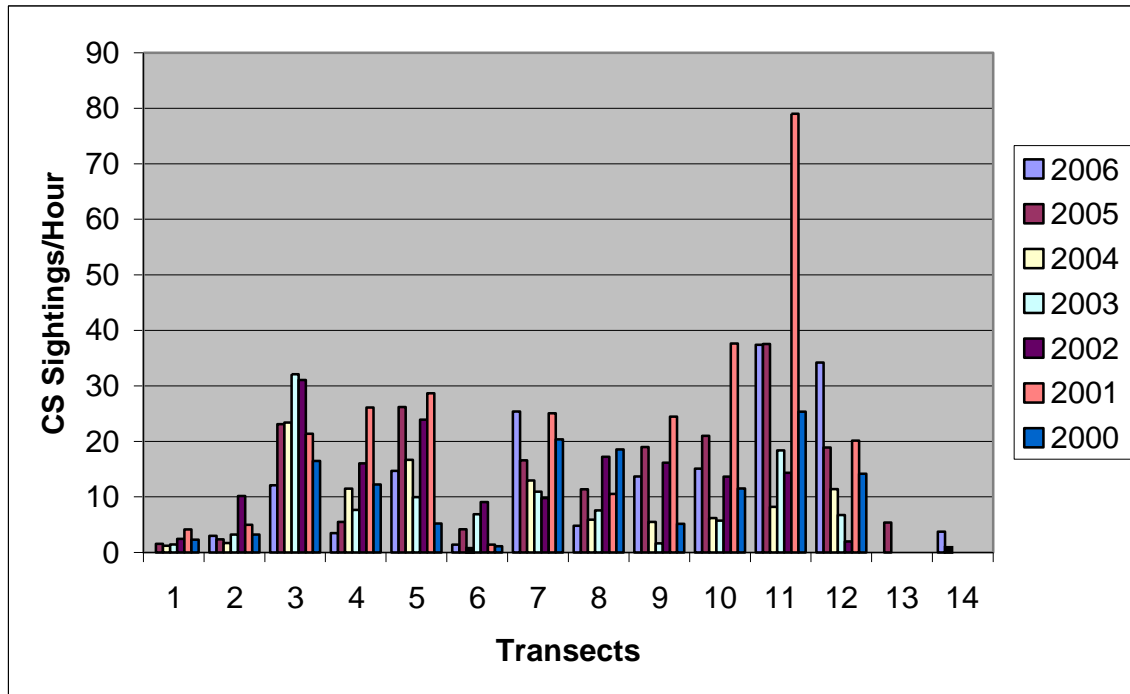


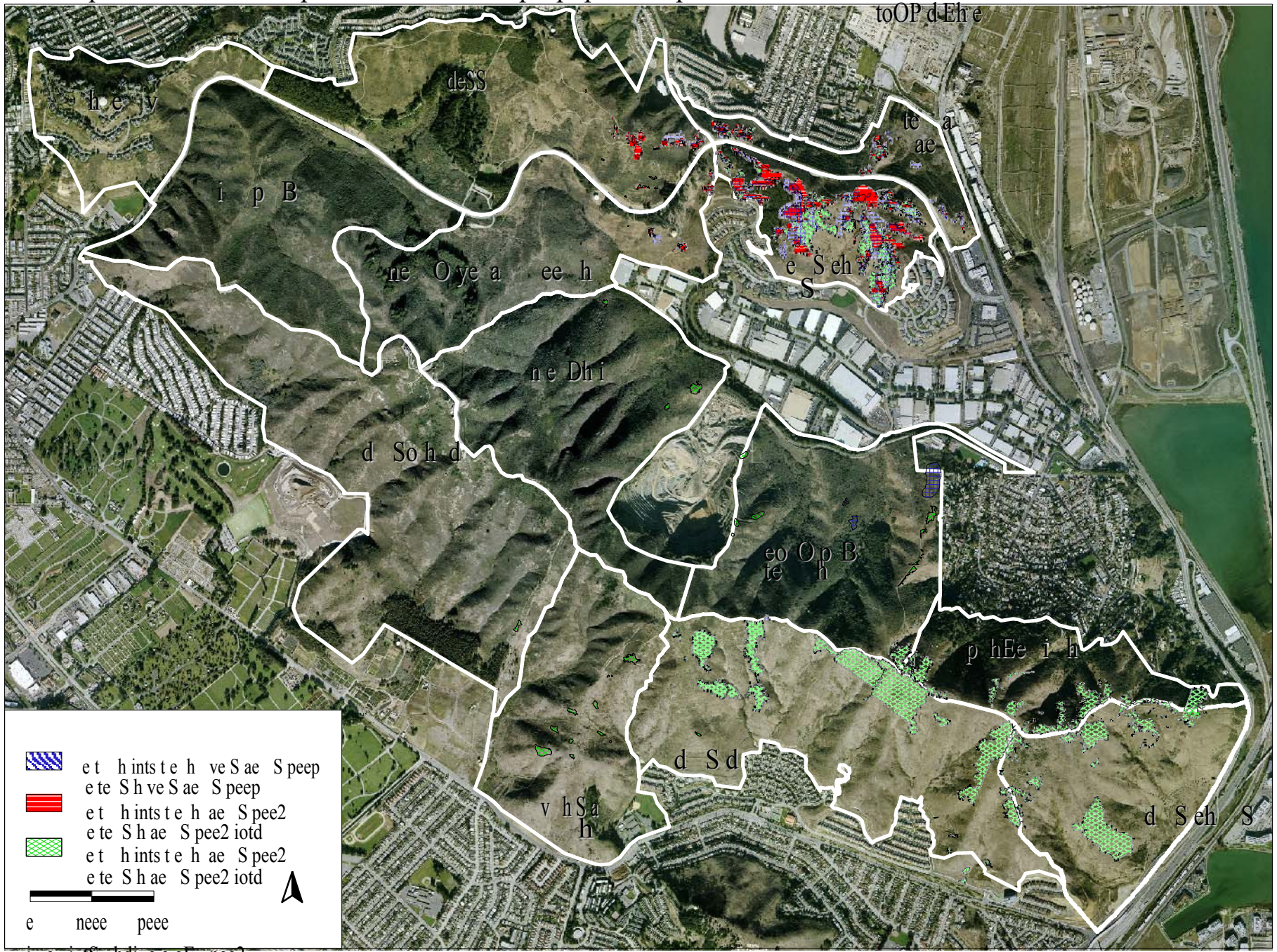
Figure 5. Average CS Sightings per Hour, Transects 1-14, Year 2000-2006






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February 2007

San Bruno Mountain Habitat Conservation Plan -- 2006 Activities Report



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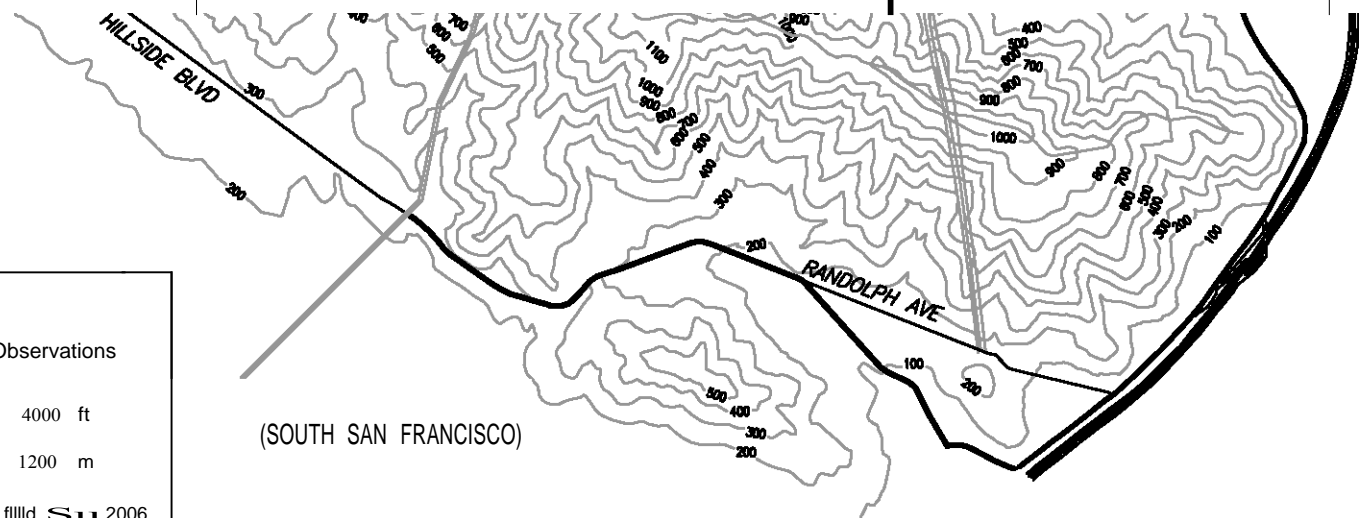
(DALY CITY)

Figure 8. San Bruno Elfin Butterfly

Larval Surveys Points and Observations: 2006

(BRISBANE)

(SOUTH SAN FRANCISCO)



- &. Point Number
- O Number of Incidental Observations
- 0 1000 2000 3000 4000 ft
- 0 400 800 1200 m

Source : TRA Environmental Sciences filed Su 2006

Figure 9. Number of San Bruno Elfin Larvae Recorded 2000-2003 and 2006

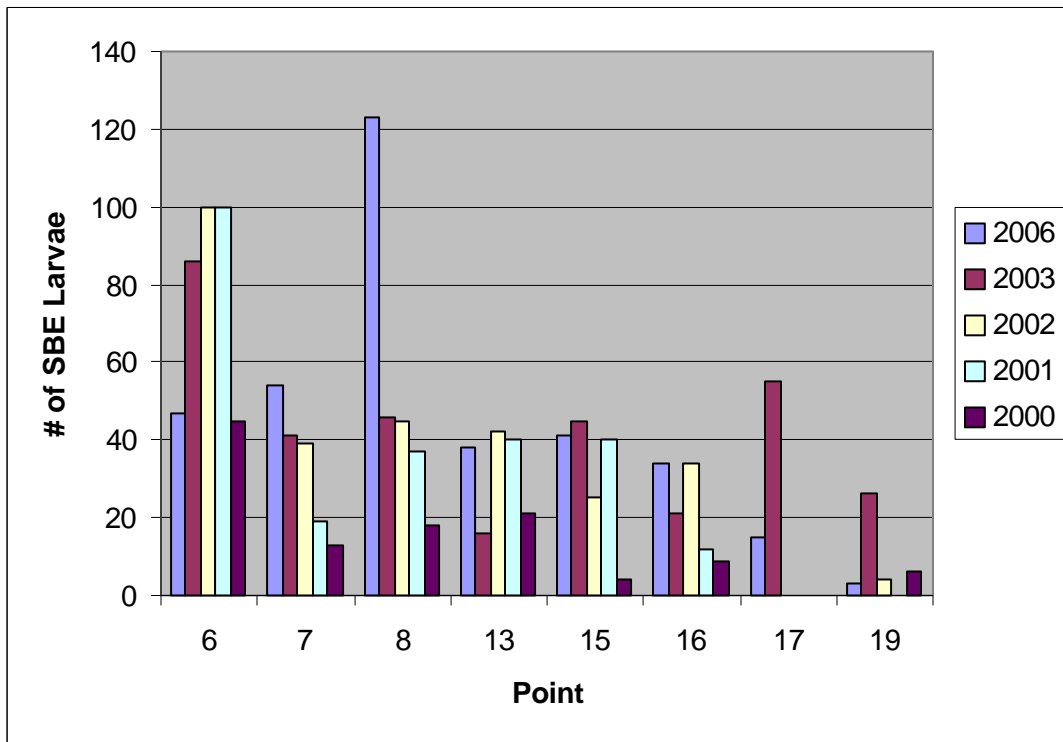
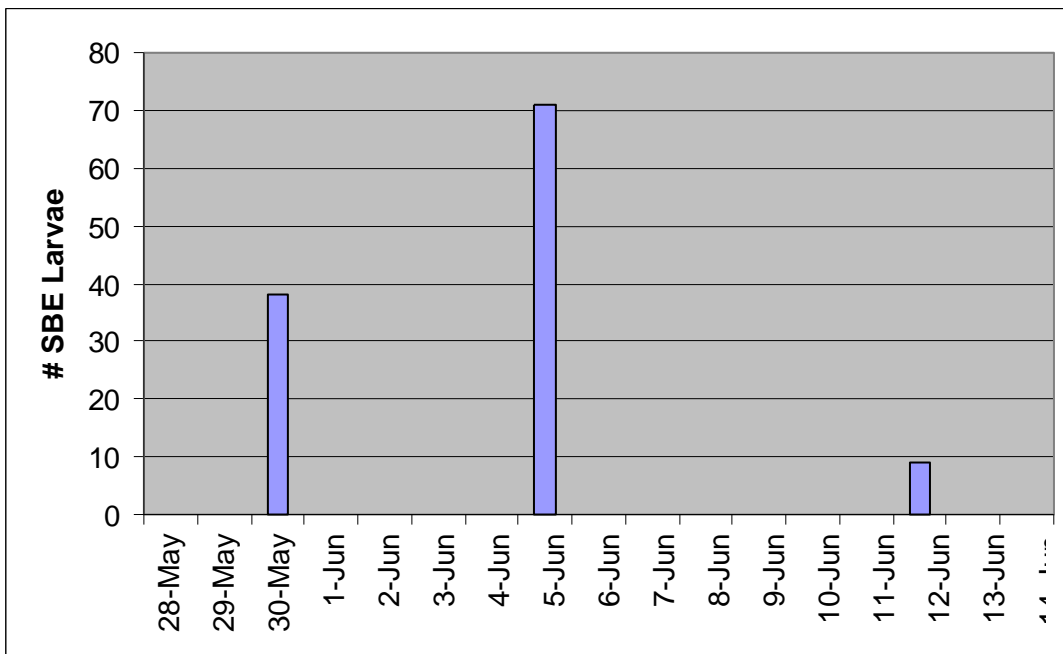
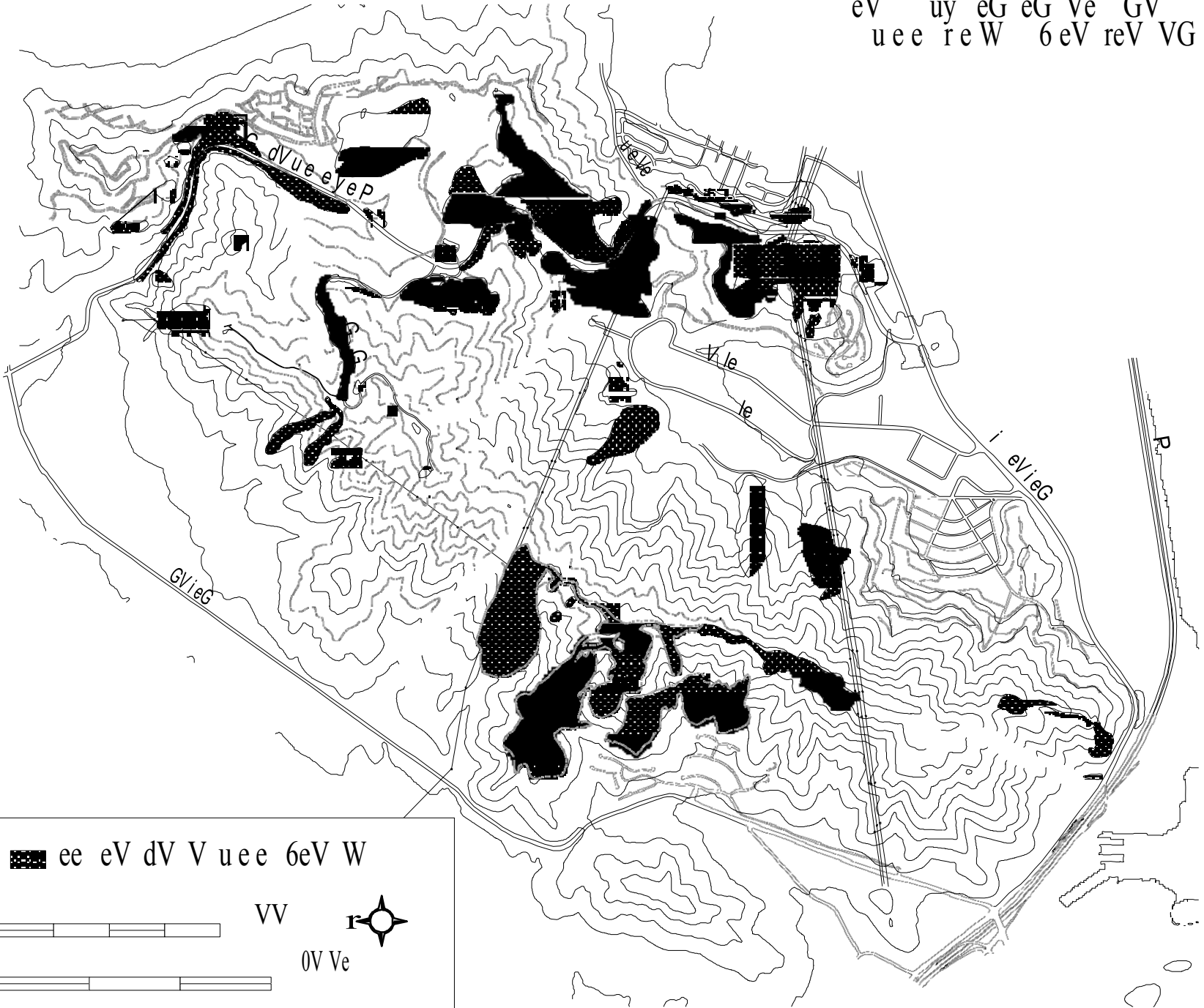


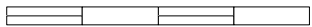
Figure 10. Number of San Bruno Elfin Recorded on Transect 13



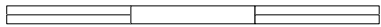
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eV 2. aeV eVe eeV eGVe
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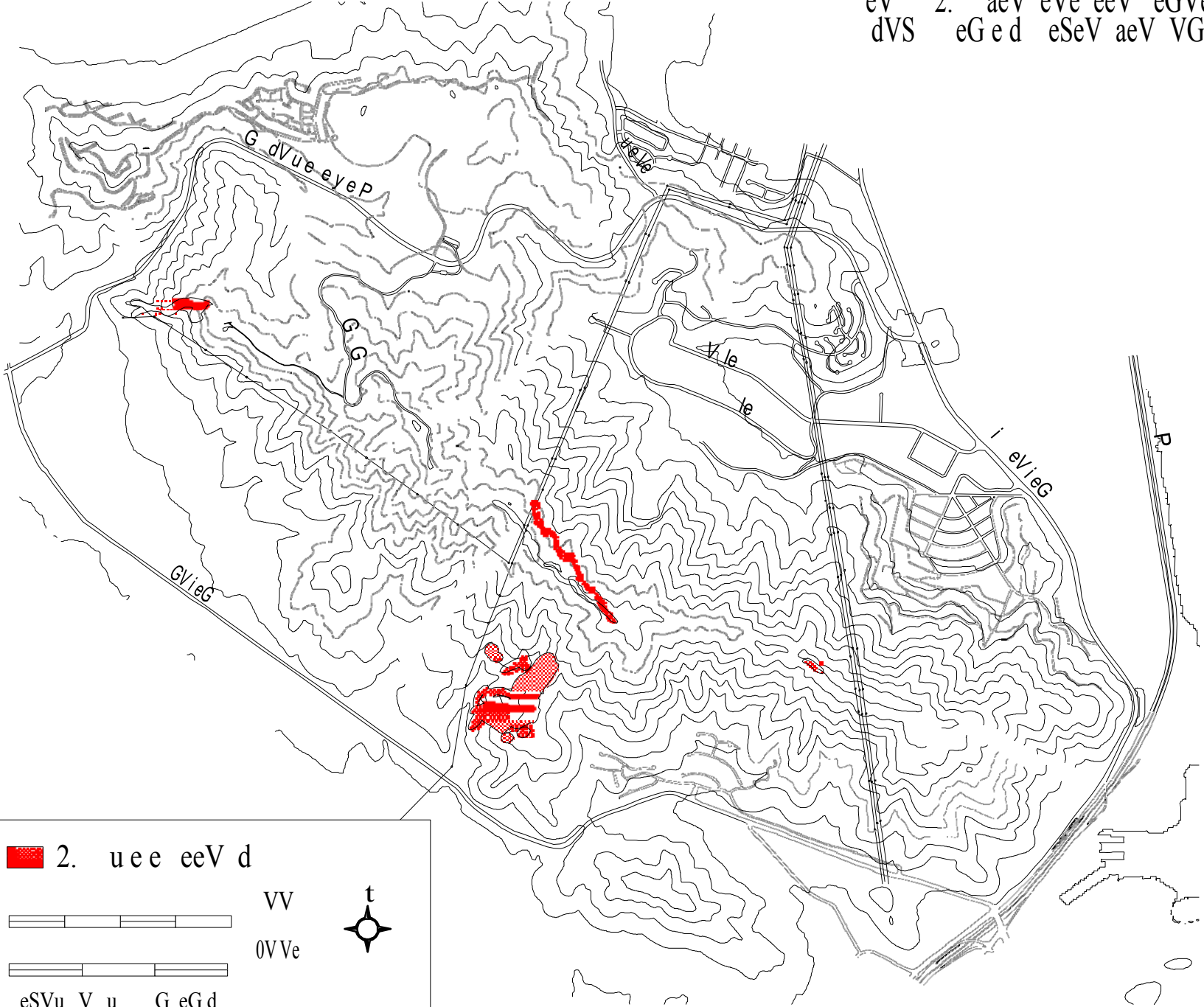




Figure 13. Before and after two years of Oxalis control work at Tank Ravine, Photo Point 3A.



Figure 14. Before and after two years of Oxalis control work at Tank Ravine, Photo Point 2B.



Figure 15. Comparison photos displaying scrub succession at Buckeye Canyon. Top photo was taken in 1981 and bottom photo in 2006.

Appendix A. 2006 Callippe Silverspot Fixed Transect Data

Appendix A. 2006 Callippe Silverspot Fixed Transect Data

ANOVA Results: Sightings/hour, Years 2000-2006

The results of a ANOVA statistical test performed at 13:58 on 27-JUL-2006

Source of Variation	Sum of Squares	d.f.	Mean Squares	F
between	8005.6	1334	6.0	4.154
error	1.2364E+05	385	321.1	
total	1.3164E+05	391		

The probability of this result, assuming the null hypothesis, is 0.0005

Group A: Number of items= 41

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1.22 2.22 2.31 3.16 3.24
3.33 3.67 4.14 4.44 4.62 5.63 6.00 6.15 7.50 7.89 8.28 9.64 10.3 12.0 12.0 13.1 14.5 17.6 20.4
23.0 27.9 28.3 30.0
34.3 35.2 38.4 43.6 47.1
Mean = 12.0
95% confidence interval for Mean: 6.481 thru 17.49
Standard Deviation = 13.4
High = 47.1 Low = 0.000E+00 Median = 6.15
Average Absolute Deviation from Median = 9.69

Group B: Number of items= 42

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 1.43 2.35
4.19 4.29 5.63 5.88 7.69 8.08 10.0 10.6 11.5 12.3 13.4 13.5 14.7 20.6 23.6 27.2 28.7 32.3 32.6
33.2 35.4 45.0 48.8
51.3 53.5 53.6 54.3 58.5 60.0 120. 131.
Mean = 24.6
95% confidence interval for Mean: 19.21 thru 30.08
Standard Deviation = 30.1
High = 131. Low = 0.000E+00 Median = 12.9
Average Absolute Deviation from Median = 20.6

Group C: Number of items= 44

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.20 2.00 2.00 2.31 2.61 2.73 4.00
4.14 4.62 5.45 6.00 6.32
6.98 7.20 7.50 8.00 8.57 10.0 12.0 15.4 16.7 16.8 16.9 17.8 18.9 19.4 20.0 20.4 20.6 22.9 25.2
25.7 28.0 30.0 33.6
33.6 38.7 48.5 56.5
Mean = 14.3
95% confidence interval for Mean: 8.988 thru 19.61
Standard Deviation = 13.6
High = 56.5 Low = 0.000E+00 Median = 9.29

Average Absolute Deviation from Median = 10.6

Group D: Number of items= 61

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
7/27/2006 http://www.physics.csbsju.edu/cgi-bin/stats/anova_pnp
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.46 1.82 1.82 2.00 4.29 4.50 4.74 4.80 5.14 5.66
7.20 8.57 9.80 10.4
10.8 10.9 11.3 12.2 12.9 15.7 16.0 16.7 16.7 17.4 17.4 18.3 20.0 20.5 20.5 20.8 21.3 24.0 25.0
27.4 34.3 42.0 50.3

Mean = 9.09

95% confidence interval for Mean: 4.579 thru 13.60

Standard Deviation = 11.3

High = 50.3 Low = 0.000E+00 Median = 4.74

Average Absolute Deviation from Median = 8.49

Group E: Number of items= 55

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.560 1.46 1.54 1.62 2.14
2.22 2.40 2.61 2.86
3.00 3.24 3.75 4.07 4.62 4.86 6.49 7.74 8.00 8.00 9.23 10.0 10.6 11.1 12.7 15.0 15.0 16.0 17.8
18.9 19.5 19.6 20.9
24.3 28.2 30.0 31.7 33.6 39.1 42.2

Mean = 9.03

95% confidence interval for Mean: 4.282 thru 13.78

Standard Deviation = 11.2

High = 42.2 Low = 0.000E+00 Median = 3.75

Average Absolute Deviation from Median = 8.10

Group F: Number of items= 80

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.88 2.00 2.07 2.40 3.33 4.29 4.50
4.62 4.80 5.00 5.45 5.45
6.00 6.15 6.67 6.67 6.92 8.37 9.00 9.23 9.60 11.3 12.0 12.0 12.0 12.6 15.0 16.0 17.6 17.8 18.3
18.8 20.0 20.0 21.9
22.1 23.1 24.0 26.7 29.0 32.1 33.0 33.7 34.3 35.0 35.5 39.6 41.7 43.5 45.6 47.6 60.0 62.5 62.5
77.1

Mean = 14.4

95% confidence interval for Mean: 10.41 thru 18.29

Standard Deviation = 17.8

High = 77.1 Low = 0.000E+00 Median = 6.67
Average Absolute Deviation from Median = 12.7

Group G: Number of items= 69

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 1.46 1.50
1.94 2.00 2.22 2.40 2.86 3.16 3.43 4.14 4.62 5.29 5.45 5.66 6.15 6.43 7.89 8.57 8.68 9.60 9.73
10.4 12.0 13.3 15.0
15.0 15.0 19.1 19.4 21.1 23.1 23.2 25.4 31.3 42.4 49.4 50.4 69.5 75.0 133.

Mean = 11.1

95% confidence interval for Mean: 6.862 thru 15.35

Standard Deviation = 21.7

High = 133. Low = 0.000E+00 Median = 2.40

Average Absolute Deviation from Median = 10.8

ANOVA Results: Sightings/hour, Years 2000 and 2002-2006

The results of a ANOVA statistical test performed at 14:02 on 27-JUL-2006

Source of Variation	Sum of Squares	d.f.	Mean Squares	F
between	1695.5	338.9	1.348	
error	8.6529E+04	344	251.5	
total	8.8223E+04	349		

The probability of this result, assuming the null hypothesis, is 0.24

Group A: Number of items= 41

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1.22 2.22 2.31 3.16 3.24
3.33 3.67 4.14 4.44 4.62 5.63 6.00 6.15 7.50 7.89 8.28 9.64 10.3 12.0 12.0 13.1 14.5 17.6 20.4
23.0 27.9 28.3 30.0
34.3 35.2 38.4 43.6 47.1

Mean = 12.0

95% confidence interval for Mean: 7.112 thru 16.86

Standard Deviation = 13.4

High = 47.1 Low = 0.000E+00 Median = 6.15

Average Absolute Deviation from Median = 9.69

Group B: Number of items= 44

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.20 2.00 2.00 2.31 2.61 2.73 4.00
4.14 4.62 5.45 6.00 6.32

6.98 7.20 7.50 8.00 8.57 10.0 12.0 15.4 16.7 16.8 16.9 17.8 18.9 19.4 20.0 20.4 20.6 22.9 25.2
25.7 28.0 30.0 33.6
33.6 38.7 48.5 56.5

Mean = 14.3

95% confidence interval for Mean: 9.597 thru 19.00

Standard Deviation = 13.6

High = 56.5 Low = 0.000E+00 Median = 9.29

Average Absolute Deviation from Median = 10.6

Group C: Number of items= 61

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.46 1.82 1.82 2.00 4.29 4.50 4.74 4.80 5.14 5.66
7.20 8.57 9.80 10.4
10.8 10.9 11.3 12.2 12.9 15.7 16.0 16.7 16.7 17.4 17.4 18.3 20.0 20.5 20.5 20.8 21.3 24.0 25.0
27.4 34.3 42.0 50.3

Mean = 9.09

95% confidence interval for Mean: 5.096 thru 13.08

Standard Deviation = 11.3

High = 50.3 Low = 0.000E+00 Median = 4.74

Average Absolute Deviation from Median = 8.49

Group D: Number of items= 55

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.560 1.46 1.54 1.62 2.14
2.22 2.40 2.61 2.86
3.00 3.24 3.75 4.07 4.62 4.86 6.49 7.74 8.00 8.00 9.23 10.0 10.6 11.1 12.7 15.0 15.0 16.0 17.8
18.9 19.5 19.6 20.9
24.3 28.2 30.0 31.7 33.6 39.1 42.2

Mean = 9.03

95% confidence interval for Mean: 4.826 thru 13.24

Standard Deviation = 11.2

High = 42.2 Low = 0.000E+00 Median = 3.75

Average Absolute Deviation from Median = 8.10

Group E: Number of items= 80

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0.000E+00 0.000E+00
0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.88 2.00 2.07 2.40 3.33 4.29 4.50
4.62 4.80 5.00 5.45 5.45

Appendix A. 2006 Callippe Silverspot Fixed Transect Data

6.00 6.15 6.67 6.67 6.92 8.37 9.00 9.23 9.60 11.3 12.0 12.0 12.0 12.6 15.0 16.0 17.6 17.8 18.3
 18.8 20.0 20.0 21.9
 22.1 23.1 24.0 26.7 29.0 32.1 33.0 33.7 34.3 35.0 35.5 39.6 41.7 43.5 45.6 47.6 60.0 62.5 62.5
 77.1

Mean = 14.4
 95% confidence interval for Mean: 10.86 thru 17.84
 Standard Deviation = 17.8
 High = 77.1 Low = 0.000E+00 Median = 6.67
 Average Absolute Deviation from Median = 12.7

Group F: Number of items= 69

0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 0.000E+00 0.000E+00
 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 0.000E+00 0.000E+00
 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 0.000E+00 1.46 1.50
 1.94 2.00 2.22 2.40 2.86 3.16 3.43 4.14 4.62 5.29 5.45 5.66 6.15 6.43 7.89 8.57 8.68 9.60 9.73
 10.4 12.0 13.3 15.0
 15.0 15.0 19.1 19.4 21.1 23.1 23.2 25.4 31.3 42.4 49.4 50.4 69.5 75.0 133.

Mean = 11.1
 95% confidence interval for Mean: 7.348 thru 14.86
 Standard Deviation = 21.7
 High = 133. Low = 0.000E+00 Median = 2.40
 Average Absolute Deviation from Median = 10.8

Callippe Silverspot 2006 Fixed Transect Data

Year	Week	Date	Transect	#CS	minutes	CS/Hour	wind	temp
2006	1	24-May	1	0	20	0	5.2	72.6
2006	4	15-Jun	1	0	19	0	5	23.7
2006	6	29-Jun	1	0	16	0	5.2	17.7
2006	9	17-Jul	1	0	20	0	1.8	93.7
						0		
2006	1	24-May	2	0	37	0	1.4	68
2006	2	1-Jun	2	0	23	0	12.6	70
2006	4	15-Jun	2	3	28	6.43	3	28
2006	6	29-Jun	2	4	25	9.6	1.1	21.7
2006	9	17-Jul	2	0	25	0	1.3	79
						3		
2006	1	24-May	3	7	28	15	4.8	69.5
2006	2	1-Jun	3	12	23	31.30	1.9	18.5
2006	4	15-Jun	3	6	37	9.73	2.3	71.8
2006	6	29-Jun	3	1	25	2.4	2.2	70
2006	9	17-Jul	3	0	16	0	1.9	82.5
						12.1		
2006	1	24-May	4	0	34	0	8.4	66.3

Appendix A. 2006 Callippe Silverspot Fixed Transect Data

Year	Week	Date	Transect	#CS	minutes	CS/Hour	wind	temp
2006	2	1-Jun	4	2	42	2.86	2.5	76
2006	4	15-Jun	4	6	24	15	7.5	28
2006	6	29-Jun	4	1	40	1.5	4.1	64.9
2006	9	17-Jul	4	1	31	1.94	2.6	81.9
						3.5		
2006	1	24-May	5	12	31	23.23	9.4	68.9
2006	2	1-Jun	5	21	25	50.4	3.6	19.2
2006	4	15-Jun	5	5	38	7.89	1.2	75
2006	6	29-Jun	5	0	40	0	9.7	66.6
2006	9	17-Jul	5	0	21	0	2.7	85
						14.7		
2006	1	24-May	6	0	28	0	2.8	71.3
2006	2	1-Jun	6	1	30	2	3	70.2
2006	4	15-Jun	6	2	29	4.14	1.5	75.6
2006	6	29-Jun	6	0	15	0	1.9	23
2006	9	17-Jul	6	0	23	0	2.1	81
						1.4		
2006	1	24-May	7	0	33	0	3.4	75.5
2006	2	1-Jun	7	10	26	23.08	0.8	73
2006	4	15-Jun	7	15	47	19.15	1.2	83.1
2006	6	29-Jun	7	51	44	69.54	6.9	23.5
2006	9	17-Jul	7	4	39	6.15	2.2	95.5
						25.4		
2006	1	24-May	8	1	19	3.16	8.8	61.8
2006	2	1-Jun	8	2	22	5.45	3	70
2006	4	15-Jun	8	1	13	4.62	2.1	34
2006	6	29-Jun	8	2	10	12	1.6	25
2006	9	17-Jul	8	0	11	0	3.4	82
						4.8		
2006	1	24-May	9	0	29	0	7.3	70
2006	2	1-Jun	9	1	41	1.46	4.8	71
2006	4	15-Jun	9	13	37	21.08	1.9	89.8
2006	6	29-Jun	9	24	34	42.35	10	24.9
2006	9	17-Jul	9	2	35	3.43	1.1	96.4
						13.7		
2006	1	24-May	10	0	34	0	4.8	72
2006	2	1-Jun	10	5	53	5.66	2.1	69.9
2006	4	15-Jun	10	35	28	75	1	33
2006	6	29-Jun	10	11	34	19.41	8.7	18.7
2006	9	17-Jul	10	0	53	0	1.6	88.6
						15.1		
2006	1	24-May	11	4	23	10.43	1.6	78.1
2006	2	1-Jun	11	3	34	5.29	3.7	23
2006	4	15-Jun	11	62	28	132.86	1	33.6
2006	6	29-Jun	11	11	26	25.38	8.85	17.7
2006	9	17-Jul	11	6	27	13.33	1.5	95.5
						37.4		
2006	1	24-May	12	5	35	8.57	6.9	80.7
2006	2	1-Jun	12	28	34	49.41	1.8	24.7

Appendix A. 2006 Callippe Silverspot Fixed Transect Data

Year	Week	Date	Transect	#CS	minutes	CS/Hour	wind	temp
2006	4	15-Jun	12	56	38	88.42	0.6	29.3
2006	6	29-Jun	12	1	27	2.22	1.9	23
2006	9	17-Jul	12	0	24	0	1.9	97.5
2006	1	24-May	13	0	12	0	5.5	65.8
2006	2	1-Jun	13	0	13	0	2.5	75.7
2006	4	15-Jun	13	0	10	0	5	27.7
2006	6	29-Jun	13	0	13	0	3.4	61.5
2006	9	17-Jul	13	0	12	0	2.6	82
						0		
2006	1	24-May	14	3	12	15	3.7	72.3
2006	2	1-Jun	14	0	10	0	2.2	70.9
2006	4	15-Jun	14	0	11	0	1.7	71.2
2006	6	29-Jun	14	0	4	0	3.2	22.1
2006	9	17-Jul	14	0	11	0	3.3	90

**Appendix B. 2006 San Bruno Elfin ANOVA Results
Years 2000-2003 and 2006**

**Appendix B. 2006 San Bruno Elfin ANOVA Results
Years 2000-2003 and 2006**

The results of an ANOVA statistical test performed at 15:48 on 9-JAN-2007

Source of Variation	Sum of Squares	d.f.	Mean Squares	F
between	3794.4	4	948.4	1.241
error	2.3688E+04	31	764.1	
total	2.7482E+04	35		

The probability of this result, assuming the null hypothesis, is 0.31

Group A: Number of items= 8
3.00 15.0 34.0 38.0 41.0 47.0 54.0 123.
Mean = 44.375
95% confidence interval for Mean: 24.44 thru 64.31
Standard Deviation = 35.9
High = 123.0 Low = 3.000 Median = 39.50
Average Absolute Deviation from Median = 21.9

Group B: Number of items= 8
16.0 21.0 26.0 41.0 45.0 46.0 55.0 86.0
Mean = 42.000
95% confidence interval for Mean: 22.07 thru 61.93
Standard Deviation = 22.4
High = 86.00 Low = 16.00 Median = 43.00
Average Absolute Deviation from Median = 16.0

Group C: Number of items= 7
4.00 25.0 34.0 39.0 42.0 45.0 100.
Mean = 41.286
95% confidence interval for Mean: 19.98 thru 62.60
Standard Deviation = 29.4
High = 100.0 Low = 4.000 Median = 39.00
Average Absolute Deviation from Median = 17.7

Group D: Number of items= 6
12.0 19.0 37.0 40.0 40.0 100.
Mean = 41.333
95% confidence interval for Mean: 18.32 thru 64.35
Standard Deviation = 31.1
High = 100.0 Low = 12.00 Median = 38.50
Average Absolute Deviation from Median = 18.7

Group E: Number of items= 7
4.00 6.00 9.00 13.0 18.0 21.0 45.0
Mean = 16.571

95% confidence interval for Mean: -4.738 thru 37.88
Standard Deviation = 14.0
High = 45.00 Low = 4.000 Median = 13.00
Average Absolute Deviation from Median = 9.29

Appendix C. 2006 Argentine Ant Survey on San Bruno Mountain

Appendix C. 2006 Argentine Ant Survey on San Bruno Mountain

Details									Summary
Date	Transect type	Transect(s)	Pre-check?	Pre-check finding	Main search?	Main Search finding	Follow-up?	Follow-up finding	List of species found
2/11/2006	Mission blue	22 and 23	Pre-check in gravel by watertank	<i>Linepithema humile</i>	5 minute search	nothing	Walked back	<i>Linepithema humile</i> nest between towers and tank	<i>Linepithema humile</i>
2/11/2006	Mission blue	1.1	Pre-check in gravel by pullout	<i>Formica moki</i>	5 minute search	<i>Prenolepis imparis</i> nest on right side of trail, 150 meters from road	n/a	n/a	<i>Prenolepis imparis</i>
2/11/2006	Mission blue	28	no pre-check	n/a	5 minute search	nothing	Baiting	nothing	nothing
2/11/2006	Elphin	19	Pre-check along summit loop trail by grassy area	<i>Aphaenogaster</i> or <i>Monomorium</i> (took photos)	5 minute search	<i>Formica subpoleta</i> ; <i>Aphaenogaster</i> or <i>Monomorium</i>	n/a	n/a	<i>Formica subpoleta</i> ; <i>Aphaenogaster</i> or <i>Monomorium</i>
2/11/2006	Mission blue	17	no pre-check	n/a	5 minute search	<i>Formica subpoleta</i> ; <i>Aphaenogaster</i> or <i>Monomorium</i>	n/a	n/a	<i>Formica subpoleta</i> ; <i>Aphaenogaster</i> or <i>Monomorium</i>
2/11/2006	Mission blue	18	no pre-check	n/a	5 minute search	<i>Formica subpoleta</i> ; <i>Tapinoma</i> ; <i>Aphaenogaster</i> or <i>Monomorium</i>	n/a	n/a	<i>Formica subpoleta</i> ; <i>Tapinoma</i> ; <i>Aphaenogaster</i> or <i>Monomorium</i>
2/12/2006	Mission blue	7	no pre-check	n/a	5 minute search	dead <i>Camponotus sessile</i> being carried by spider	looked for extra time and then baited	nothing	<i>Camponotus sessile</i>
2/12/2006	Mission blue	6	no pre-check	n/a	5 minute search	<i>Linepithema humile</i> nest; a lot of <i>Prenolepis imparis</i> foragers	n/a	n/a	<i>Linepithema humile</i> ; <i>Prenolepis imparis</i>
2/12/2006	Mission blue	5	no pre-check	n/a	5 minute search	<i>Prenolepis imparis</i> nest	walked back to road	<i>Linepithema humile</i> foragers on trail in juncus meadow between transect #5 and road	<i>Prenolepis imparis</i>
2/12/2006	Mission blue	24	no pre-check	n/a	5 minute search	<i>Linepithema humile</i> in cement gully; <i>Prenolepis imparis</i> nest by toys	n/a	n/a	<i>Linepithema humile</i> ; <i>Prenolepis imparis</i>
2/12/2006	Mission blue	26 and 27	no pre-check	n/a	5 minute search	<i>Monomorium</i> ; <i>Leptothorax</i> or <i>Aphaenogaster</i> (took pictures)	n/a	n/a	<i>Monomorium</i> ; <i>Leptothorax</i> or <i>Aphaenogaster</i>
2/12/2006	Mission blue	13	no pre-check	n/a	5 minute search	nothing	Baiting	<i>Prenolepis imparis</i> at bait	<i>Prenolepis imparis</i>
2/12/2006	Mission blue	12	no pre-check	n/a	5 minute search	<i>Linepithema humile</i> nest in culvert			<i>Linepithema humile</i>
2/12/2006	Elphin	15	no pre-check	n/a	5 minute search	<i>Monomorium</i> nest	n/a	n/a	<i>Monomorium</i>
2/12/2006	Elphin	13	no pre-check	n/a	5 minute search	<i>Prenolepis imparis</i> ; two different non- <i>Prenolepis</i> /non- <i>Linepithema humile</i> ants	n/a	n/a	<i>Prenolepis imparis</i> ; two different non- <i>Prenolepis</i> /non- <i>Linepithema humile</i> species

Linepithema presence
yes
no
no
no
no
no
no
no
Yes
not really
yes
no
no
yes
no
no

Appendix D. Memo Regarding Brisbane Fire



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Memo

To: Gary Lockman, San Mateo County Parks Division
Sam Herzberg, San Mateo County Parks Division

From: Patrick Kobernus, Habitat Manager, TRA

Job Code: HADM

Subject: Brisbane Acres Burn on San Bruno Mountain

Date: 09/26/06

A wildfire in the Brisbane Acres area of San Bruno Mountain occurred on August 14, 2006. The fire apparently started about 150 feet behind a house near Glen Parkway and Humboldt Avenue (CBS-5 News, August 14, 2006). I visited the burn area twice since the burn occurred, once to walk the site with San Mateo County Park Ranger Brian Gatt on August 16, 2006 to assess erosion control needs, and again on September 20, 2006 to map the burn area.

The fire was located just west of the Brisbane Acres water tank, in a steep ravine and hillside area (Figure 1). The fire burned from the base of the ravine near a city of Brisbane water tank, to the top of the summit of San Bruno Mountain, and burned approximately 34 acres of grassland, brush, and woodland. Most of the acreage burned consisted of north-facing slopes consisting of grasslands and coastal scrub, and to a lesser extent coast live oak woodland. At the base of the ravine, several Monterey pine and blue gum eucalyptus trees were also burned. The fire occurred entirely within the San Bruno Mountain Habitat Conservation Plan area, and burned over portions of San Mateo County Park land and parcels within the City of Brisbane (Figure 2). The fire was extinguished through a combination of aerial water drops, aerial fire retardant drops, and creation of bare ground containment lines around the burn.

Erosion Control Needs

Figure 2 shows the extent of the fire, and the areas where CDF bulldozer lines and hand lines were put in to contain the fire. The areas where deep cuts were made by a bulldozer are highlighted in blue, and lines cut by hand crews are highlighted in yellow.

Most of the fire breaks created by CDF fire crews and bulldozers were shallow and were either cut along existing fire roads where the soils are thin and rocky, or were cut by hand into side slopes. These areas appear stable and do not need any erosion control work, other than leveling (by hand raking) the small berms of grass and dirt, along the trail and roadsides (Figure 3). Areas where deep cuts were made into deeper soils and on steep side slopes will need some type of erosion control measures installed. Several deep bulldozer cuts were made on the slope immediately above the Brisbane Water Tank (Figure 4), and on the south side of the summit trail (Figure 5). In addition the hand cut line along the northeast side of the burn, as it traverses steeply through a wooded ravine, created a steep section of disturbed soils (Figure 6). Based on my conversation with Park Ranger Gatt on site, the following measures are

recommended:

- Pull back berms along road and trail edges to restore topography. This should especially be done in areas where deep cuts were made and where new fire breaks were created during the burn.
- Use fiber rolls in steep sections along fire breaks to slow water down and protect bare ground.
- Consider putting in water bars to slow down flow on the straight, steep portions of the water tank fire break (west side of the burn area).

Impact on Sensitive Species

The Brisbane acres fire burned through highly diverse native grasslands and native coastal scrub habitat, and burned over habitat areas of the federally endangered Mission blue (*Plebejus icarioides missionensis*) and Callippe silverspot butterfly (*Speyeria callippe callippe*). The amount of habitat for both of these species was low to moderate within the burn area, and should respond well after the fire. The fire containment lines created during the burn will need to be monitored and controlled for invasive species that are likely to colonize the disturbed soils. French broom (*Genista monspessulana*) is a common invasive species along disturbed roadcuts in the Brisbane acres area, and is likely to invade these areas in the coming year.

A few days following the fire, CDF re-graded and widened the summit trail along the top of the mountain (personal communication Dennis Hanley, SMC Parks). The road has not been surveyed for impacts at this time, but it appears the work done from Radio Road to the east end of the Mountain, as a response to the Brisbane acres burn. Mission blue habitat is abundant on the east end of the summit road, and it is likely that the re-grading of the road impacted portions of mission blue habitat. The mission blues' host plants (*Lupinus albifrons* var. *collinus*, *Lupinus formosus* var. *formosus*, and *Lupinus variicolor*) often colonize disturbed roadcuts, and very dense mission blue habitat had formed on the east end of the summit road over the past 10 years due to a lack of fire road maintenance. Road maintenance work often cannot avoid impacting the Mission blue butterfly, due to the tendency for lupines to colonize fire roads, trails and other disturbed areas. The San Bruno Mountain HCP requires that agencies work with the HCP habitat managers to minimize the impact to Mission blue butterfly as best as possible.



Figure 1. Brisbane Acres burn that occurred on 08/14/06. Photo date: 09/20/06.

Figure 2.

Figure 2. Brisbane Acres Burn Area

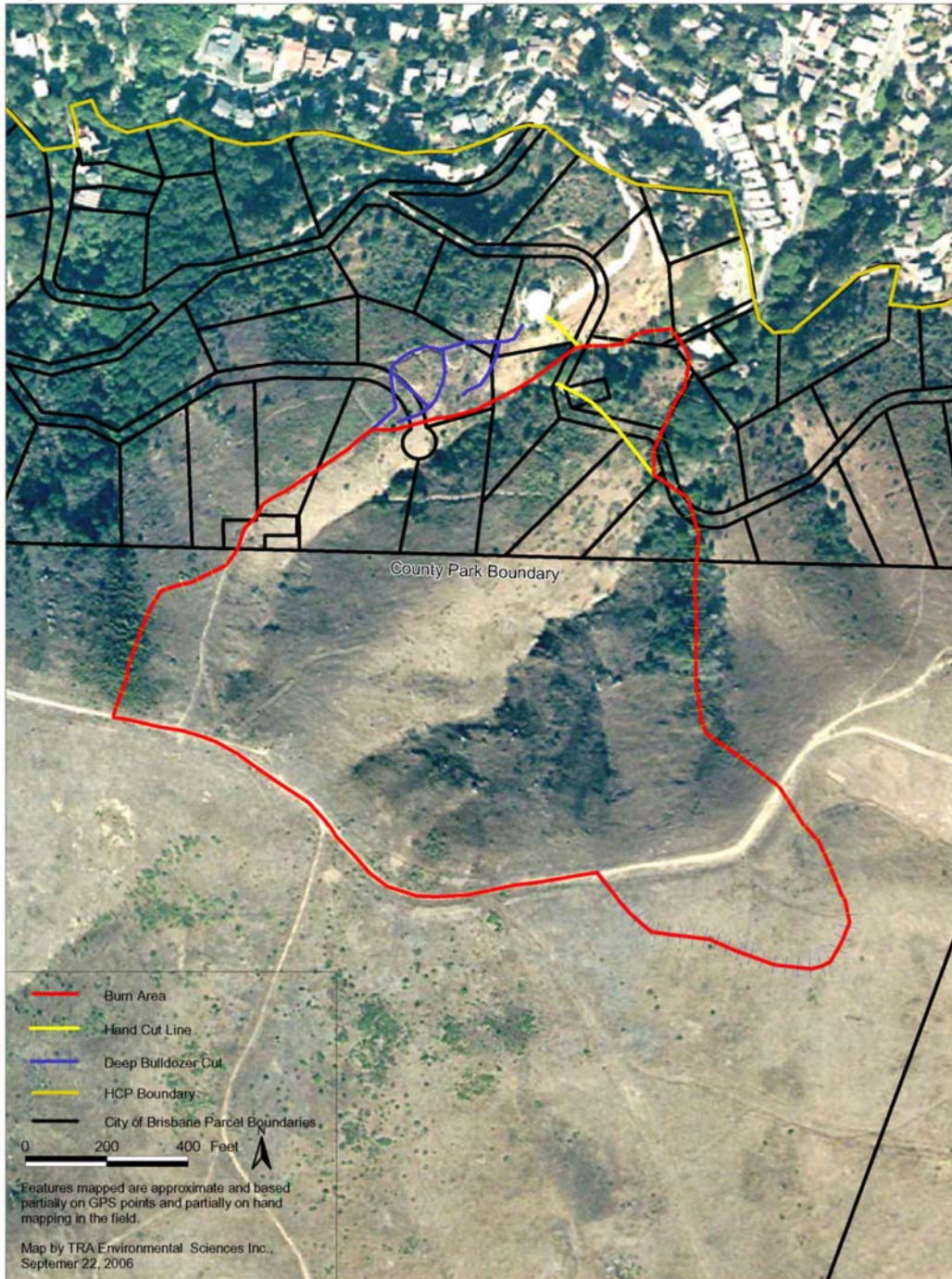




Figure 3. Shallow fire break cut by CDF bulldozer along west side of burn area, along Brisbane Acres Water Tank road. Photo date: 09/20/06.



Figure 4. Example of a deeper cut fire break above the Brisbane Acres Water tank. Photo date: 08/16/06.



Figure 5. Example of a deeper cut fire break on the south side of the summit trail.
Photo date: 09/20/06.



Figure 6. Northeast side of burn area, within a steep ravine. Area was hand cut, and the fire break has created exposed, loose soils. Photo date: 09/20/06.

References

Brush Fire Burns On San Bruno Mountain, (CBS 5) Brisbane. Website accessed 09/22/06.
http://cbs5.com/local/local_story_226193825.html

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