

**SAN BRUNO MOUNTAIN
HABITAT CONSERVATION PLAN
ACTIVITIES REPORT - 1996**

**For Endangered Species Permit
PRT 2-9818**

January 1997

**Prepared by
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Palo Alto, CA**

**Prepared for
San Mateo County and
The U.S. Fish and Wildlife Service**

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JANUARY 1997

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INTRODUCTION

This report describes biological and development related activities which took place on San Bruno Mountain under Endangered Species Act Section 10(a) Permit PRT 2-9818 for the 1996 Calendar year. It provides information on the relative population status of the butterflies of concern, exotic species control work, and development activities. Anyone interested in reviewing raw field data or other information collected by Thomas Reid Associates should contact Patrick Kobernus at (415) 327-0429 or Roman Gankin at (415) 363-1826.

1. STATUS OF SPECIES OF CONCERN

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

Methodology

Annual monitoring of the population status of the butterflies of concern on San Bruno Mountain is carried out using the following method. Transects are walked by experienced field biologists and data is recorded on data logs and topography maps. At the end of the field season the data is tabulated and non productive transects eliminated. The tabulated data for 1996 is contained in Appendix A. A butterfly sightings per hour figure is derived by dividing the total number of hours spent on transects by the total number of butterfly observations made. A sightings per hour figure can be calculated for each colony by using data from those colonies only (see Appendix A).

Using a standard formula derived in 1982 (see Appendix A for explanation of formula), the sightings per hour data is used to determine relative population size for the entire population as well as for each colony. The numerical results are input into a computer graph spreadsheet and the data is depicted in graph form (see Figure 2).

The distribution data is input directly from the field maps into a computer map of San Bruno Mountain. The resultant butterfly distribution map is contained in Figure 1. Note all figures are included at the end of the report.

Data Analysis

A total of 76.5 person hours were spent monitoring the adult population of Mission blue on San Bruno Mountain in 1996. During this time, 312 Mission blue butterflies were documented (see Figure 1 for the locations of each sighting). Observations were scattered throughout the Mountain with several sightings noted above Colma, in Buckeye Canyon, Juncus Ravine, and above Brisbane.

Analysis of the total number of Mission blue butterflies observed during the 76.5 hours of monitoring provided a figure of 4.1 sightings per hour for all survey areas; up slightly from last year's 3.7 sightings per hour. This number indicates that the relative population increased slightly from what it was in both 1994 and 1995 (see Figure 2).

In 1996, there were several survey days when over 20 adult Mission blue were observed (refer to Appendix A, Mission Field Data Summary). On April 29th, a total of 59 Mission blue were observed along the Southeast Ridge in the area above Brisbane. The observer spent 6.5 hours and the weather was hot and sunny. Table 1 below provides the monthly total of Mission blue butterflies observed from 1989 to 1996.

TABLE 1
MONTHLY TOTALS OF MISSION BLUE ADULTS

	MARCH	APRIL	MAY	JUNE	JULY	TOTAL
1989	26	202	445	51	1	725
1990	28	236	268	76	0	608
1991	0	182	93	158	0	433
1992	19	191	356	107	0	673
1993	0	144	154	15	7	320
1994	14	210	90	13	0	327
1995	0	75	124	2	5	206
1996	0	213	87	12	0	312

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

The same methods used to monitor and assess relative population size for Mission blue are used for the callippe (see Appendix A).

Analysis

The locations of the 296 callippe adults observed in 1996 are shown in Figure 3. Figure 4 shows the relative population size of the callippe silverspot for years 1981-1996. Table 2 provides a breakdown of adult observations by month.

The population of the callippe on San Bruno Mountain was relatively high compared to the preceding two years even though significantly less adults were observed in 1996. This is due to a high sightings per hour figure. Within the 31.5 hours spent monitoring adult callippe in 1996, 296 adults were observed, resulting in an average of 9.4 individuals being observed per hour (S/H). In 1995 there were 7.7 S/H (454 adults in 58.75 hours). The 1996 S/H figure is skewed upward as a result of 84 callippe being observed in a one hour period on the Southeast Ridge above Brisbane on May 31st, and 64 callippe being observed in Buckeye Canyon in a three hour period on June 18th. In 1992, the most recent high year for callippe, over 1350 callippe were observed in 108 hours of survey time resulting in an average of 12.6 S/H.

TABLE 2
MONTHLY TOTALS OF CALLIPPE SILVERSPOT ADULTS

	MAY	JUNE	JULY	AUGUST	TOTAL
1989	461	789	127	0	1377
1990	191	610	52	0	853
1991	0	611	314	2	927
1992	915	440	3	0	1358
1993	503	469	24	0	996
1994	22	461	124	0	607
1995	38	306	110	0	454
1996	132	160	4	0	296

c. San Bruno Elfin (*Incisalia mossii bayensis*)

The locations of the 30 adult San Bruno elfin butterflies observed in 1996 are shown in Figure 5. See Table 3 for a breakdown of adult observations by month. Larval observations are also included in Figure 5; there were 30 total larvae observed at four colonies. A tally of the 1996 field data is included in Appendix A.

TABLE 3
MONTHLY TOTALS OF SAN BRUNO ELFIN ADULTS

	FEBRUARY	MARCH	APRIL	TOTAL
1989	0	164	21	185
1990	0	161	1	162
1991	13	63	10	86
1992	38	202	3	243
1993	0	149	3	152
1994	0	56	3	59
1995	0	13	0	13
1996	0	30	0	30

The San Bruno elfin appears to be recovering slowly from the previous two wet periods experienced during its adult flight season which significantly depressed the elfin population on the Mountain. Whereas only 13 adults were observed in 1995, 30 were observed in 1996. Most of the adults were observed just below the Summit and along the north side of the Summit Loop/Dairy Ravine Trail. In late May and early June a total

of 30 elfin larvae were observed -- 14 at the Summit, 10 on the Summit Loop/Dairy Ravine Trail, and 6 near the Quarry. The same time last year only 1 larvae was observed at the summit colony, a location where many larvae are typically observed each year.

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

In 1996, no bay checkerspot butterflies (larvae or adults) were observed on San Bruno Mountain.

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

No San Francisco garter snakes (SFGS) were observed on San Bruno Mountain by field crew while conducting biological activities and overseeing development activities.

f. Plants of Concern

Thomas Reid Associates provided information to the U.S. Fish and Wildlife Service on the status and distribution of the San Bruno Mountain manzanita (*Arctostaphylos imbricata*). The San Bruno Mountain manzanita is proposed for federal listing and the USFWS was conducting a review of the plant to determine whether it warranted listing. No decision on the listing has been made available as of the writing of this report.

2. EXOTIC PEST PLANT CONTROL ACTIVITIES

The exotic pest plant control activities are being conducted to protect, enhance, and restore the grassland and coastal scrub habitat on San Bruno Mountain. Primary emphasis is placed on controlling exotic infestations that are invading or threatening to invade the habitat areas of the rare butterflies.

a. 1996 Exotic Pest Plant Treatment Summary

Currently there are 35-40 exotic pest plant species found on the Mountain. Hand control is done on most of these species, which occur in relatively small scattered populations. Herbicide treatment is conducted on species which have relatively large infestations (gorse, broom, fennel, and eucalyptus).

The following list shows the exotic species that received hand and/or herbicide control work in 1996.

- | | |
|---|--|
| <i>Acacia</i> sp. (<i>Acacia</i>) | <i>Cytissus striatus</i> (<i>Portuguese broom</i>) |
| <i>Carduus pycnocephalus</i> (<i>Italian thistle</i>) | <i>Hedera helix</i> (<i>English Ivy</i>) |
| <i>Carpobrotus edulis</i> (<i>hottentot fig</i>) | <i>Erechtites arguta</i> (<i>New Zealand fireweed</i>) |
| <i>Centranthus ruber</i> (<i>red valerian</i>) | <i>Eucalyptus globulus</i> (<i>blue gum tree</i>) |
| <i>Cirsium vulgare</i> (<i>bull thistle</i>) | <i>Festuca arundinacea</i> (<i>reed fescue</i>) |
| <i>Conium maculatum</i> (<i>poison hemlock</i>) | <i>Foeniculum vulgare</i> (<i>fennel</i>) |
| <i>Cortaderia jubata</i> (<i>pampas grass</i>) | <i>Genista monspessulana</i> (<i>French broom</i>) |
| <i>Cotoneaster</i> sp. (<i>Cotoneaster</i>) | <i>Senecio mikenoides</i> (<i>German Ivy</i>) |

Hirschfeldia incana (mustard)
Holcus lanatus (velvet grass)
Hypericum perforatum (Klamath weed)
Lactuca virosa (wild lettuce)
Lactuca serriola (prickly lettuce)
Lobularia maritima (Lobularia)

Pinus radiata (Monterey Pine)
Myoporum laetum (Myoporum)
Picris echioides (bristly ox-tongue)
Pyrocantha crenato-serrata (Pyrocantha)
Rubus discolor (Himalaya blackberry)
Silybum marianum (milk thistle)
Ulex europaeus (gorse)

TRA maintains daily record sheets for all exotic pest plant work conducted on the Mountain. For hand control work an accounting of the number of all plants removed is recorded, while for herbicide work the estimated acres treated is recorded. In 1996, over 190,000 exotic pest plants were removed by hand (see Table 4) and approximately 53 acres of pest plant infestations were treated with herbicide (see Table 5). Figure 6 shows a generalized view of the locations where hand and herbicide control work was conducted.

TABLE 4 — NUMBERS OF EXOTIC PEST PLANTS REMOVED BY HAND IN 1996

Area	UE	EG	GM	CS	FV	LV	PE	Other
Radio Rd./ Summit	107		144		26	444		138
Wax Myrtle Ravine	84	269	156	314	166	60	368	36
GCP	16	889	42398	88	7044	209	26209	370
NE Ridge/ Water Tank	38	389	8548	250	5115	86	765	454
Carter / Martin	230				1136	315	236	19
Callippe Hill		91	770	141	9452	101	4310	333
Arnold Slope		5	21	47	16683	20	812	13
Buckeye Canyon			1397	59	5766	170	1023	18422
Owl Canyon			2570					85
Buckeye/ Owl subridge			157			145	54	1099
Brisbane Acres			865		1680	100		70
Bayshore Blvd.					5848	51		568
Terrabay/ South slope			18		2182	786	458	79
Juncus Ravine/ Hillside		241			16637	46	750	201
Tank Ravine					60			
Pointe Pacific	14	306	1		112		123	105
Totals	489	2190	57045	899	71907	2533	35108	21992
Grand Total	192,163							

Numbers shown include both mature and seedling plants. Categories represented are: **UE:** *Ulex europaeus* (gorse), **EG:** *Eucalyptus globulus* (blue-gum tree), **GM:** *Genista monspessulana* (French broom), **CS:** *Cytissus striatus* (Portuguese broom), **FV:** *Foeniculum vulgare* (fennel), **LV:** *Lactuca virosa* (wild lettuce), and **PE:** *Picris echioides* (bristly ox-tongue). Other category includes 19 other species listed in columns above.

TABLE 5 — ACREAGES OF EXOTIC SPECIES TREATED WITH HERBICIDE IN 1996

Area	Gorse (UE)	Euc. (EG)	F.Broom (GM)	P.Broom (CS)	Fennel (FV)	Other ¹
<i>Saddle- Unit I</i>						
Med. density	1					
Low density	4					
<i>Saddle- Unit II</i>						
Med. density	0.75					
Low density	3.25	0.5				
<i>Saddle- Unit III</i>						
High density	0.125					
Med. density	4.75	0.5				
Low density	5.75		0.3			
<i>Radio Rd./Summit</i>						
Low density	3.5					
<i>Bitter Cherry Ridge</i>						
High density	0.1					
Low density	0.3					
<i>Dairy Ravine</i>						
High density		2.75				
Med. density		0.75				
Low density		2				
<i>April Brook</i>						
High density		0.25				
Low density		1				
<i>Colma Creek</i>						
Low density		1				
<i>Hill West of Quarry</i>						
<i>NE Ridge/Water Tank</i>						
High density	0.6		1	1	0.5	
Med. density	1.8					
Low density	0.25					

Area	Gorse (UE)	Euc. (EG)	F.Broom (GM)	P.Broom (CS)	Fennel (FV)	Other ¹
<i>Callipe Hill</i>						
High density						0.1
<i>GCP</i>						
Med. density	0.1					
Low density	0.1		0.75			
<i>Brisbane Acres</i>						
High density			3.5			
Med. density			1.5			
Low density			0.5			
<i>Tank Ravine</i>						
Low density					5	
<i>Juncus Ravine</i>						
Low density					3	
Totals	26.4	8.8	7.6	1	8.5	1.1

High density = >50% cover, Medium density = 25-50% cover, Low density = <25% cover. Density and acreages were visually estimated in field. 1. Other species include German ivy, English ivy, and pampas grass.

b. Exotics Control Strategy and Future Goals

Exotic plant infestations are attacked in a priority fashion based upon proximity to native habitat. The priority system is as follows:

- Priority 1: Small patches of exotics within native habitat
- Priority 2: Small patches of exotics at the periphery of native habitat
- Priority 3: Edges of large exotic infestations expanding into native habitat
- Priority 4: Large exotic infestations

For treatment of most broad leaf infestations our methodology for the past three years has been to spray the plants with an herbicide solution containing either 2% Garlon 4®, or 2% Roundup® depending upon the species targeted. These herbicides are preferred due to their high effectiveness, low toxicity rating, and short half-life in the soil. Herbicide is applied one to two times per year in suitable weather (low wind, low humidity) for maximum plant uptake. The plants are left to die and decay in place, a process that takes from one to five years, depending upon the size of the plants. Gorse

and broom seedlings are highly responsive to fire or disturbance of any kind, and this approach has been effective at reducing seedlings and allowing the native plant community to come back on its own. An experiment to study how well the native plant community is reestablishing in these areas has been set up in the Saddle (see section C; gorse treatment plots).

An assessment of the aerial extent of gorse in the saddle was made from aerial photographs taken in the spring of 1996. The gorse infestations on San Bruno Mountain have been treated for several years now, and the infestations are now primarily limited to two sections of high density gorse. A 41-acre (estimated) section of the Saddle, which includes infestations adjacent to the State Park area and in Wax Myrtle Ravine, and a 65 acre (estimated) section along the steep northeast slopes of the Saddle which burned in 1995 (Figure 7). Work to date has gone into maintaining the surrounding 300 acres (estimated) free of gorse, while only small edge treatments have been made in the high density gorse areas.

The 65-acre section has not been considered a high priority due to the lack of butterfly habitat. A large portion of this area was burned in July 1995, allowing temporary access for eradication. A small portion of unburned gorse in this area is scheduled for treatment in winter 1997, however most of this area will likely return to gorse in the next few years due to the high seed germination that has occurred after the burn.

Exotic control work has moved into different areas in recent years, as areas such as Callippe Hill, Radio Ridge, Buckeye Canyon, and portions of the Saddle have been brought under control. More control work is planned for 1) the south and southwest slopes where fennel and many annual exotics species have expanded in recent years, and 2) the north slope areas where French and Portuguese broom have expanded and will require intensive exotics control work. Maintenance of all areas previously controlled of exotics will be the first priority before treatment of new infestations. Sources of additional funding are being sought (section 6 grant) to expand and accelerate the exotics control work on the Mountain. The 1996 San Bruno Mountain HCP Five Year Strategic Plan gives a comprehensive breakdown of habitat management goals under different funding scenarios.

c. Gorse Treatment Plots

An experiment to investigate native plant recovery in herbicide-treated gorse areas was set up in the Saddle area of San Bruno Mountain in the fall of 1995. Twenty-four quadrats were placed within 3 treatment groups, (8 quadrats per treatment group). The experiment is intended to collect data on plant species recruitment into the former gorse areas, and on the rate of change of percent cover of habitat types in treated and non-treated areas. The treatment groups are as follows: 1) recently sprayed gorse; 2) gorse sprayed for 2 or more years; and 3) untreated gorse (control).

Data being collected in each plot includes:

- * Percent cover of gorse
- * Number of gorse plants (adults and seedlings)

- * Percent cover of native shrubs and grasses
- * Number of native shrub/ herbaceous /grass plants (adults and seedlings)

Data collection was originally planned to be conducted quarterly or semi-annually, but these intervals appear to be too short to produce significant data, thus, the data collection will be done once per year instead. Results are expected within 2 years.

d. Eucalyptus Removal and Native Plant Community Restoration Update

Through a coordinated effort between San Mateo County and Thomas Reid Associates, approximately 63 acres of mature eucalyptus forest was clear-cut from several areas of the Mountain in the spring of 1995. The trees were cut to provide corridors and restore habitat for the three species of rare butterflies on the Mountain, as well as increase habitat for other native wildlife species.

The 63 acres are spread out over the Mountain and are broken up into eight different restoration units (Figure 8). The restoration units are Dairy Ravine (22.4 acres), Pacific Nursery (21 acres), Wax Myrtle Ravine (6.4 acres), Hoffman Street (5 acres), Botanic Garden (5 acres -- within the Dairy Ravine site), Colma Creek (4.8 acres), and April Brook (3.6 acres).

Paul Kephart of Rana Creek Ranch is carrying out the restoration program. Detailed restoration plans for each site are described in the 1996 San Bruno Mountain Restoration Plan (Paul Kephart). Habitat types being re-created include mixed grassland, northern coastal scrub, and central coast riparian scrub. The plant list for each location was prepared based on composition of adjacent native flora at each site. Plants to be used include the larval host plants and adult nectar plants of the Mission blue butterfly, the San Bruno elfin butterfly, and the callippe silverspot butterfly, as well as many other grasses, herbs, and shrubs found on the Mountain.

Restoration sites: Colma Creek, April Brook, Dairy Ravine, and Botanic Garden

Restoration work in the 1996 year focused on Colma Creek, April Brook, Dairy Ravine, and Botanic Garden. To date approximately 19 acres have received eucalyptus regrowth control, and approximately 5 acres have been replanted.

The April Brook site (3.6 acres) is cooler and moister than areas typically associated with the Mission blue or the callippe silverspot. However removing the eucalyptus from this area and replanting with native coastal scrub plants will provide more habitat for other wildlife that inhabit the Mountain. The site was controlled for eucalyptus regrowth, English ivy, German ivy, and other exotics in 1996 but will require continued exotics control and monitoring until these exotics are wiped out. The site has good potential for natural recolonization by native coastal scrub habitat, and the scope of replanting efforts is likely to be less here than at other sites.

At the Colma Creek site (4.8 acres), Mission blues are consistently recorded on a nearby road cut, (area A; figure 8). There are no host plants established at the restoration site yet, but it seems likely that Mission blues would colonize the site from the nearby road cut if host plants can be established in suitable locations. This site

received eucalyptus regrowth control and approximately 3/4 of the site was replanted with 6500 native plants in 1996. Weedy annuals have colonized some areas of the site, and these are to be mowed once per year in the spring to give native plantings a competitive edge.

At the Dairy Ravine site, a stand of eucalyptus trees separated two areas of San Bruno elfin populations, one at Fern Rock at the base of Dairy Ravine, and another on rocky outcrops in upper Dairy Ravine. The removal of the eucalyptus trees here was done to provide connectivity between the two apparently separate populations of San Bruno elfin, as well as provide more habitat for callippe silverspots, (area B, figure 8). Callippe silverspots are found on the slopes east of Dairy Ravine and in the Saddle. The removal of the eucalyptus in Wax Myrtle Ravine was done to provide a more open corridor for callippes between the Saddle and Wax Myrtle Ravine (area C, figure 8). This area has extensive eucalyptus debris, eucalyptus regrowth, and gorse seedlings. Approximately 10 acres of eucalyptus regrowth was controlled at the Dairy Ravine site in fall, 1996. Continued regrowth control in Dairy Ravine and Wax Myrtle Ravine is scheduled along with a controlled burn for the winter and spring of 1997.

Intensive site preparation including regrowth control, stump grinding, and grading was done on a one acre section of the Botanic Garden site. This project is being managed by the Friends of San Bruno Mountain who have completed initial planting phases of the site. Over 125 volunteers planted over 2000 native plants at the site on Restoration Day (October 26, 1996).

South slope restoration sites- Pacific Nursery and Hoffman Street sites

Both the Hoffman Street site (5 acres) and the Pacific Nursery site (21 acres) have extensive eucalyptus regrowth that has not been controlled to date. The Hoffman site has been cleared of most eucalyptus debris from the logging operations, and has been colonized by grasses. There is a substantial colony of Mission blues along a road cut on the slope above the Hoffman site (area D, figure 8), and the site has the potential to support Mission blues in appropriate locations.

The Pacific Nursery site has extensive eucalyptus regrowth, exotic pest plants, and eucalyptus debris littering the site. This site will require intensive exotics control and controlled burns to clear the weedy vegetation. Along the transmission line ridge to the east of the site there are colonies of Mission blues and occasional sightings of callippe silverspots (area E; figure 8). This site has the potential to support both Mission blues and callippe silverspots in appropriate locations. The burning and exotics control work at the Hoffman Street and Pacific Nursery sites has not been scheduled at this time.

3. Development Activities

Take of habitat on San Bruno Mountain was authorized under the Endangered Species Act Section 10(a) Permit PRT 2-9818. Figure 9 shows the land status of parcels as of December 1996. The following development related activities took place which may have resulted in the take of the endangered species in 1996.

- * The Northeast Ridge project (A.P. 1-07) concluded grading activities in the Phase 1 development area. Home construction commenced in the Phase 1 area. The pad for the new Brisbane water tank was constructed on Guadalupe Canyon Parkway.
- * The Terrabay project site (2-04) continued home construction and new residents moved in. Remediation of the Area D landslide was completed.
- * The final construction phase of Bay Ridge (1-01) in Daly City was initiated. Home construction in this final phase will be completed in 1997.

The 1996 San Bruno Mountain HCP Operating Program is included as Appendix B to this report.

REFERENCES

Study Participants

Annual Report Prepared by: Victoria Harris, Patrick Kobernus, and Joseph Chen of Thomas Reid Associates

1996 Thomas Reid Associates Field Crew: Mike Forbert, Maria "Alvin" Baggett, and Lion Baumgartner.

Habitat Manager: Roman Gankin, San Mateo County Planning Division

Special thanks for their help and cooperation to:

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Charles Brock
Kendall Simmons

and The Friends of San Bruno Mountain

Louis and Kathy Manus
Doug Allshouse
Mac Macormick

FIGURE 1 — MISSION BLUE BUTTERFLY OBSERVATIONS - 1996

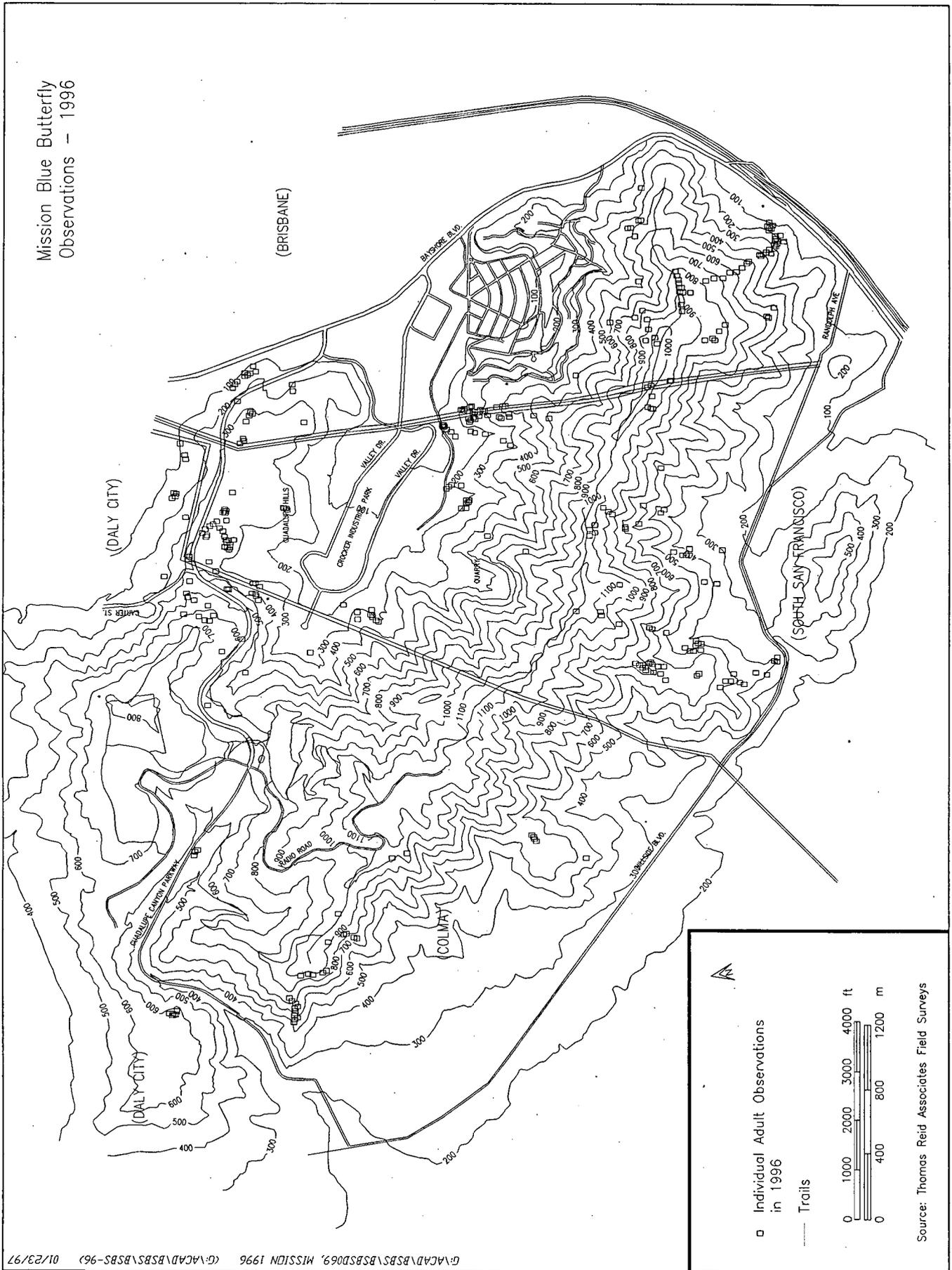


FIGURE 2 — MISSION BLUE BUTTERFLY: RELATIVE POPULATION SIZE (1989-96)

MISSION BLUE BUTTERFLY
RELATIVE POPULATION SIZE (1981-1996)

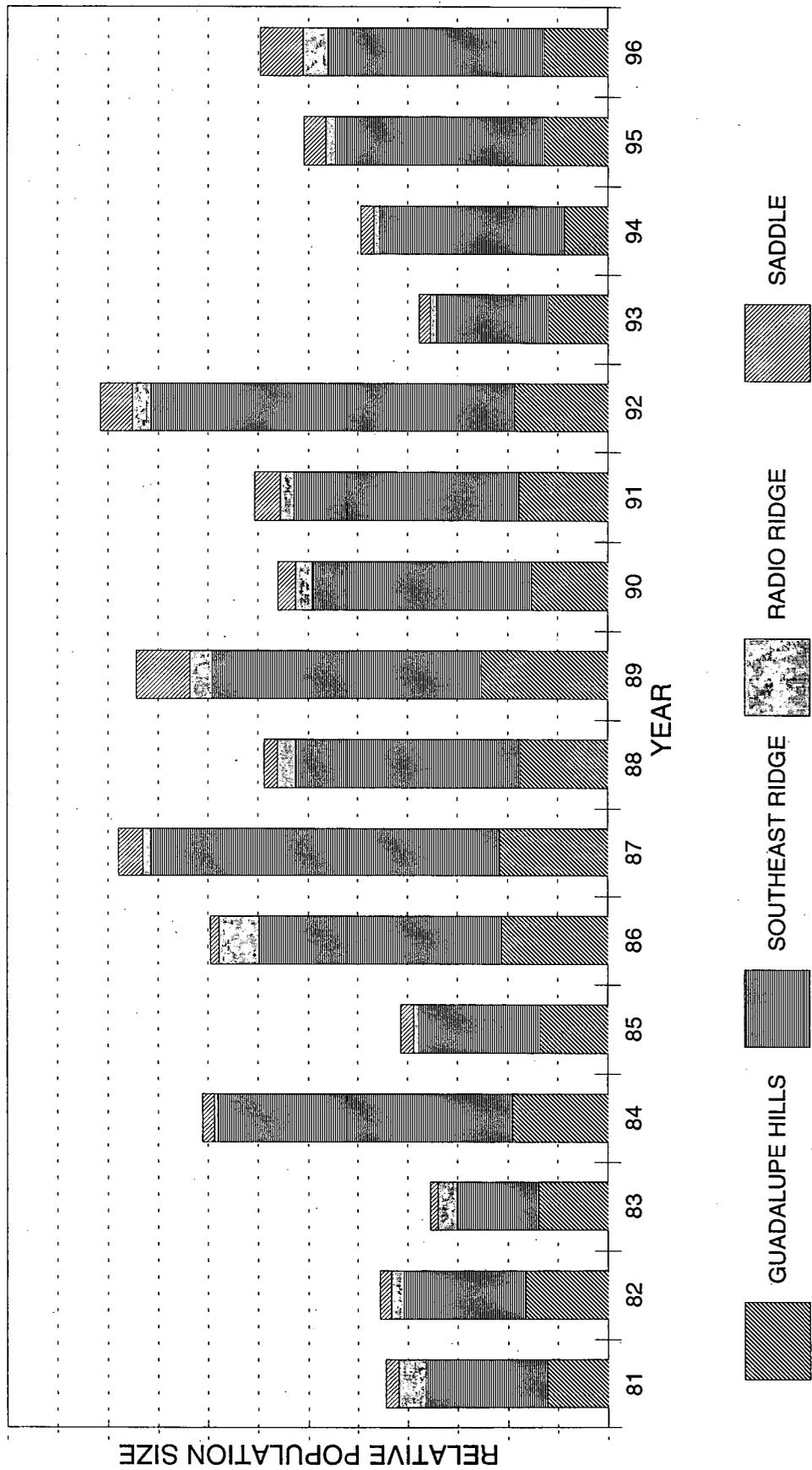


FIGURE 3 — CALLIPPE SILVERSPOT BUTTERFLY OBSERVATIONS - 1996

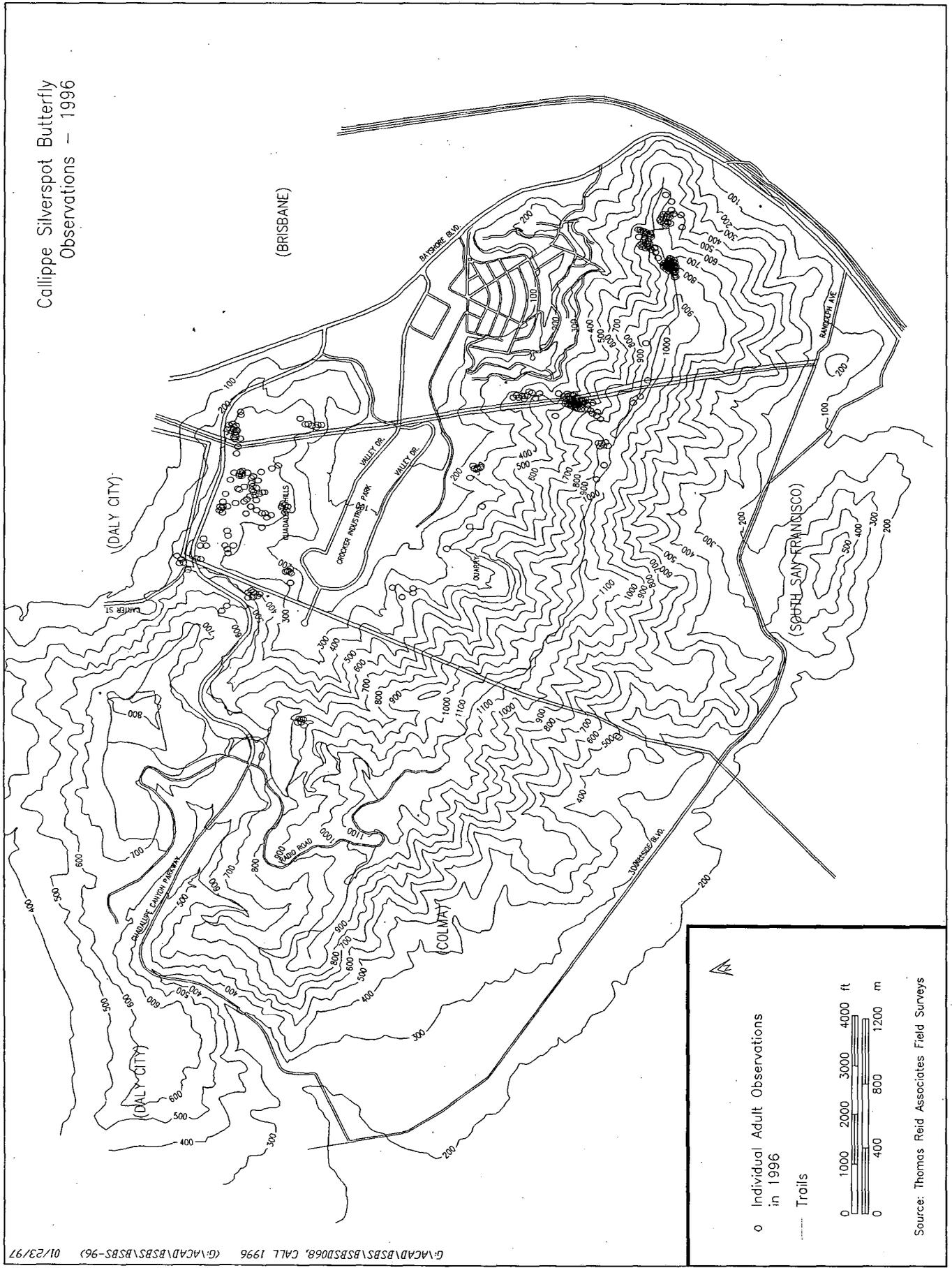


FIGURE 4 - CALLIPPE SILVERSPOT BUTTERFLY: RELATIVE POP. SIZE (1981-96)

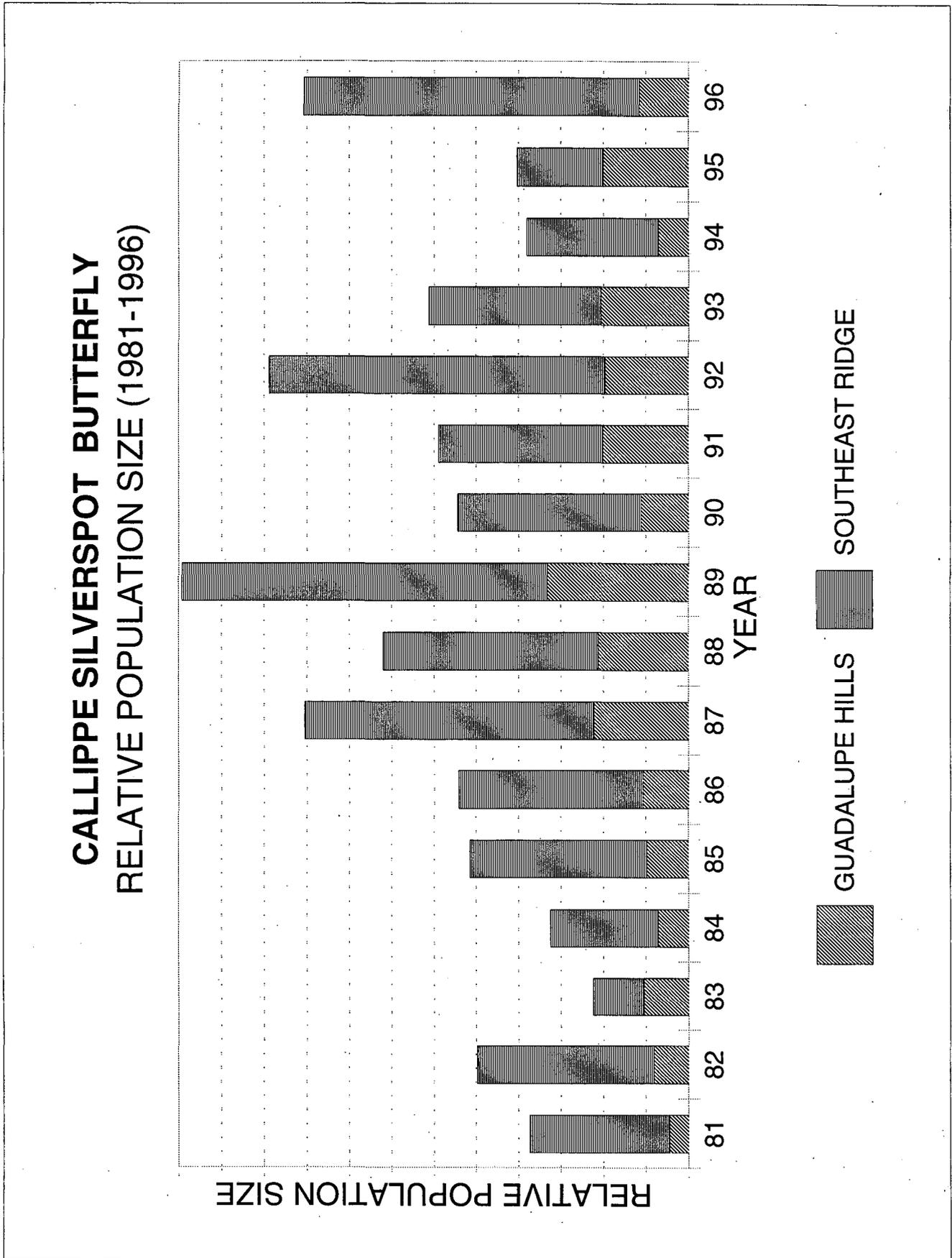
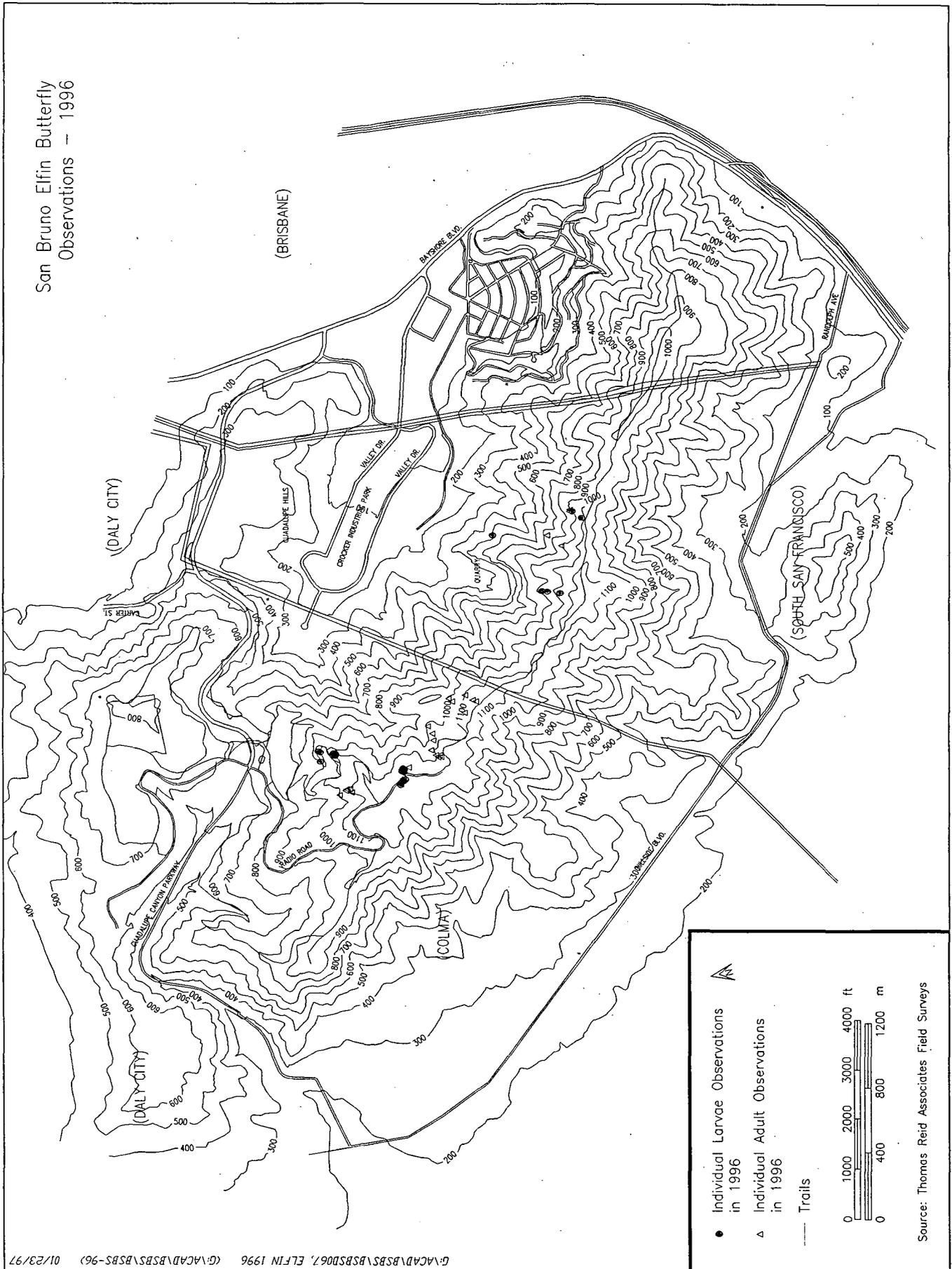


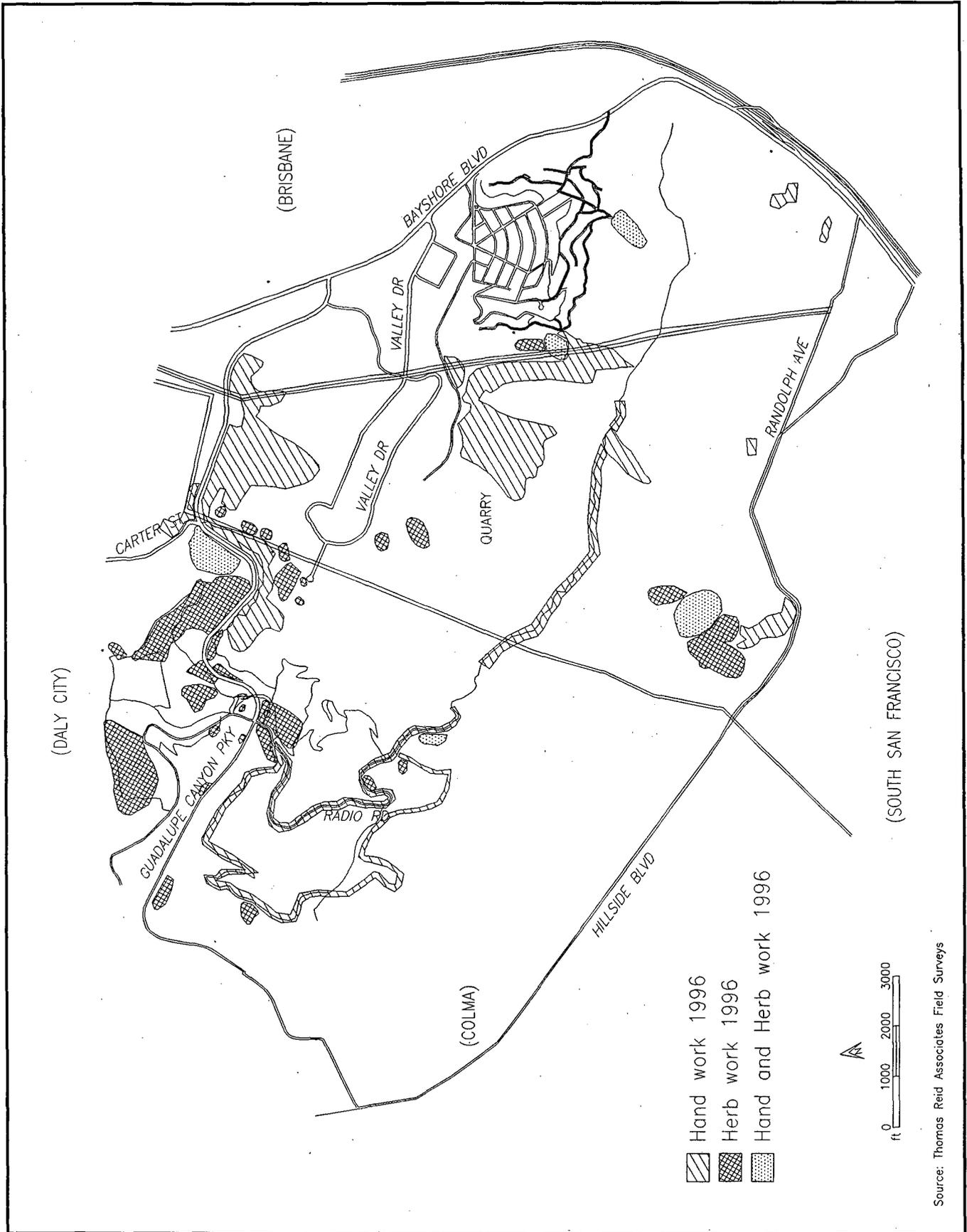
FIGURE 5 — SAN BRUNO MOUNTAIN ELFIN BUTTERFLY OBSERVATIONS - 1996



San Bruno Elfin Butterfly
Observations — 1996

G:\ACAD\BBS\BBS\BSD067, ELFIN 1996 (G:\ACAD\BBS\BBS-96) 01/23/97

FIGURE 6 — LOCATION OF 1996 HAND AND HERBICIDE EXOTICS CONTROL

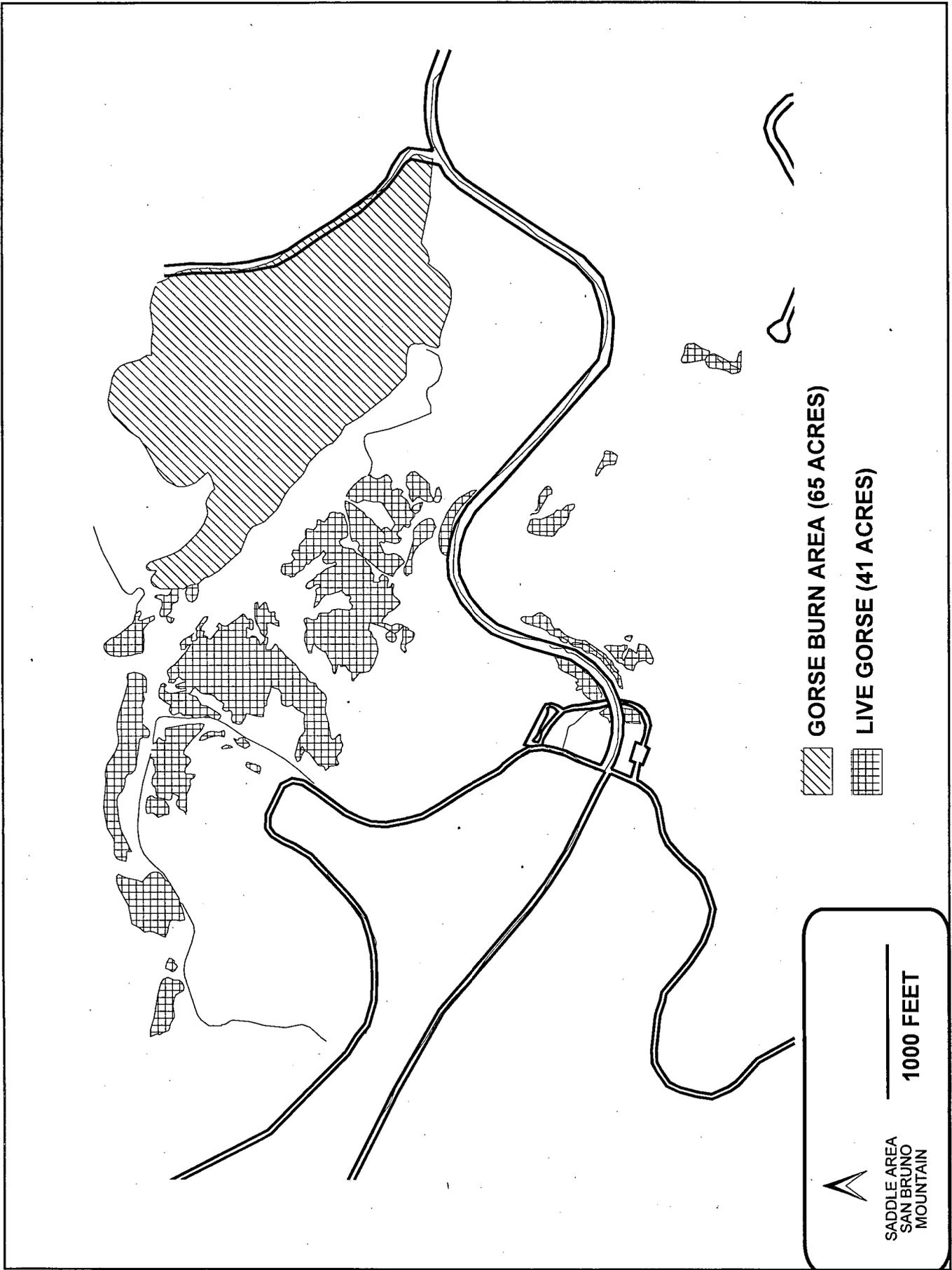


Source: Thomas Reid Associates Field Surveys

G:\ACAD\HAPM\HAPM010_96 HAND & HERB WORK (G:\ACAD\HAPM\97EXD1C) 01/23/97

FIGURE 7 — AREAL EXTENT OF GORSE ON SAN BRUNO MOUNTAIN IN 1996

Gorse96.FH5, 01/23/97,



APPENDIX A
1996 BUTTERFLY FIELD DATA SUMMARY

MISSION BLUE BUTTERFLY
FIELD DATA SUMMARY --1996
ALL AREAS

DATE	LOCATION	ELAPSED TIME	NUMBER OBSERVED	WEATHER CONDITIONS
4/7	Northeast Ridge	2.5	5	Temp: sunny to hot, 70s 60's, Wind: light
4/19	Juncus Ravine	3.0	20	Temp: sunny to overcast Wind: light to heavy
4/23	Radio Road above George's Welding	3.5	19	Temp: 60's, sunny Wind: light to windy
4/24	Owl and Buckeye Canyons	0.25	4	Temp: cool to warm Wind: windy
4/25	Reservoir Hill	0.75	6	Temp: warm Wind: on and off
4/25	Saddle	1.5	14	Temp: clear, sunny Wind: slight to windy
4/25	South Slope	4.5	13	Temp: clear, sunny, 70s Wind:
4/26	Juncus Ravine	5.0	24	Temp: sunny, high 70s Wind: less than 10 mph
4/28	Northeast Ridge	3.0	22	Temp: sunny, hot, 80s Wind: windy
4/29	Southeast Ridge	6.5	59	Temp: hot, sunny Wind: windy in pm
4/30	Owl/Buckeye	6.5	27	Temp: sunny, hot Wind: calm to slight
5/1	South Slope Terrabay	4.0	7	Temp: sunny, hot, 80s Wind: calm to windy in pm
5/2	Hillside	3.5	5	Temp: sunny, 80s Wind: light
5/2	Upper Valley	7.0	20	Temp: sunny, hot, 80's windy
5/8	Southeast Ridge	2.25	2	Temp: sunny, warm Wind: on and off
5/9	Southeast Ridge	1.25	3	Temp: warm, sunny Wind: windy

DATE	LOCATION	ELAPSED TIME	NUMBER OBSERVED	WEATHER CONDITIONS
5/10	Rio Verde	3.5	16	Temp: sunny & warm Wind: light to moderate
5/10	South Slope above Brisbane	2.0	4	Temp: sunny, 70-80 Wind: on and off
5/11	Northeast Ridge	2.0	4	Temp: hot, 80s Wind: ??
5/12	Northeast Ridge	1.0	3	Temp: sunny, warm Wind: windy
5/13	Owl/Buckeye	2.0	12	Temp: sunny, warm to hot Wind: windy on and off
5/24	Northeast Ridge	2.25	7	Temp: sunny, warm to cool Wind: windy on and off
5/27	Upper Valley	1.25	1	Temp: sunny, warm to hot Windy on and off
5/30	South Slope	1.0	1	Temp: sunny, warm Wind: windy on and off
5/31	Southeast Ridge above Brisbane	0.5	2	Temp: sunny, hot Wind:
6/1	Owl/Buckeye	1.5	6	Temp: sunny to hot, calm
6/2	Northeast Ridge	0.5	2	Temp: sunny, hot Wind: calm
6/5	Northeast Ridge	2.0	2	Temp: sunny, hot to warm Wind: calm
6/6	Northeast Ridge	2.0	2	Temp: sunny, hot Wind:
TOTAL	ALL AREAS	76.5000	312	4.1 = Sightings Per Hour

CALLIPPE SILVERSPOT BUTTERFLY
FIELD DATA SUMMARY -- 1996
ALL AREAS

DATE	LOCATION	ELAPSED TIME	NUMBER OBSERVED	WEATHER CONDITIONS
5/10	Southeast Ridge above Brisbane	1.50	4	Temp: sunny, hot Wind: on and off
5/11	Northeast Ridge	1.50	6	Temp: hot, 80s
5/12	Northeast Ridge	1.50	6	Temp: warm Wind: windy
5/24	Northeast Ridge	3.50	18	Temp: warm Wind: on and off
5/27	Northeast Ridge by Water Tank	1.00	5	Temp: sunny, clear Wind: windy, on and off
5/30	Southeast Ridge	3.00	9	Temp: cool, windy, 60s
5/31	Southeast Ridge	1.00	84	Temp: sunny, ot Wind: very little
6/1	Owl and Buckeye	0.50	3	Sunny, hot, windy
6/2	Northeast Ridge Callippe Hill	4.50	40	Temp: hot Wind: calm to breezy
6/3	Northeast Ridge	3.50	12	Temp: sunny, 80s Wind: on and off
6/5	Northeast Ridge	2.00	19	Temp: 80s Wind: windy on and off
6/6	Northeast Ridge and Carter Street	2.00	6	Temp: sunny, hot Wind: yes
6/18	Dairy Ravine	0.50	6	Temp: clear, warm Wind: breezy
6/18	Owl and Buckeye	3.00	64	Temp: 70s Wind: on and off
6/27	Owl and Buckeye	0.50	6	Temp: warm to hot Wind: windy
6/29	Northeast Ridge	0.50	4	Temp: sunny, hot Wind: windy
7/1	Upper Valley by Quarry	1.50	4	Temp: sunny, hot Wind:
TOTAL	ALL AREAS	31.500	296	= 9.4 Sightings Per Hour

1996 SAN BRUNO ELFIN SEASON SUMMARYADULTS

3/8 00, Lion
3/14 09, Lion, sunny, warm, summit, calm, Summit, Building E, Dairy Ravine Trail
3/17 17, Lion, Ridge Trail, sunny, warm, calm
3/18 00, Vic, sunny, light winds, April Brook, Reeberg spot
3/18 02, Lion, next to Quarry, sunny, 70s, calm to breezy
3/20 02, Lion, next to Quarry, sunny, 70s, calm to breezy
4/3 00, Lion, Dairy Ravine, Breezy, cool
4/4 00, Lion, Dune Tansy area, sunny, clear, high 60s

TOTAL 30 observed on four days

LARVAE

5/22 14, Summit
5/26 10, Dairy Ravine Trail
5/30 5, above Quarry
6/1 1, next to Quarry

TOTAL 30 larvae on four days

Formula for Determining Relative Population Size

The productivity ratio, the ratio of sightings to hours spent, is the measure of density. Density is expressed as sightings/hour (S/H). The productivity ratio is directly proportional to density, related by a constant. The Area (A) of grassland in the colony is the measure of the total resource in a colony. The product of density (sightings/hour) times Area yields a measure of the insects present (area cancels out). The actual value of the product has no direct meaning -- it is related to the true number of insects by an unspecified constant. However, if the product for the various colonies is summed and the product for one colony is expressed as a percentage of the total, then the unspecified constant cancels out. The result is a valid estimate of the proportion of all insects in the colony.

For the Mission blue the following formula was used in 1996:

Colony	Sightings per Hour	Area (hectares)	A x S/H	% of Population
Guadalupe Hills	3.11	207	644.0	18.5%
Southeast Ridge	4.32	500	2160.0	62.5%
Radio Ridge	5.43	46	250.0	7%
Saddle	8.90	48	427.0	12%

For the callippe the following formula was used:

Colony	Sightings per Hour	Area (hectares)	A x S/H	% of Population
Guadalupe Hills	5.60	207	1160.0	13%
Southeast Ridge	15.80	500	7900.0	87%

APPENDIX B
OPERATING PROGRAM BY ADMINISTRATIVE PARCEL -- 1996

Administrative Parcel	Species Monitoring	Exotics Control	Revegetation	Planning Assistance *
<i>GUADALUPE HILLS (1)</i>				
01 Linda Vista III (Bay Ridge)	X	X	X	X
02 Carter St.	X	X		
03 Rio Verde Heights	X			X
04 Levinson Property	X			
05 Brisbane Office Park	X			
06 Parcel Z	X			X
07 Northeast Ridge Project	X	X	X	X
08 Guadalupe Valley West	X	X		
09 State Park	X	X	X	X
10 Guadalupe Canyon Pkwy.	X	X		X
11 PG&E Transmission Lines	X			X
12 PG&E Fee	X			
13 Water Pipelines	X			X
14 Linda Vista I	X	X		
15 Water Tank				
16 Parcel V	X	X		
<i>SOUTHEAST RIDGE (2)</i>				
01 Quarry	X	X	X	X
02 Owl and Buckeye Canyons	X	X	X	X
03 Brisbane Acres	X			X
04 Terrabay Project	X	X	X	X
05 County Park	X	X		X
06 Hillside School				
07 PG&E Transmission Lines	X	X	X	X
08 Juncus Ravine	X	X		
09 Water Pipelines	X			
10 Fire Breaks	X			
<i>RADIO RIDGE (3)</i>				
01 Telecommunications Site	X	X	X	X
02 County Park	X	X	X	X
03 Guadalupe Canyon Pkwy.	X	X		
04 PG&E Transmission Lines	X		X	X
<i>SADDLE (4)</i>				
01 Pointe Pacific	X	X		
02 Village-in-the-Park		X		
03 South Hills Estates				
04 State Park	X	X	X	X
05 Guadalupe Canyon Parkway	X	X		X
06 Water Tanks				

* Includes monitoring of construction, project design review and HCP compliance review