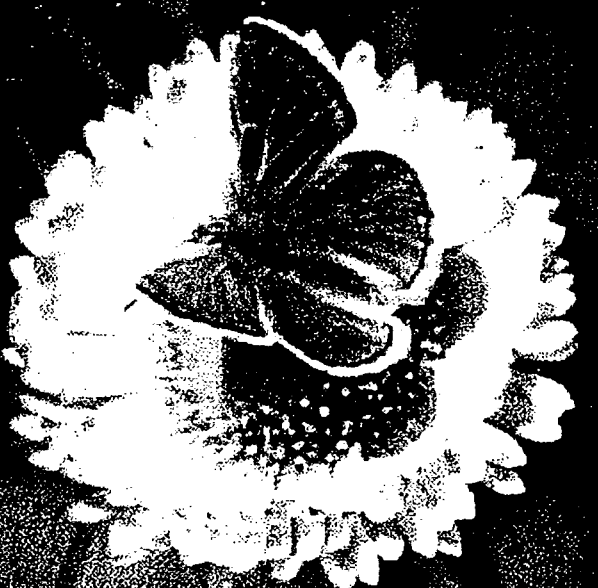
SAN BRUNO MOUNTAIN HABITAT CONSERVATION PLAN ACTIVITIES REPORT - 1995

For Endangered Species Permit
PRT 2-9818

January 1996



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Prepared for
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the U.S. Fish and Wildlife Service

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 1995 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 Victoria Harris at (415) 327-0429 or Roman Gankin at (415) 363-1826.

1. Status of Species of Concern

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 1995 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 locational 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. For general interest a breakdown of adult observations by month from 1989 to 1995 is provided in Table 1. Note all figures are included at the end of the report.

Data Analysis

Inclement weather conditions hampered monitoring efforts considerably in 1995 so that only 58.75 hours were spent on productive Mission blue transects, during which 206 adult Mission blue were observed. Field crew were available throughout the season to monitor, however, monitoring did not take place during inclement weather. Only four hours were spent in the Radio Ridge planning area, 18 hours in the Guadalupe Hills area, 26.5 in the Southeast Ridge, and 7 hours in the Saddle. This is the fewest number of hours spent on Mission blue butterfly monitoring for the 14 year survey period.

Analysis of the total number of Mission blue butterflies observed during the 58.75 hours of monitoring provided a figure of 3.7 sightings per hour for all survey areas. This number indicates that, although there were fewer windows of activity for adult flight, the relative population increased slightly from what

it was in both 1993 and 1994 (see Figure 2).

In 1995, there were only a couple of "optimum" days where many Mission blue butterflies were observed in a particular area. For instance on May 19, 22 Mission blue were observed on the slopes above Bayshore Boulevard in a 2 hour period. During this time the temperature was between 70 and 80 degrees, the wind was calm, and the sun was shining. If an observer happened to be at another area of the Mountain at this particular time he may have observed bigger numbers there also.

Based on a review of both recent and past monitoring data and from consultations with field personnel, it seems that with Mission blue butterflies, monitoring success is very much related to being in the right place at the right time. Data suggests that on an optimum weather day, if peak flight had already occured then fewer adults will be observed in an otherwise rich area. Similarly, if peak flight has not occured, then an early season visit with optimum weather could prove fruitless. Occassionally, an observer is in the right place at the right time, such as on April 15, 1994 in Juncus Ravine when 62 Mission blue butterflies were observed in a 6 hour period on a beautiful day.

The large size of San Bruno Mountain and the few number of optimal weather days provides limited opportunities for being in the right place at the right time. This is especially true given the fact that, as Murphy's Law would dictate, the best butterfly weather occurs on weekends or when field crew are absent from the Mountain for some reason or other.

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

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 454 callippe adults observed in 1995 are shown in Figure 3. Figure 4 shows the relative population size of the callippe silverspot for years 1981-1995. See Table 2 for a breakdown of adult observations by month.

The relative population of the callippe on San Bruno Mountain was similar to 1994 with 7.7 callippe observed per hour of transect time. The 1995 Southeast Ridge colony appears to have a bigger relative population size compared to 1994. Unlike the Mission blue, there were several days when observers were successful at seeing high numbers of callippe when weather was good for flight. More than 50 callippe were observed on each of four days during the flight season: 6/21, 6/23, 6/30, and 7/13, all in the Southeast Ridge planning area.

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

San Bruno Elfin (*Incisalia mossii bayensis*)

The locations of the 13 adult San Bruno elfin butterflies observed in 1995 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 17 total larvae observed at four colonies. A tally of the 1995 field data is included in Appendix A.

As noted last year, weather during the 1994 San Bruno elfin adult monitoring season was extremely poor. The weather was even worse in 1995. There were several severe storms in the months of January and March with high rainfall totals. In addition to the poor weather windows for adult flight, there may have been high pupal mortality caused by extreme wet weather. The result was very few adult observations in March and a very low number of larvae observed in May. In fact, 1995 had the lowest larval count in recent times. Only 1 larvae was observed at the summit colony, a location were many larvae are typically observed each year.

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

Bay Checkerspot Butterfly (*Euphydryas editha bayensis*)

In 1995, no bay checkerspot butterflies (larvae or adults) were observed on San Bruno Mountain.

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.

Plants of Concern

Lion Baumgartner mapped populations of *Helianthella castenea* on San Bruno Mountain in 1995. The ten colonies of *Helianthella* documented are scattered within the area shown in Figure 6. The ten colonies comprise some 200 individual plants. The bigger colonies have been known since the early 1980's. Some small clumps have been identified in more recent times. The population of this plant on San Bruno Mountain is considered stable, or slightly increasing with no apparant threats at the present time.

Helianthella castenea is endemic to the San Francisco Bay Area and is considered rare or endangered by the California Native Plant Society. *Helianthella* is associated with valley needlegrass grassland and coastal terrace prairie intersperced with northern (Franciscan) coastal scrub and coastal live oak plant communities. Individual native plant species typically associated with *Helianthella* colonies include the following:

Danthonia californica
Elymus glaucus
Festuca idahoensis
Koleria macrantha
Acaena californica
Achillea millefolium
Allium dichlamydeum
Arabis blepharophylla
Clarkia rubicunda

Chlorogalum pomeridianum
Dichelostemma pulchellum
Eriogonum latifolium
Erysimum franciscanum
Eschscholtzia californica
Heterotheca bolanderi
Lomatium caruifolium
Lomatium utriculatum
Lupinus albifrons
Quercus agrifolia
Quercus chrysolepis var. nana
Quercus X morehus
Quercus wislizeni var. frutescens
Ranunculus californicus
Viola pendunculata
Wyethia angustifolia

2. Exotic Pest Plant Control Activities

The exotic pest plant control activities on San Bruno Mountain are being conducted to improve native habitat for several rare and endangered plant and animal species found on the Mountain.

a. 1995 Exotic Pest Plant Treatment Summary

In 1995, over 100,000 exotic pest plants were removed by hand and over 36 acres of pest plant infestations were treated with herbicide throughout the Mountain by TRA. Summary tables of the exotic pest plant work conducted in 1995 are contained in Appendix B. Herbicide treatments were conducted mainly in the Saddle area, while handwork was done over the rest of the Mountain (Figures 7 and 8). 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, acres treated is recorded.

b. Exotics Control Strategy and Future Goals

Currently there are 35-40 different exotic pest plant species found on the Mountain. Of these, there are some that are much more aggressive in moving in and taking over new areas. These include French broom, (*Genista monspessulana*), blue-gum eucalyptus (*Eucalyptus globulus*), gorse (*Ulex europaeus*), and fennel (*Foeniculum vulgare*). Other highly invasive species that are less widespread than those above include; Himalaya blackberry (*Rubus discolor*), cotoneaster (*Cotoneaster sp.*), and German ivy, (*Senecio milkeniodes*). Since 1992, exotic plant infestations have been attacked in priority fashion based upon the following criteria:

Priority 1: Small isolated patches of exotics within native habitat

Priority 2: Small patches of exotics at the periphery of larger exotic infestations

Priority 3: Edges of large infestations expanding into native habitat

Priority 4: Large infestations

For gorse infestations our methodology for the past three years has been to spray the gorse plants with an herbicide solution containing 2% Garlon 4a. The herbicide is applied twice per year in suitable weather (low wind, low humidity) for maximum plant uptake. We then leave the plants to die and decay in place. Gorse seedlings are highly responsive to fire or disturbance of any kind, and this methodology has been effective at reducing gorse seedlings and allowing the native plant community to come back on its own (Figures 9 and 10).

The gorse infestation in the Saddle has been attacked from all sides, and is now mostly limited to a 45 acre area of the Saddle. A dense stand of gorse along the steep northeast section of the Saddle was burned in June 1995, (Figure 8), allowing access for possible future eradication. Future efforts for gorse control for the 1996-97 fiscal year will focus on controlling isolated gorse infestations in Wax Myrtle Ravine and along Guadalupe Canyon Parkway, as well as impinging further into the main gorse infestation in the Saddle from both the northwest (sites 5 and 6) and the southeast (sites 26 and 27) borders.

In other areas of the Mountain where handwork is the primary means of exotics control, we have gained control of areas in the northeast ridge and on the main ridge (i.e. Callippe Hill, Wax Myrtle Ravine, Buckeye Canyon, Owl Canyon and others). Future efforts will maintain these areas while expanding into others on the south and southwest slopes where infestations are more recent and have received less attention due to lower butterfly activity in these areas.

c. 1994 Pre-emergent Herbicide Test Plot Results

In 1994, TRA assisted Dave Kaplow of Pacific Open Space in performing experiments to evaluate the effectiveness of pre-emergent chemicals for control of non-native annual grasses infesting native perennial grasslands. Results showed that two pre-emergents, one for the control of exotic annual grasses and one for the control of fennel, were very effective at improving survival of native grasses and herbs (*Nasella pulchra*, *Viola peduculata*, and others) in restoration plots. The full report of this experiment is available from TRA.

d. 1994 Native Plant Restoration of Gorse Treated Areas

An experiment to test techniques of revegetating areas controlled for gorse by herbicide application was set up in January 1995, (see 1994 San Bruno Mountain HCP activities report). Three plots each of native seed mix, native grass plugs, sterile wheat, and control, were set up in the Saddle in site 33. Each plot is 3m x 3m and was cleared of all existing vegetation.

Native grass plugs:	*Festuca rubra*, *Bromus carinatus*, *Elymus glacaus*
Native seed mix:	*Bromus carinatus*, *Danthonia californica*, *Achillea millefolium*, *Grindelia sp.*, *Wyethia angustifolia*, *Lupinus albifrons*, *L. formosus*, *L. variicolor*, *Iris douglasianna*, *Monardella villosa*, *Chlorogallum pomeridianum*, *Potentilla glandulosa*

The sites were inspected in January 1996 to assess success rates. Preliminary observations seem to indicate that the native grass plugs were the

most effective method of revegetation. The plots planted with grass plugs had the lowest average number of gorse seedlings in them (u=107), while the sterile wheat and native seed plots had similarly higher numbers of gorse (u=200, and u=207 respectively). The native grass plug plots also had much higher percent cover of grass than any of the other treatment plots, (90%, 75%, and 75%). In the native seed plots, *Achillea* was the only plant that was evident, and it was abundant. Only one of the sterile wheat plots contained sterile wheat in it, (aprox. 50% cover). More detailed results should be available in spring of 1996 when more of the plants will be discernable.

e. 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. 24 quadrats were placed within 3 treatment groups, (8 quadrats per treatment group) to test for effectiveness of herbicide treatment efforts in the Saddle. The treatment groups are as follows: 1) recently sprayed gorse; 2) gorse sprayed for 2+ years; and 3) untreated gorse (control). Existing data shows that gorse takes about 2-3 months to die after spraying, and 2 years or more for structural breakdown to occur. For this reason, two treatments will be used for the herbicide-sprayed areas; one in an area of live gorse that has not been sprayed with herbicide in the past, and another in an area of dead, standing gorse that has already undergone herbicide treatment for approximately 2 years.

An overall assessment of change in percent cover of gorse and native habitat for the Saddle area of San Bruno Mountain will be assessed from aerial photography in the Winter/Spring of 1996. Aerial photographs of the Mountain were taken in January 1996 in order to make detailed comparisons to low-altitude 1993 aerial photography. Past analysis of vegetation changes were not possible due to the lack of larger scale photography.

Data will be collected every 3 months for 2 years+. Detectable results are expected within 2 years. 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)

f. Eucalyptus Removal and Native Community Restoration

Through a coordinated effort between the San Mateo County Parks and Planning Departments, and Thomas Reid Associates, approximately 63 acres of mature eucalyptus forest was clear-cut from several areas of the Mountain, (see Figure 11). The trees were cut by Planned Sierra Resources, Inc. in the spring of 1995. The trees were cut to provide more habitat for the 3 species of rare butterflies on the Mountain, as well as improve habitat for other native wildlife.

In the Dairy Ravine area of the Saddle, 22 acres of eucalyptus were cut. This 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 these trees should allow connection between these two apparently separate populations of San Bruno elfin,

as well as provide more habitat for callippe silverspots, which are found on the eastern slope of Dairy Ravine bordering the former eucalyptus stand.

30 acres on the south side of the Mountain, (above Hoffman Street and Pacific Nursery), were cut to provide more habitat for the Callippe silverspot and the Mission blue, which prefer the dryer grassland areas found on southfacing slopes. The April Brook and Colma Creek sites (11 acres) in the Saddle area are cooler and moister than areas typically associated with the Mission blue or the Callippe silverspot. However removing the eucalyptus from these areas will provide more habitat for other wildlife that inhabit the Mountain such as fossorial rodents, songbirds, raptors, carnivores, amphibians, and reptiles.

The former eucalyptus groves will be re-planted with native plants collected from the Mountain to re-create the native plant communities of the Mountain. Plants to be used include the larval food and adult nectar plants of the Mission blue butterfly and the Callippe silverspot butterfly, as well as many other grasses, herbs, and shrubs found in the native coastal scrub and grassland communities. Elkhorn Ranch of Moss Landing, California has prepared restoration plans is currently carrying out the work program for the re-planting of the Colma Creek site (Figure 11). Habitat types to be re-created include central coast riparian scrub, northern coastal scrub, and mixed grassland. The remaining sites will be controlled for exotics by herbicide and hand removal over the next three years, and replanted as funds become available. Site preparation and planting plans are currently being drawn up for the 33 acres cut in the Saddle area. Copies of the restoration plans are available from the San Mateo County Planning Department.

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 1995. The following development related activities took place which may have resulted in the take of the endangered species in 1995.

* The Northeast Ridge project (A.P. 1-07) continued grading activities in the Phase I development area.

* PG&E replace two transmission towers on the south slope. All host plants of listed butterflies were avoided through the Site Activity Permit process.

* The Terrabay project site (2-04) was purchased by a new owner (Sun Chase) and site clean up commenced in 1995. Habitat slopes that had been reclaimed during the initial grading activities in the early 1990's were assessed for success/failure. Remediation work was done to improved habitat quality and correct erosion problems. Development of the site will continue in 1996.

The 1995 San Bruno Mountain HCP Operating Program is included as Appendix C to this report.

REFERENCES

Study Participants

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

1995 Thomas Reid Associates Field Crew: Maria "Alvin" Baggett, Lion Baumgartner, Craig Fee, Mike Forbert, Isaac Serabia.

Habitat Manager: Roman Gankin, San Mateo County Planning Division

Special thanks for their help and cooperation to:

San Mateo County Department of Parks and Recreation

Patrick Sanchez
Dennis Hanley
Kendall Simmons

FIGURE 1 -- MISSION BLUE BUTTERFLY ADULT OBSERVATIONS 1995

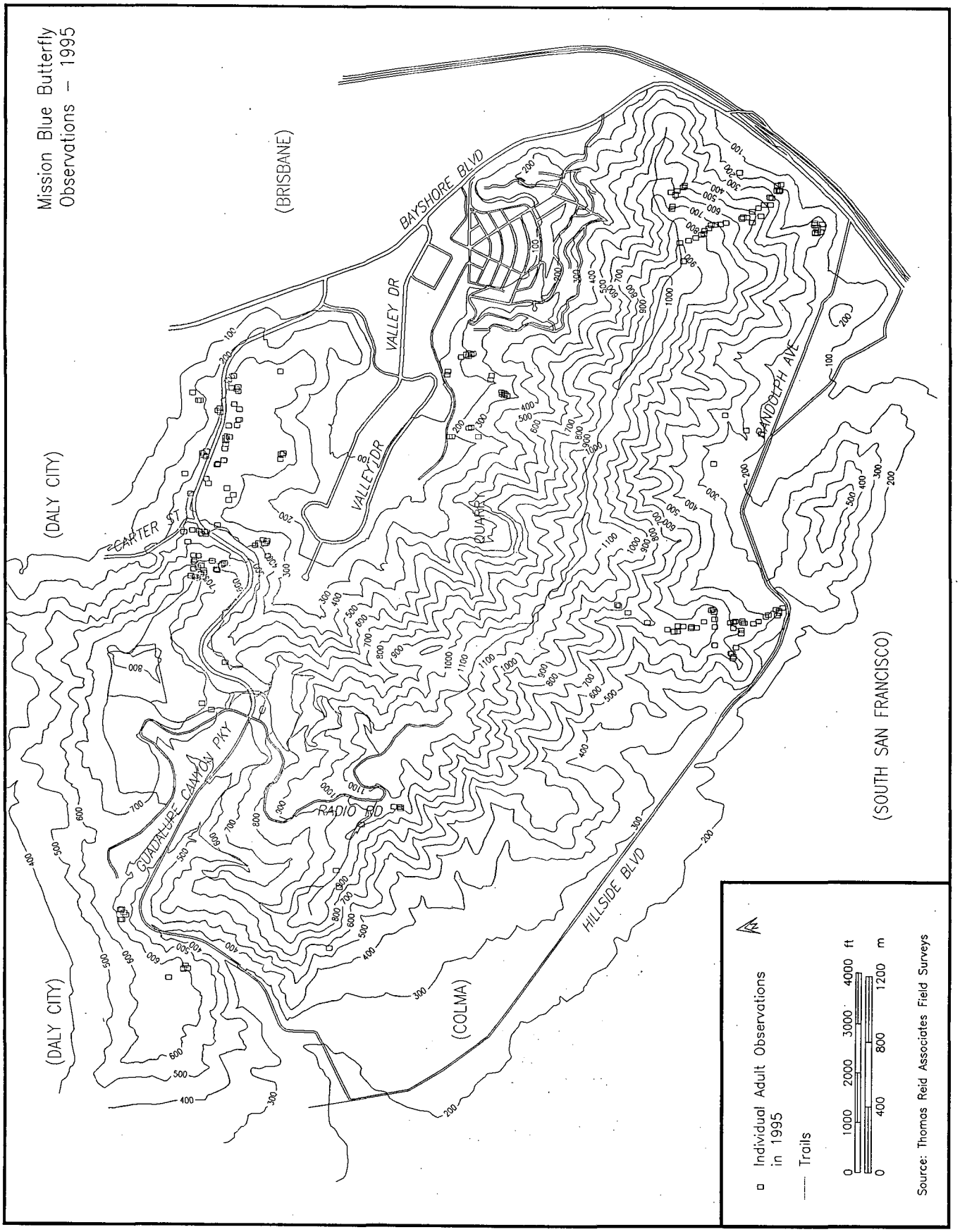


FIGURE 2 -- MISSION BLUE BUTTERFLY RELATIVE POPULATION SIZE 1981 - 1995

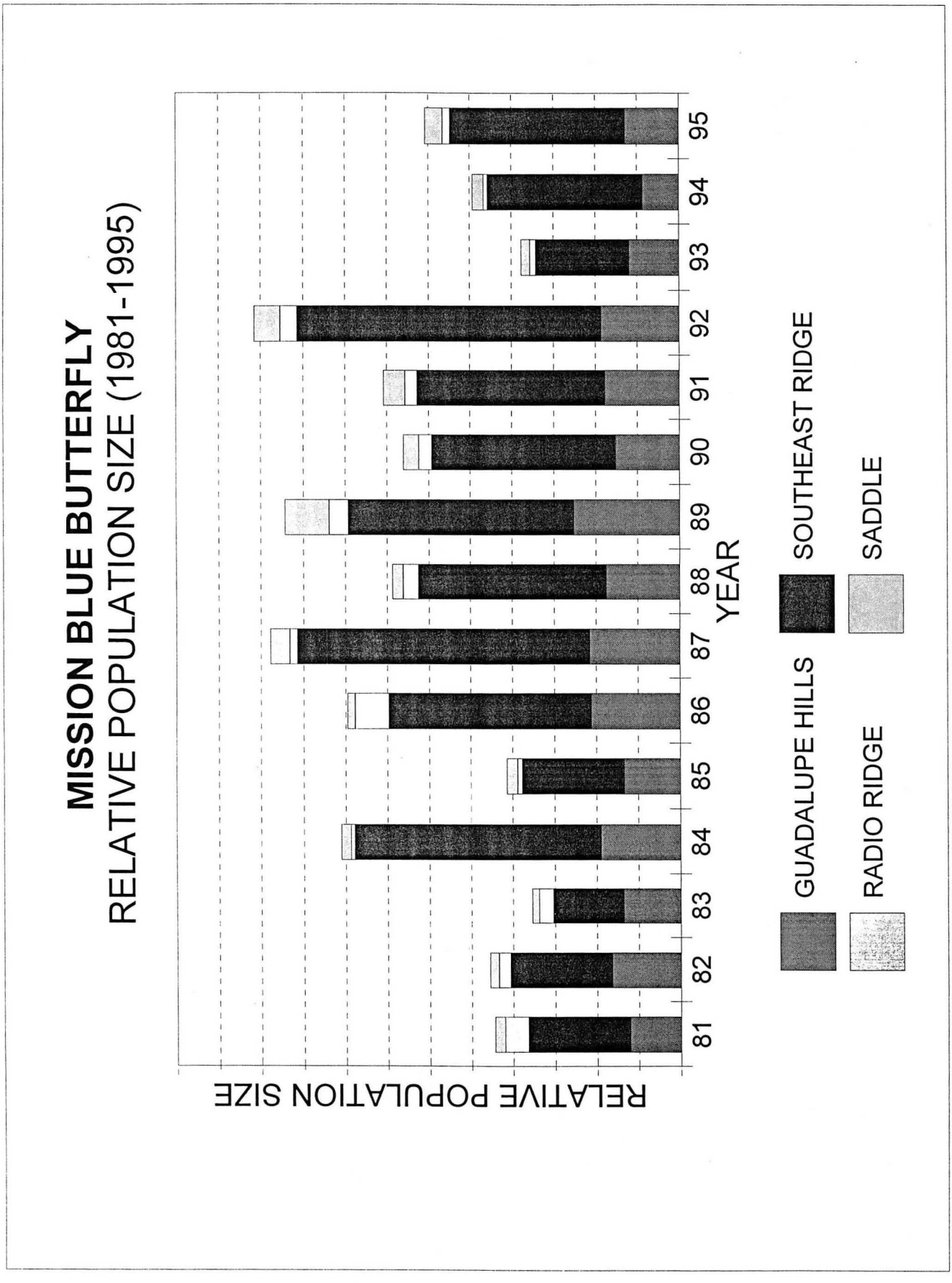


FIGURE 3 -- CALLIPPE SILVERSPOT BUTTERFLY ADULT OBSERVATIONS 1995

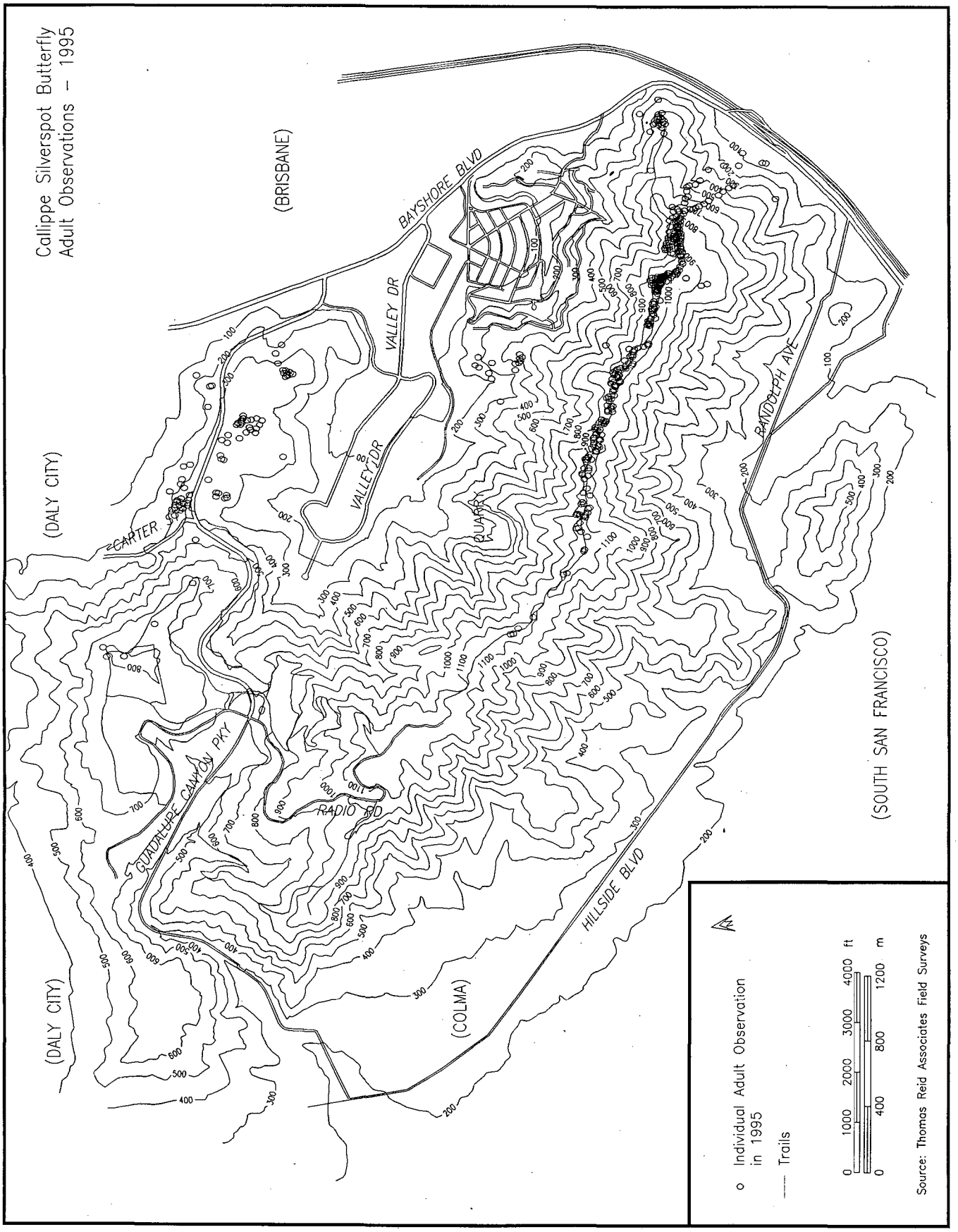


FIGURE 4 -- CALLIPPE SILVERSPOT BUTTERFLY RELATIVE POPULATION SIZE 1981 - 1995

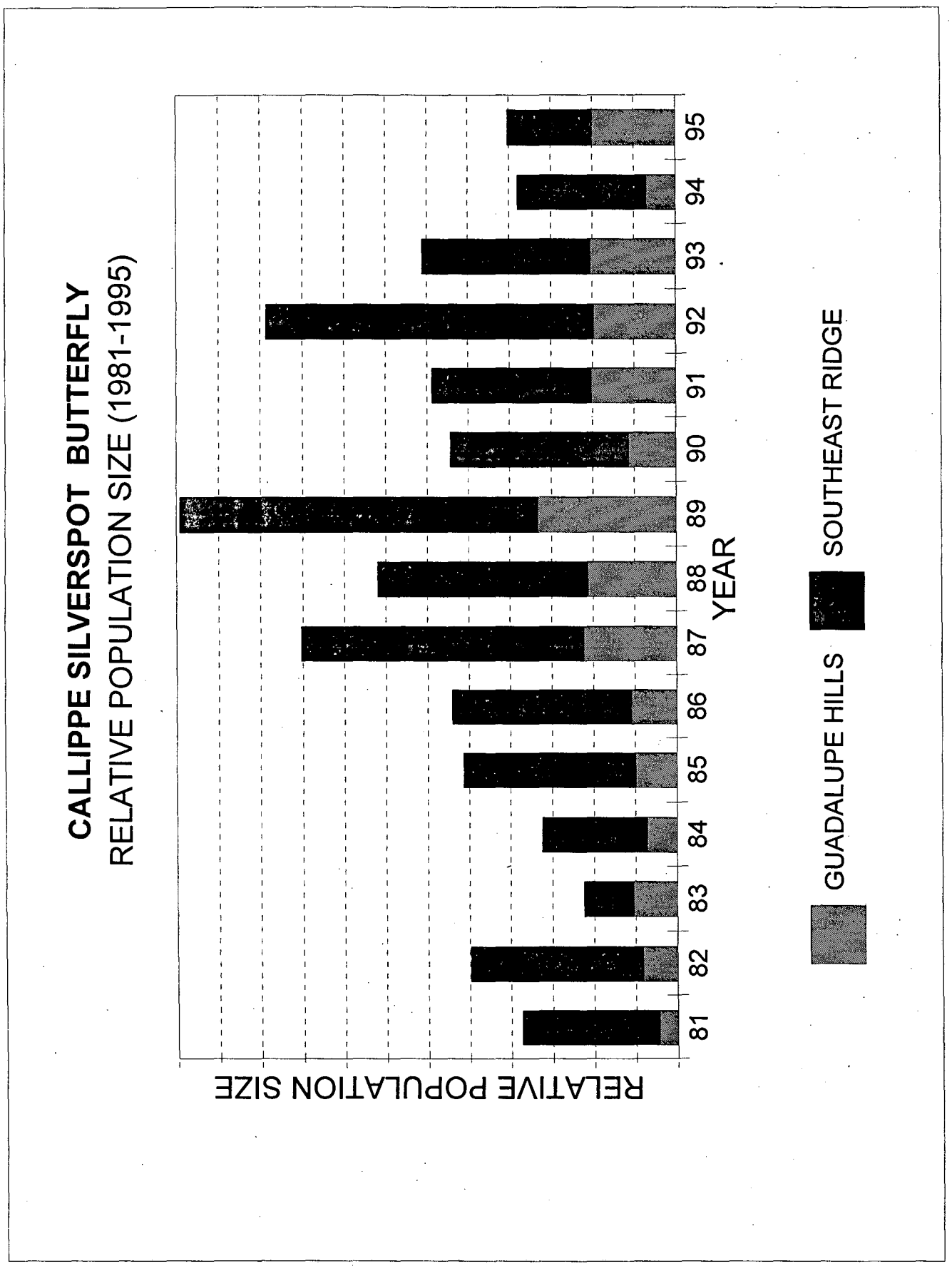
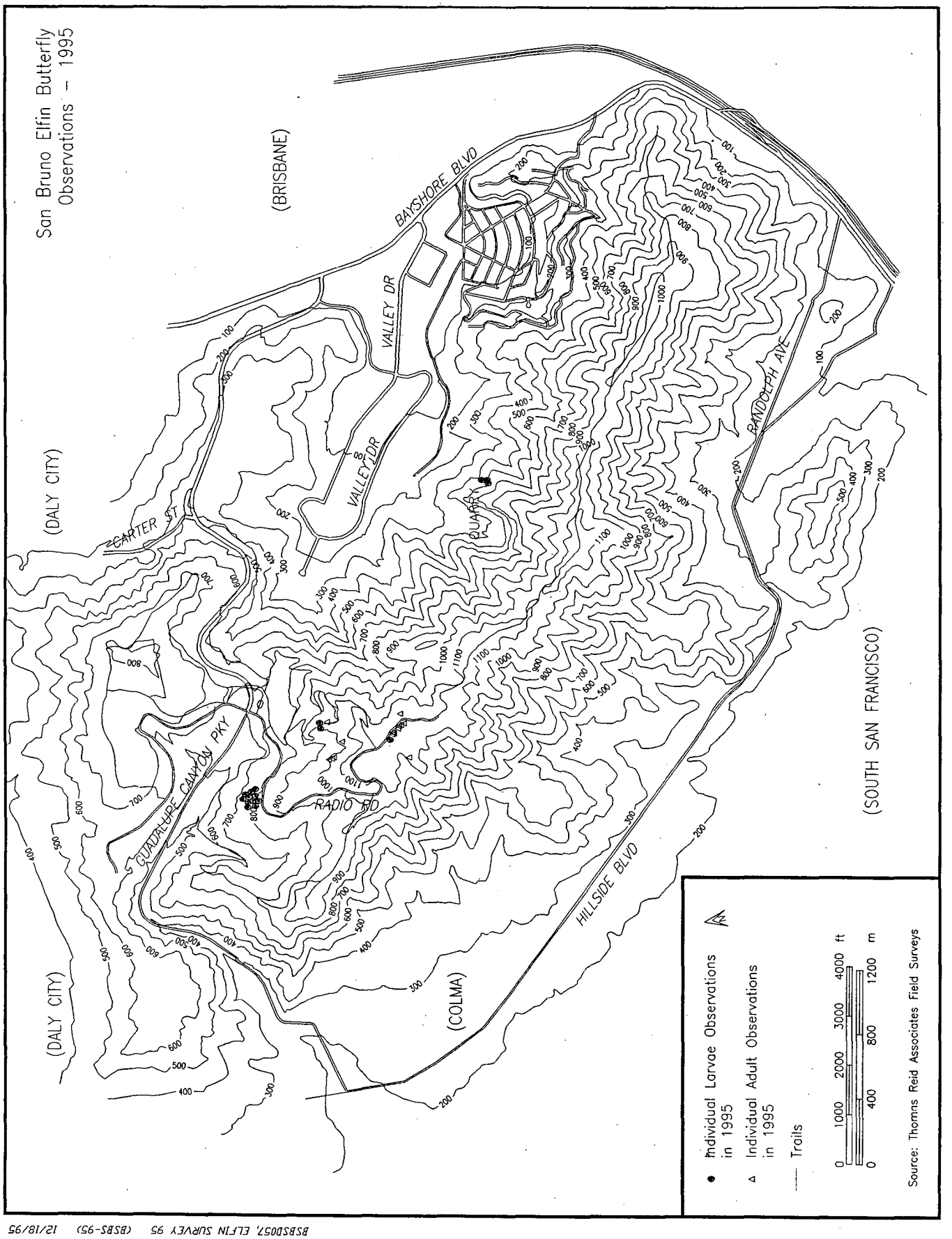


FIGURE 5 -- SAN BRUNO ELFIN ADULT OBSERVATIONS 1995



BSBSD057, ELFIN SURVEY 95 (BSBS-95) 12/18/95

FIGURE 6 -- CONCENTRATIONS OF HELIANTHELLA CASTANEA

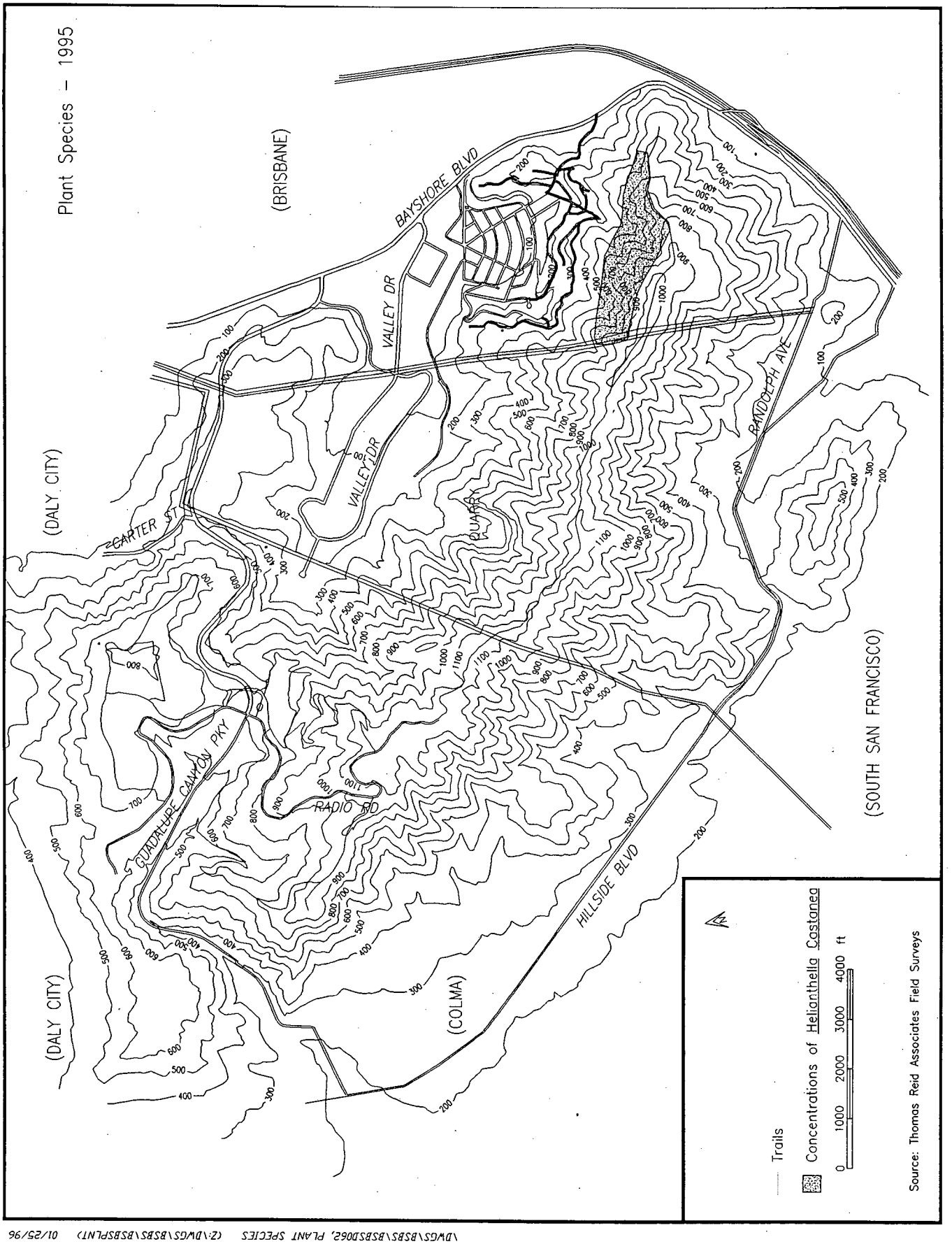


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FIGURE 7 -- HAND AND HERBICIDE TREATMENT AREAS -- MAIN MOUNTAIN

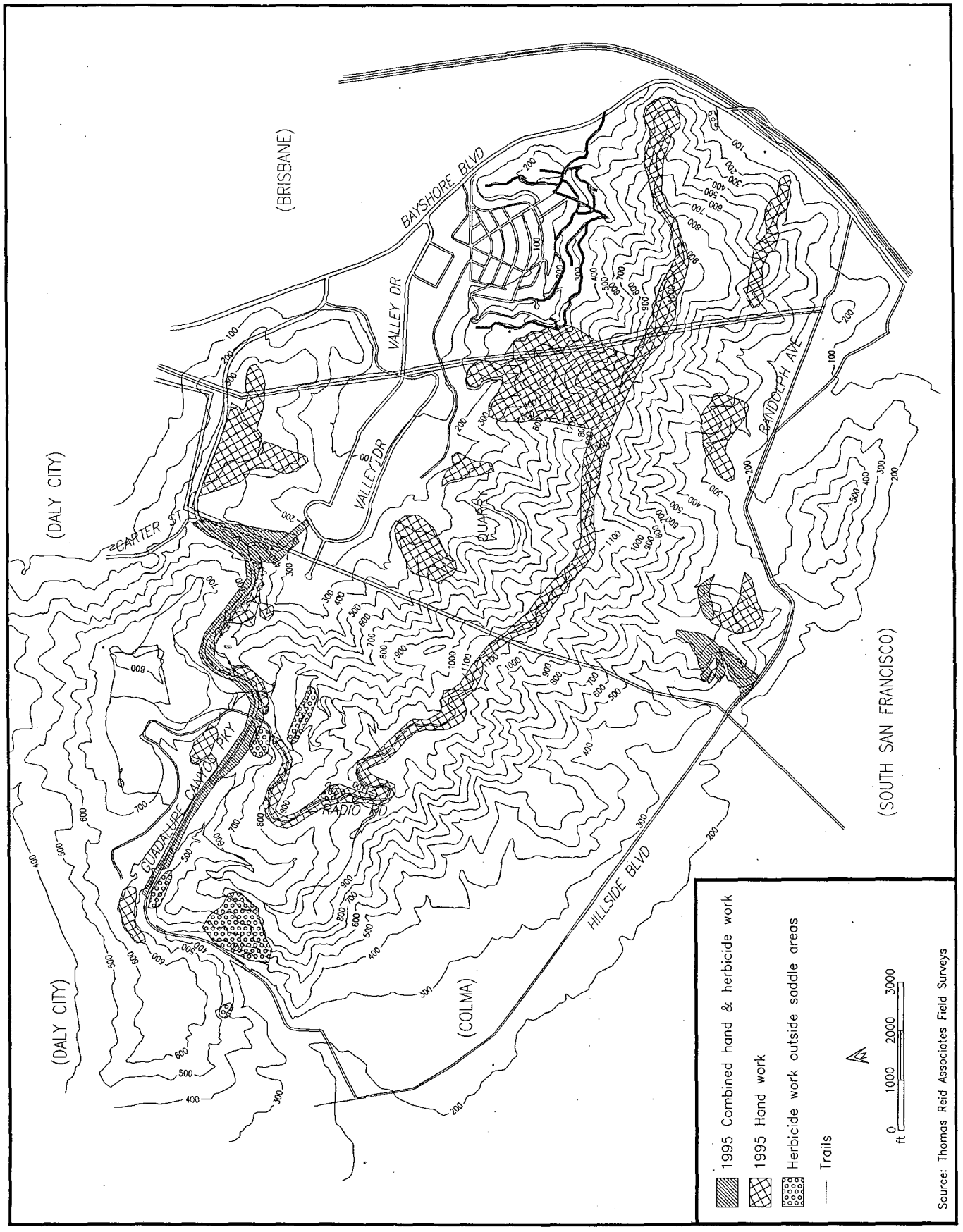

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FIGURE 8 -- 1995 HERBICIDE TREATMENT AREAS (AND BURN) -- SADDLE ONLY

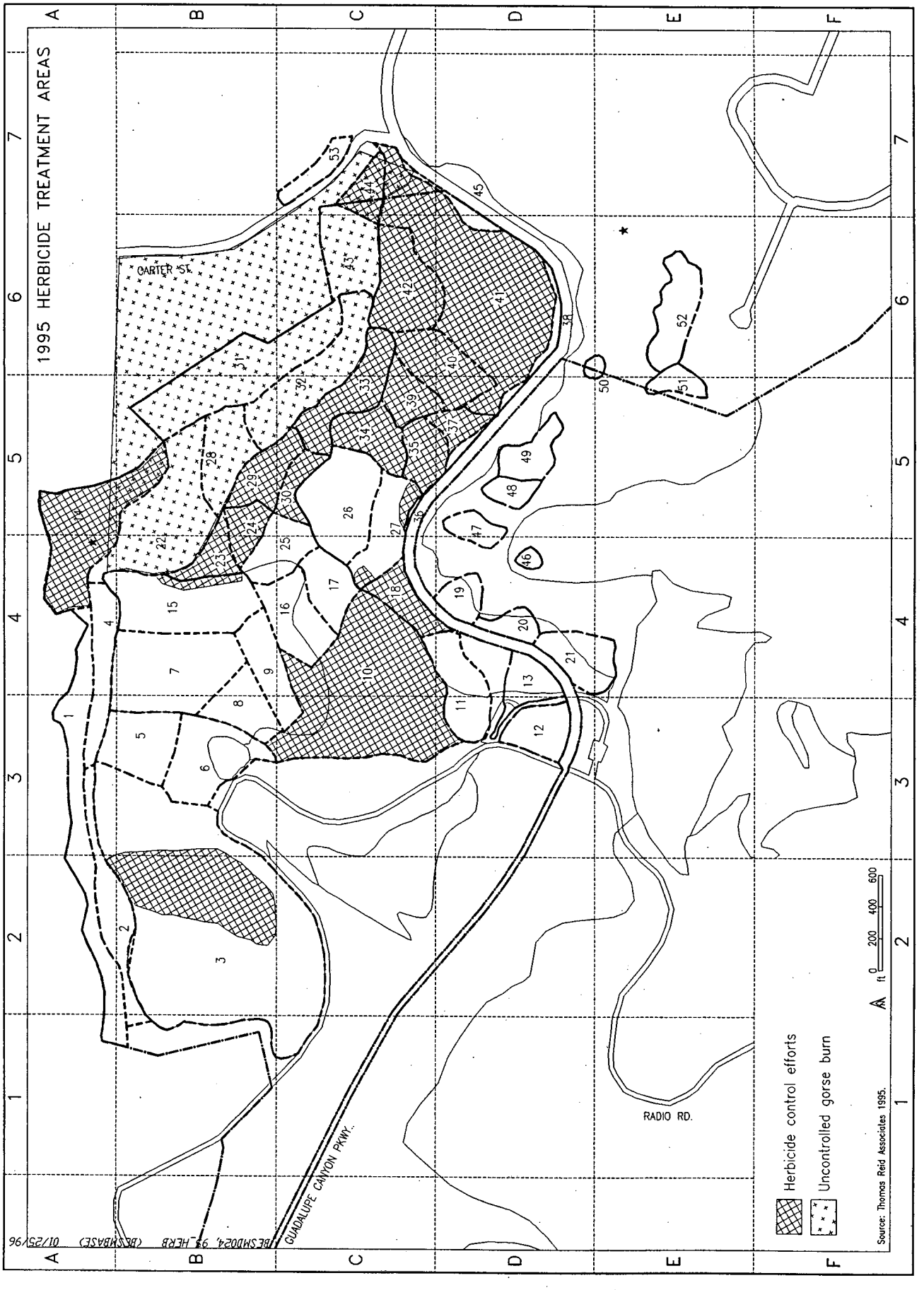

FIGURE 9 -- SADDLE SITE 39 BEFORE (11/92) AND AFTER (5/95) SPRAY TREATMENT

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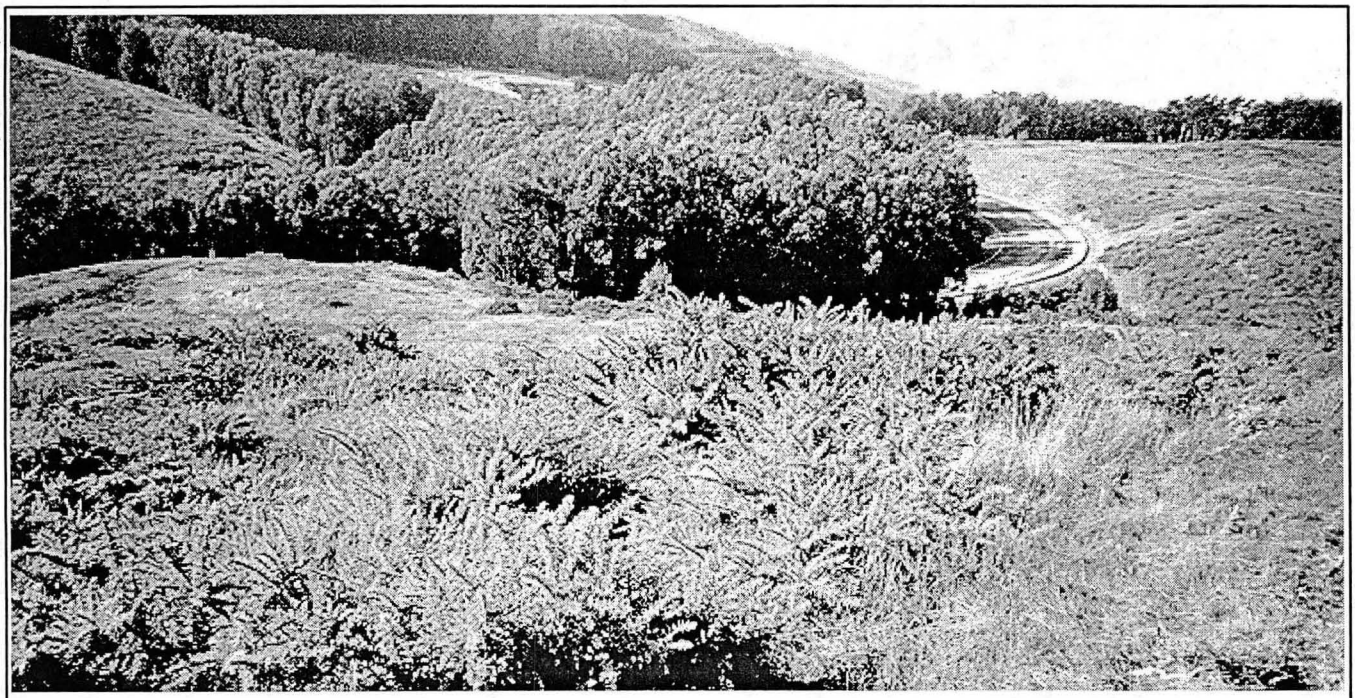
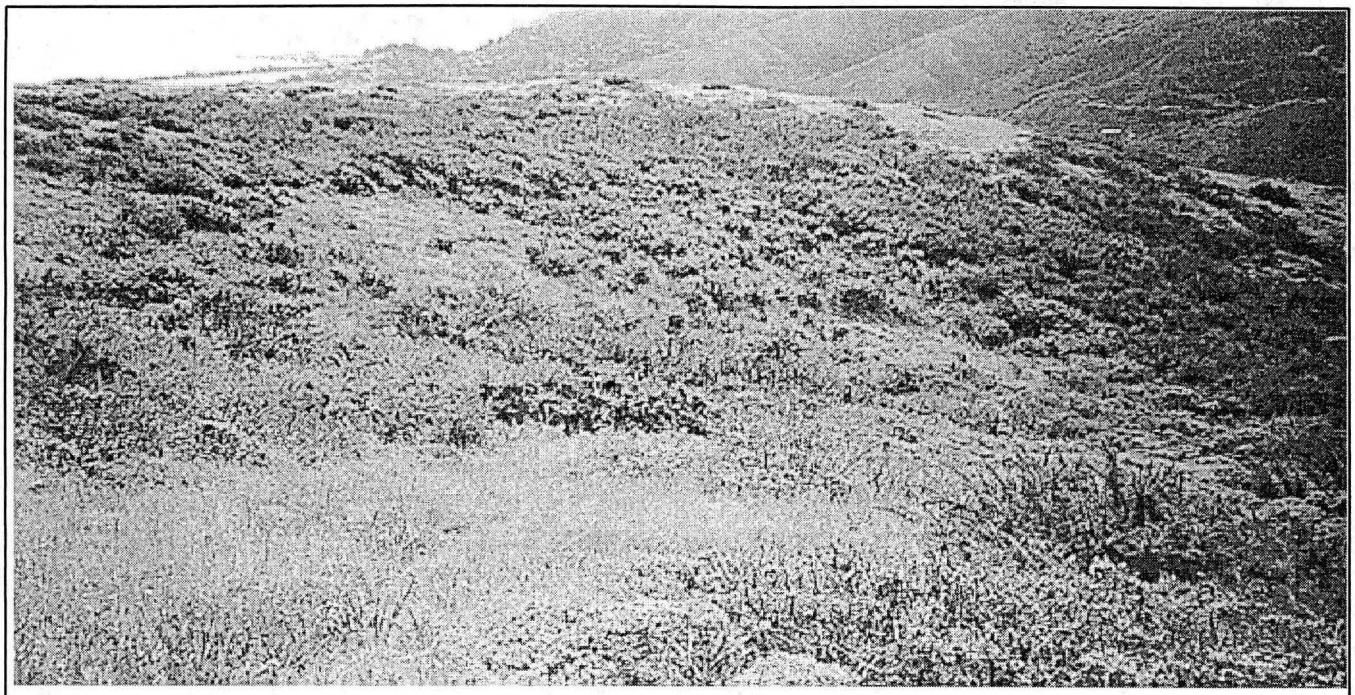


Stand of gorse in November 1992.

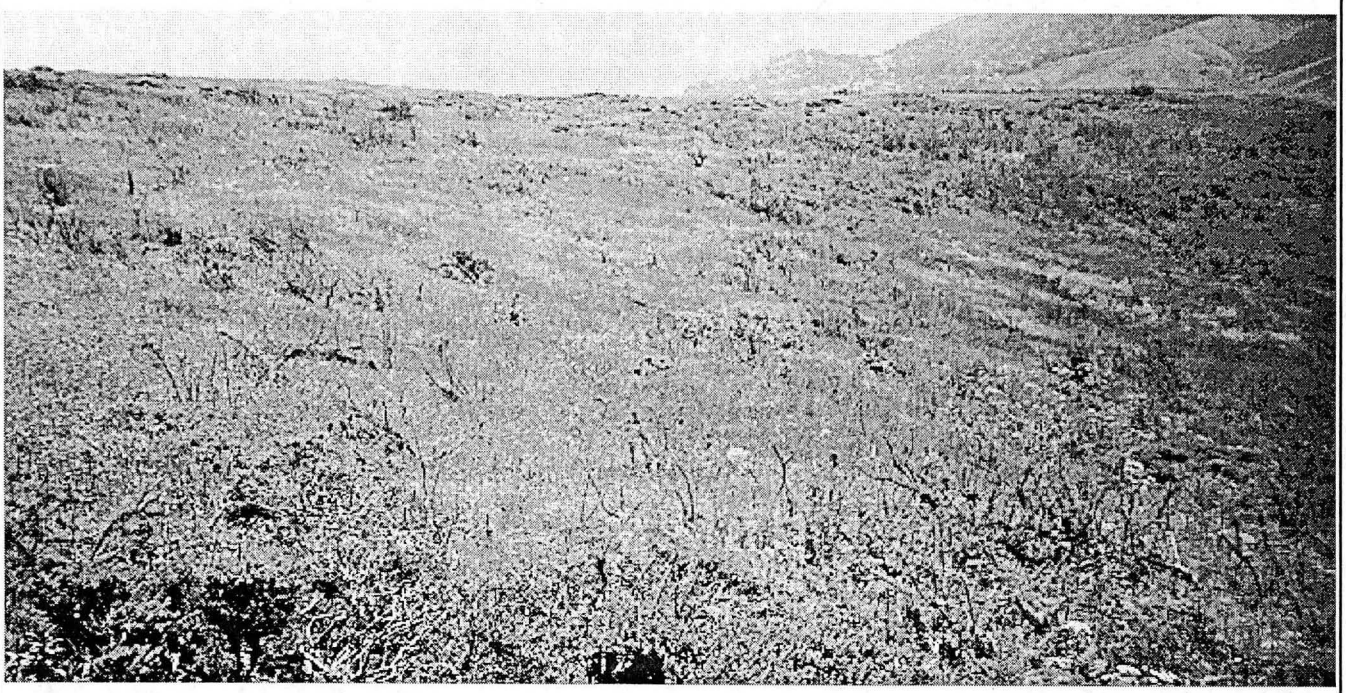
Same site in May 1995, after 2.5 years of annual herbicide treatment. No physical removal of gorse was done, instead gorse plants were left to decay in place.

FIGURE 10 -- SADDLE SITE 40 BEFORE (3/93) AND AFTER (5/95) SPRAY TREATMENT

BSBM-PHO.PM5, 01/24/96, P2



Stand of gorse in March 1993.



Same site in May 1995, after 2 years of annual herbicide treatment. No physical removal was done, and gorse plants were left to decay in place.

FIGURE 11 -- EUCALYPTUS CUT AREAS -- 1995

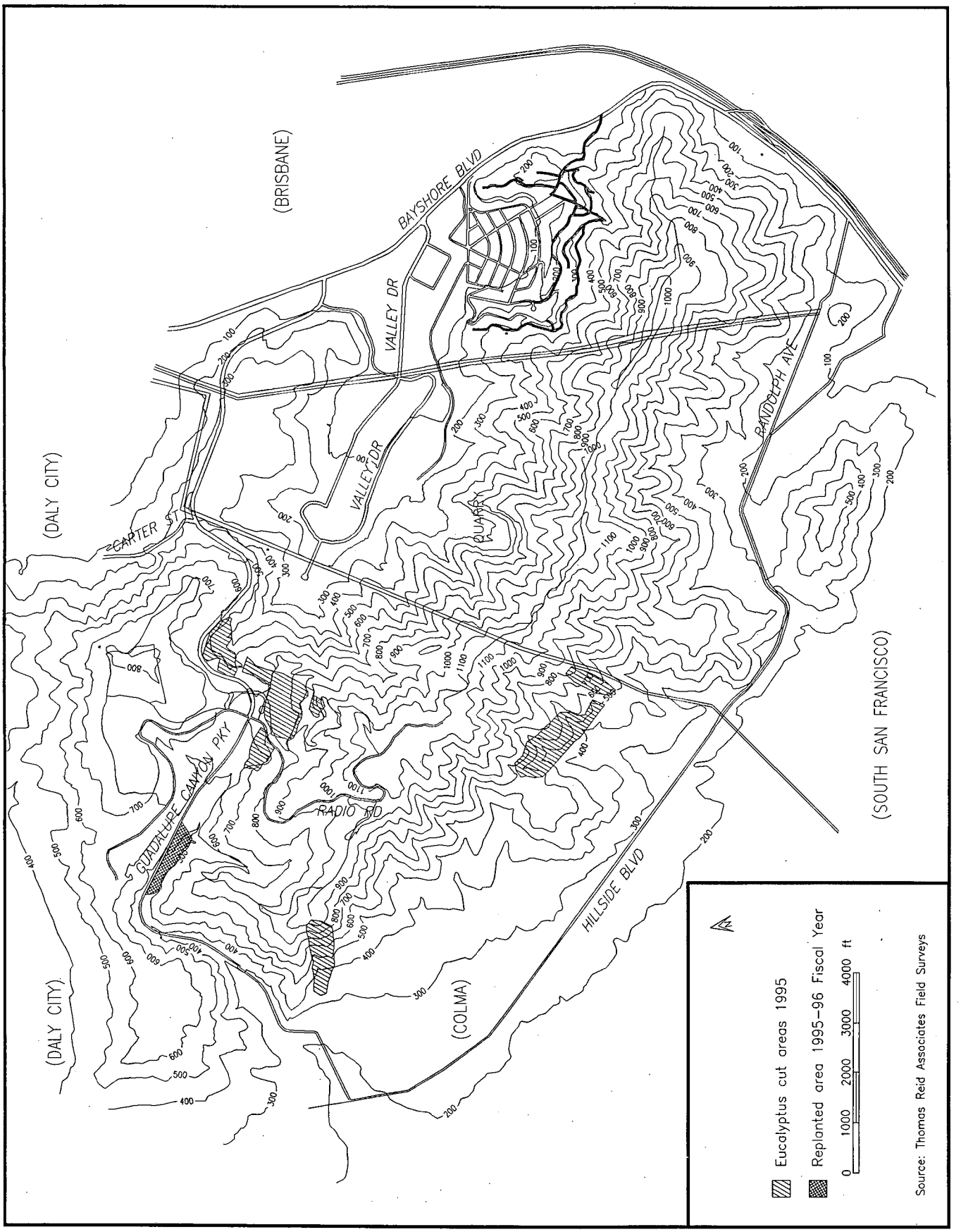


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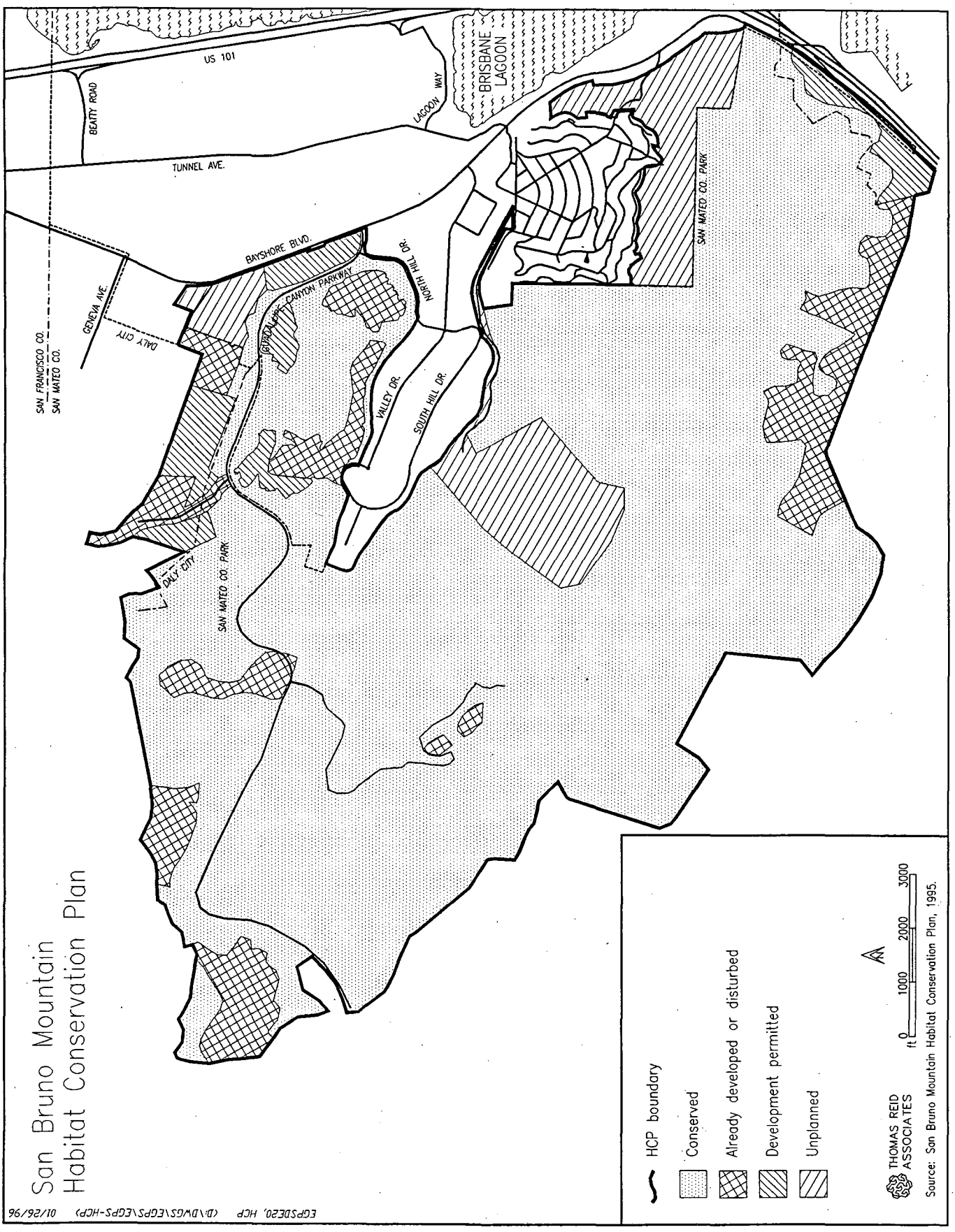
FIGURE 12 -- 1995 PARCEL STATUS



APPENDIX A
MISSION BLUE BUTTERFLY
FIELD DATA SUMMARY --1995
ALL AREAS

DATE	LOCATION	ELAPSED TIME	NUMBER OBSERVED	WEATHER CONDITIONS
4/11	South Slope	4.0	21	Temp: sunny to overcast, 60's, Wind: light
4/11	Saddle Reservoir Hill	1.0	3	Temp: sunny to overcast 60's, Wind: light
4/11	Radio Ridge	2.0	2	Temp: sunny, 60 Wind: 10-15 mph
4/18	South Slope Juncus Ravine	3.0	11	Temp: 60's Partly cloudy to clear
4/18	Saddle Colma Canyon	0.75	4	Temp: cool, clear Wind: light
4/21	South Slope above Bayshore	3.5	15	Temp: warm Wind: on and off
4/23	Saddle	3.0	13	Temp: clear, 65-75 Wind: 0-5 mph
4/23	Radio Ridge	2.0	6	Temp: clear, 75 Wind: 0-5 mph
5/2	South Slope	1.0	5	Temp: sunny, mid 60's Wind: breezy
5/2	Saddle	1.0	3	Temp: sunny, mid 60's Wind: breezy
5/4	Northeast Ridge Water Tank	1.0	6	Temp: overcast, mid 60's Wind: windy
5/5	Saddle	0.25	3	Temp: overcast, mid 60's Wind: windy
5/10	Saddle Reservoir Hill	0.25	1	Temp: overcast, 65 Wind:
5/10	South Slope Juncus Ravine	3.0	13	Temp: 60, clear to cloudy Wind: calm to windy
5/10	Northeast Ridge	1.5	8	Temp: warm to cool Wind: breezy
5/12	Northeast Ridge	1.0	8	Temp: warm to cool, 60's drizzle,
5/16	Saddle	0.75	4	Temp: clear, high 50's Wind: light winds
5/18	South Slope Terrabay	1.25	1	Temp: 65-67, sunny Wind: 0-3 mph

DATE	LOCATION	ELAPSED TIME	NUMBER OBSERVED	WEATHER CONDITIONS
5/18	South Slope Juncus Ravine	2.0	2	Temp: sunny & warm Wind: light to moderate
5/19	South Slope above Bayshore	2.0	22	Temp: sunny, 70-80 Wind: calm
5/22	Northeast Ridge	1.5	8	Temp: ?? Wind: ??
5/23	Owl and Buckeye	2.0	3	Temp: sunny, edge of fog Wind: windy
5/24	Northeast Ridge	1.0	4	Temp: mostly sunny Wind: windy, fog edge
5/25	Guadalupe Hills Linda Vista	4.0	10	Temp: sunny, warm to cool Wind: windy, fog edge
5/28	Northeast Ridge	4.0	5	Temp: sunny, warm to hot
5/29	Northeast Ridge	1.0	3	Temp: sunny, warm to hot Wind:
5/31	Owl and Buckeye	4.0	15	Temp: sunny, warm to hot Wind:
6/27	Northeast Ridge	1.0	2	Temp: sunny to cloudy, edge of fog
7/11	Owl and Buckeye	0.75	3	Temp: sunny, warm to hot Wind:
7/14	Guadalupe Hills Linda Vista	2.0	2	Temp: sunny, hot to warm Wind: calm
TOTAL	ALL AREAS	55.50	206	3.7 = Sightings Per Hour

CALLIPPE SILVERSPOT BUTTERFLY
FIELD DATA SUMMARY -- 1995
ALL AREAS

DATE	LOCATION	ELAPSED TIME	NUMBER OBSERVED	WEATHER CONDITIONS
5/19	Southeast Ridge above Bayshore	2.00	3	Temp: hot, 80ish Wind: mild breezes
5/24	Northeast Ridge	0.25	1	Temp: sunny, fog edge Wind: windy
5/25	Northeast Ridge	4.00	4	Temp: sunny, fog edge Wind: windy, warm to cool
5/28	Northeast Ridge	4.00	21	Temp: warm to hot
5/29	Northeast Ridge	0.50	2	Temp: sunny, warm to hot Wind: windy
5/31	Owl and Buckeye	4.00	7	Sunny, warm to hot
6/6	Southeast Ridge	4.00	19	Temp: beautiful, clear Wind: 0-wind picking up
6/13	Southeast Ridge	4.00	23	Temp: sunny, cool to warm Wind: light to strong
6/14	Northeast Ridge	1.50	14	Temp: sunny, 60-70, fog burned off, winds
6/20	Saddle	2.00	0	Temp: beautiful, clear, light wind, 60-65
6/20	Juncus Ravine	1.50	0	Temp: sunny, 68, beautiful
6/21	Southeast Ridge above Bayshore	4.00	64	Temp: sunny, hot Wind: windy of and off
6/23	Southeast Ridge	3.00	53	Temp: sunny, hot Wind: very little
6/25	Northeast Ridge	1.50	20	Temp: ?? Wind: ??
6/27	Northeast Ridge	1.00	7	Temp: sunny, warm to cool, edge of fog
6/28	Southeast Ridge above Bayshore	2.00	27	Temp: sunny, hot Wind: late afternoon
6/30	Southeast Ridge	3.25	79	Temp: sunny to overcast Wind: light to strong
7/4	Saddle	2.00	5	Temp: fog, cool Wind: light
7/11	Northeast Ridge	1.00	4	Temp: Warm to hot Wind:

DATE	LOCATION	ELAPSED TIME	NUMBER OBSERVED	WEATHER CONDITIONS
7/13	Southeast Ridge above Brisbane	4.25	61	Temp: sunny, hot Wind:
7/14	Guadalupe Hills Linda Vista	2.75	5	Temp: sunny, hot, 80's Wind: in afternoon
7/18	Owl and Buckeye	0.75	7	Temp: cool to warm Wind: foggy and windy on and off
7/26	Southeast Ridge	2.50	13	Temp: mostly hot Wind: calm to breezy
7/28	Southeast Ridge	3.00	15	Temp: sunny, warm, 70 calm to slight winds
TOTAL	ALL AREAS	58.75	454	= 7.7 Sightings Per Hour

1995 SAN BRUNO ELFIN SEASON SUMMARY

ADULTS

3/16	Summit, 1.5 hours, mostly clear, slight breezes, 65, 7 observed
3/16	Above Cable Ravine, 0.75 hours, clear, breezy, 65, 3 observed
3/17	Dairy Ravine, Summit, April Brook loop, 1 seen at Kamchatka Point, 5.5 hours, overcast, slight winds
3/24	Owl/Buckeye, 3 hours, 65ish, windy, none
3/25	Dairy Ravine Summit, April Brook loop, 4.75 hours, clear, windy on and off, none
3/27	Quarry and Southeast Ridge, 5.0 hours, upper 60s, none
3/28	End of Radio Road, 1.25 hours, 70ish, winds, none
3/28	Dairy Ravine, Summit, April Brook loop, 6.0 hours, clear, 60-70, some winds, 1 observed
3/29	End of Radio Road, 1.0 hour, 70ish but windy, none
3/30	Southeast Ridge/Summit, 6.0 hours, 70ish but windy, 1 observed at Summit
3/30	Dairy Ravine, Summit, April Brook loop, 6.0 hours, clear, 60-70, light winds, none
4/4	Dairy Ravine, Summit, April Brook loop, 6.0 hours, overcast, low 60's, light to strong winds, none
TOTAL	13 observed in 46.75 hours = 0.3 sightings per hour

LARVAE

5/9	Summit, none
5/16	Radio Road, Dune Tansy Pull Out, 11 observed
5/16	Wax Myrtle, none
5/16	Summit, none
5/18	Summit, 1 observed
5/18	Dairy Ravine Trail (by Euc. curve), 2 observed
5/23	Next to Quarry, 3 observed
5/25	Owl/Buckeye, none
TOTAL	17 larvae at 4 colonies

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 1995:

Colony	Sightings per Hour	Area (hectares)	A x S/H	% of Population
Guadalupe Hills	3.11	207	643.8	21%
Southeast Ridge	4.18	500	2090.0	69%
Radio Ridge	2.00	46	92.0	3%
Saddle	4.43	48	212.6	7%

For the callippe the following formula was used:

Colony	Sightings per Hour	Area (hectares)	A x S/H	% of Population
Guadalupe Hills	9.70	207	2007.9	50%
Southeast Ridge	4.05	500	2025.0	50%

APPENDIX B
TALLY OF 1995 EXOTIC PEST PLANT WORK

HANDWORK

Area	Hours	Plant Species Removed	# of Plants
Saddle	14	Cirsium vulgare (Bull's thistle)	473
		Picris echioides	2758
		Genista monspessulana (French broom)	351
		Foeniculum vulgare (Fennel)	99
		Eucalyptus globulus	45
		Raphanus sativus (Wild radish)	188
		Erechtitus arguta, E. minima	440
		Conium maculatum	206
		Cupressus macrocarpa	213
Guadalupe Canyon Parkway	16	Lactuca virosa, L. serriola (Wild Lettuce)	22
		Ulex europaeus (Gorse)	590
		Picris echioides	257
		Genista monspessulana	4165
		Foeniculum vulgare	614
		Erechtitus arguta, E. minima	353
Bitter Cherry Ridge	9.5	Lactuca virosa, L. serriola	127
		Ulex europaeus	24
		Foeniculum vulgare	26
		Erechtitus arguta, E. minima	26
		Rubus discolor (Himalaya blackberry)	28
		Cirsium vulgare	86
		Pinus radiata	4
		Cotoneaster sp.	363
		Hypochoeris sp.	52
		Cortaderia jubata (Pampas grass)	15

Handwork cont'd.

Radio Road	44	Lactuca virosa, L. serriola	612
		Ulex europaeus	336
		Foeniculum vulgare	181
		Erechtitus arguta, E. minima	107
		Rubus discolor	35
		Cirsium vulgare	20
		Cotoneaster sp.	6
		Hypochoeris sp.	25
		Cortaderia jubata	2
		Carduus sp.	842
		Silybum marianum	131
		Ilex aquifolium	8
		Plantago coronopus	942
		Carpobrotus edulis	4
		Crassula multicava	96
		Hedera helix	10
		Lathyrus latifolius	15
		Arctotheca calendula	35
		Lobularia maritima	1625
		Senecio milkeniodes (German Ivy)	150
		Conium maculatum	495
		Genista monspessulana	98
		Eucalyptus globulus	430
		Cupressus macrocarpa	55
Ridge Trail	24	Lactuca virosa, L. serriola	1730
		Foeniculum vulgare	614
		Erechtitus arguta, E. minima	1687
		Rubus discolor	12
		Cirsium vulgare	186
		Pinus radiata	1
		Cortaderia jubata	5
		Cytisus striatus	33
		Picris echioides	8
		Genista monspessulana	51
Wax Myrtle Ravine	16	Lactuca virosa, L. serriola	18
		Ulex europaeus	197
		Foeniculum vulgare	133
		Cirsium vulgare	10
		Cytisus striatus	136
		Raphanus sativus	180
		Conium maculatum	2
		Eucalyptus globulus	175
		Genista monspessulana	4143

Handwork - cont'd.

Point Pacific	22	Ulex europaeus	8
		Foeniculum vulgare	154
		Cirsium vulgare	20
		Raphanus sativus	316
		Eucalyptus globulus	1300
		Genista monspessulana	840
		Cortaderia jubata	52
		Acacia sp.	844
		Rubus discolor	56
		Lobularia maritima	200
		Cotoneaster sp.	72
Callipe Hill	87.5	Lactuca virosa, L. serriola	1075
		Foeniculum vulgare	13352
		Cirsium vulgare	33
		Cytisus striatus	117
		Eucalyptus globulus	64
		Genista monspessulana	18272
		Centranthus ruber	94
		Picris echioides	151
		Plantago coronopus	70
		Cotoneaster sp.	2
		Erechtites arguta, E. minima	217
Arnold Slope	40	Foeniculum vulgare	14060
		Carduus sp.	103
		Cytisus striatus	2
		Genista monspessulana	4
		Plantago lanceolata	45
Bayshore	8	Foeniculum vulgare	1750
		Genista monspessulana	3
		Picris echioides	263
		Lactuca virosa, L. serriola	68
Brisbane Acres	48	Dactylis glomerata	20
		Scabiosa atropurpurea	36
		Lactuca virosa, L. serriola	2871
		Foeniculum vulgare	1836
		Cirsium vulgare	110
		Genista monspessulana	2588
		Picris echioides	283
		Eucalyptus globulus	226
		Cotoneaster sp.	23
		Erechtites arguta, E. minima	60
Owl/Buckeye Sub-ridge	8	Lactuca virosa, L. serriola	288
		Foeniculum vulgare	1112
		Genista monspessulana	530
Owl Canyon	8	Lactuca virosa, L. serriola	15
		Foeniculum vulgare	337
		Genista monspessulana	620
		Cotoneaster sp.	52
		Pyrocantha sp.	6

Handwork - cont'd.

Buckeye Canyon	68	Lactuca virosa, L. serriola Foeniculum vulgare Cirsium vulgare Genista monspessulana Picris echioides Cotoneaster sp. Erechtites arguta, E. minima Rubus discolor	2199 3174 315 8547 33 1002 73 8
Hill West of Quarry	8	Lactuca virosa, L. serriola Foeniculum vulgare Cirsium vulgare Picris echioides Erechtites arguta, E. minima Cytisus striatus	219 994 2 2 5 936
Southslope / Hillside	16	Lactuca virosa, L. serriola Foeniculum vulgare Cirsium vulgare Picris echioides Cortaderia jubata	180 3944 105 727 4
Juncus Ravine	48	Lactuca virosa, L. serriola Foeniculum vulgare Cirsium vulgare Picris echioides Erechtites arguta, E. minima	1035 7329 775 638 12
Tank Ravine	27	Lactuca virosa, L. serriola Foeniculum vulgare Picris echioides Cortaderia jubata	27 4374 202 2
Totals	512.0		128,589

HERBICIDE WORK- SADDLE

Unit	Site Acreage	Hours	Species Treated	Acres Sprayed
I (sites 40,41,42,44)	28.7	6.5	Gorse	1.5
II (sites 33,34,35, 37,39)	13	46	Gorse	7
III (sites 3,10,14,18, 23,24,29,30)	79.4	56	Gorse, Eucalyptus, French Broom	15.8
IV site 27	5	15.25	Eucalyptus	.1
Totals	126.10	123.75		24.40

The acreage sprayed at each site does not equal the site acreage because the gorse is patchy throughout most of the sites. All visible gorse plants at each site were sprayed semi-annually with Garlon 4A, with a resultant kill rate of approximately 90% (visual estimate).

HERBICIDE WORK- MAIN MOUNTAIN

Area	Hours	Plant Species	# of Plants	*Acres
Colma Canyon	5.5	Gorse Pampas grass Fennel		1.0
Radio Road/ Summit	7.75	Gorse		.7
Bayshore	6	French broom		.5
Bitter Cherry Ridge	27.5	Gorse Fennel Pampas grass French Broom Echium	 164	2.8 .6 .2 .2
Guadalupe Canyon Parkway	15.75	Eucalyptus Pampas grass French broom Echium	 209 10 63	.1
Jefferson High Area	10	Eucalyptus	83	
Colma Creek	16.5	Eucalyptus	290	
North East Ridge / Water Tank	2	Eucalyptus	57	
Callipe Hill	4.5	Gorse Striatus broom		.5 .5
Wax Myrtle Ravine	5.25	Gorse		1.0
Tank Ravine	13.5	Fennel Pampas grass French broom		3.0 .1 1.0
Totals	114.25		876	12.2

*Herbicide treatment of plants is either recorded in acres or number of individual plants, depending on density of infestation.

APPENDIX C
OPERATING PROGRAM BY ADMINISTRATIVE PARCEL -- 1995

Administrative Parcel	Species Monitoring	Exotics Control	Revege-tation	Planning Assistance *
GUADALUPE HILLS (1)				
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			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		
SOUTHEAST RIDGE (2)				
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			
RADIO RIDGE (3)				
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
SADDLE (4)				
01 Pointe Pacific	X	X		
02 Village-in-the-Park		X		
03 South Hills Estates			X	X
04 State Park	X	X	X	X
05 Guadalupe Canyon Pkwy.	X	X		X
06 Water Tanks				

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