

## **V. HABITAT MANAGEMENT METHODS**

### **A. Habitat Management and Restoration Techniques**

To preserve, enhance and restore grassland habitat a number of techniques can be utilized either alone or in combination. Techniques are used that can reduce and control invasive plant infestations and brush, reduce thatch and dense annual grasses, and restore native plant communities. Techniques described include hand removal, herbicide application, pile burning, prescribed burning (when permissible), grazing, mechanical clearing, mowing, mycorrhizal inoculation, nutrient fixation, seeding, and planting. The sequence and timing of implementation of these management tools is critical to the success of grassland habitat protection and restoration. To date (2007), the habitat management methods utilized on San Bruno Mountain have been primarily herbicide treatment, mowing, hand removal and replanting (Table 4).

Adaptive Management has been a key strategy in the implementation of the HCP since its inception in 1982. Based on changing conditions, emphasis of the management has shifted from the control of a few highly invasive woody plant species (i.e. gorse, eucalyptus, pampas grass and French broom) in 1982, to inclusion of over 40 invasive woody, herbaceous and grass weeds as of 2007. This adaptive management strategy is integral toward insuring protection of the endangered species habitat on San Bruno Mountain.

For the control of invasive species, a strategy of control and containment is recommended based on the effectiveness of this strategy in the past. Complete eradication of many invasive species is not a practical reality, as invasive species have become well entrenched within the grassland plant community over the past several decades or more. Focusing a substantial amount of resources on the complete eradication of a few invasive species is likely to allow other invasive species to spread.

The continued dominance of native grasslands in Brisbane Acres, April Brook, and the ridgelines and upper slopes along the summit from Radio Road to Owl and Buckeye Canyons, indicates that native perennial grasses on north-facing, moderate to steep slopes are more resistant to weed infestations than dryer, south and east-facing slopes on the Mountain (Guadalupe Hills and the South Slope grasslands). For this reason, management of grasslands needs to be adaptive and utilize techniques that are specific to the particular management needs of the area. Management methods need to be consistent in some respects, such as when controlling weed invasions (either through grazing, mowing, or other methods), by treating weeds prior to seed set. In addition, restoration should utilize over-seeding of native species where non-native species have a competitive advantage (Noxious Weed IVM Guide, undated).

#### ***Habitat Management Impact Minimization Measures***

Habitat management work is conducted to provide long-term beneficial impacts to the special status species as well as other wildlife on the Mountain. However there is potential for short-term impacts to the endangered species and birds and other wildlife that use habitat areas where treatments are proposed. Significant impacts to special status species and populations of common wildlife species are regulated through the California Environmental Quality Act (CEQA). Nesting birds are protected under the Migratory Bird Treaty Act and California Department of Fish and Game Code, both of which prohibit disruption of nests during the nesting season.

A wide variety of bird species nest within the brush and woodland communities on San Bruno Mountain. Common nesting birds include spotted towhee (*Pipilo maculatus*), bushtit (*Psaltriparus minimus*), white-crowned sparrow (*Zonotrichia leucophrys*), chestnut backed chickadee (*Poecile rufescens*) and many others. Special status bird species such as salt marsh common yellowthroat (*Geothlypis trichas sinuosa*), yellow warbler (*Dendroica petechia*), loggerhead shrike (*Lanius ludovicianus*), white-tailed kite (*Elanus leucurus*), northern harrier (*Circus cyaneus*), cooper's hawk (*Accipiter cooperi*) and sharp shinned hawk (*Accipiter striatus*) are also known to occur on San Bruno Mountain.

The following impact minimization measures are required:

1) For all projects:

a) if any nests are detected within a project area, a no activity buffer zone will be delineated around the nest (CDFG typically recommends a 50-foot radius buffer zone around active songbird nests and a 250-foot buffer zone around active raptor nests). No habitat management activities can be performed within the buffer zones during the bird nesting season (February 1 to September 1), or until the nest is determined to be no longer active.

2) For herbicide and hand control projects that are conducted year-round:

a) The habitat management supervisor should conduct pre-project surveys for nesting birds and other wildlife prior to commencing herbicide and/or hand control work. The habitat management supervisor must be competent in identifying signs of wildlife usage (nests, dens, etc.).

b) For projects near drainages, work should be scheduled for the dry season (June to August) to the greatest extent possible, to minimize any potential impact to aquatic areas. A 20-foot buffer zone on both sides of drainages is currently required for non-aquatic approved herbicides (Forbert, pers. comm).

c) Invasive species control work targeting species utilized as nectar plants by the mission blue, callippe silverspot butterflies, and/or San Bruno elfin butterflies should be treated prior to the flowering time of the invasive species to prevent impacts to nectaring butterflies.

3) For brush and/or tree clearing projects (using mechanical methods, goat grazing, prescribed burning or other methods):

a) Projects should be limited to the fall and/or winter months (September 1 to February 1), unless pre-project surveys for nesting birds are conducted and impacts to nesting birds are determined to be insignificant.

b) Tree and woodland removal projects should have pre-project assessments for roosting bat species.

c) Project activities should not be conducted within a 100-foot buffer zone on both sides of drainages unless these activities are deemed necessary to remove an invasive species, protect a listed species, and/or have soil and slope aspects that provide suitable conditions for grassland restoration within the buffer zone. Appropriate erosion control measures will be implemented for these exceptions. This will provide additional protection to species that nest near drainages, and minimize the potential for erosion and sedimentation pollution.

**Table 4. Major Invasive Pest Plants on San Bruno Mountain and Current Hand/Herbicide/ or Mowing Treatment Methods for Each (2007).**

Invasive Pest Plant Species	Area <sup>6</sup> (acres)	Treatment
Blue Gum <i>Eucalyptus spp.</i>	148	After trees are cut, stumps are cut as low to the ground as practical and sprayed with 25% Garlon 4 herbicide
Fennel <i>Foeniculum vulgare</i>	90	Fennel is controlled by hand methods or with a 2% Garlon 4 herbicide. The plants are treated by basal foliar spray during the months of April and May prior to seed formation.
Gorse <i>Ulex europaeus</i>	34	Gorse is treated, by foliar spraying, year round with 2% Garlon 4 herbicide. Hand removal of seedlings is done when the population is greatly reduced.
French Broom <i>Genista monspessulana</i>	28	French broom is controlled with a 2% Roundup Pro (Glyphosate) herbicide throughout the year and with 2% Garlon 4 when fruiting perennial grasses are present. Hand removal of seedlings is done when the population is greatly reduced
Bermuda Buttercup <i>Oxalis pes-caprae</i>	25	Bermuda buttercup is controlled with a foliar application of 2% Galon 4/Roundup Pro mixture when a monoculture is present and 2% Garlon 4 when the infestation is intermixed with perennial grasses.
Striatus Broom <i>Cytisus striatus</i>	15	Striatus broom is controlled with a 2% Garlon 4 herbicide. The plants are treated, by foliar spraying, year round with the same results. Hand removal of seedlings is done when the population is greatly reduced.
Monterey Cypress <i>Cupressus macrocarpa</i>	13	Monterey cypress trees are cut at the base with a pruning or chain saw. Herbicide is not needed to kill the stump. Resprouts are easily removed by hand.

<sup>6</sup> Acreages of invasives were calculated using a combination of GPS data and visual estimates in the field. \* Estimates for herbaceous invasive acreages (mustards/radish, Italian thistle, bristly ox-tongue, poison hemlock.) were likely underestimated due to time and seasonal constraints on mapping.

Invasive Pest Plant Species	Area <sup>6</sup> (acres)	Treatment
Silver Mountain gum <i>Eucalyptus pulverulenta</i>	11	After trees are cut, stumps are cut as low to the ground as practical and sprayed with 25% Garlon 4 herbicide.
Bristly ox-tongue*	9	Bristly ox-tongue is typically mowed 2-3 times prior to seed set, when present in predominately native grassland areas. For areas with dense invasive species, treatment may also include 2% Garlon 4 herbicide sprayed on the foliage prior to bolting.
English Ivy and German Ivy <i>Hedera helix</i> & <i>Delaria oderata</i>	7	English ivy and German ivy are controlled with 2% Garlon 4 herbicide. The plants are treated, by foliar spraying, year round with the same results. A second application is done 3 to 6 months after the initial treatment. The entire site must be sprayed with herbicide to ensure no runners are missed.
Monterey Pine <i>Pinus radiata</i>	5	Monterey pine trees are cut at the base with a pruning or chain saw. Herbicide is not needed to kill the stump. Resprouts are easily removed by hand.
Pampas Grass <i>Cortaderia jubata</i>	4	Pampas grass is treated with 2% Round-up Pro. Treated primarily in summer months before seed formation, but can be treated year round.
Italian Thistle*	3	Italian thistle is treated successfully by repeated mowing, or with herbicide prior to bolting, with 2% Garlon 4 herbicide that is sprayed on the foliage.
Mustard/Radish* Brassica/Hirschfeldia/ Raphanus	3	Mustard and radish are treated, prior to flowering, with 2% Garlon 4 herbicide that is sprayed on the foliage.
Acacia sp.	3	Acacia trees are cut as low to the ground as practical and sprayed with 25% Garlon 4 herbicide
Poison Hemlock* <i>Conium maculatum</i>	3	Poison hemlock is controlled with 2% Garlon 4 herbicide. The plants are treated, by foliar spraying, during the months of April and May.
Iceplant <i>Carpobrotus edulis</i>	<1	Iceplant is treated with 1.5% or 2% Round-up (or Rodeo) herbicide. Plants are treated year round.

<b>Invasive Pest Plant Species</b>	<b>Area<sup>6</sup> (acres)</b>	<b>Treatment</b>
Cotoneaster <i>Cotoneaster spp.</i>	<1	Cotoneaster is cut at the base with a pruning or chain saw. The stumps are treated with 50% Garlon 4. The herbicide is sprayed on cut stumps within 30 minutes of cutting.
Echium <i>Echium pinanana</i>	<1	Echium are cut and the stumps are allowed to decay. Treatment is done in the Summer, prior to flowering, when the plants are more visible.
Hairy cat's ear <i>(Hypochaeris radicata)</i>	UNK	Hand pulling and/or use of glyphosate.
Veldt Grass <i>Ehrharta erecta</i>	<1	Handwork is conducted with Polaski's and herbicide treatment with Aquamaster.
Lolium multiflorum	UNK	Repeated mowing, and/or use of glyphosate, imazapyr, or Envoy (clethodim).
Hordium murinum	UNK	Repeated mowing, and/or use of glyphosate, imazapyr, or Envoy (clethodim).
Holcus lanatus	UNK	Repeated mowing, and/or use of glyphosate, imazapyr, or Envoy (clethodim).
Bromus diandrus	UNK	Repeated mowing, and/or use of glyphosate, imazapyr, or Envoy (clethodim).
Briza maxima	UNK	Repeated mowing, and/or use of glyphosate, imazapyr, or Envoy (clethodim).
Harding grass (Phalaris)	UNK	Repeated mowing, and/or use of glyphosate, imazapyr, or Envoy (clethodim).
Orchard grass	UNK	Repeated mowing, and/or use of glyphosate, imazapyr, or Envoy (clethodim).
Tall fescue	UNK	Repeated mowing, and/or use of glyphosate, imazapyr, or Envoy (clethodim).
Bromus hordeaceus	UNK	Repeated mowing, and/or use of glyphosate, imazapyr, or Envoy (clethodim).

### **Handwork**

Hand removal of invasive plants is an effective method for eliminating clusters of plants, especially seedlings and plants whose root structure is not prohibitively deep or large.

Hand removal is done with a maddox, weed-wrench, or by hand pulling. Removing the whole plant including roots is essential for control of most weedy invasive plants. Handwork is most effective in the winter and spring when soils are moist. Hand removal initial costs range from \$25 to \$400/acre depending on the density of the infestation. Annual maintenance work follows the same schedule as herbicide control work.

### **Herbicide**

All herbicide control conducted on San Bruno Mountain is conducted by Certified Pesticide Applicators and in accordance with EPA approved label directions. Only spot treatment applications are done, and no broadcast application is conducted.

Herbicide control is typically used on mature, dense stands of invasives that are more cost effective to spray than to pull by hand. Most invasive pest plant infestations treated with herbicide are treated 2-3 times per year by foliar spraying. Spraying can be done year-round with the same results on certain species, while treatment must be done within a certain season (e.g. early spring for fennel) on others. The initial treatment typically has a 95% kill rate followed up with routine maintenance every six to twelve months for up to three years until the infestation is controlled. The majority of the originally sprayed plants will decay to skeletons in one to three years. Hand removal of seedlings can then be used when the population is greatly reduced. Burning should be considered to remove the biomass of dead plants and stimulate seedling germination. Once an infestation is controlled, there is still the potential for re-establishment due to either long-term seed viability in the soil, and/or the potential for seed dispersal from surrounding areas, and therefore ongoing monitoring is needed on at least an annual basis.

Currently (2007), it costs approximately \$1000/ acre to apply initial spray treatments on medium to high-density infestations for most invasive species, and approximately \$200 per acre for low-density infestations. Control of dense infestations that require intensive brush control or logging prior to herbicide control is not included in these estimates. After tree removal operations, spraying eucalyptus stumps costs approximately \$1250-\$1500 per acre, depending upon stump density. Typically, the cost for follow-up work is reduced by approximately 50% after 1 to 2 years, and by 75% after 3 to 4 years (Mike Forbert, pers. comm.).

More herbicide work is conducted on San Bruno Mountain than handwork, because herbicide work can be conducted faster than handwork and is more cost effective. The removal of weeds through handwork however has the benefit of removing weed biomass from sensitive areas. Herbicide application over successive years can create a dense layer of thatch, and this additional biomass on the soil tends to favor colonization by nonnative annual grasses, herbaceous weeds, and coastal scrub succession. This thatch layer, especially if composed of woody species, is slow to breakdown over time and is difficult to remove without burning or grazing.

## **Grazing**

Grazing is the utilization of grassland (forage) by domestic livestock such as cattle, sheep, goats or horses. Where appropriate, re-introduction of grazing can be an effective means of maintaining the grassland habitat by reducing brush and tall annual grasses which out-compete native grassland plants including the butterfly host plants.

Since the cessation of livestock grazing in the early 1960's, and the more efficient prevention of fire since that time, the grasslands on San Bruno Mountain have reduced in a real extent as a result of the expansion of coastal scrub and the influx of weeds. During the 25-year span of the HCP, grazing has yet to be used on a large scale on San Bruno Mountain for habitat enhancement purposes. Though grazing was recommended as an important tool to utilize on the Mountain in the original San Bruno Mountain HCP, grazing has been regarded by many as an environmentally damaging activity. This is due to the history of overgrazing that has occurred on lands used for cattle grazing. The damage has occurred due to a single-minded focus on raising as many cattle as possible for dairy and meat products, without consideration of the impacts to vegetation and soils.

Depending upon a variety of factors, grazing can have a positive (encourage more natives) or negative (stimulate more invasives and erosion) impact upon a landscape. The number of animals, type of animals, season, duration and frequency of grazing events, and vegetation type are all variables that will influence the results of grazing. Grazing will effect soil compaction, soil nutrients, light, and both native and nonnative vegetation. Livestock type may be the most critical factor to consider due to the variation in diet preferences for different species and even breeds. For instance goats tend to focus on broadleaf species, cattle on grasses, and sheep on a combination of both grasses and forbs. In some cases, a combination of different livestock may be used together or in separate phases. The right combination will need to be determined through experimentation, and target goals and limitations need to be well understood.

There is substantial evidence that documents the impacts on the California landscape that have resulted from the removal of grazing and the suppression of fire. Grazing was an integral part in shaping and maintaining grassland communities over thousands of years (Edwards, 1992).

Research at Kirby Canyon and elsewhere has indicated that cattle grazing in the early spring is beneficial to native grasses if it is done prior to seed set of weedy annual grasses. Native bunchgrasses are less palatable at this time and their deep root structure is an adaptation which allows rebound after being grazed. Over time, a consistent practice of grazing in the early spring can result in a reduction of weedy annual grasses and perpetuation of native grasslands and native annual wildflowers (Lewis, Peterson, and Weiss, pers. comm.). Grazing can also be an effective tool for managing fire buffers.

A stewardship grazing plan was written for the Mountain in April 2002 (D. Amme, 2002). The document describes a rotational grazing program that would minimize the negative impact and maximize the beneficial impact of cattle and/or sheep on soils and plants.

A stewardship grazing program for San Bruno Mountain will need to be peer reviewed by experts in Stewardship Grazing, and should have the following components:

- A phased approach, with areas left ungrazed within each management unit;
- Conducted under a range of habitat conditions;

- Multiple year duration;
- Protection of sensitive areas from grazing animals (wetlands, oak woodlands, etc).

When properly managed, grazing may be a cost effective method of controlling invasive species and increasing grassland habitat. Grazing would have a high initial cost of \$750-900/ acre to develop infrastructure, but would decrease each subsequent year and level off at \$400/ acre or lower, depending on the economic value of the rangeland. Long-term grazing leases could also potentially bring in revenue to the HCP.

Certain grasslands on San Bruno Mountain, such as moist north-facing grasslands containing dense stands of *Festuca sp.* And/or *Calamagrostis nutkaensis* have a high native species component, and may be more resilient to invasive species and coastal scrub succession than grasslands on dryer exposures. These grasslands are located on upper elevation slopes, and have high moisture levels from coastal fog influence. These areas should not be grazed without careful analysis that determines that grazing is appropriate and beneficial to the native species.

Grazing can also have short-term negative impacts on the sensitive species (through direct take of adults, caterpillars, pupae, and/or eggs) from trampling; however long-term impacts are likely to be beneficial due to the removal of thatch and stimulation of host and nectar plant recruitment. Application of grazing would need to be conducted on a rotational system to provide a sufficient quantity of ungrazed refuge habitat for the butterflies at all times.

### **Goat Grazing**

A 2-year pilot grazing and mowing project on San Bruno Mountain was conducted from March 2003 to July 2004. Grazing was tested for its efficacy in controlling weeds (specifically: wild oat, ripgut brome, Italian thistle, fennel, and Oxalis), and reducing coastal scrub. Grazing using goats was conducted in 4-5 separate corrals in March 2003, June 2003 and March 2004. Plant species, percent cover data, and residual dry matter (RDM) was collected prior to the grazing treatments in March 2003, and again in March 2004. The project was cancelled after two years due to budgetary constraints.

The goal of the pilot grazing and mowing experiment was to test the efficacy of controlled livestock grazing as a tool to enhance and restore the health and diversity of native grassland plant communities. Specifically, the program targeted rank annual grasses and weeds that suppress the diverse native herbaceous and perennial grassland plant community and reverse the encroachment of coastal scrub into grassland areas. The pilot program included labor and material required to conduct mowing and managing a herd of goats (100 – 400 animals).

Results of the goat grazing experiment were not conclusive, and this may be due at least in part to the short duration of the project. The project was funded for only two years, and grazing projects typically require approximately four successive years of implementation before a significant reduction in targeted invasive species can be obtained (Peischel, pers. comm.). Over this period, goats were not found to significantly reduce annual grass or herbaceous weed cover. Goat grazing however was found to significantly reduce residual dry matter (RDM) within the grasslands, and in combination with native grass seeding, a significant increase in native grass cover was observed.

Maintaining an appropriate level of RDM allows for development of annual and perennial grasses and wildflowers, retains water in the soil, and discourages erosion. Recommended ranges for RDM in coastal prairie grasslands with minimal woody plant cover range from 1,200

to 2100 lbs/ acre (UC Davis, 2002). The East Bay Municipal Utility Department uses RDM guidelines of 840, 1120, and 1400 lbs per acre for flat, gradual and steep slopes respectively (EBMUD, 1996). In contrast, RDM values measured within the grasslands in the Hillside/ Juncus area on San Bruno Mountain prior to grazing treatments in 2002, showed RDM levels of 5000 to 9000 lbs/ acre (Figure 16). This level of RDM is indicative of unhealthy grassland conditions. While goat grazing was not found to be effective at reducing European annual grass coverage, it was found to reduce RDM levels by an average of 32% within grazing treatment plots, while control plots increased in RDM by an average of 8% over the same period (San Bruno Mountain data).

### **Cattle Grazing**

Cattle grazing has proven to be a cost effective tool for managing serpentine grasslands and protecting habitat for the federally Threatened bay checkerspot butterfly at Kirby Canyon Conservation Land Trust in Santa Clara County (Figure 17). Cattle grazing has also been tested within non-serpentine coastal prairie habitats, and native annual forbs were found to increase within grazed plots (Hayes, et al 2003), however native perennial forbs were found to have higher coverage within non-grazed plots.

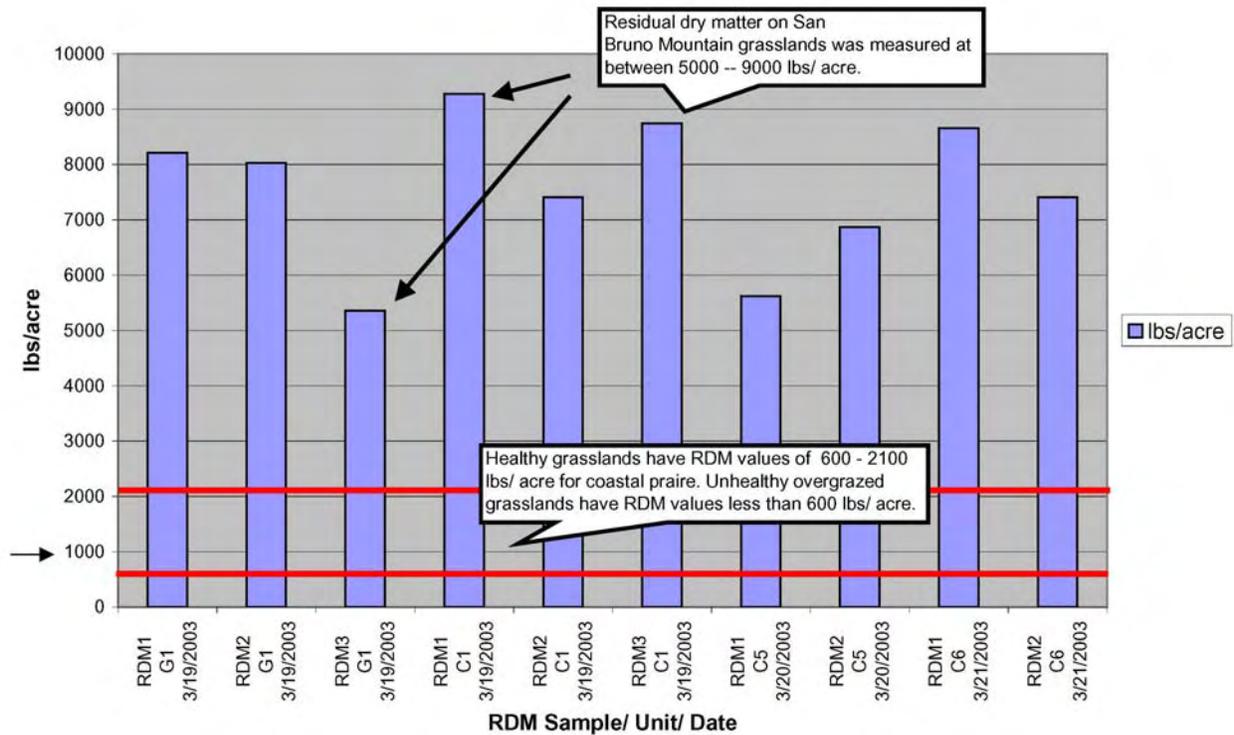
The cattle grazing program at Kirby Canyon utilizes low intensity grazing with 1 cow/calf per 10 acres and two grazing periods per year, one in winter/spring and one in summer/fall. Cattle are allowed to graze over large paddocks, approximately 1,000 acres or larger. Ranchers typically remove their cattle from the conservation area in April, coinciding with the time that the cattle stop gaining weight and when annual wildflowers come into bloom, including the host plants for the federally threatened bay checkerspot butterfly.

Because some of the host plants (e.g. lupines) on San Bruno Mountain are less palatable to grazing animals, they tend to increase within areas grazed by cattle or sheep. A grazing regime also crops and limits the seed production of annual grasses, thereby improving the competitive position of broadleaf species (wildflowers) so that they maintain a higher overall density within the grassland.

### **Native Grazing Animals**

Native grazing animals such as Tule elk were likely an important component in maintaining the grasslands of San Bruno Mountain in the past. This species, though nearly extirpated by the beginning of the 20<sup>th</sup> Century, has made a comeback and herds have been introduced into 21 different open space areas in California. These herds are overseen by the California Department of Fish and Game. Release sites for Tule elk need to be several thousand acres in size to maintain a genetically viable and healthy herd. San Bruno Mountain would not provide enough habitat to support a viable herd for Tule elk, and would create a 'captive herd' situation that would require expensive and ongoing management including contraception, culling, and bringing in individuals from other herds on a routine basis to maintain the genetic health of the herd (Palmisano, pers. comm.).

**Figure 16. Residual Dry Matter (RDM) Values Measured on San Bruno Mountain, 2003**



**Burning**

Wildfire is a natural process that has shaped the native flora of California. Historically, moderate-intensity wildfires would occur in grassland, scrub, and forest habitats in the summer and fall on a frequency generally once every few decades. In habitats that have evolved with wildfire, an absence of burning results in a shift in community composition. Vegetation becomes age-stratified as older, larger species inhibit new growth and recruitment. Diversity decreases in the absence of fire as species that either require fire for regeneration or require the space and nutrient flush that follows fire begin to disappear.

Due to the documented expansion of coastal scrub on the Mountain and the corresponding loss of butterfly habitat over the course of the HCP, burning may be an important tool for reversing this trend and for achieving long-term sustainability of the grasslands and butterfly habitat on the Mountain. However, because San Bruno Mountain is an open space area that is surrounded by dense urban and suburban development, the ability to allow wildfires to burn or to implement prescribed burning on a regular basis (if even at all), is not a reliable option for habitat managers. Burning on San Bruno Mountain is further restricted by air quality regulations that prohibit burning on days of poor air quality. Though prescribed burning, especially on a small scale, may be permitted from time to time, the vegetation management program cannot rely on the implementation of prescribed burning to meet the goals and objectives of the program.

Research by TRA and others has shown that invasive species such as gorse and French broom regenerate strongly after fire, and that post-burn control of seedlings is paramount to gaining control of the invasives. Any burning projects implemented on the Mountain will need to include a management plan for follow-up weed control. Also, wherever burning is conducted on slopes with erosion potential, proper methods for erosion control and soil stabilization will be employed.

Burning can have short-term negative impacts on the sensitive species (through direct take of adults, caterpillars, pupae, and/or eggs) but long-term impacts are likely to be beneficial due to the removal of thatch and reinvigoration of host and nectar plants. Application of burning would need to be conducted on a rotational system to provide a sufficient quantity of unburned refuge habitat for the butterflies at all times.

### **Figure 17. Effects of Cattle Grazing at Kirby Canyon Land Trust in Santa Clara County**

**Left side of fence line shows an ungrazed grassland area dominated by European annual grasses, while the right side of the fence line shows the grazed area that is dominated by native annual wildflowers.**



### **Prescribed Burning**

The introduction of a burning regime similar to what occurred historically on San Bruno Mountain could be instrumental in maintaining native grasslands. Prescribed burning on San Bruno Mountain could be used to achieve two main habitat management objectives. Firstly, fire could be used to clear out native and non-native scrub in areas that previously supported grasslands, such as the lower slopes south of the Brisbane Industrial Park. A second management objective for which prescribed burning may be beneficial is for the maintenance of grassland habitat, through the removal of dead vegetative biomass (thatch) which inhibits

regeneration of grassland plant species. Controlled burning could also have a beneficial impact upon certain rare plants on the Mountain, such as the San Bruno Mountain manzanita.

To achieve the habitat management goal of maintaining or promoting native habitat, the burning prescription should mimic the historical and natural fire regime as closely as possible. This includes burning in conditions under which a wildfire would be expected to occur; specifically, in the summer/fall dry season (June to October). Burning under moist and cool conditions may actually damage native species, and result in favoring invasive species over native vegetation. As the time of year that a burn occurs influences the vegetation's response to the burn, some management goals may not be achievable by burning in the winter or spring. When the objective of prescribed burning is simply to clear out vegetation such as coastal scrub or dense infestations of invasive species, burning under damp conditions would still be expected to meet program goals.

If some level of prescribed burning is to be employed for managing vegetation, the Habitat Manager will work with San Mateo County Parks, the California Department of Forestry, and Bay Area Air Quality Management in coordinating burns on San Bruno Mountain. Burning will be conducted under the authorization and direction of CDF, and implementation will require the assistance of CDF. Any burning conducted will be consistent with *The San Bruno Mountain Community Wildfire Protection & Fire Use Plan* (CDF and TRA 2005).

The *San Bruno Mountain Community Wildfire Protection & Fire Use Plan* provides a mechanism for reviewing sites for conducting fuel reduction and vegetation management utilizing fire as a management tool. The Plan does not include any specific sites for implementing prescribed burns. CDF develops prescribed burn plans through the Vegetation Management Plan (VMP) process based on site-specific information. Environmental impacts must be evaluated consistent with CEQA for each proposed project. Mitigations for the listed species in the HCP are one important component of a VMP on SBM, although many other potential impacts to the environment are also considered. Any VMP that is developed for SBM must comply with the HCP and requires consultation with the USFWS, California Department of Fish and Game, Regional Water Quality Control Board, Bay Area Air Quality Management District, archaeologists and Native American representatives, California Geological Survey as well as other experts and interested groups on SBM.

When the fire defense system is in place (i.e., buffer zones, fire breaks, fire roads, treatment of hazardous fuels) implementing prescribed fires on San Bruno Mountain may be considered. The cost of prescribed burning is difficult to estimate due to the high variability in planning costs.

### **Pile Burning**

Pile burning is incorporated into this management program as a valuable tool for reducing the accumulation of brush (wildfire fuels) and for decreasing native scrub and invasive species coverage. Vegetation is hand pulled and piled on site during the winter and spring months when the ground is soft and humidity and fuel moisture levels are high. Piles are then burned by the CDF, and the risk of fire escape is negligible.

Combined with mowing and/or grazing, pile burning is an excellent tool for opening up areas for conversion to grassland and for preparing areas for replanting. Post-disturbance follow-up weed control is critically important to control the flush of weeds that may occur in areas following clearing and pile burning activities. This follow-up is necessary after virtually any natural event

(slope failure) or management activity (pile burn, wildfire, prescribed burn, mowing or grazing treatment) due to the aggressiveness of invasive weeds in colonizing recently disturbed soils.

Pile burning could not be used for the goal of removing thatch from grasslands. Rather prescribed burning, mowing and/or grazing can be used to remove or breakdown thatch and cycle carbon and nutrients back into the soil. Pile burning can be conducted at a relatively low cost with CDF prison crews at approximately \$500 per acre.

### **Micro-Burns**

Given the constraints, and the likelihood that broad-scale prescribed burns may be difficult to implement, micro-burns (burns on the order of a few hundred square meters or less, and contained in fire-proof fencing) might prove useful and feasible. These small burns can aid in combating localized weed or scrub infestations or thatch build-up and may be more easily permitted. Given their small size, they cannot be used for broad scale management. Planning and implementation of micro-burns would need approval from CDF.

To be an effective tool for the maintenance of grasslands, micro-burns would need to be conducted in the summer or fall to meet grassland maintenance goals. Micro-burns in the winter may damage grassland species, as they are not adapted to burns in the winter. At this time, CDF is unlikely to approve dry-season burns on San Bruno Mountain.

With the establishment of fire breaks and buffers, micro-burns may be a promising tool for habitat management in the future. Micro-burns could be utilized to achieve goals that include for example the removal of gorse thatch or broom. The cost associated with micro-burns however, for fencing, planning, supervision, and follow-up work, would need to be considered and may outweigh the benefits.

### **Wildfires**

The California Department of Forestry and Fire Protection (CDF) has the primary fire protection responsibility for protecting the natural resources of San Bruno Mountain from fire damage. CDF can be available for road and firebreak maintenance with dozers, graders and hand crews to do the work. CDF may also be available for assistance with buffer zone establishment and maintenance. Buffer zones are areas adjacent to development where vegetation must be modified to reduce the fire hazard.

The San Bruno Mountain Community Wildfire Protection & Fire Use Plan does not provide a "let burn" policy for wildfire. The plan does state that when the fire defense system is in place (i.e. buffer zones, fire breaks, fire roads, treatment of hazardous fuels) managing unplanned fires on San Bruno Mountain may be considered.

### **Flaming**

Flaming involves using a gas torch to pass intense heat over the leafy parts of a plant. The heat causes the plant cell walls to burst, killing the plant. Flaming can be used on young, emerging weeds without affecting established, desirable plants and it leaves no residue. Flaming is not effective on weeds with underground reserves. Disadvantages to flaming include a lack of residual control, poor effectiveness on some grasses and perennials, critical timing requirement to ensure adequate control, hazards associated with handling pressurized flammable gas, and the potential for fire. Flaming may be effective on invasive species such as French Broom, and should only be used during the wet season, during appropriate conditions. Costs for flaming are

estimated at approximately \$500 - \$2000 per acre, depending upon the density of the infestation treated.

### **Fire Breaks and Buffers**

Areas adjacent to developments should be grazed, hand weeded or mowed rather than burned, to create a sizable fire buffer zone between potential wildfires and residential and commercial areas. For some areas such as the Brisbane Acres, where there are abundant fuel loads present from dense eucalyptus woodland in the ravines, extensive work to remove ladder fuels is needed. The clearing of vegetation to create fire buffers on San Bruno Mountain is an opportune management action for CDF prison crews.

The creation of fire buffers will not only provide a level of protection to homes and businesses in the event of a wildfire, but may also pave the way for future prescribed burning on the Mountain. As discussed above, the greatest limiting factor to prescribed burning on San Bruno Mountain is the proximity of urban development and the risk posed to structures in the event of a fire. By creating and maintaining a buffer between development and wildland, the risk of fire spreading from the Mountain and onto adjacent properties is greatly decreased.

Fire breaks and roads on the Mountain are not consistently maintained by CDF, partly due to concerns over impacting endangered species habitat on the road cuts, especially mission blue butterfly habitat. Ongoing coordination between the Habitat Manager and CDF to maintain fire breaks and minimize impact to the endangered species is needed. As specified in the *San Bruno Mountain Community Wildfire Protection & Fire Use Plan*, CDF can be available for road and firebreak maintenance with dozers, graders and hand crews to do the work. Future maintenance and road and firebreak work may include:

- Maintaining firebreaks in the South Slope areas at a 25-foot width.
- Assisting with road maintenance by installing erosion control features and grading existing roads.
- Developing new firebreaks as needed in cooperation with San Mateo County Parks and the HCP Habitat Manager.

Any work to be done by CDF on roads or firebreaks must be coordinated with the HCP Habitat Manager to minimize direct impacts to sensitive habitat.

### **Mowing**

Mowing has shown to be an effective tool and is used frequently as part of the current ongoing grassland management of San Bruno Mountain. Mowing can be used to depress invasive species in the same manner as grazing and burning, and has shown to be successful within specific areas, such as on the preservation parcel on the Southeast Ridge, the Hillside/Juncus area, various restoration sites (habitat islands), and along the Summit Ridge Trail. It is especially useful within highly sensitive areas, to avoid impacting rare species.

Mowing has been found to be effective at reducing annual grasses and providing a competitive advantage to native species, including the host plants for the mission blue butterfly. It does not reduce thatch levels within the grassland however, unless thatch is raked and removed from the treatment area.

Though mowing is effective, it cannot be effectively implemented on a large scale to address annual invasive species. A GIS analysis of slopes was done to determine the extent of San Bruno Mountain that could be mowed. Most of the grassland acreage (approximately 75%) is on very steep slopes that cannot be cost-effectively mowed with labor crews. Where slopes are more gradual and accessible, mowing is a cost effective tool for controlling invasive species.

Mowing needs to be conducted repeatedly, 2-4 times per year, and prior to invasive species seed set. Mowing can be done with a tractor mower for large areas, or with a weed-eater for small areas. Mowing costs approximately \$500 per acre with a tractor mower, and \$750 per acre for weed-eater mower.

### **Brush and Tree Clearing**

Clearing of unwanted brush and trees, such as broom, gorse, coyote brush, Monterey pine and eucalyptus may be accomplished by a variety of means. Private contractors, the California Conservation Corps, County Fire Safe crews, and CDF prison crews have been used for brush clearing projects on San Bruno Mountain. At this time, CDF prison crews are the most cost effective method for attaining the desired results. The CDF prison crews are staffed with approximately 12 non-violent crime inmates per crew and are supervised by a CDF crew chief and the San Bruno Mountain HCP Habitat Manager. Crews are trained and provide their own tools, with the exception of weed wrenches which are provided by San Mateo County Parks Division.

CDF crews are most efficient in areas that are dominated by brush and/or invasive species and where sensitive habitat is minimal. Ideal areas for crew work include large infestations of broom and coastal scrub targeted for conversion to grassland. The benefits of using CDF prison crews is that a large amount of work can be accomplished for relatively low cost and there is less disturbance to the soil than from mechanical clearing. After the vegetation is cleared it is pile burned, creating openings for reseeding and/or planting. Cost for brush control depends on the density of the brush and the terrain. Cost for brush control with CDF prison crews can range from \$500 to \$1500 per acre.

Mechanical methods for brush and tree removal may successfully meet management goals, but generally at a higher cost. A Brontosaurus (a large cutting head mounted on a tracked caterpillar) can effectively remove brush where hand removal or grazing is not feasible. The Brontosaurus removes and chips brush and small trees in a single operation. Approximately 60 acres of dense, mature stands of gorse and Portuguese broom have been removed with a Brontosaurus from the Saddle and the Northeast Ridge as part of the State Parks Grant and other projects. The cost of brush removal using this equipment is approximately \$1,500 per acre, including post-clean up of debris.

Removal of eucalyptus forest or other large trees requires logging. The most recent logging of eucalyptus occurred within the Colma Creek restoration area in 2006. Approximately 150 large and small trees were felled and chipped on site. Once cleared, areas that previously supported eucalyptus forest may be returned to native habitat with the replanting of native vegetation and follow-up removal of eucalyptus seedlings or saplings. The cost for logging is approximately \$8,000-10,000 per acre.

Brush and tree clearing should be conducted in the fall or winter (September 1 to February 1), to avoid impacting nesting birds unless pre-project surveys for nesting birds are conducted and impacts are determined to be insignificant. Brush clearing conducted in the fall will also be more efficient since clearing in the fall may kill coyotebrush and other shrub species outright,

since these species are drought stressed at this time of year (personal communication David Amme). Brush control activities should not be conducted within a 100-foot buffer zone on both sides of drainages, unless these activities are deemed necessary to remove an invasive species, protect a listed species, and/or soil and slope aspects provide suitable conditions for grassland restoration within the buffer zone.

### ***Re-seeding***

Re-seeding in areas that have been managed for unwanted vegetation or that have been disturbed is desirable and at times crucial for the establishment of native vegetation, particularly grasses. Often times the soil seed bank is dominated by annual invasive grasses, and the natives are not able to gain a foothold following a disturbance event such as a wildfire. In areas that have long been dominated by invasives, the density of the native seed in the soil may be markedly diminished. Re-seeding with locally grown, native seed is the best practice, but due to cost, it often cannot be used over broad areas. Instead, re-seeding is used only in specific areas that have had intensive invasive species control work, have a high erosion potential and/or within habitat restoration islands. Examples of the latter include areas where vegetation is being grazed down, following fire, or after removal of species that form mono-specific stands, including Oxalis and Himalayan blackberry.

Seed mixes should to the greatest extent possible be composed of local seed sources, and even collected on site when available. This is to maintain the unique and specific genetics of San Bruno Mountain and to prevent hybridization with similar, yet genetically distinct, stock. Driving seeds into the soil either mechanically or via hooved animals (in areas that are grazed) will protect seed from predation and increase germination rates.

### ***Mycorrhizal Inoculation***

Mycorrhizal fungi are present in most native coastal sage scrub soils. However, most coastal sage scrub species are only facultative users of mycorrhizal fungi and do not require their presence to establish on site (St. John, 1995). These fungi grow into the root tip cells of the plants and form a symbiotic relationship with them. This relationship allows the fungi to obtain some of its nutrient needs from the plant and helps the plant obtain phosphorus, which can sometimes be difficult for plant roots to extract. In general, mycorrhizal populations are eliminated from highly disturbed sites through the removal of topsoil and other soil disturbance activities. However, if appropriate native species are reintroduced to a site, it appears the associated mycorrhizal fungi will return in 1-5 years (Nelson and Allen, 1993). There is currently a debate over whether it is useful to introduce mycorrhizal fungi to coastal sage scrub restoration sites. Experiments done with coastal sage scrub species and non-native grasses where mycorrhizae were introduced showed that non-native grasses may obtain a competitive edge because they put on more top growth while native species increase root growth (Nelson 1995). A few practitioners feel that no restoration can be truly successful without mycorrhizae (St. John, 1995). The cost of utilizing mycorrhizal fungi for invasive control has not been determined.

### ***Nutrient Fixation***

Soil testing at each restoration site should be accomplished on a regular basis (once or twice each year). If nutrient levels are found to be higher than what is normally expected, remediation should be accomplished. This can be done through the addition of recalcitrant mulch, such as bark or wood chips, to the soil. This will provide an additional source of carbon for microorganisms, in particular soil fungi, which will enable them to increase in numbers and

therefore take up the available nitrogen from the soil through the process known as nitrogen fixation. This will both decrease the amount of available nutrients in the soil and provide a "slow-release" process, caused by the re-release of nitrogen into the soil as the micro-organisms slowly die off, that will benefit the native species over the non-native exotics. The cost of utilizing nutrient fixation for invasive control has not been determined.

### ***Replanting***

While much greater effort and expense has gone toward habitat maintenance and enhancement, replanting<sup>7</sup> has been used with success when areas have been properly selected and thorough follow-up work has been done to protect plantings. Smaller habitat islands, approximately 1 acre or less in size, can be planted and more easily managed to provide habitat for the endangered species once host and nectar plants have become established. This process takes approximately 2 years. Several habitat islands for the mission blue butterfly have been created within HCP conserved areas using this approach (Figure 19).

Typically all broadleaf plants are grown from seed stock collected from San Bruno Mountain. Collection of seed and allotting enough time for propagation (6 months to one year) must be considered for replanting projects. All host and nectar plants for the endangered butterflies must be collected from San Bruno Mountain to avoid any potential for hybridization between varieties from other regions.

Costs range from \$500 per acre for reseeding with native grasses to \$10,000 per acre for growing and installing native plants.

The availability of native grass seed for restoration projects on San Bruno Mountain has been a limiting factor in reseeding areas after disturbance from fire, brush clearing, and slope stabilization. A program of growing and storing an ample supply of native grass seed for the Mountain, either grown on the Mountain itself or within the region is needed. If additional funding can be secured, a portion of HCP funding should be used to provide ongoing support to assist in the development of a native plant nursery that would provide a sustainable supply of native plants and grass seed for San Bruno Mountain restoration projects.

### ***Volunteer Assisted Habitat Management and Restoration***

- Training
- Monitoring weed free areas (weed patrol)
- Weeding days
- Supervision

The San Bruno Mountain HCP has not relied on volunteers for meeting management or monitoring goals in the past, and this habitat management plan does not recommend such reliance in the future. Volunteer assistance however is important towards increasing the overall

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<sup>7</sup> The term "restoration" is used to refer to land management that includes replanting and/or reseeding with native plant species; whereas "maintenance" or "enhancement" is used to refer to invasives control, brush control, or other techniques that do not include replanting/reseeding efforts.

success of the program, and this should be cultivated through the development of a more organized and large-scale community stewardship program for the Mountain.

The role of volunteers on San Bruno Mountain is an important aspect in management. Volunteer activities provide the important connection between the Mountain and its management needs and the surrounding community. Volunteers have had a beneficial impact on the Mountain's management through assistance with weed control, plant propagation and planting, public education, and in providing feedback to Park and Habitat Managers. Volunteer activities on the Mountain have focused primarily on four locations to date: 1) The Botanic Garden area (by Friends of San Bruno Mountain), 2) Owl and Buckeye Canyons (by San Bruno Mountain Watch), 3) Pointe Pacific Property (by Pointe Pacific Homeowners Association), and 4) Colma Creek (by Heart of the Mountain). In addition a native plant nursery (Mission Blue Nursery) was founded in 2002 and is operated by volunteers with the Friends of San Bruno Mountain. The Nursery is currently being relocated from its former site in South San Francisco to Brisbane.

Through the period of 1996 to present, the results from these activities have been successful and very encouraging. As the volunteer base for these organizations builds, there is the potential for expansion of volunteer activities into other habitat areas of the Mountain, which will increase the effectiveness of habitat maintenance and restoration efforts. Under grant programs, volunteer organizations now have the capability of conducting large-scale vegetation management projects, as exemplified by projects such as the San Bruno Mountain Watch Coastal Conservancy Grant Project in Owl and Buckeye Canyons. The County will continue to coordinate with volunteer organizations as their programs develop.

### ***Combination of Techniques and Ongoing Management***

For successful habitat maintenance or restoration, it is often necessary that several techniques be used. The types of techniques used in combination will depend upon the vegetation community, invasive species type and density, slope exposure, grazing infrastructure, distance to residential areas, wind patterns, and other factors.

For habitat management projects on San Bruno Mountain, the initial treatment of invasives and the clearing of brush and/or trees requires regular follow-up work using hand weeding, herbicide control, mowing and potentially reseeding and planting for at least 3-5 successive years. Success of these management techniques depends upon a funding mechanism that can support their repeated use over the course of several years.

Even after a site is stabilized with native vegetation, ongoing management is still required, due to the need for episodic disturbances (in the form of grazing, mowing, and/or burning) to maintain the health of native grasslands and coastal scrub plant communities. Therefore even the most pristine areas of the Mountain, and the most successful restoration sites, will still require ongoing management in one form or another, in perpetuity.

## **B. Methods for Directly Enhancing Butterfly Populations**

### ***Captive Breeding***

Captive breeding and reintroduction of mission blue, callippe silverspot, and San Bruno elfin butterflies is not necessary or foreseeable at this time based on the current status of the populations. All of these species are locally abundant on San Bruno Mountain. Based on their home range size, flight capabilities, distance between habitat patches, and lack of significant

movement barriers, it is likely that all suitable habitat is being utilized and genetic exchange is occurring between butterfly colonies throughout the Mountain.

Reintroduction of the bay checkerspot butterfly could potentially be done on the Mountain, however the current limited extent of the habitat for this species would make re-establishment of this species difficult. With continued management of the Mountain to increase the extent of grasslands, re-establishment of the bay checkerspot butterfly could become possible in the future.

A captive breeding program for any of the listed butterflies occurring on San Bruno Mountain would need to be overseen by the USFWS, and any physical handling of the listed butterflies would need to be conducted and supervised by a USFWS permitted biologist.

### ***Genetic Exchange Program***

Genetic exchange between butterfly populations on San Bruno Mountain and other isolated open space areas that support the mission blue butterfly, callippe silverspot butterfly, and/or San Bruno elfin butterflies should be considered and investigated. Areas where very small populations of mission blue are present (Twin Peaks, Milagra Ridge), and San Bruno elfin (Milagra Ridge) would likely benefit from a genetic exchange program that introduces genetic material (in the form of female butterflies) to provide greater genetic viability to these isolated populations. This program would need to be overseen by the USFWS, and any physical handling of the listed butterflies would need to be conducted and supervised by a USFWS permitted biologist.

## VI. HCP HABITAT MANAGEMENT ACTIVITIES (1982 – 2007)

Since the inception of the HCP in 1982, habitat management has focused on using herbicide, hand control, and mechanical removal to control weed infestations, with a primary emphasis on protecting grassland habitat areas for the mission blue, callippe silverspot, and San Bruno elfin butterflies. In addition, work has focused on protecting areas with high native plant diversity and rare plant populations. The previous management plans (San Bruno Mountain Exotic Species Control Program, 1993; and The San Bruno Mountain 5 Year HCP Strategic Plan, 1996) identified the distribution of invasive species and treatment methods and strategies to control these species. The 1993 Plan focused primarily on gorse (*Ulex europaeus*), blue gum eucalyptus (*Eucalyptus globulus*), French broom (*Genista monspessulana.*), Portuguese broom (*Cytisus striatus*), and fennel (*Foeniculum vulgare*), and expanded the invasives control program from its original primary focus within habitat areas on the main ridge, Saddle, and Northeast Ridge to include areas on Southslope, Southeast Ridge, and Brisbane Acres. A more systematic approach to controlling gorse was described in the 1993 plan and implementation of this strategy has contributed to the control of this species (see below).

The 1996 Plan further expanded the number of invasive species to be controlled to include pampas grass (*Cortaderia selloana*), Monterey pine (*Pinus radiata*), Monterey cypress (*Cupressus macrocarpa*), poison hemlock (*Conium maculatum*), Pride of Madeira (*Echium ssp.*), Cotoneaster (*Cotoneaster ssp.*), Cape ivy (*Delaeria oderata*), and English ivy (*Hedera helix*). The 1996 Plan also expanded the program to address invasive species on a Mountain-wide scale and provided an estimate of the level of invasive species control that could be expected under different funding scenarios.

### A. Invasive Species Control

As of 2007, habitat management over the 25-year span of the HCP has reduced the extent of gorse on the Mountain by approximately 85%, and the extent of eucalyptus by approximately 30%. Gorse has been controlled since 1993, using brush clearing and herbicide control. Recent work on gorse over the past 4 years through a California State Parks grant has resulted in the control of an additional 49 acres of gorse in the central Saddle.

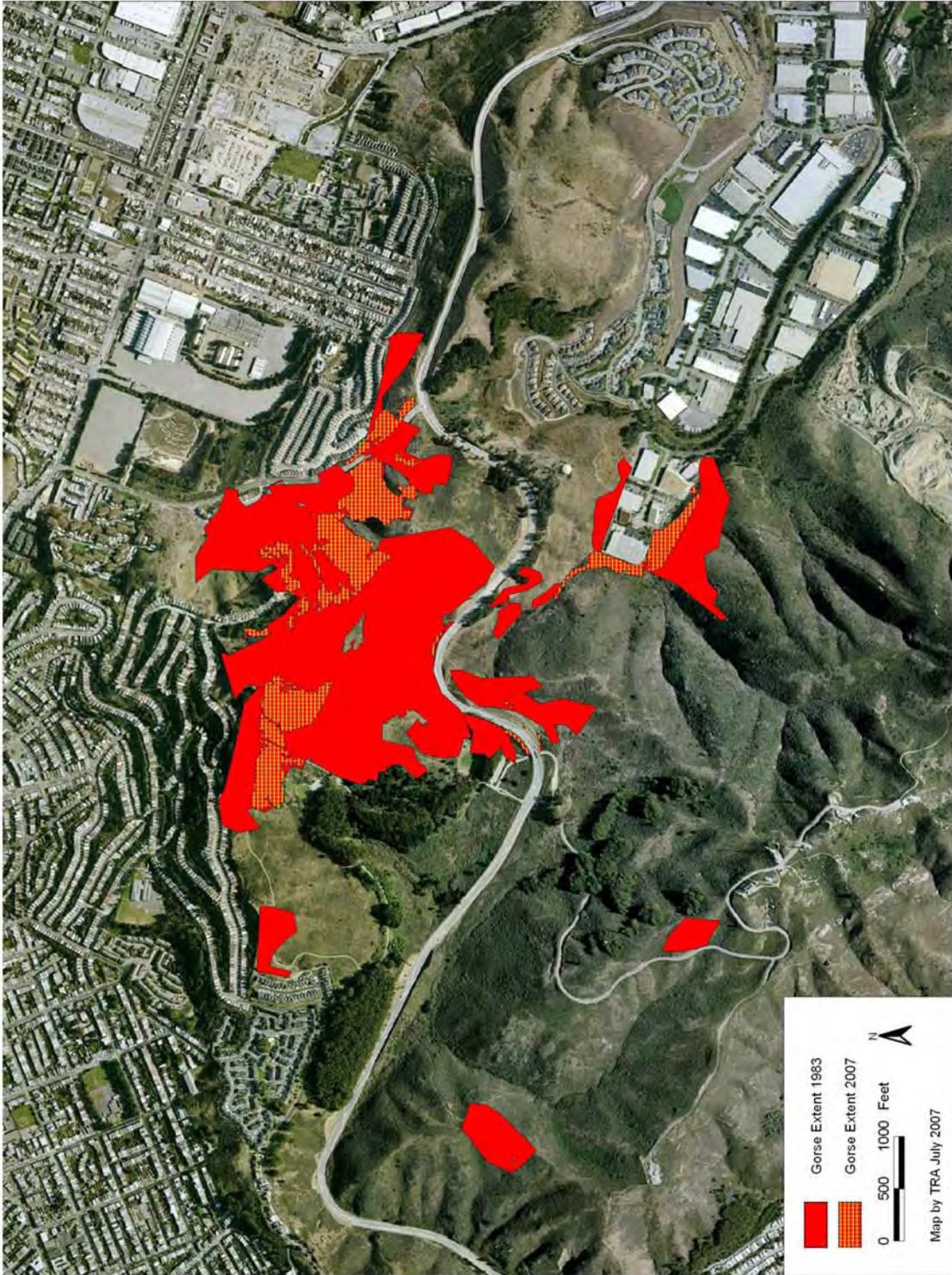
The management strategy that has been employed has reduced the amount of gorse in the eastern and western Saddle and has prevented the spread of gorse to other areas. The mission blue and callippe silverspot habitat in the Saddle is primarily limited to the eastern Saddle and therefore this area has received consistent control efforts to maintain this habitat free of gorse. This approach has effectively contained gorse to a 34-acre area of the central Saddle, however the density of gorse has increased within this area. Figure 18 shows the current extent of gorse on San Bruno Mountain.

Approximately 45 acres of blue gum eucalyptus forest has been logged and controlled over the past 12 years on San Bruno Mountain (Figure 19). Areas where eucalyptus has been controlled include Wax Myrtle Ravine (10 acres), Dairy Ravine (21 acres), Colma Creek (4 acres), April Brook (4 acres), Colma Creek Headwaters/Bog (2 acres), and Hoffman/West Peak (4 acres). The control and management of the eucalyptus-logged areas required an extensive expenditure of HCP funds between 1995 and 2001 to restore these areas to native habitats. Extensive slash removal through mechanical removal and burning was conducted, and thorough and repeated follow-up invasive species control work was performed. Areas that have been treated to control gorse and eucalyptus require ongoing management due to the influx of other invasive species such as poison hemlock (*Conium maculatum*) and Himalayan blackberry (*Rubus*

*discolor*). Through the eucalyptus control work, a mosaic of coastal scrub and grassland has returned to these areas, though weed control is an ongoing challenge.

Though the previous management approach for the Mountain has worked well in directing control efforts toward the most serious invasive species threats and has protected the core habitat areas of the endangered butterflies, it has not been capable of addressing the need for management of brush and herbaceous invasive weeds on a broad scale. Herbaceous invasive species (Italian thistle, bristly ox-tongue, mustards (*Brassica* ssp. / *Hirschfeldia* ssp.), wild radish, poison hemlock, rattlesnake grass and velvet grass) have expanded on the Mountain in the absence of large scale control (Figure 20). In recent years (2005 and 2006) focused control efforts on herbaceous species such as Bermuda buttercup (*Oxalis pes-caprae*) has led to successful control within specific areas. Many of these species are not easily controlled through herbicide or hand control methods, and are more difficult to track as they can invade new areas quickly due to wind or other mechanisms of seed dispersal. Though these species have been removed by HCP crews and volunteer groups for many years, addressing these species on a large scale has not been feasible.

Figure 18. Change in Gorse Distribution on San Bruno Mountain 1983 - 2007



## **B. Habitat Restoration**

The term restoration is used to refer to areas where both invasive species control and replanting of native species is conducted. Within the conserved habitat, establishment of butterfly habitat (primarily mission blue) has been created within former gorse and eucalyptus infestations in the Colma Creek area, Dairy Ravine and Saddle through the creation of habitat islands. Habitat islands are areas approximately 0.1 - 1.0 acre in size that can be managed more thoroughly using mowing, hand control, herbicide and replanting to establish and maintain butterfly host and nectar plants. As of 2007, five HCP habitat islands have been established, and three of these sites have had documented mission blue butterfly utilization (Figure 21).

Habitat islands have also been established by developers and agencies on temporarily disturbed slopes that are to be restored and dedicated to the HCP conservation area. Nine habitat islands have been created thus far that provide potential habitat for mission blue and callippe silverspot butterflies. Four of these islands have documented occurrences of mission blue butterfly as of 2007. Most of the habitat islands established thus far on temporarily disturbed slopes are located on the Northeast Ridge (Figure 21).

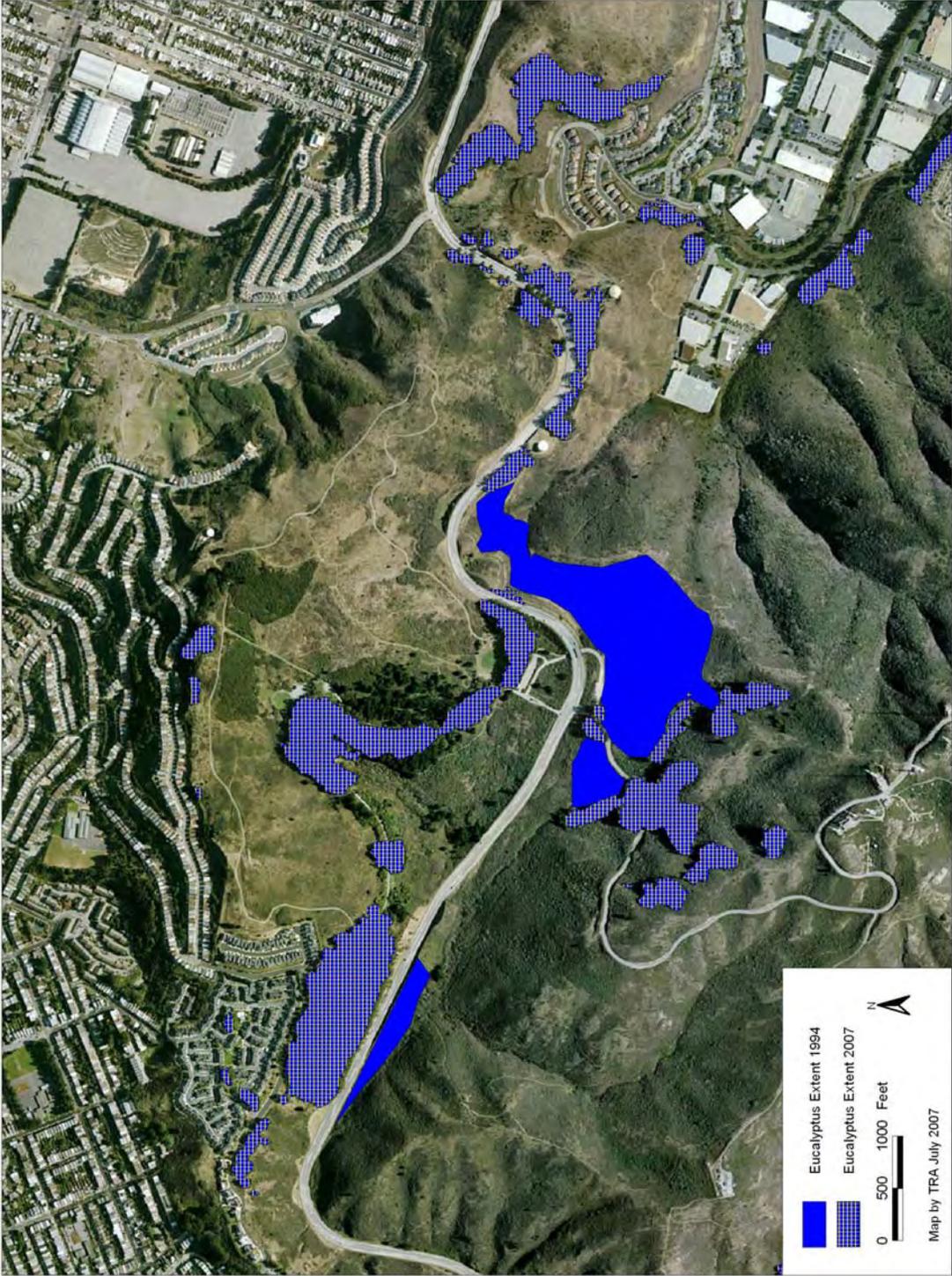
The habitat island approach has been used as a method for creating or enhancing endangered species habitat through the planting of host and nectar plants in suitable locations. The creation of the islands has provided additional habitat for the mission blue butterfly, and potentially buffers the butterfly population from impacts from coastal scrub succession and host plant dieback at existing habitat areas. Creating habitat islands also provides potential educational opportunities for volunteers, and creating a program to attract and train volunteers to assist in the management of habitat islands is being explored by the County Park staff at this time (2007). In the past 5 years (2003 – 2007) approximately 6% of the annual HCP budget (\$5,000 - \$10,000) has been used to create and manage habitat restoration islands.

While habitat islands have been created for the mission blue butterfly, and can be created for the San Bruno elfin butterfly, it is unknown if the habitat island approach is appropriate for the callippe silverspot butterfly. The callippe relies on much larger areas (minimum of several acres) that consist of its host plant, *Viola pedunculata*, and near topographic high points. Due to the high cost and difficulty of propagating *Viola*, restoration of callippe habitat is likely better served through large scale brush removal that opens up grassland habitat and allows for natural recruitment of *Viola*.

## **C. Restoration Projects Funded by Non HCP Sources**

Figure 22 shows the locations of several habitat restoration and/or invasive control projects on San Bruno Mountain funded through primarily non-HCP sources in 2005. Restoration projects shown include projects being done by San Mateo County Parks with funding provided through grants from California State Parks, the California Coastal Conservancy, and the California Native Plant Society. Additional projects are being carried out by the City of Brisbane, San Bruno Mountain Watch, Friends of San Bruno Mountain, and Myers Development Corporation. Most projects are 3-5 year projects, and are still be implemented as of 2007.

Figure 19. Change in Eucalyptus Distribution on San Bruno Mountain 1983 - 2007



**Figure 20. Southeast Ridge of San Bruno Mountain, May 2004**

**Flowers in background are infestations of herbaceous weeds including field mustard (*Hirschfeldia incana*) and wild radish (*Raphanus sativus*).**



Figure 21. Habitat Restoration Islands on San Bruno Mountain 2007

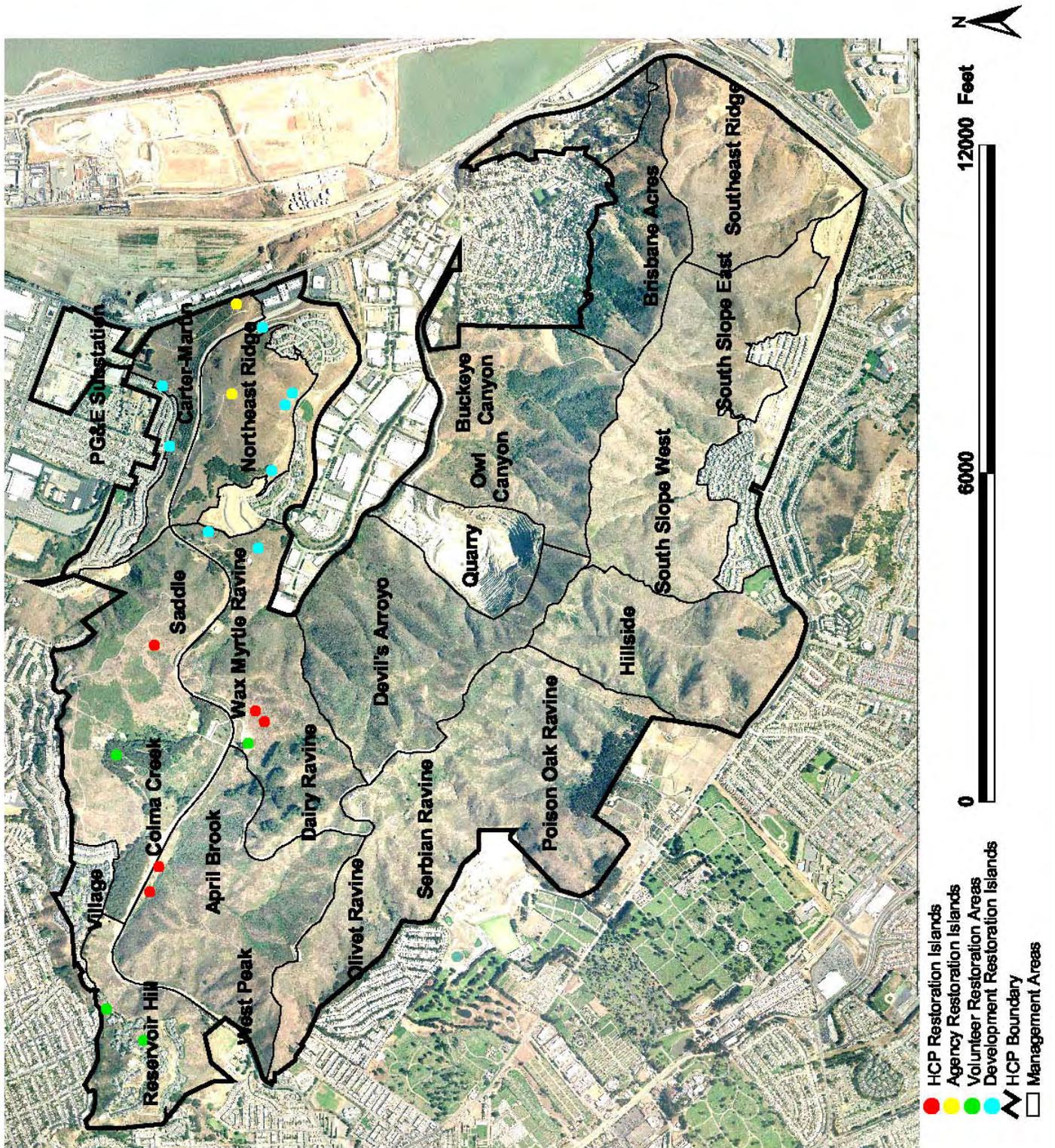
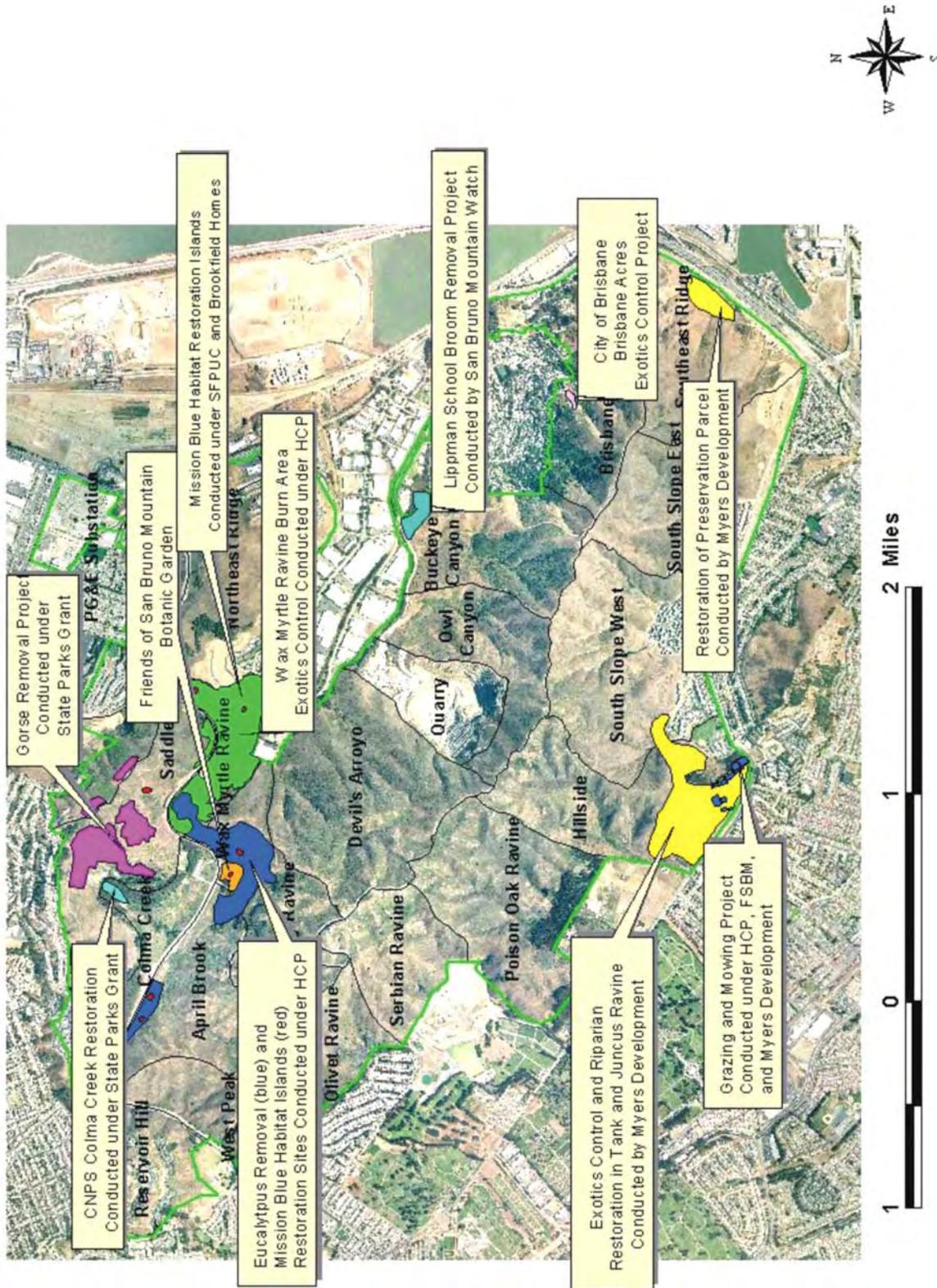


Figure 22. Habitat Restoration Projects Funded Through Primarily Non HCP Sources

Habitat Restoration Projects on San Bruno Mountain 2005. Mountain-wide HCP exotics control program area and San Bruno Mountain Watch CCC grant area not shown. Map prepared by Thomas Reid Associates, May 2005.



**D. Site Activity Permit Process**

The site activity permit (SAP) process is used to review projects that are minor in scale, yet have potential to impact sensitive habitat areas within the San Bruno Mountain HCP area. The permit is not a discretionary permit, but rather a notification process by which the Habitat Manager can oversee and regulate the activities of developers, agencies, restoration contractors, researchers, volunteer groups and others who wish to conduct work on the Mountain. The SAP applies to any proposed project that is within the conserved habitat, and within areas to be dedicated as conserved habitat in the future. Examples of projects that require an SAP include vegetation control (hand pulling, mowing, chipping, pile burning) by County, City, or volunteer groups; seed collection by restoration contractors and volunteer groups; and roadway maintenance by County, PG&E, and San Francisco Water Department. To obtain an SAP, the applicant must fill out the SAP form and send it to the Habitat Manager. The Habitat Manager reviews the project description, location, equipment involved and time frame, and assesses if there will be any potential impact to sensitive habitat. Sometimes a site visit is required. If it is determined that there will be no negative impact to protected habitat, the SAP is approved and the form is signed and sent back to the applicant, with a copy directed to the County. If there is the potential for impact to sensitive species, conditions are placed on the project to avoid or reduce impacts. Conditions may include monitoring, altering the timing of the project, post-project invasive species control work and/or replanting. Any project that has the potential to take a species not covered under the San Bruno Mountain HCP cannot be approved through the SAP process. The SAP does not provide coverage for activities that may impact wetlands or other sensitive habitats or species not covered by the San Bruno Mountain Habitat Conservation Plan Endangered Species 10(a) permit.

**E. Roadsides, Trails, and Utility Easement Management**

Throughout the HCP area there are roads, trails, and utility line easements. In some areas these areas have high concentrations of endangered species habitat along these corridors. These areas are also often the sites of weed colonization and dispersal. Management of these areas requires coordination with jurisdictional agencies including County Park Rangers, County Public Works, City and County Public Works Agencies, PG&E, CDF, San Francisco Water Department, and local fire departments. To minimize impacts to the endangered species from maintenance activities, the Habitat Manager works with agencies through the Site Activity Permit process to avoid, minimize, or replace impacted habitat.

## **VII. HABITAT MANAGEMENT PRIORITIES AND PRESCRIPTIONS**

### **A. Vegetation Management Priority Areas**

The Mountain has been divided into four priority categories for management purposes, as shown in Figure 1 and described below.

#### Priority 1: (1,292 acres)

This management area includes all core habitat for the mission blue, callippe silverspot butterfly, San Bruno elfin and bay checkerspot butterflies on San Bruno Mountain, and currently consists of approximately 30% coastal scrub, and 70% grassland. This management area has been consistently managed over the span of the HCP, though management cannot be conducted thoroughly throughout the 1292 acres on an annual basis due to limitations in funding. Management of the endangered species habitat has been accomplished within most of the unit by prioritizing management areas based on habitat value, and modifying work areas annually based on the changing distribution of invasive species.

#### Priority 2: (495 acres)

This management area includes less important habitat areas located on the periphery of the core habitat areas. It consists of 1) all additional grassland habitat on the Mountain that provide habitat for the mission blue, callippe silverspot, and/or bay checkerspot butterflies; and 2) all grassland areas that have converted to coastal scrub over the span of the HCP and/or provide important movement corridors for the listed butterflies.

#### Priority 3: (884 acres)

This management areas includes primarily dense stands of coastal scrub and woodland plant communities. It includes: 1) all additional coastal scrub habitat not within Priority 1; and 2) and all native oak woodlands and riparian areas on San Bruno Mountain. These areas are primarily located on the western half of the Mountain and on north- facing slopes where fog and/or brush communities limit occurrence of the butterflies. These areas generally do not support listed butterfly species however pockets of grassland butterfly habitat are present within some coastal scrub habitat. Coastal scrub is a plant community that depends on infrequent fire for regeneration and overall plant community health. Treatment of the coastal scrub within this unit utilizing the additional tools of grazing, mowing, and/or burning would require a significant increase in funding. Although butterfly habitat is limited within this management area (and it is therefore a lower management priority) this area would benefit from more frequent burning to maintain the health of this plant community.

#### Priority 4: (248 acres)

This management area has significant dense infestations of invasive species including eucalyptus forest, gorse and French broom. These infestations are expensive to eradicate and do not pose a significant threat to native habitats and/or to the butterflies of concern as long as they are controlled from spreading into Priority 1, 2, and 3 areas. Some of the Priority 4 areas could be restored to butterfly habitat and would be suitable for stand-alone restoration projects. Management of these areas and efforts to restore these areas are not a high priority use of HCP funds due to the high cost of conducting such work, and the long-term commitment required to obtain results. This Plan recommends that the control of these areas be pursued through grant

funds or other sources of funding whenever possible. For example, the gorse control project located in the central Saddle has been implemented under a Coastal Conservancy grant since 2002, and has expended \$330,000 to control 49 acres of gorse over a 5-year period.

Treatment of Priority areas 1, 2, and 3 on a broad scale utilizing the tools of grazing and/or burning supplemented by hand control, herbicide, and mowing would require a significant increase in funding. Without an increase in funding, the Priority 1 management area would continue to be managed with a focus on the highest priority invasive species threats using hand control, herbicide, and mowing.

## **B. Habitat Management Units and Prescriptions by Unit**

The HCP area has been divided into 13 habitat management units for the purpose of organizing vegetation management into a more comprehensive structure for implementing and evaluating management (Figure 23). The management units were redrawn based on vegetation boundaries, roads, trails, and previous management and monitoring boundaries. Descriptions, figures and prescriptions for the 13 management units are provided in Appendix B.

Within each management unit there are Priority 1, 2, 3, and 4 areas. If funding is limited to the current HCP funding program, all Priority 1 areas would continue to be managed within each of the management units. Priority 2, 3 and 4 areas would be added in sequence when additional funds are acquired for the management program.

Prescriptions for each unit are focused upon using a combination of techniques to reduce invasive species and reverse coastal scrub succession, as well as change the conditions that give rise to invasive species and coastal scrub succession. The primary tool to change the conditions is grazing. This approach diverges significantly from previous management approaches, which focused primarily on directly eliminating invasive species and reducing the extent of coastal scrub through the use of hand or herbicide work.

If supplemental funding is acquired, grazing will be tested for the first 3-5 years of the plan and if results show a significant benefit to the butterfly species, this tool would be expanded along with the tools of mowing, herbicide and hand control as supportive techniques. Grazing and/or mowing could also be used to provide low vegetation buffers between wildland and urban interface areas so that controlled burning may become a more reliable management tool in the future. During the experimental phase, no more than 15% of the grasslands of San Bruno Mountain (between 100 and 200 acres) would be grazed. In addition, once an effective management strategy is developed utilizing grazing, mowing, and/or burning, no more than 50% (approximately 600 acres) of the Priority 1 management area would be treated on an annual basis.

The following general prescriptions will be followed within each management unit, depending upon available funding. Until additional funding is acquired, the current management program utilizing mowing, hand and herbicide control techniques with a focus on the highest priority invasive species threats within all of the Priority 1 management areas will be continued. Exceptions and modifications are noted in the descriptions for each management unit.

- a) Conduct grazing and/or mowing to reduce thatch, non-native species coverage and reverse coastal scrub succession. ;
- b) Continue and expand herbicide, hand control and mowing control to reduce fennel, bristly ox-tongue, and other invasive weeds, to supplement burning and/or grazing;

- c) Consider reseeding native grasses and forbs, including butterfly host plants into sites where non-natives have been dominant;
- d) Use 'weed emergency fund' to control weeds on an as-needed basis after wildfires and other non-predictable disturbance events;
- e) Coordinate with CDF to minimize and restore areas impacted during wildfire control operations.
- f) Conduct brush control as needed to control coastal scrub succession, using pile burning or other methods approved and supervised by CDF.

### **C. Emergency Management Funds**

A portion of the habitat management budget shall be set aside each year (starting at \$10,000) for dealing with any emergency management needs that arise during the course of a fiscal year. This would allow for emergency steps to be taken immediately to deal with a new weed infestation or other change of condition, until the annual HCP budget can be re-prioritized at the beginning of the next fiscal year. Emergency HCP Trust meetings could also be scheduled to re-prioritize funds, when necessary. Emergency funds allocated but not used, would be rolled over to the following fiscal year.

Figure 23. Habitat Management Units on San Bruno Mountain



## VIII. EFFECTIVENESS MONITORING

Effectiveness monitoring is vital to recognizing changes to the ecosystem and to gauge the results of habitat management work and the status of the butterfly populations. Effectiveness monitoring over the 25-year span of the HCP has been focused on collecting five types of data: distribution and/or the relative abundance of the endangered butterflies; distribution of rare plants; invasive species distribution; distribution of plant community types, and documentation of habitat management work. This information has been reported in the San Bruno Mountain HCP annual reports (1982 – 2006).

### A. Endangered Butterfly Monitoring

Endangered Butterfly monitoring conducted over the 25-year span of the San Bruno Mountain HCP has focused on assessing the distribution (using wandering surveys from 1982- 2000) and relative abundance (using set transects from 1998 – 2007) of the federally endangered mission blue and callippe silverspot butterflies. The San Bruno elfin butterfly has been assessed through point counts of larvae and adults within representative habitat areas on the Mountain. All three butterflies have low growing host plants that can easily be overgrown by weeds and/or coastal scrub vegetation, and all three species overlap in their distribution on the Mountain.

The San Bruno elfin is primarily limited to upper elevation grasslands on north-facing slopes along the main ridge of the Mountain, whereas the callippe silverspot and mission blue are found in upper and lower elevation grasslands on a variety of slopes and exposures. The callippe silverspot is found throughout the large grassland areas of the Mountain, and is largely absent from the western and northwestern side of the Mountain (i.e. West Peak, west Saddle areas), where fog and coastal scrub are more prevalent. The mission blue is the most widely distributed of the three endangered butterflies and is found in most grassland areas, but less commonly on the northwest side of the Mountain.

#### ***Butterfly Monitoring Methods***

Two monitoring systems have been used to monitor the endangered species on San Bruno Mountain over the span of the HCP: set transects and wandering transects. Wandering transects (surveyors do not follow set routes) were used from 1982 to 2001. This system provided an annual assessment of the distribution of the butterflies, but did not provide a reliable estimate of the relative abundance of the butterflies. Set transects have been used from 1998 to 2007, and were installed to provide a more robust data set for estimating relative abundance and population trends of the endangered butterflies.

#### **Set Transects**

Set transects are areas marked in the field that are walked frequently during the flight season. The transect system provides repeatable, site-specific data on butterfly presence and abundance. Set transects have been used to monitor the mission blue butterfly on San Bruno Mountain since 1998. The mission blue transects are 50 meters long and are comparable to the National Park Service's mission blue monitoring transects at Milagra Ridge and in the Marin Headlands within the Golden Gate National Recreation Area. As of 2007, the MB transects are being modified (lengthened) to increase the number of MB recorded per transect and reduce the variance recorded within individual transects.

Set transects have been used for callippe silverspot on San Bruno Mountain since 2000. The callippe silverspot transects are of variable length (470 to 2180 meters) due to the larger range of this butterfly.

For the San Bruno elfin butterfly, set points have been used rather than transects. The point system involves visiting approximately 20 points on a weekly basis during appropriate weather during the elfin's adult flight season, and visiting approximately 8 points during a 1-2 day period for larval searches after the flight season is over. For each point, a radius of 50 feet is monitored and all adult butterflies observed within a 5-minute period are recorded. Due to the high variance of this method, the San Bruno elfin monitoring now consists of monitoring the larvae of the species at points, as this is a more reliable method for year-to-year comparison. Larvae have been recorded within a 25-meter radius around set points since 2001.

For adult butterfly monitoring, each transect is monitored approximately 5 times per flight season, and once during the estimated adult life span of a single butterfly (once every 7-10 days for mission blue once every 2 weeks for callippe silverspots). All transects are surveyed during warm, calm weather conditions within 1-2 days of one another. Actual monitoring visits are not this consistent due to summertime fog and occasional cool weather days during the flight season.

For mission blue monitoring, only transect visits that had temperatures greater than or equal to 18.0 C and wind speeds less than or equal to 5.0 mph are used for analysis. These parameters are used to stratify the data to reduce the variability in butterfly detection from poor weather conditions. All butterflies observed outside of the mission blue or callippe silverspot transects or in the transect vicinity during travel between transects are recorded as incidental observations.

For the San Bruno elfin butterfly, approximately 20 survey points were installed in 1998. The points are monitored each year for adults during the flight season (March/April), and a subset of the points are monitored again in late spring (May) for larvae. Larval surveys are timed with a period when the larvae are most visible as they feed on the flower heads of the Sedum, typically within a 2-3 week window in May. San Bruno elfin adult and larvae counts were conducted using point counts from 1998 - 2003. Starting in 2006, SBE adult counts were eliminated due to the high level of variance, and larval counts were increased to three counts per point per season.

### **Wandering Transects**

Wandering transects are routes that cover large areas of the Mountain and are monitored typically 1-3 times during the butterfly flight season. The wandering transects provide distribution data on the butterflies and allow monitors to check on the status of butterfly habitat in remote areas of the park.

Wandering data for the mission blue and callippe silverspot butterflies was collected annually on San Bruno Mountain from 1982 to 2001, (though between 1997 and 2001 data was not collected thoroughly, due to the transition to a set transect system in 1998). All of the wandering data has been digitized from field data sheets and Figure 6 shows the distribution of mission blue and callippe silverspot butterfly observations recorded annually on San Bruno Mountain from 1982 to 2001.

### **Status of Butterfly Populations**

An independent review and thorough analysis of the butterfly monitoring data ('wandering' data) collected over the period of 1982-2000 was done by Travis Longcore and the GIS lab at USC in 2004. Their analysis used a system of 250-meter square cells overlaid across the HCP area within a Geographic Information System. The years after 2000 were not used in the analysis due to a lower number of 'wandering' surveys done in those years as biological monitoring was modified to a set transect design.

The analysis found that the wandering method was suboptimal for calculating relative abundance estimates, however the data could be tested for trends in butterfly occupancy. Trend analysis was applied to the 218 cells that were occupied at least once by mission blue butterfly, and the 165 cells that were occupied at least once by callippe silverspot butterfly.

The analysis concluded that for the period 1982–2000 the populations of the mission blue and callippe silverspot butterflies were stable in overall total distribution, but indicated geographic areas of concern for each, specifically the edges of the Northeast Ridge for callippe and the northwest portion of the study area for mission blue.

An analysis of the set transect data for mission blue and callippe silverspot has been done annually on the set transect data included in the San Bruno Mountain annual reports over the past seven years. Results have indicated no discernable positive or negative trend in butterfly abundance at this time, however a minimum of eight years is needed before reliable trends (if present) can be detected.

Adult and larval surveys for San Bruno elfin have been conducted on the Mountain during the 25-year span of the HCP. These surveys have been done with much more consistency and over a larger area of the Mountain since a point system was established in 1998. At that time it was thought the species could be in decline due to low counts recorded in 1996 and 1997. The results of the more recent surveys have shown that elfins continue to be present and widespread within their habitat areas, and the perceived decline in 1996 and 1997 was likely due to a lack of survey effort, rather than an actual decline in abundance.

The current butterfly monitoring program reflects recommendations made by USFWS in 2006, after receiving peer reviews on the HCP monitoring program by Steve Courtney (Courtney S., Bigger D., 2001), and Travis Longcore (Longcore, et al. 2004). The Service received peer reviews also on Travis Longcore's proposed monitoring program by Stuart Weiss and Erica Fleishman in January 2005. Based on the reviews, the Service recommended in 2006 that the current set transect monitoring system be continued, with minor modifications (i.e., lengthening) made to the mission blue transects to reduce the variance in butterfly observations and provide a smaller confidence interval for determining trends (USFWS, Biological Opinion, April 2004). These modifications were completed prior to the mission blue flight season in 2007.

The San Bruno elfin larval surveys are much more reliable for detecting the presence and abundance of this species within its habitat areas. The USFWS has recommended that larval surveys at monitoring points should continue, and adult surveys be discontinued due to the lack of sufficient numbers to perform statistical analysis (USFWS, communications Craig Aubrey). Larval surveys were conducted three times at each point beginning in 2006. (Prior to this, both adult and larval counts were conducted). The larval surveys provide greater consistency in numbers for statistical analysis, and it is recommended that a statistical power analysis be conducted to determine usefulness of this data.

Thus far data analysis of the set transect data has shown no significant trends, (either declining or increasing) for the mission blue or callippe silverspot butterfly populations (San Bruno Mountain Annual Reports, 2004, 2005, 2006, 2007). In addition, the wandering data analysis conducted by Travis Longcore (1983 –2001) concluded that the overall distribution of the butterflies was stable over the period 1982 – 2000. An analysis of the set transect data by Charlie Knight, determined that at least seven years of transect data would be required to determine trends, (if trends are occurring). Knight recommended conducting a consistent number of transect visits per year (at least five visits per transect each year of monitoring during the flight season, and that all transects are visited during appropriate flight weather within 1-2 days of each visit. This level of effort has been implemented for seven seasons for the callippe, however no significant trend has been detected. Only one season of mission blue monitoring data for lengthened transects (2007) is currently available.

The current set transect monitoring program has been identified as a reasonable monitoring program that balances cost efficiency with management decision-making needs (Weiss, 2006; Erica Fleishman; 2006). However, to provide more assurance that the program is providing useful information, it is recommended that a statistical power analysis be conducted on the callippe silverspot and mission blue transect data.

Incorporating a mission blue and callippe silverspot presence/absence monitoring program to the existing set transect design would provide distribution data of the butterflies to complement the relative abundance data provided by transect monitoring. The presence absence program would provide a distribution data set that could be compared to provide trends in occupancy for different subregions of the Mountain, similar to what the wandering data provided. Due to the high cost of conducting both a transect (relative abundance) monitoring program, and a presence/absence (distribution) monitoring program, it is recommended that a presence/absence monitoring program be developed using volunteer assistance.

The costs of the current monitoring set transect system is approximately \$8,000 - \$10,000 per butterfly species per year (in 2007 dollars). A presence/ absence system is expected to cost a similar amount, but may have higher initial costs to set up the program. Though a presence/absence system would require less repeated visits to the Mountain, it would require that more area of the Mountain be covered by surveyors to provide a thorough and accurate assessment of distribution.

The current monitoring program of monitoring each species using set points or transects on an every other year basis, should be considered as the minimum data requirement to assess the status of the endangered butterfly species on the Mountain. If additional funding becomes available it is recommended that this funding be used to develop and implement a presence/ absence monitoring program that would complement the current relative abundance system.

## **B. Rare Plant Surveys**

Rare plant distribution data has been collected in GIS format within the last 5 years for all plant species on San Bruno Mountain that are listed federally, by the state, and/or CNPS List 1B species (Appendix C). This includes the manzanita colonies (all species), Diablo helianthella, San Francisco Lessingia, San Francisco spineflower, San Francisco champion (*Siliene vercunda vercunda*), and dune tansy (*Tanacetum camphoratum*). Historically reported occurrences of white-rayed pentachaeta (*Pentachaeta bellidiflora*) and San Francisco gumplant (*Grindelia hirsutula maritime*) occurrences on San Bruno Mountain have not been verified.

We recommend that GPS mapping of all the special status rare plant species should be done on a cycle of once every two years on the Mountain to track changes in distribution and monitor health of these colonies. A simplified monitoring program of counting individual plants and GPS mapping from year to year will detect any significant changes in distribution and abundance that would then trigger management.

### **C. Monitoring of Additional Species**

#### ***California Red-legged Frog and San Francisco Garter Snake***

Monitoring over the course of the HCP has focused primarily on the butterfly species of concern, with additional monitoring of rare plants. Occurrences of the federally Threatened California red-legged frog (*Rana aurora draytonii*), (CRLF) and the State and Federally Endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), (SFGS) were reported on San Bruno Mountain up until the early 1970's (Sean Barry, pers. comm.). However focused surveys in the 1980's and early 1990's for these species were conducted and neither species were detected. Both species require the presence of freshwater marsh, ponds, and/or still or slow moving streams with deep pools for breeding (USFWS, 2007). Freshwater marsh habitats associated with Colma Creek on the south and west sides of the Mountain, and on the east side of the Mountain within the Guadalupe Valley, likely supported both CRLF and SFGS at one time, however these habitats were destroyed by road building and urbanization prior to the formation of the Park. Current potential habitat within the HCP area exists at a few isolated freshwater pond/marsh areas in Colma Creek, the western Saddle, and at the PG&E marsh in Daly City. There have been no recorded observations of California red-legged frogs or San Francisco garter snakes on San Bruno Mountain during the 25-year span of the HCP.

Restoration work to remove eucalyptus forest and restore riparian wetland habitat within Colma Creek by the HCP Habitat Manager and by Heart of the Mountain has expanded the amount of riparian corridor by approximately 4 acres over the last 12 years. However the lack of ponds and freshwater marsh habitat on San Bruno Mountain likely prevents the potential for establishment of breeding populations of CRLF and/or SFGS at this time. If suitable breeding habitat were to be re-established for these species on San Bruno Mountain, reintroduction would likely be necessary due to the significant urbanization barriers surrounding the Mountain that inhibit natural recruitment of the animals from known breeding locations.

#### ***Bay Checkerspot Butterfly***

The bay checkerspot butterfly, a federally Threatened butterfly, was observed to be present within a linear band of habitat 0.8 kilometers in length along the summit of San Bruno Mountain. This species has not been recorded on the Mountain since 1984, after a wildfire burned through its habitat.

The species was extremely limited in its distribution on San Bruno Mountain, and was once thought to be extirpated from the Mountain during a drought in 1975-1977, when no observations were made. The population rebounded to "several hundred" individuals in 1981. Surveys conducted in 1982, 1983, and 1984 found very few individuals (average of 10 per year) during an attempt to assess the population through a mark and recapture study (Thomas Reid Associates, 1985 SBM HCP Annual Report). At that time, it should be noted that it was not illegal to collect bay checkerspot butterflies. The combination of an extremely small population size, drought, wildfire, and possibly collection appears to have brought about the extirpation of bay checkerspot butterflies on the Mountain, as no individuals have been observed on San Bruno Mountain since 1984. The host plants for this species, California plantain (*Plantago*

*erecta*) and owl's clover (*Castilleja densiflora*) are still found within coastal prairie grasslands on San Bruno Mountain.

The USFWS designated Critical Habitat for this species on San Bruno Mountain in 2001. The acreage defined by the Service is located on the eastern half of the Mountain, and is located above the 500 foot elevation contour. Host plants for the species occur in isolated locations both within and outside of the designated Critical Habitat area on the Mountain. San Bruno Mountain represents the most northerly part of the subspecies' former range on the San Francisco peninsula and has reasonably good conditions to support the species. The San Bruno Mountain unit is considered as an essential supporting element of the San Mateo metapopulation, and a backup to the Edgewood and Jasper Ridge populations (USFWS 2001).

At the inception of the HCP, the solitary bee (*Dufourea stagei*) and the San Francisco tree lupine moth (*Grapholita edwardsiana*) were recorded on the Mountain and proposed for protective status, but were later determined to be relatively common by the USFWS.

A variety of large and medium-sized mammals have been reported within the last three years (2004-2006) on San Bruno Mountain including mountain lion (*Felis concolor*), coyote (*Canis latrans*), mule deer (*Odocoileus virginianus*) and badger (*Taxidea taxus*). In addition red foxes (*Vulpes vulpes*), a nonnative species, have colonized the Mountain within the last 2-3 years, and are apparently breeding on the Mountain based on reports from workers at the Guadalupe Quarry.

### **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 1900's. 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 bumblebees 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 (Thorp, pers. comm.).

Due to their importance as pollinators of a wide variety of native plant species, a loss of bumblebees either in diversity or abundance, could negatively impact the ecosystem 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 status is recommended.

Monitoring for additional species of concern may be conducted and academic research on the Mountain is encouraged to provide this additional information. HCP monitoring funds are focused on the endangered species and their habitats, as required under the HCP permit. While monitoring is focused on the butterflies of concern and rare plants, study and management of the Mountain's overall ecosystem will benefit the listed species.

## **D. Monitoring of Plant Communities and Invasive Species**

Vegetation types including invasive species were first mapped by TRA in 1981, as part of the biological study for the HCP. This data was compared to US Forest Service vegetation maps

from 1932 (SBM HCP Vol.1. Figure III-5), and this provided the basis for understanding the overall magnitude of the threats posed by invasive species and coastal scrub succession to the grassland habitat. During the course of the HCP, invasive species and vegetation types were mapped in 1993 and 1996 using aerial photography and ground truthing. This information was used to develop 5-year strategic plans. Since 2002 with the advent of digital ortho-photography and global positioning navigation systems (GPS), this format has been used to map the vegetation.

The methodology for tracking finer course progress on invasive species control within the HCP area has been through daily recording of individual numbers and acreages of invasive species treated by hand control, mowing, and herbicide methods. This data is summarized and reported with a map showing all areas treated in the SBM HCP Annual Reports (1982-2006).

Photo points established on the Mountain in the early 1980's have also provided a means by which to track vegetation changes on the Mountain. A system of photo points was used to track the progress of gorse control within the Saddle for several years. Though gorse is now controlled in most of these areas monitored, monitoring should continue at some of these sites to document the on-going status of the area. Currently photo points are established in several locations on the Mountain, however a systematic method of collecting photo point data needs to be established and implemented within representative areas over the entire HCP area.

Effectiveness monitoring to date has focused on evaluating large scale changes on the Mountain, and putting as much money as possible into invasive species control work. However more effort is needed to evaluate small-scale changes in vegetation composition due to the potential impact these changes may have on the species of concern and the native plant communities of San Bruno Mountain.

While the early years of effectiveness monitoring conducted through the HCP focused on the large and/or woody invasive species (gorse, pampas grass, French broom, fennel, eucalyptus), recent years have focused on tracking the extent of herbaceous species such as Bristly ox-tongue, Italian thistle, wild radish, and Bermuda buttercup. Though several of these herbaceous species were present on the Mountain for years, they appear to have increased over the past two decades, possibly due to climatic and/or soil changes occurring on the Mountain.

Evaluation of habitat areas is currently conducted on a semi-annual basis through a review of all sites by the Habitat Manager (TRA) and the subcontractors. During these meetings, strategies and methods are discussed, and changes made where necessary to maximize the protection of endangered species habitat. Because the Habitat Manager conducts the endangered species monitoring program and oversees the habitat management programs, this arrangement has allowed for direct transference of "on the ground knowledge" of the current status of endangered species habitat to the restoration/ invasives control subcontractors. This arrangement allows management to adapt to changing conditions observed on an annual or sub-annual basis within the butterfly habitat and is crucial for maximizing protection of the endangered species habitat.

Table 5 shows the methodology for monitoring effectiveness of the habitat management efforts. For monitoring the vegetation on San Bruno Mountain, at least two scales are necessary. One to track the overall changes in vegetation types occurring on the Mountain (larger course), and the second to track changes in vegetation composition within the different plant communities (finer course). To track large scale changes in vegetation, it is proposed that mapping using aerial ortho-photo interpretation and ground-truthing be continued on a 5-year rotation. To track grass and herbaceous species presence and distribution within the grasslands, institution of a monitoring design that can effectively track these changes is needed.

The specifics of the monitoring program may need to be modified based on preliminary monitoring results and the types of vegetation management programs being implemented. For instance, approval of a pilot grazing program and/or pilot brush control program may require the addition of vegetation monitoring within specific locations, and require additional types of data. The overall vegetation monitoring system will be adapted or redesigned as needed based on input from the TAC and the USFWS, with approval from the HCP Trust, to ensure that the methodology used meets the desired objectives.

**Table 5. Effectiveness Monitoring Program for the San Bruno Mountain HCP Area**

Sampling Area	Monitoring Objective	Sampling Method	Sampling Unit	Replicates	Monitoring Interval	Data Types (*potential)
HCP Area	Status of vegetation types	Digital aerial ortho-photography and GIS vegetation analysis	HCP Area	N/A	Once every 5 years	Vegetation Types
Representative locations within a variety of habitat types	Status of vegetation composition	Quadrats/ Transects or other method	TBD	TBD	TBD	Species composition Percent cover Residual dry matter *Soil nitrogen Photo points
HCP Area	Tracking of Invasive species control and vegetation management work	Daily Data sheets and spreadsheets	Variable (depends upon invasive species patch size)		Each Workday	Control Method ( <i>Hand/ Herbicide/ Mowing/ Grazing</i> )  Control Type ( <i>Herbicide type, etc</i> )  Number of Plants Removed/ treated  Estimated Density  Area Treated ( <i>GPS</i> )

Establishment of transects and/or quadrats for ongoing vegetation sampling and analysis is recommended. Within the core habitat area, a selection of grassland and brush sites should be chosen that represent the vegetation communities of the Mountain and these should be consistently monitored over time. Data collected should include species composition, species percent cover and residual dry matter. Other data collected could include soil nitrogen levels. Sampling within each unit should be conducted within both managed and unmanaged areas.

Recording treatment information is vital towards evaluating the effectiveness of management tools, or combinations of management tools over time. The current system of using daily record sheets to track the number of invasive species and acreage treated through hand control, herbicide and/or mowing should be continued. Additional types of management data will need to be collected including burn intensity, residual dry matter, timing and duration of treatment events, types and number of livestock, etc.

The Habitat Manager reports the results of habitat management and monitoring efforts to the HCP Trust and the US Fish and Wildlife Service on an annual basis (San Bruno Mountain HCP Annual Reports 1982 – 2006). In addition (since fall 2006) the Habitat Manager provides updates on management efforts on a quarterly basis to the San Bruno Mountain HCP TAC.

## **IX. STATUS REPORTS FOR HCP HABITAT MANAGEMENT**

The HCP annual reports will stay consistent in content to previous years, but will switch to a biannual cycle (with USFWS and HCP Trustees approval). The format based on previous reporting, is presented below.

### **SUMMARY AND INTRODUCTION**

#### **1. STATUS OF SPECIES OF CONCERN**

- a. Mission blue Butterfly (*Icaricia icarioides missionensis*)
- b. Callippe Silverspot Butterfly (*Speyeria callippe callippe*)
- c. San Bruno Elfin (*Callophrys mossii bayensis*)
- d. Special Status Species Butterfly Monitoring Discussions and Conclusions
- e. Bay Checkerspot Butterfly (*Euphydryas editha bayensis*)
- f. San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*)
- g. California Red-legged Frog (*Rana aurora draytonii*)
- h. Plants of Concern

#### **2. STATUS OF VEGETATION MANAGEMENT AND RESTORATION**

(Summary of Work by Management Unit)

- a. Invasives Control (hand/herbicide/mowing)
- b. Burns (pile burning, wildfire post-burn management)
- c. Grazing
- d. Restoration (Habitat Islands)

#### **3. DEVELOPMENT ACTIVITIES**

- a. Status of Development
- b. Status of Restoration Work

#### **4. VOLUNTEER ACTIVITIES**

#### **5. SPECIAL PROJECTS**

#### **REFERENCES AND STUDY PARTICIPANTS**

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**APPENDIX A**

**Butterfly Habitat Restoration Guidelines**

**SAN BRUNO MOUNTAIN HABITAT CONSERVATION PLAN  
MISSION BLUE AND CALLIPPE SILVERSPOT  
BUTTERFLY HABITAT RESTORATION GUIDELINES**

Prepared by

Patrick Kobernus  
Thomas Reid Associates

Updated: August 2003

## Objectives

The purpose of this document is to provide information to professional and volunteer restorationists that are conducting work to restore endangered butterfly habitat on San Bruno Mountain. Restoration of graded or disturbed lands are a requirement of the San Bruno Mountain Habitat Conservation Plan (HCP). The primary goal of the restoration work is the establishment of high quality habitat for the Mission blue (*Icaricia icarioides missionensis*) and Callippe silverspot (*Speyeria callippe callippe*) butterflies. Restoration work has been ongoing on the Mountain since the mid-1980's.

The following guidelines address some of the previous problems and will assist restoration professionals and volunteers with accomplishing the habitat restoration goals of the HCP. They should 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, San Mateo County.

## Problems to Avoid

The following is a list of problems that have occurred in the past with restoring butterfly habitat on San Bruno Mountain:

- 1) Not enough seed is collected (i.e. the seed collection window is missed, or there is a lack of knowledge of where to collect).
- 2) Propagated plants are too small and root structure is not developed enough to survive the first few months after installation.
- 3) Plants are not planted in appropriate locations. (i.e. host plants are planted in areas that are too moist or too rocky).
- 4) Plants are not sufficiently protected from herbivore predation (e.g. snails, brush rabbits, mice).
- 5) Invasive species, coastal scrub, and/or weedy annual grasses and forbs are not controlled well enough around planting areas.

## Measurement of Success

For successful establishment of butterfly habitat, four components are needed:

- 1) planting is done in appropriate **soils**
- 2) planting is done on appropriate **slope exposure** to provide wind shelter
- 3) planting is done with sufficient densities of **host and nectar plants**
- 4) planting sites are routinely **monitored and maintained** to insure plant survival

The best measure of success in establishment of endangered butterfly habitat is density of host plants. The following table shows the recommended densities of host plants that will provide high quality Mission blue (MB) and Callippe silverspot (CS) butterfly habitat. The figures in Table 1 should be used to determine how much seed to collect and how many plants should be propagated for restoration projects on San Bruno Mountain.

**Table 1.** Plant densities recommended to establish Mission blue and Callippe silverspot habitat. Based on natural habitat areas that support MB and CS colonies.

Requirement	Mission Blue	Callippe Silverspot <sup>1</sup>
Number of host plants (For planting, it is recommended that 2-4 times as many plants are planted per acre to account for 50-75% mortality).	A minimum of <b>100 <i>Lupinus albifrons</i> and/or <i>Lupinus formosus</i> plants</b> established per acre.	A minimum of <b>250 <i>Viola pedunculata</i> plants</b> established per acre.
Plant health	Plants should be well established, and have set seed for at least one growing season.	Plants should be well established, and have set seed for at least one growing season.
Planting design/ spacing	Established habitat should be concentrated in small habitat islands (0.1- 0.25 acres in size).	Established <b>habitat should have 500 - 1500 plants</b> within a large habitat island (0.1- 0.5).
Nectar plants	A minimum of <b>100 nectar plants</b> (combination of species) should be established per acre, concentrated within habitat patches.	A minimum of <b>100 nectar plants</b> (combination of species) should be established per acre concentrated within habitat patches.

1. For Callippe silverspot habitat, *Viola* patches tend to be more spread out. The smaller habitat island approach is still recommended due to the difficulty in controlling weeds within larger habitat patches.

The recommended plant densities were determined from biological data collected in 1999 in habitat areas that have supported consistent MB and CS colonies. The MB densities are based on data taken from fourteen 50 by 10 meter transects that have Mission blue utilization. The average number of lupines was found to be 67 medium-sized plants (2.5% cover) per 0.125 acre. Multiplying this number by 1.5 to account for lupines on the periphery of the transect that were likely contributing to the MB observations gives a total of 100 plants per 0.125 acres. Typically these high quality patches of roughly 100 plants occurs on the frequency of one patch per acre, or less.

The CS host plant densities are based upon *Viola* distribution data collected on the Northeast Ridge in 2000. The Northeast Ridge has had consistent observations of Callippe silverspots over the past 18 years of monitoring. The range of host plant densities estimated for *Viola* was approximately 500 - 1500 plants per acre on 25% of the lands of the Northeast Ridge. This corresponds to an average of 250 plants per

acre. (“plants”=clumps that appear to be individual units from above. Root structures were not investigated).

The Viola planting islands should be placed on appropriate soils, possibly higher up on the slopes to allow seed to spread downhill. Due to the difficulty in establishing grassland on steep graded slopes, the establishment of CS planting islands in the conserved habitat areas should be an option if it's determined that it's too difficult to establish Viola on the graded slopes. This is a satisfactory trade-off as long as the 250 plants per acre criteria is followed. (Establishing lupines on graded slopes has not been as difficult).

### Habitat Islands

Planting should be done in relatively small islands where weeds can be controlled more easily. This approach cuts down on the area where maintenance is required. To determine appropriate planting areas with proper soil conditions and slope exposure, habitat island sites should be chosen with assistance from the Habitat Manager.

A recommended size for planting islands is from 0.1 - 0.25 acres. For monitoring purposes, these areas should be delineated in the field with stakes, and recorded on high resolution maps (preferably using GPS). The number of plants planted in each island area should be recorded and each plant or cluster of plants marked in the field with flagging or tags. Planted plants should be counted so they can be differentiated from plants that naturally colonize the site.

### Seed Collection for Butterfly Host and Nectar Plants

For seed collection on San Bruno Mountain, two permits are required. First, a seed collection permit must be obtained from San Mateo County Department of Parks and Recreation. Also required is an HCP Site Activity Permit from the Habitat Manager. The Habitat Manager can suggest collection locations and provide information on the status of seed development for specific plant species.

*Viola pedunculata* seeds need to be collected in the spring (May) when the seed pods have ripened and have a black caste to them. The seed collection window is short, only a few weeks long. Several areas on the Mountain should be checked routinely in the spring to insure seed is collected.

*L. albifrons* and *L. variicolor* seeds need to be collected in May/June, and *L. formosus* in June/July. *L. albifrons* and *L. formosus* are the favored host plants for the mission blue butterfly, and these should be collected in much higher amounts than *L. variicolor*. When ripe, lupine seed pods become swollen and begin turning from green to brown.

Table 2 shows the butterfly plants and estimated time of year for seed collection. Plants should be inspected during the spring to assess plant stage because collection time can vary greatly from year to year.

**Table 2.** Host and nectar plants of the Mission blue and Callippe silverspot butterflies.

Butterfly	Plants	Collection Time
Host Plants		
Mission blue	<i>Lupinus albifrons</i>	May/June
Mission blue	<i>L. formosus</i>	June/July
Mission blue	<i>L. variicolor</i>	June
Callippe silverspot	<i>Viola pedunculata</i>	May
Nectar Plants		
MB & CS	<i>Eriogonum latifolium</i> (coast buckwheat)	Aug/Sept
MB & CS	<i>Monardella villosa</i> (coyote mint)	Aug
MB	<i>Phacelia californica</i>	July/Aug
MB & CS	<i>Cirsium quercetorum</i> (brownie thistle)	June/July
MB	<i>Heterotheca sessiliflora bolanderi</i> (A.K.A. <i>Chrysopsis villosa</i> (golden aster))	Aug/Sept
MB	<i>Achillea millefolium</i> (yarrow)	July/Aug
MB	<i>Sisyrinchium bellum</i> (blue-eyed grass)	June
MB & CS	<i>Horkelia californica</i>	July/Aug
MB	<i>Sidalcea malviflora</i> (checkerbloom)	May/June
MB & CS	<i>Dichelostemma capitatum</i> (blue dicks)	June

### Seed Germination and Growing

Viola seeds should be put into a 3:1 (moistened peat/ seeds) mix that is then stratified in a refrigerator (40-45F) for 3 weeks to a month until they begin to germinate. Seedlings can then be taken out and sewn into stubbies (7 cubic inch cells). *Violas* need to be grown in the nursery for several months to over one year, and have a well developed root structure (25-75 % of cell is occupied by roots) before planting (personal communication Nicole Salgado, SLUG nursery).

Lupines require a pretreatment to break down the hard seed coat and accelerate germination. Seeds can be scarified by rolling seeds between sheets of sandpaper, then sewed into D-16 (16 cubic inch) cells. Lupines should be grown for approximately 6 months and have a well-developed root structure (25-75 % of cell occupied by roots) before planting.

Nectar plants should be sewn into flats and then moved into two inch square pots for growing. Plants should have a well developed root structure (25-75 % of cell occupied by roots) before planting.

### Planting Strategies

#### **Callippe Silverspot Habitat**

1. Plant *Viola* in larger habitat islands on gradual to steep slopes where there is good soil development and grasses have already been well established. For rocky, graded slopes, consider using hydro-mulching and soil amendments (nutrients, mycorrhizae), to develop soil prior to any host plant planting.
2. Plant *Viola* as propagules in winter or as dormant root masses in fall\*. Plant *Viola* in small clusters and mark them. Plants should be planted where soils are appropriate. Plant nectar plants in surrounding spaces between or on periphery of *Viola* clusters.
3. Routinely visit and maintain each planting island area by pulling large weeds, and mowing annual grasses around the host and nectar plants.
4. Consider using covering to protect the *Viola* from herbivorous animals (i.e. mice, rabbits).
5. Consider supplemental watering if necessary.

#### **Mission Blue Habitat**

1. Plant lupines in smaller habitat islands. Plants should be planted in disturbed soils in appropriate locations and not uniformly spaced apart. Plant *Lupinus albifrons* in rockier, thinner soiled locations and/or in deeper soil spots. Plant *Lupinus formosus* only in deeper soil or sandy soil spots.
2. Plant (or seed) *lupines* in small clusters and mark them. Plant nectar plants in surrounding spaces between or on periphery of lupine clusters.
3. Consider using snail bait if snail predation on lupine appears to be a problem.
4. Routinely visit and maintain each planting island area by pulling large weeds, and mowing annual grasses around the host and nectar plants.
5. Consider supplemental watering if necessary.

### Vegetation Management

Restoration sites will probably require vegetation management to prepare and to keep slopes in a condition to support butterfly habitat. Techniques such as mowing, burning, herbicide treatment, or grazing should be incorporated into the long-term restoration plans. These techniques are needed to maintain the health and vigor of the native grassland habitat by reducing competition from weeds, coastal scrub, and annual

grasses, and removing thatch. Burning and grazing programs will require special permits/authorization from the County and/or other agencies before they can be implemented.

### 5-Year Maintenance Period

The HCP's mandatory 5-year maintenance period commences after all initial restoration work (erosion control, exotic plant control, and planting) has been completed. This period begins once the Plan Operator has determined that the property is stable from erosion, mostly free of exotic pest plants, and initial restoration seeding and/or planting has been successful.

If the Plan Operator has determined that butterfly habitat has been successfully established after the 5-year maintenance period has expired, dedication of the property can occur. If problems with exotic pest plants, erosion, poor survival of restoration planting, or habitat degradation from other factors is evident after 5 years has elapsed then the maintenance period would continue until the problems have been solved. Not until then would the Plan Operator determine that success is attained and accept the dedicated lands.

# **San Bruno Mountain Habitat Management Plan 2007**

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## **APPENDIX B**

### **Management Units**

## Appendix B. Management Units

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The following is a description of each of the 13 management units including a description of the topography, vegetation communities, invasive species, and rare and endangered species. A brief description of past and current land-use and management practices is also provided. Finally, conservation needs are identified and recommended management is provided. Each management unit map shows: 1) Priority management areas, 2) invasive species infestations, 3) proposed brush control areas, and 4) potential grazing areas.

### 1. Southeast Ridge (191 acres)

#### Figures 1 and 2

The Southeast Ridge is located on the far eastern edge of the Mountain and is bordered by Bayshore Boulevard and Highway 101 on the east and south, and the ridge trail on the north. The unit has expansive areas of grassland on steep slopes and narrow bands of coastal scrub and some woodland vegetation within the ravines. The lower slopes have an Indian midden site (the Preservation Parcel), and development grading has been done on the southeastern corner and eastern flat areas for the Terrabay Phase III commercial development. The grassland within this unit has infestations of French broom, fennel, and a variety of herbaceous weeds (Figure 1).

The unit has significant mission blue and callippe silverspot habitat along the upper ridgelines and on the northern slopes between Bayshore Boulevard and the ridge. Significant patches of mission blue habitat are located along the ridge trail and on fire roads, rocky outcrops and slumps within the unit. Approximately 75% of this unit is within the Priority 1 management area (Figure 2).

The lower northern slope of this unit includes the Preservation Parcel, which is an Ohlone Native American midden site. The steep slopes were used for cattle grazing

primarily in the last century. A San Francisco Water Department pipeline runs through the eastern side of the unit, and the Terrabay Phase III commercial development is currently under construction on the more gradual slopes on the southeastern side of the unit. The Southeast Ridge has very dry conditions in summer and fall, and is prone to occasional wildfires.

<b>Resource</b>	<b>Habitat Value</b>
Mission Blue	High
Callippe Silverspot	High
San Bruno Elfin	Not Present
Bay Checkerspot	Moderate
Native Plant Community Diversity and Dominance	Moderate

#### Conservation Needs and Prescription

This unit, like many grassland areas on the south side of the Mountain, has many species of grassland weeds. Many of these weeds are too ubiquitous to control using herbicide or hand control methods and require the use of burning, grazing and/or mowing. The objective for this unit is to protect existing butterfly habitat and populations through management of grasslands with grazing and control of non-natives.

The conservation prescription for the Southeast Ridge includes the following: conduct grazing to reduce thatch, non-native species coverage, and reverse coastal scrub bristly ox-tongue, and other invasive weeds as a supplement to grazing; consider reseeding native grasses and forbs, including butterfly host plants into sites where non-natives have been dominant; use the 'weed emergency fund' to control weeds on an as-needed basis after wildfires; coordinate with CDF to minimize and restore areas impacted during wildfire control operations.

Figure 1. Southeast Ridge, Invasive Species Map

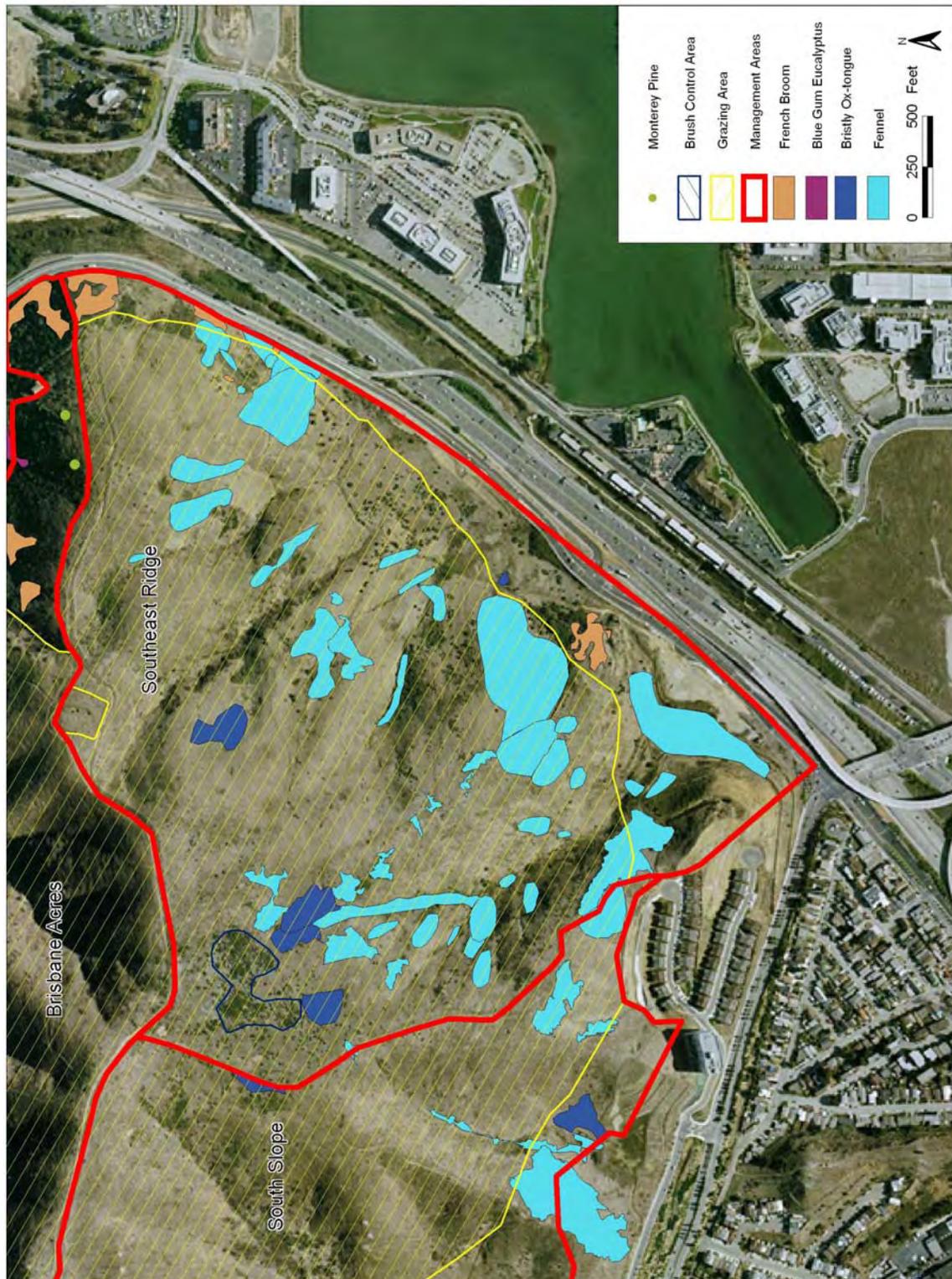


Figure 2. Southeast Ridge, Priority Management Areas



## 2. Brisbane Acres (190 acres)

### Figures 3 and 4

The Brisbane Acres management unit is bordered by the Southeast Ridge management unit on the south side and the City of Brisbane on the north. Steep slopes, ravines and ridgelines compose a significant amount of the topography in the area. The lower northern slopes are typified by non-native Monterey cypress, Monterey pine, French broom and Eucalyptus forests interspersed with native coastal scrub and coast live oak woodland (Figure 3). Residential development rims the northern boundary of the unit. Upper ridge areas are typified by native grassland and a lesser amount of northern coastal scrub. The unit has significant mission blue and callippe silverspot habitat along the upper ridgelines. Significant patches of mission blue habitat are located along the ridge trail and on fire roads, rocky outcrops and slumps within the unit. There are a few rocky outcrops supporting *Sedum spathulifolium* within the unit, which may provide very marginal habitat for San Bruno elfin. A few ridgeline locations also support populations of rare plants including *Diablo helianthella* (CNPS 1B), and one documented location of San Francisco campion (FE). Approximately 50% of this unit is within the Priority 1 management area (Figure 4).

This management area contains high economic value in the form of private residences, infrastructure (including paved and unpaved roads, water tanks, drainage systems, etc.) and close proximity as a view-shed for the City of Brisbane. The area also contains a PG&E easement and is crossed by San Francisco Water District water supply lines.

Based on historical photography and communications with local residents, the unit was thoroughly grazed and burned during the early and middle 20<sup>th</sup> century, and grassland was the dominant plant community at that time. Since then, coastal scrub has reclaimed much of those areas. The Brisbane Acres is prone to occasional wildfires, and the most recent occurred in August 2006 and burned 38 acres.

<b>Resource</b>	<b>Habitat Value</b>
Mission Blue	High
Callippe Silverspot	High
San Bruno Elfin	Low
Bay Checkerspot	Moderate
Native Plant Community Diversity and Dominance	High

This management area currently has a very high fuel hazard and fire risk. The proximity of fuel loads to existing structures and residences within the Brisbane Acres area presents a serious potential threat to human life and health. These threats are in the form of Eucalyptus and Monterey cypress groves with an understory of native and non-native shrubs and trees. Large French broom stands adjacent to and within these non-native forests also represent a fire hazard.

### Conservation Needs and Prescription

This unit, like other higher elevation, north facing grasslands on the Mountain, has significant stands of native grasslands and wildflowers. The objective for this unit is to protect existing butterfly habitat and populations through the management of grasslands through grazing and control of non-natives. Due to the habitat value of this unit, grazing should first be successfully tested on slopes with similar aspects and vegetation before being implemented within this unit. To reduce fire danger, methods such as manual removal and pile burning in winter are recommended to manage brush.

Figure 3. Brisbane Acres, Invasive Species Map

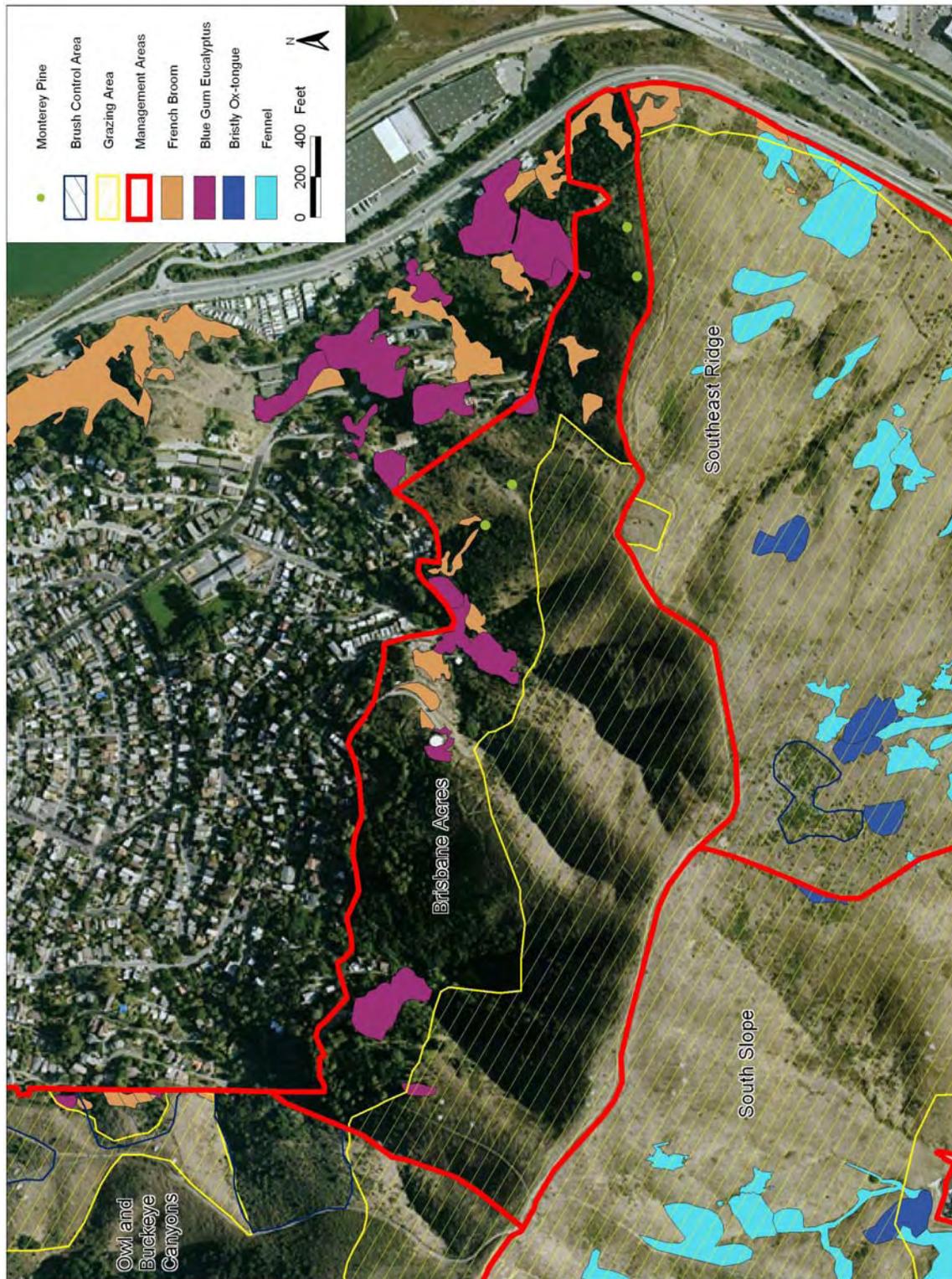
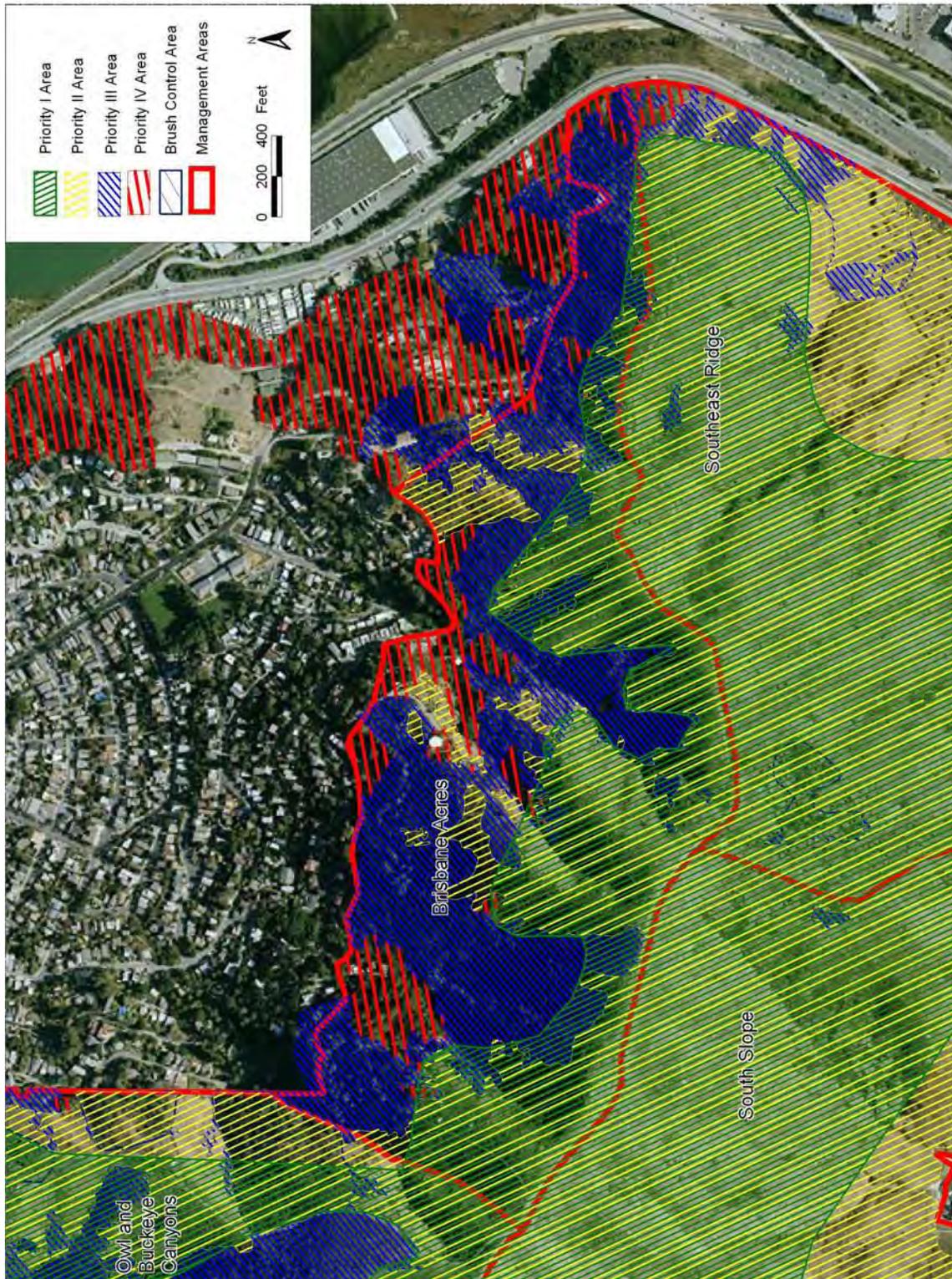


Figure 4. Brisbane Acres, Priority Management Areas



### 3. South Slope (477 acres)

#### Figures 5 and 6

This area is bordered by the ridge trail on the north and the Terrabay development on the south. The South Slope management unit is dominated by grasslands on steep, south facing slopes and ravines. Small areas of coastal scrub and with rocky intermittent drainages occur within the ravines. The Area D landslide and surrounding cut slopes created by the Terrabay development have the low quality habitat due to infestations of fennel, bristly ox-tongue, pampas grass and non-native grasses and forbs (Figure 5). Higher quality grasslands are found on undisturbed middle and upper elevation grasslands. This unit has significant callippe silverspot and mission blue habitat throughout the unit, with important habitat along the Ridge Trail. Approximately 75% of this unit is within the Priority 1 management area (Figure 6).

Resource	Habitat Value
Mission Blue	High
Callippe Silverspot	High
San Bruno Elfin	Not Present
Bay Checkerspot	Moderate
Native Plant Community Diversity and Dominance	High

The South Slope provides a view-shed for the City of South San Francisco. No specifically designated HCP trails are located in this area, other than the ridge trail. However, there are small foot trails and old fire trails along some of the ridges. Historically wildfire, prescribed burning and grazing have been important in maintaining this area as open grassland.

#### Conservation Needs and Prescription

This unit, like many grassland areas on the south side of the Mountain, needs to be grazed and/or burned more frequently to control brush and invasive species. Many of the invasive species are too ubiquitous to control using herbicide or hand control methods and require the use of grazing and/or burning. Weeds have proliferated on the Area D landslide area and adjacent cut slopes, and have radiated outward. It is important that management utilize methods such as grazing and/or burning to reduce thatch build-up and control coastal scrub expansion. Reseeding and planting with native grasses, and butterfly host and nectar plants could improve habitat quality for mission blue and callippe silverspot within the disturbed cut slope areas. Well-established fire buffer zones need to be maintained around the residential developments along the lower slopes.

Figure 5. Southslope, Invasive Species Map

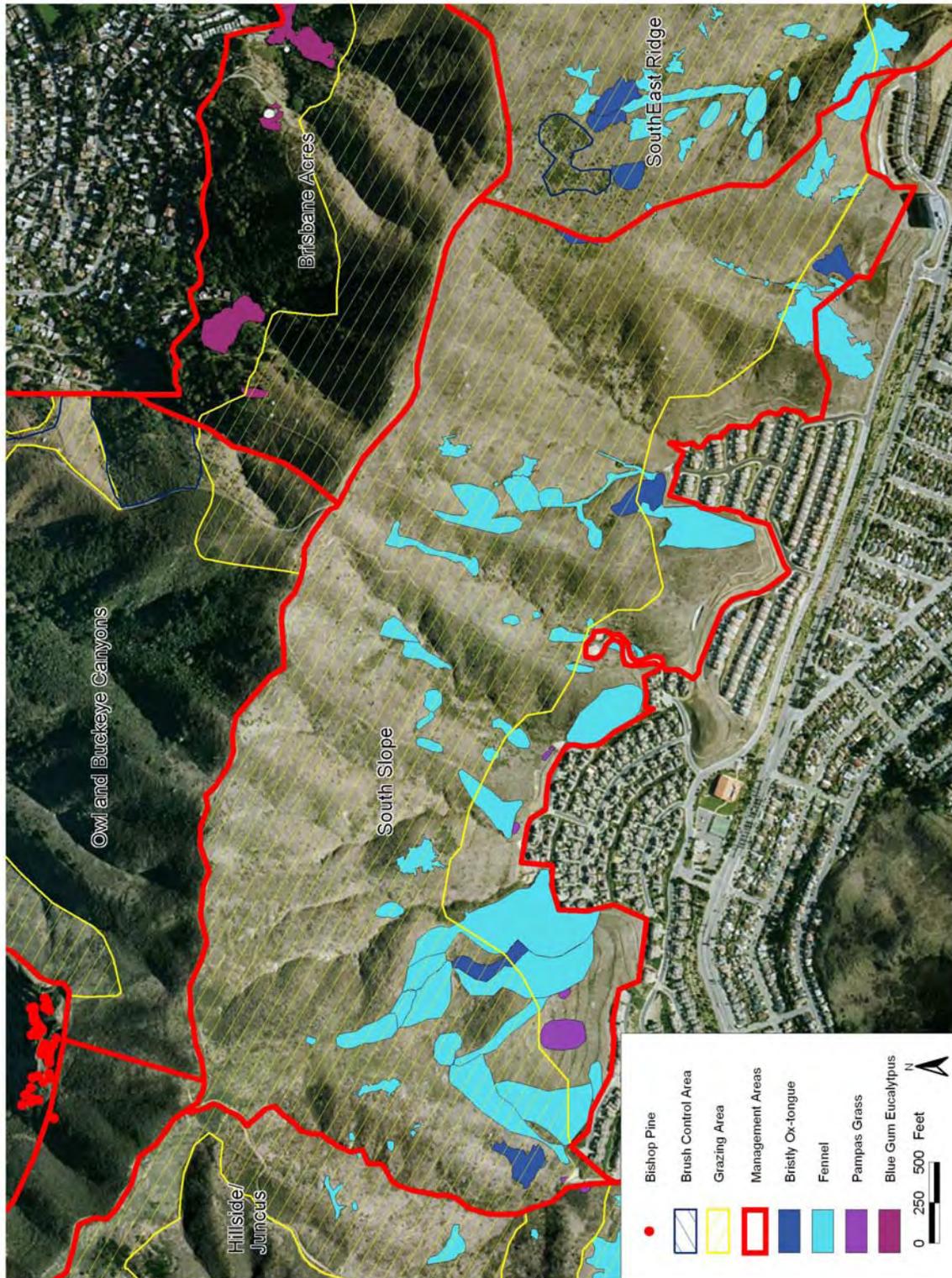
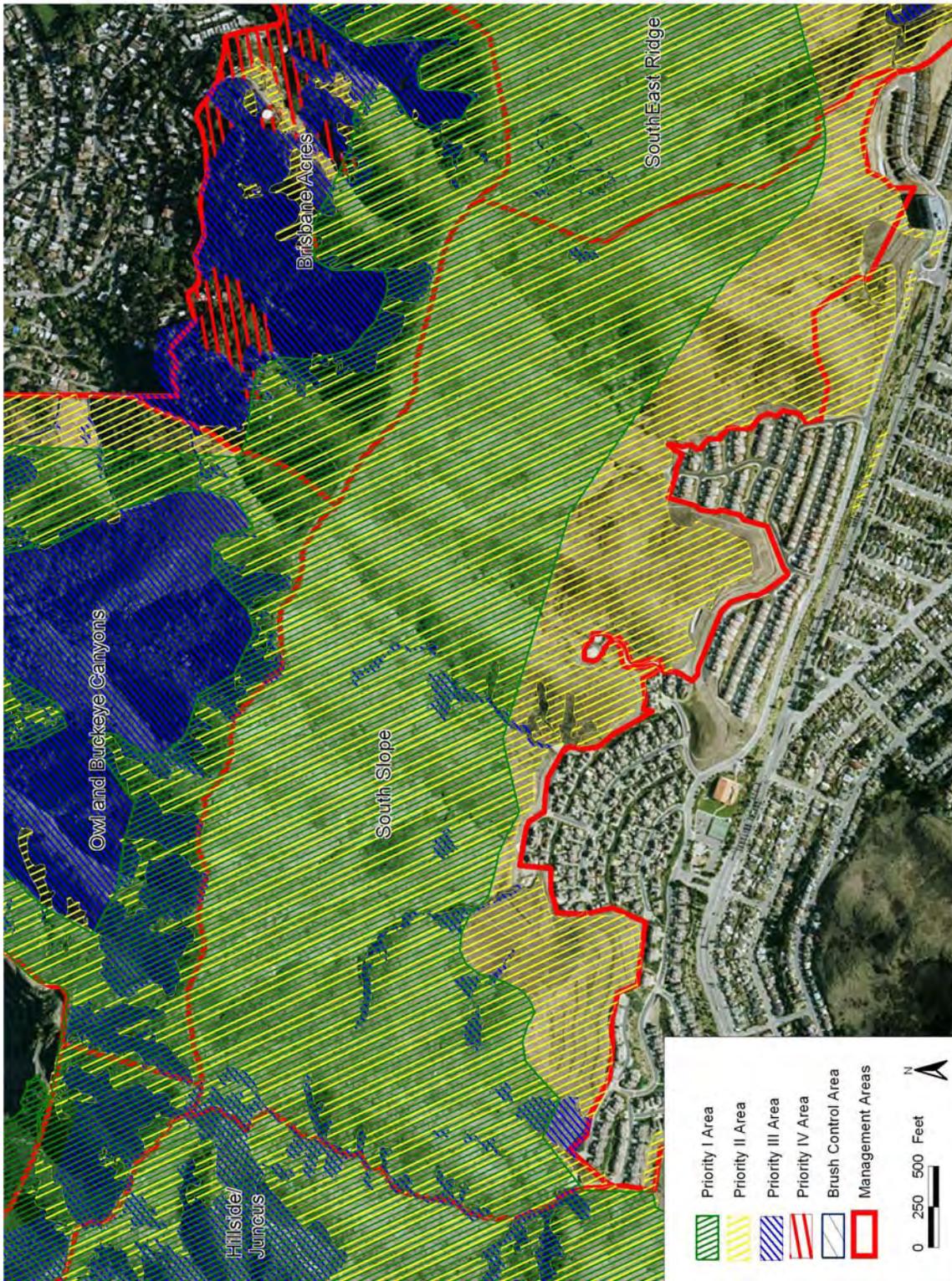


Figure 6. South Slope, Priority Management Areas



#### 4. Owl and Buckeye Canyons (294 acres)

##### Figures 7 and 8

The Owl and Buckeye Canyons management unit is partially owned by the California Department of Fish and Game and is managed by the County of San Mateo. It is located along the southern and western border of the City of Brisbane. The area is characterized by steep canyons and ridgelines. Intermittent drainages are present in the larger canyons and associated ravines. Slopes are typified by native grasslands, and coastal scrub and Coast live oak woodland occupies ravines and slopes at mid-slope positions. Upper ridges are typified by native grassland and prairie communities and a significant amount of northern coastal scrub. The overall extent of invasive, non-native herbs, shrubs and trees is low due to management by volunteer groups such as San Bruno Mountain Watch and the HCP Habitat Manager (Figure 7). The canyons contain a dominance of native, undisturbed communities and some of the best recreational values due to the variety of habitats (coast live oak woodlands, riparian woodlands, seasonal marsh, and coastal scrub). This unit has high habitat value for endangered species within the grassland areas, and overall high ecological diversity. Approximately 50% of this unit is within the Priority 1 management area (Figure 8).

Resource	Habitat Value
Mission Blue	High
Callippe Silverspot	High
San Bruno Elfin	High
Bay Checkerspot	Moderate
Native Plant Community Diversity and Dominance	High

The Quarry Road represents one of the only developed or significantly altered areas within this unit and provides access to the quarry operations. Additionally, the PG&E transmission and gas lines pass through the eastern slope of this management area. A gravel road (Army Road) connects the Quarry Road to the Ridge Trail. Older roadcuts are found on the upper slopes on the west side of Owl Canyon, some of which provide habitat for the San Bruno elfin butterfly.

Buckeye and Owl Canyons were grazed and burned in the past, but have not burned or been grazed for over three decades. As a result, the lower slopes of the unit have converted to coastal scrub vegetation.

##### Conservation Needs and Prescription

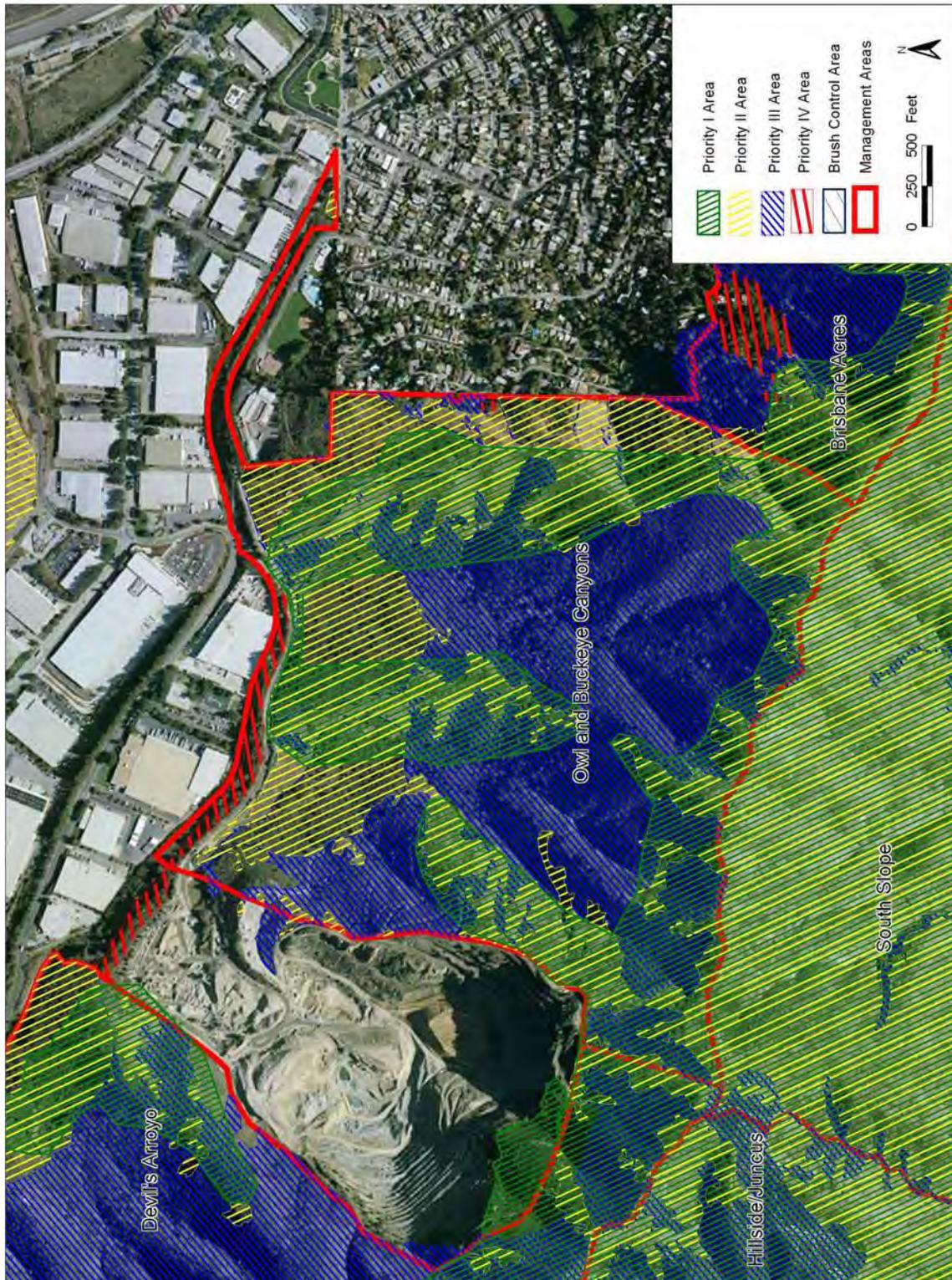
A large stand of French broom occurs on the lower northeastern slopes of this management unit, and on the western boundary near the Quarry. This infestation has been largely contained, but continues to threaten the diverse grasslands and mission blue and callippe silverspot habitat. Other invasive species such as pin-cushion plant (*Scabiosa purpurea*), and annual European grasses need to be managed. Brush control and grazing may be needed to manage the native grasslands more effectively. A fire

buffer should be established and maintained along the western and northern boundary of the unit between habitat areas and the City of Brisbane.

Figure 7. Owl and Buckeye Canyons, Invasive Species Map



Figure 8. Owl and Buckeye Canyons, Priority Management Areas



## 5. Northeast Ridge (214 acres)

### Figures 9 and 10

The Northeast Ridge or the Guadalupe Hills area includes rolling hillsides, terraces and slopes. It is an important habitat area for the callippe silverspot and mission blue butterflies. Grasslands are the dominant community and abundant host plants for both the callippe silverspot and mission blue are present. Plant communities include valley needlegrass grassland, blue wild rye grassland, northern coastal scrub, non-native grassland, eucalyptus forest, and broom shrublands. The grasslands are dominated by non-native annual grasses and herbaceous weeds in many areas, yet the grasslands still support the rare butterflies and their host plants in stable numbers. Approximately 80% of this unit is within the Priority 1 management area (Figure 10). Control work on French broom, eucalyptus and fennel has been effective; however non-native annual grasses and weeds such as Italian thistle and wild radish pose potential threats to the grassland (Figure 9). Eucalyptus groves on the west side are a potential fire risk.

<b>Resource</b>	<b>Habitat Value</b>
Mission Blue	High
Callippe Silverspot	High
San Bruno Elfyn	Not Present
Bay Checkerspot	Low
Native Plant Community Diversity and Dominance	Low

PG&E transmission lines run northeast to southwest across the ridge. The Ridge development is located on Mission Blue Drive spanning the entire southern boundary of the conserved habitat. The Northeast Ridge supports several trails that are well used by the public and therefore provide recreational value.

### Conservation Needs and Prescription

With both mission blue and callippe silverspot abundant on the Northeast Ridge, the greatest conservation need is the restoration and maintenance of grassland habitat. Grazing and burning are two processes that, as is common with the whole of the Mountain, were vital for the maintenance of the Northeast Ridge grassland habitat. In the absence of these processes, exotics and scrub have proliferated. To manage unwanted vegetation, the Northeast Ridge would likely benefit from a cattle grazing program. Areas for restoration and maintenance should be prioritized by butterfly host plant densities. Also, more habitat islands could be created on the Northeast Ridge, such as has occurred on the graded slopes as mitigation by Brookfield Homes. Follow-up herbicide and hand control will be crucial to maintaining areas cleared by grazing from returning to weeds.

## 6. Carter-Martin (129 acres)

### Figures 9 and 10

These rolling hills and steeper slopes have similar topography to the Northeast Ridge management area. The Brisbane Technology Park and Bayshore Boulevard form the southeast border of this management area, while the Guadalupe Canyon Parkway forms the southwestern border. These slopes range from north to south facing, but have predominately northeastern exposure.

Plant communities include northern coastal scrub, valley wild rye grassland, non-native grassland, broom shrubland, and eucalyptus forest. Grassland communities dominate the most acreage within the unit. Though pockets of grassland enriched with a high percentage of native grasses and forbs occur in the area, there is a prominence of grasslands dominated by non-native annual grasses and other invasive herbs and shrubs. The slopes above the Bay Ridge development on the west are exclusively dominated by thick stands of gorse, while the slopes above the Bay Vista and Linda Vista developments are a mixture of native and non-native scrub (French broom) along with non-native herbaceous infestations including oxalis, pampas grass and fennel (Figure 9). The unit has moderate habitat value for mission blue and callippe silverspot. Areas of restoration (planting islands) are present and providing mission blue habitat within this management unit. Approximately 40% of this unit is within the Priority 1 management area (Figure 10).

<b>Resource</b>	<b>Habitat Value</b>
Mission Blue	Moderate
Callippe Silverspot	Moderate
San Bruno Elfin	Not Present
Bay Checkerspot	Low
Native Plant Community Diversity and Dominance	Low

Infrastructure within this management area includes the S.F. Water District lines and easements, and the PG&E transmission lines. Developments and residences include the Brisbane Technology Park, and three residential complexes: Bay Ridge, Bay Vista and Linda Vista. The Carter-Martin management unit provides an open space for hiking and outdoor recreation for the residents of the HCP developments. However, usage does not appear to be significant and there are no designated roads or trails, aside from the S.F. Water Districts access roads.

Dense gorse and broom stands represent significant fuel loads and are mixed with native coastal scrub in places. This mixture of native and non-native scrub is especially prominent on the slopes above Bay Vista and Linda Vista, while the slopes above Bay Ridge are almost exclusively dominated by gorse. Maintaining a minimum 30-foot fuel-free buffer zone around all residences/fence lines and infrastructure is essential for reduction of fire risk to homeowners.

### Conservation Needs and Prescription

A high priority for this area is reversing the establishment of gorse, broom and coastal scrub. This management area has connectivity to other Northeast Ridge grasslands and has a high density of endangered butterfly habitat and butterfly populations. Restoring and maintaining a dominance of grassland communities is essential for this area.

Much of the land in this unit is in the ownership of private landowners and developers, and is to be dedicated to the County as conserved habitat once the lands have been restored to a suitable condition for acceptance. Management of vegetation may include scrub removal and pile burning by CDF crews and goat grazing to reduce the density and extent of heavy non-native brush cover and native scrub. In addition, regular treatments of non-native plant infestations with herbicide and manual removal will be needed. Continuing the establishment of butterfly habitat islands and localized restoration projects is also important.

Figure 9. Northeast Ridge and Carter/ Martin, Invasive Species Map



Figure 10. Northeast Ridge and Carter/ Martin, Priority Management Areas



## 7. Hillside/ Juncus (217 acres)

### Figures 11 and 12

The parcel west of Hillside School is a combination of areas of low quality habitat adjacent to Pacific Nursery and Holy Cross Church coupled with steeper, rocky ravines and slopes (Juncus Ravine and Tank Ravine). There are PG&E Transmission lines through Tank Ravine. Plant communities include northern coastal scrub, coastal terrace prairie, valley needlegrass grassland, central coast riparian scrub, valley wild rye grassland non-native grassland, and eucalyptus forest. Fennel infestations have spread throughout the lower slopes in Tank and Juncus Ravines, and Bermuda buttercup (*Oxalis pes-caprae*) has moved upslope into grasslands from the Pacific Nursery (Figure 11). The habitat value is high for mission blue butterflies and moderate for callippes. Eucalyptus groves are a fire hazard near the school due to the explosiveness of the oils in the trees and the strong westerly winds that frequent this area. Approximately 80% of this unit is within the Priority 1 management area (Figure 12).

The parcel has received extensive control work primarily on fennel in recent years funded by Myer's development and the HCP. A pilot grazing experiment was initiated on the lower slopes in 2003 and focused treatment of Oxalis was performed in 2005 and 2006.

Resource	Habitat Value
Mission Blue	High
Callippe Silverspot	Moderate
San Bruno Elfin	Low
Bay Checkerspot	Moderate
Native Plant Community Diversity and Dominance	Moderate

This management area receives moderate public use. A network of roads and trails favor outdoor recreation hiking, photography, and picnics.

### Conservation Needs and Prescription

Conservation needs include the reduction of scrub communities, continued monitoring and control of oxalis, fennel and other non-natives, and the maintenance of diverse native grasslands. It is recommended that a buffer area be established between Pacific Nursery and HCP lands to help control the introduction of non-native vegetation.

Figure 11. Hillside/ Juncus, Invasive Species Map

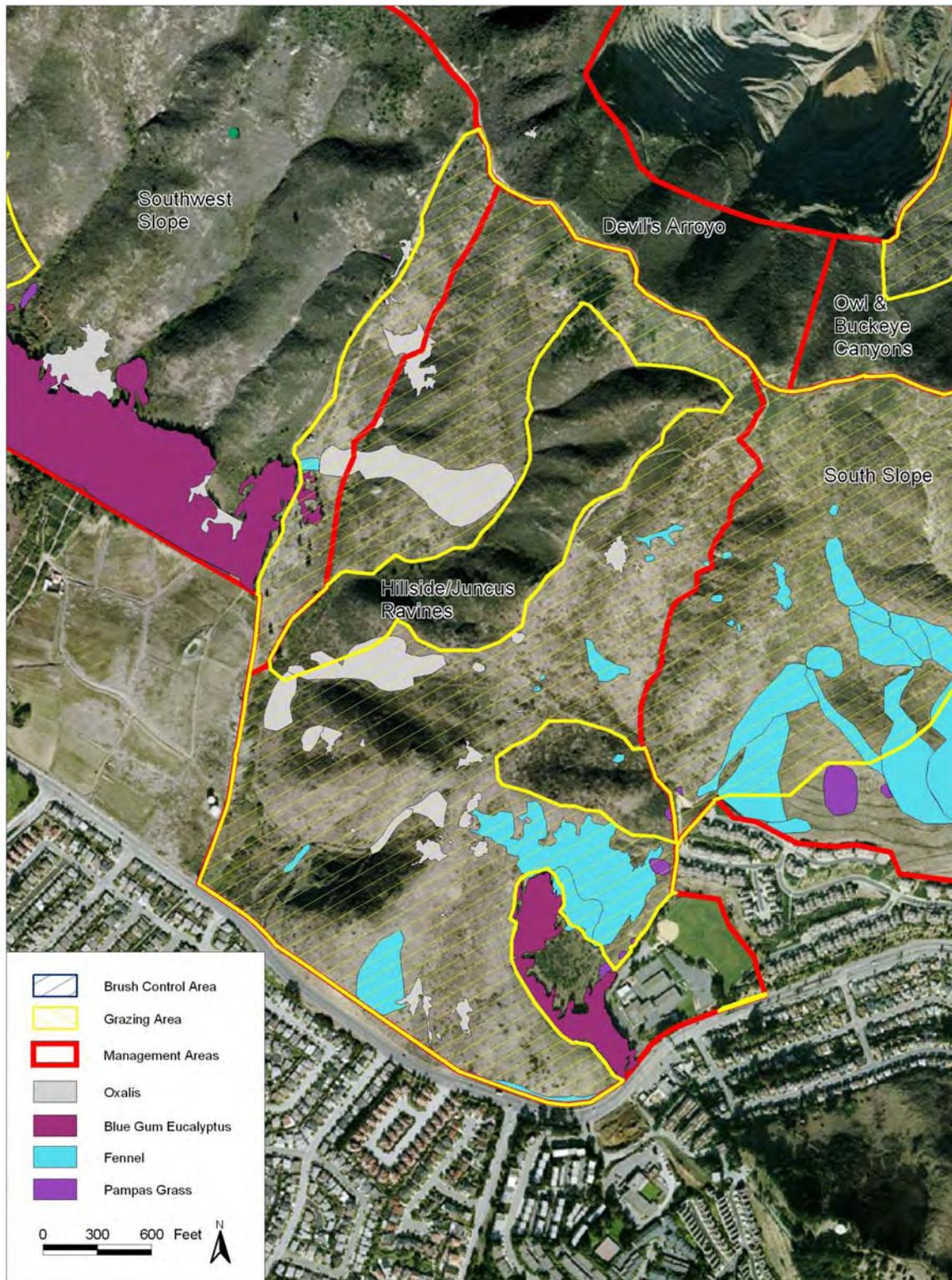
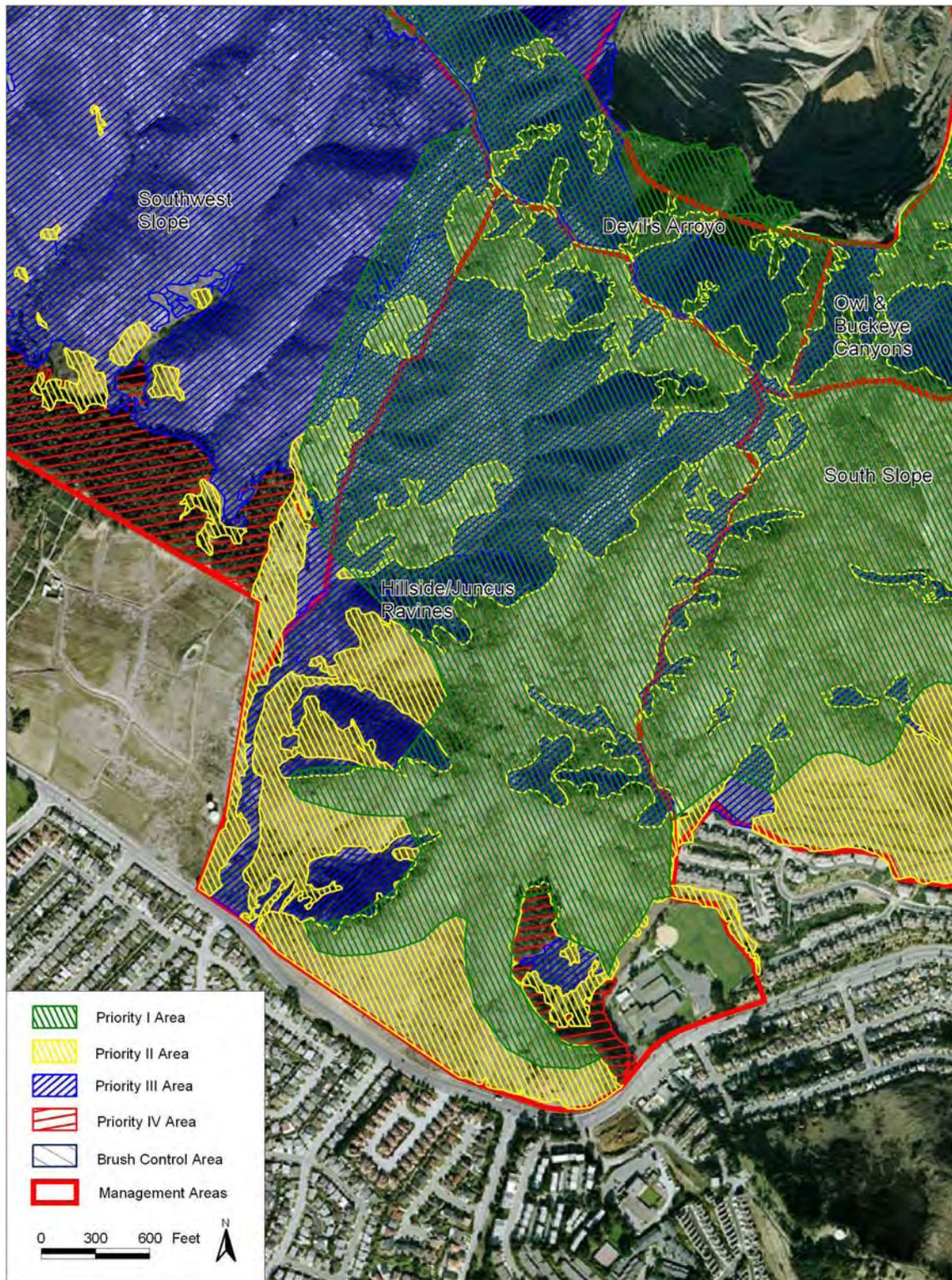


Figure 12. Hillside/Juncus, Priority Management Areas



## 8. Devil's Arroyo (268 acres)

### Figures 13 and 14

Devil's Arroyo represents an area of large expansive slopes covered mostly by dense coastal scrub. Steep north-facing slopes and ravines extend from the base of the slope near the Brisbane Industrial Park to the Summit Trail. Plant communities include blue blossom chaparral, northern coastal scrub, coastal terrace prairie, valley needlegrass grassland, central coast riparian scrub, eucalyptus forest, broom shrubland, and non-native grassland. Relatively small yet botanically diverse grassland patches are found on ridgelines and balds on the upper slopes of this unit. The habitat value is high for San Bruno elfin butterflies, and moderate for mission blue and callippe silverspot butterflies. Manzanita Dike, the largest colony of San Bruno manzanita (CE, CNPS 1B) is found in Devil's Arroyo. Montara manzanita (CNPS 1B) is also found within this management unit. The Summit Trail forms the southern boundary, the Guadalupe Valley Quarry forms the eastern boundary, the Brisbane Industrial Park the northern boundary, and the eastern ridgeline adjacent to Dairy Ravine forms the western boundary. The upper slopes of this unit are mostly pristine, while the lower slopes have non-native infestations emanating from disturbed areas around the industrial park (Figure 13). High fuel loads are present in this area from build-up of dense scrub communities coupled with steep inaccessible slopes. The last burn event that occurred in this unit was in 1964. Approximately 40% of this unit is within the Priority 1 management area (Figure 14).

Resource	Habitat Value
Mission Blue	Moderate
Callippe Silverspot	Moderate
San Bruno Elfin	High
Bay Checkerspot	Moderate
Native Plant Community Diversity and Dominance	High

This unit was likely grazed and burned in the past, and supported a greater extent of grassland that it has currently. No structures or development is within this unit, except for PG&E Transmission and gas lines which extend in a north south direction through the unit. Although Devil's Arroyo provides dramatic views of coastal prairies and shrublands there are no maintained trails through this unit, except for the ridge trail along the southern boundary.

### Conservation Needs and Prescription

Maintaining stands of native grasslands and conserving the endemic manzanita species should be focus of this area, in addition to maintaining healthy stands of blue blossom chaparral. Senescent stands of chaparral are ubiquitous through this unit. Blue blossom, a fire-dependent plant species, needs to burn in a hot fire approximately every 25-35 years in order to germinate and recruit new stands to replace old and decaying shrubs.

Figure 13. Devil's Arroyo, Invasive Species Map

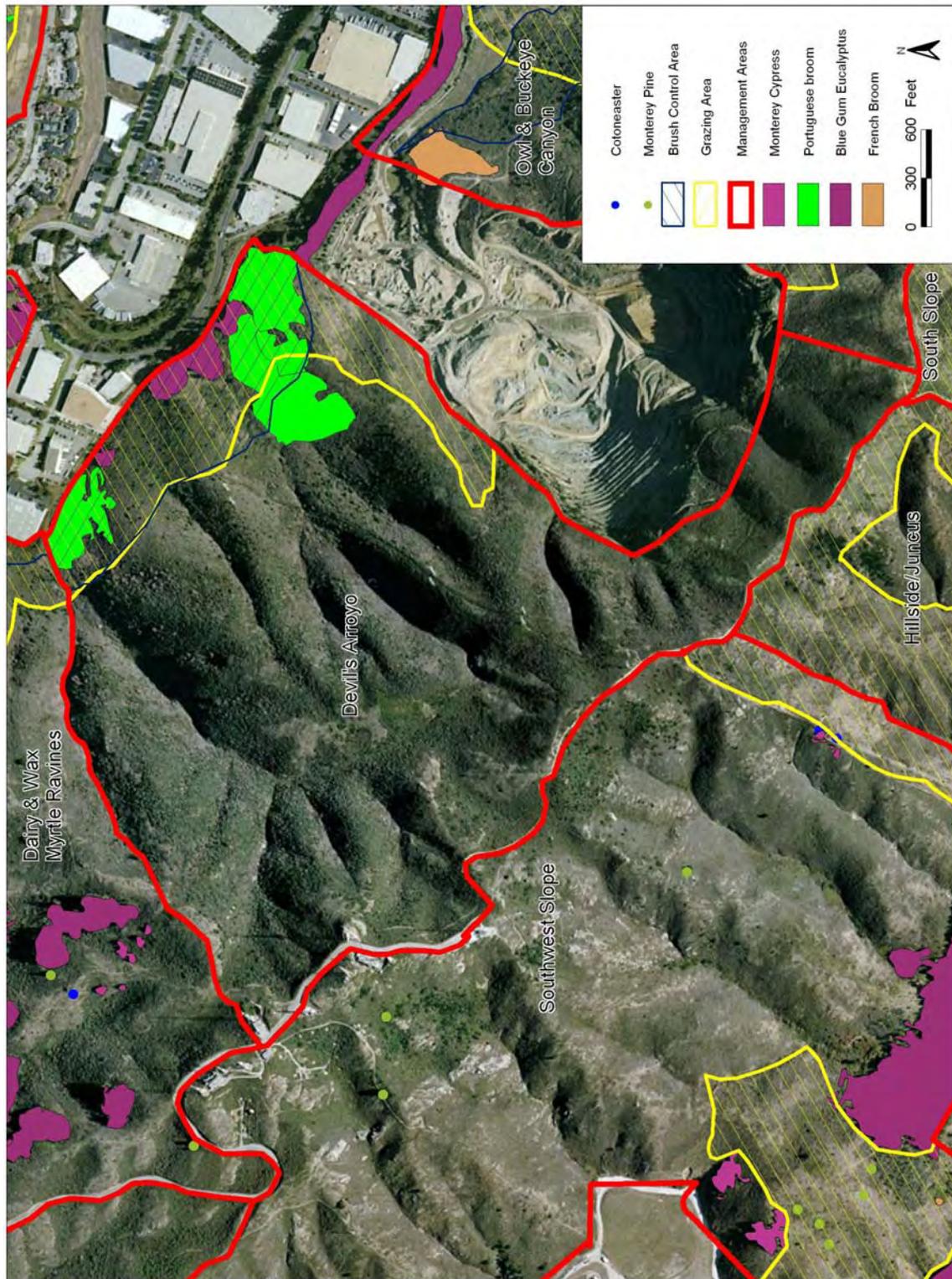
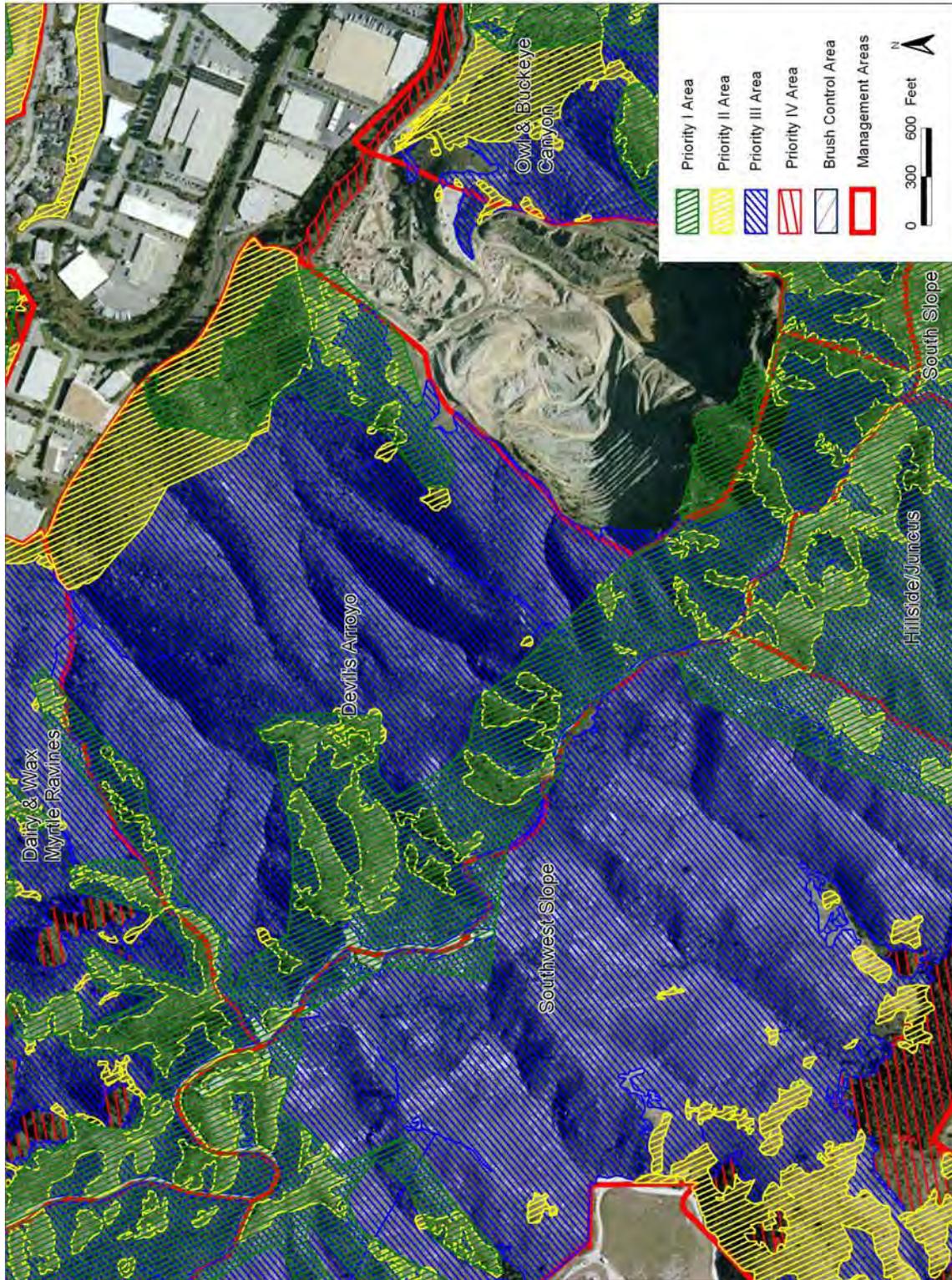


Figure 14. Devil's Arroyo, Priority Management Areas



## 9. Dairy and Wax Myrtle Ravines (214 acres)

### Figures 15 and 16

Dairy and Wax Myrtle Ravines have a combination of high quality native habitats and disturbed restoration areas. Most of the parcel is owned by the County of San Mateo, with lower elevation portions of the unit owned by McKesson, Inc, and Brookfield Homes. The unit consists of steep slopes that extend from the Brisbane Industrial Park along Guadalupe Canyon to the summit of the Mountain and includes a variety of vegetation types and slope exposures, with coastal scrub being the dominant plant community (Figure 15). Radio Road forms the northern and western boundary of this unit, Devil's Arroyo and the city of Brisbane form the eastern boundary, and Guadalupe Canyon Parkway forms the southern boundary. The Friends of San Bruno Mountain established a native plant 'Botanic Garden' area on the south side of Radio Road within this unit. Over 30 acres of the site was logged in 1995, and restoration work has been focused on returning this area to native habitats. Important habitat for mission blue, callippe silverspot, and San Bruno elfin is found in this unit. Approximately 50% of this unit is within the Priority 1 management area (Figure 16).

The Botanical Garden area receives a significant amount of visitor usage in the form of docent-led hikes, visits from local school children and regular use by local outdoor enthusiasts. The area contains the Eucalyptus Loop Trail, and the Dairy Ravine Trail. On the north side of the ravine is Old Ranch Road, which was the original road that traversed the Mountain before Guadalupe Canyon Parkway was built in the 1960's. The Road was used to move cattle between Dairy Ravine on the top of the slope down to a Dairy located at the western end of the Brisbane Industrial Park. Two City of Brisbane Water Tanks (upper and lower) are located on the north side of the ravine, and PG&E transmission lines cross over the lower slopes adjacent to the Ridge development.

Resource	Habitat Value
Mission Blue	Moderate
Callippe Silverspot	Moderate
San Bruno Elfin	High
Bay Checkerspot	Low
Native Plant Community Diversity and Dominance	Moderate

The grasslands on the north side of Wax Myrtle Ravine have the highest densities of mission blue and callippe silverspot host plants and populations in this unit. The unit has high quality San Bruno elfin habitat located near nine-fern rock and within upper Dairy Ravine. A controlled burn that escaped fire lines resulted in a wildfire that burned 72.5 acres of this unit in July 2003. The burn has significantly improved the condition of this management unit by removing dense stands of gorse and eucalyptus slash, which has provided access into the ravine for restoration crews.

### Conservation Needs and Prescription

Expand butterfly habitat through brush control and grazing on the lower elevation slopes surrounding the Brisbane Industrial Park and in other areas as determined. Continue control of eucalyptus, gorse, Himalayan blackberry, poison hemlock, oxalis and other weeds throughout the unit.

Figure 15. Dairy and Wax Myrtle Ravines, Invasive Species Map

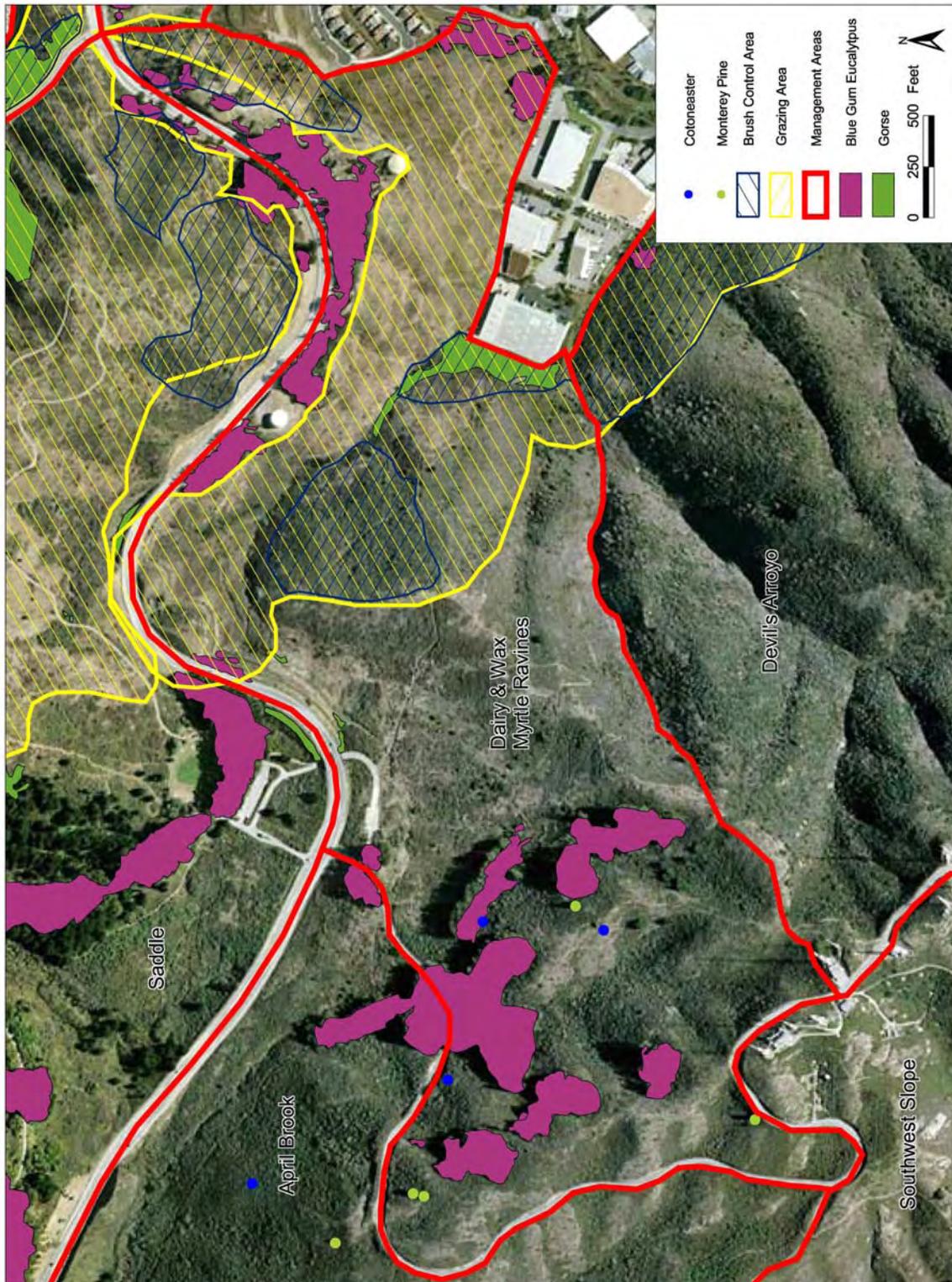
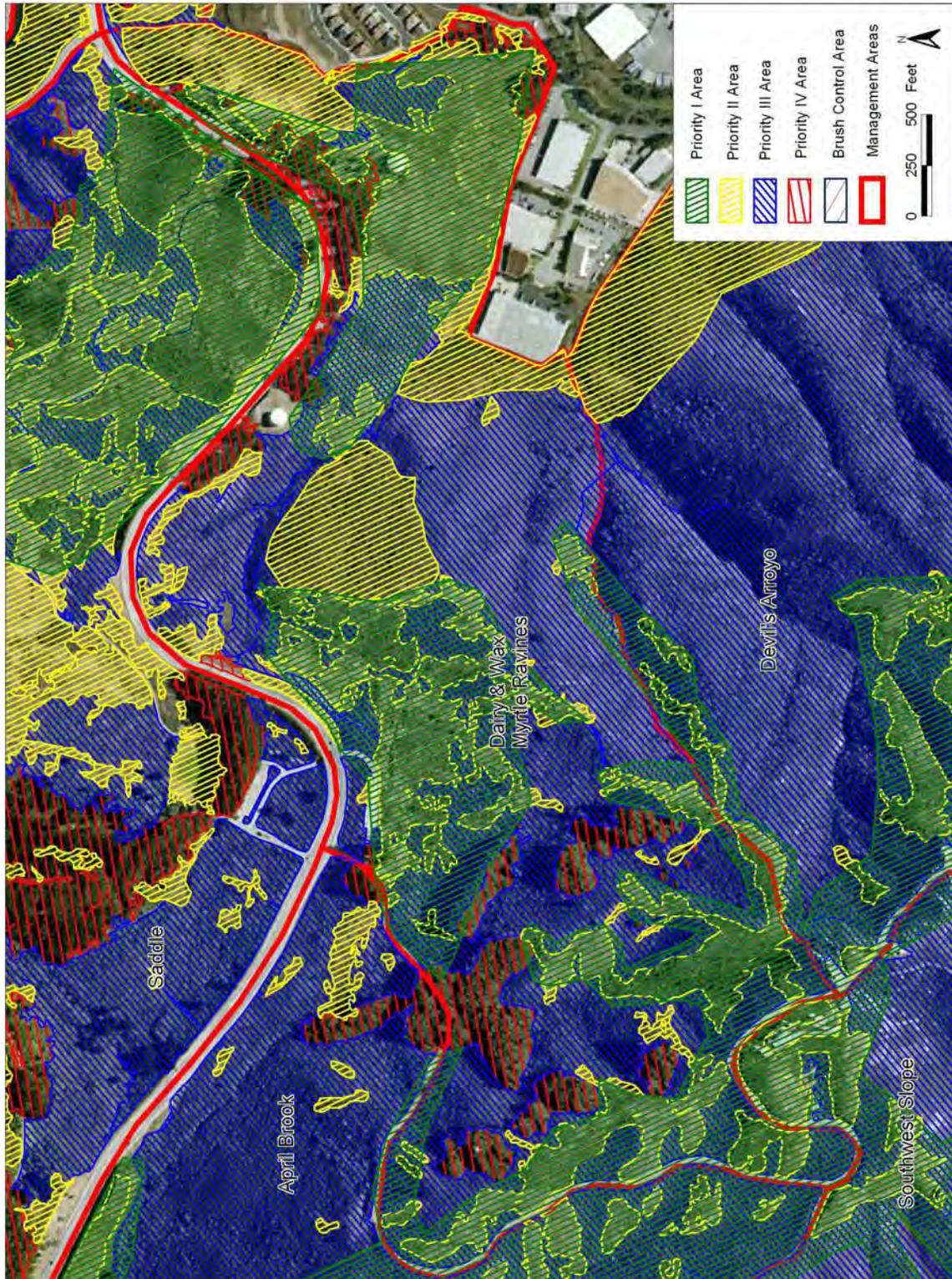


Figure 16. Dairy and Wax Myrtle Ravines, Priority Management Areas



## 10. Southwest Slope (436 acres)

### Figures 17 and 18

Southwest Slope is composed of steep south facing slopes on the west side of San Bruno Mountain. Summertime coastal fog strongly influences the vegetation, which is dominated by coastal scrub with patches of native grassland along ridgelines and isolated side slopes. The management unit is bordered by the Cypress AMLOC landfill, the Cypress golf course and residential development within the City of Colma.

Resource	Habitat Value
Mission Blue	High
Callippe Silverspot	Low
San Bruno Elfin	Low
Bay Checkerspot	Low
Native Plant Community Diversity and Dominance	High

This management unit is composed of steep, rocky slopes and ravines dominated by coastal scrub vegetation (Figure 17). The unit was likely used for cattle grazing in years prior to the HCP. The Cypress AMLOC landfill is located at the base of the slopes and along the summit are a series of radio towers, dishes, transmission lines and buildings operated by American Tower Corporation and PG&E. The County Park ranger station is located on the west peak. The lower slopes have been disturbed from farming and horticultural practices on lands above Pacific Nursery.

Eucalyptus logging operations were conducted in 1995 on a 21-acre section of eucalyptus forest on slopes above Pacific Nursery that has since grown back. A 4-acre site was logged of eucalyptus in 1995 (above Hoffman Street) for restoration, and has converted to native and nonnative brush and weeds. The western low elevation grasslands are dominated by purple needlegrass and fescue bunchgrasses. The federally endangered San Francisco Campion (*Silene verecunda* ssp. *verecunda*) is located within this unit on the upper slopes near Radio Road. Approximately 20% of this unit is within the Priority 1 management area (Figure 18).

Coastal scrub requires infrequent burning to maintain healthy stands of grassland and brush. Mission blue habitat is scattered within patches of grassland and on fire roads along ridgelines. This unit has only very small patches of habitat for the San Bruno elfin and callippe silverspot butterflies.

### Conservation Needs and Prescription

The unit needs infrequent controlled burns to protect and enhance the grassland patches within it, and reduce fuel loads within senescing coastal scrub habitat. Weed infestations within lower elevation ravines and disturbed areas need to be controlled. This management unit could benefit from creating a grazed buffer zone at the base of the slopes. The western low elevation grasslands dominated by purple needlegrass and

fescue bunchgrasses, need extensive invasives control work and would likely benefit from being grazed.

Figure 17. Southwest Slope, Invasive Species Map

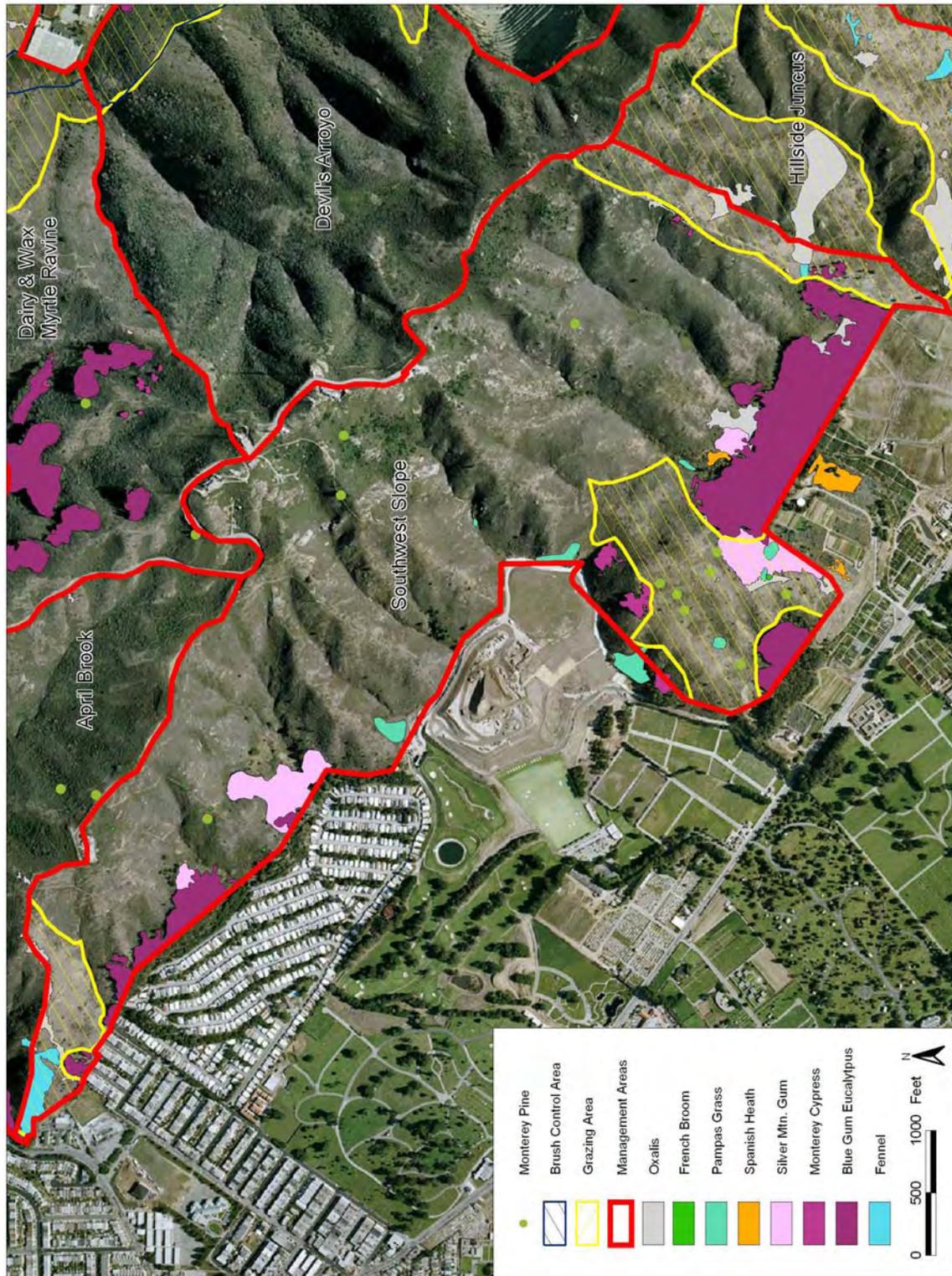
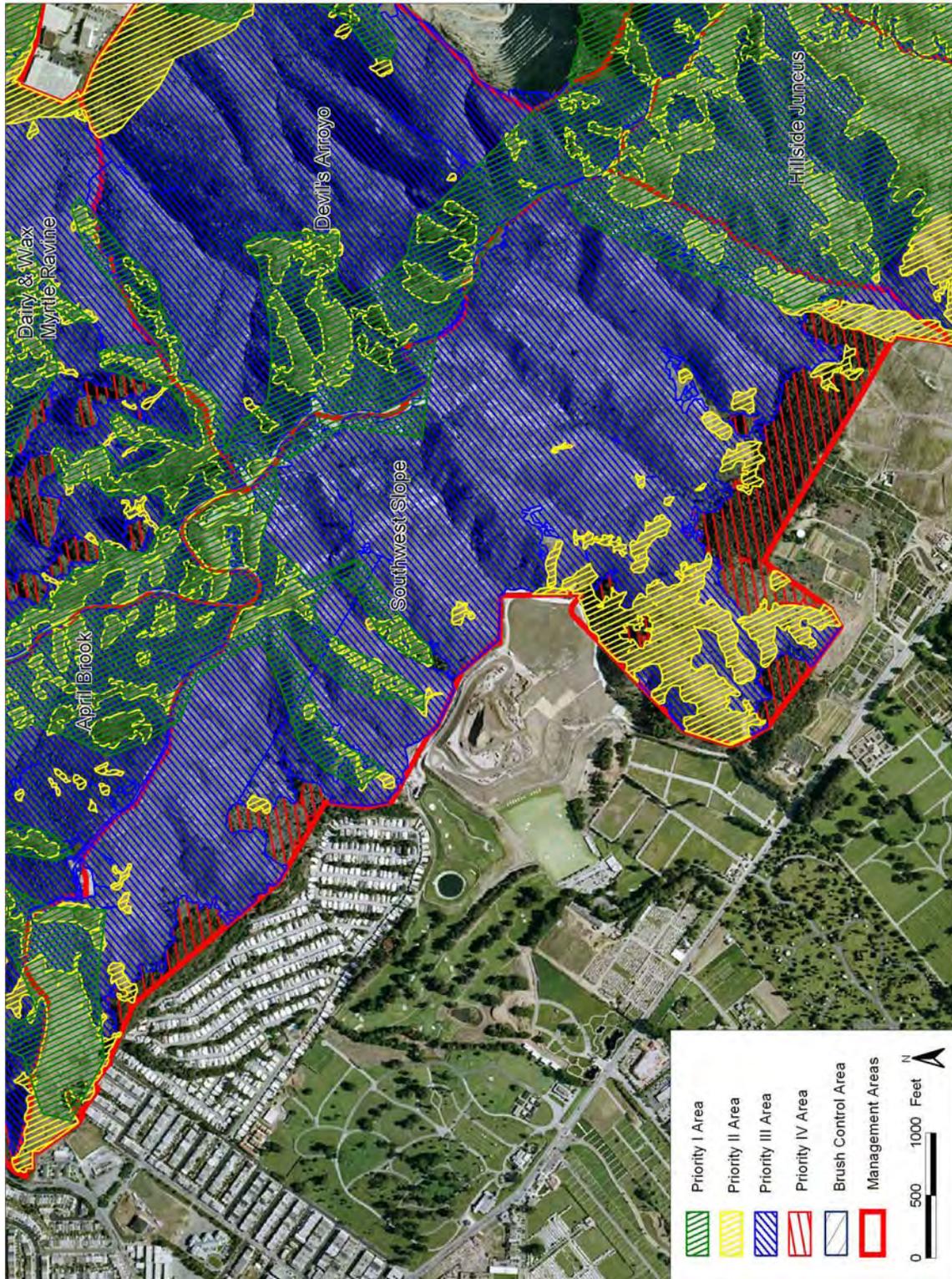


Figure 18. Southwest Slope, Priority Management Areas



## 11. April Brook (273 acres)

### Figures 19 and 20

The April Brook management area is characterized by a mosaic of native grasslands, coastal scrub and rock outcrops occurring over a range of topography from rolling hills to relatively steep slopes and ravines. The Guadalupe Canyon Parkway forms the northern border of this unit. The April Brook area is a favorite for hikers on the Mountain due to its wide-open slopes covered by coastal prairie and moist scrublands. The Summit Trail loops through this management area and provides views of San Francisco, the ocean and the Farrallon Islands.

The lower slopes are typified by riparian forests and scrub along Colma Creek and associated drainages, while vegetation on the upper ridges are typified by fescue dominated prairies and rocky outcrops. Colma Creek flows westward and through the Colma Creek restoration site.

This management area has very limited mission blue and callippe silverspot habitat; however it provides moderate San Bruno elfin habitat, and contains large expanses of pristine grasslands and coastal scrub (Figure 19). A single dune tansy (*Tanacetum camphoratum*) plant is present within this unit. This area was likely grazed and burned in the past. In most areas native vegetation dominates this unit. A 4-acre eucalyptus removal and restoration project was conducted along Colma Creek. The Colma Creek restoration site has two mission blue habitat islands, and a mixture of grassland, coastal scrub, and arroyo willow riparian plant communities. Approximately 50% of this unit is within the Priority 1 management area (Figure 20).

Resource	Habitat Value
Mission Blue	Low
Callippe Silverspot	Low
San Bruno Elfin	Moderate
Bay Checkerspot	Low
Native Plant Community Diversity and Dominance	High

### Conservation Needs and Prescription

Maintenance will likely require grazing and/or periodic prescribed burns in order to keep this area from converting to coastal scrub and to maintain a mosaic of open grasslands and scrub. The spread of non-native invasive species into this ecologically rich management area should be prevented. Conduct weed control work along roadsides and trailsides in this unit, to prevent the further expansion of herbaceous weeds and non-native grasses into the coastal prairies. Continue control on other weeds such as gorse, cotoneaster, acacia, and Monterey pines. Monitor and control for new invasive species problems such as Veldt grass (*Ehrharta ehrharta*) and Bermuda buttercup.

Figure 19. April Brook, Invasive Species Map

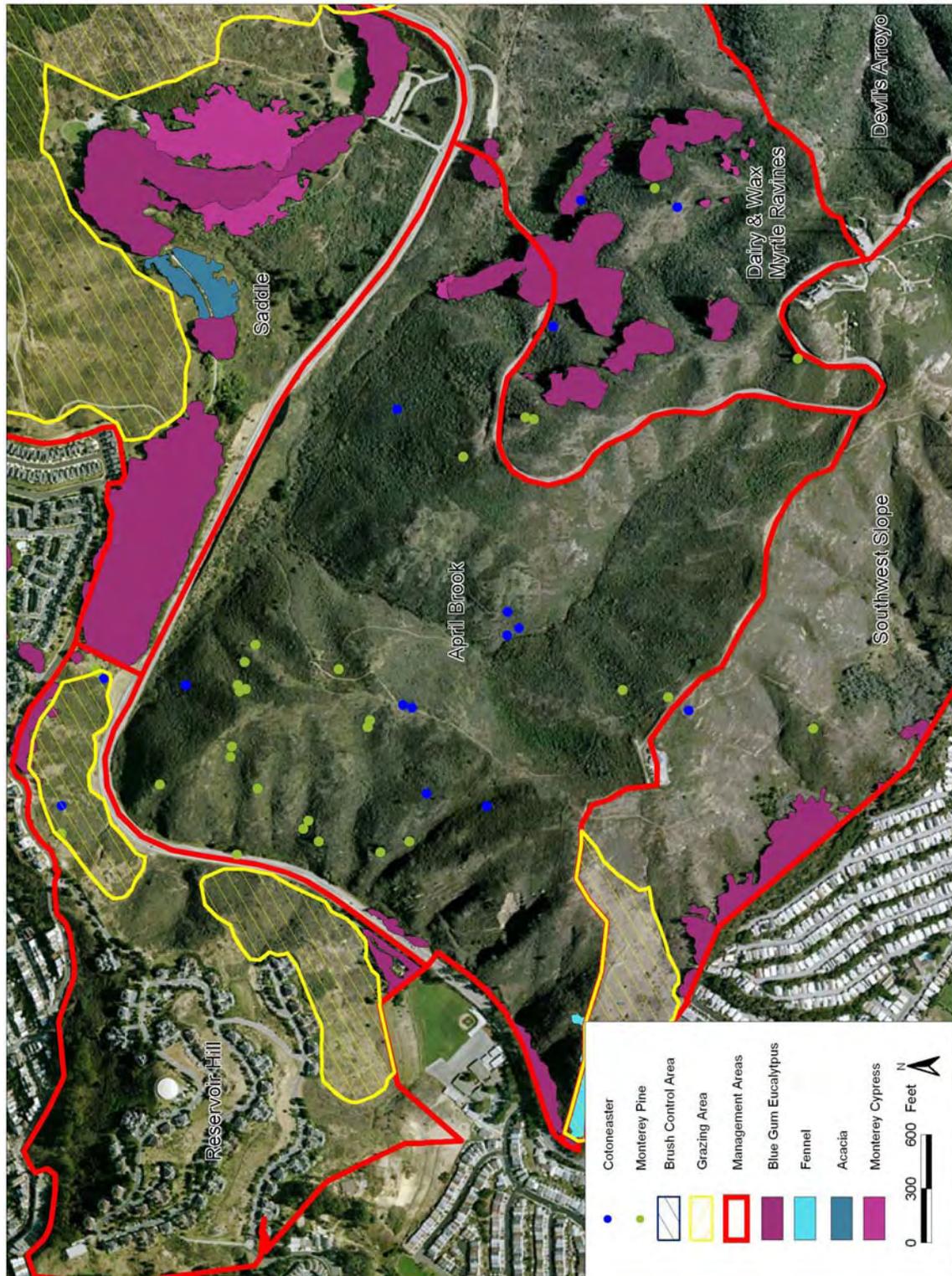
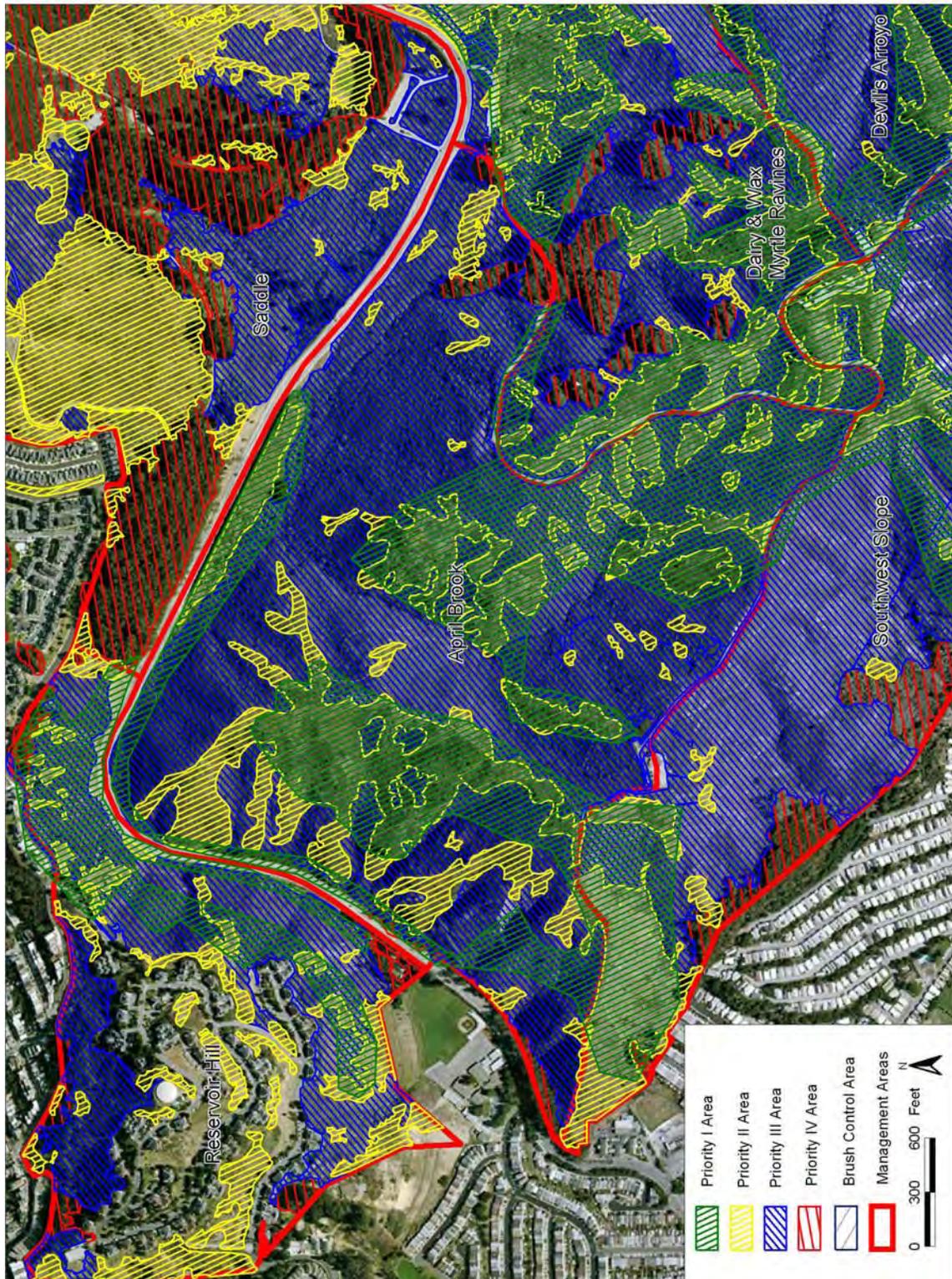


Figure 20. April Brook, Priority Management Areas



## 12. Saddle (320 acres)

### Figures 21 and 22

The Saddle is bordered by Guadalupe Canyon Parkway on the south and east, and the City of Daly City on the north and west. Due to the large infestation of gorse once present in this unit, the unit has been the site for intensive gorse control treatments including herbicide, brushing, and burning since the inception of the HCP in 1982. The eastern slopes provide important grassland habitat for the callippe silverspot and mission blue butterflies. The north saddle is mostly made up of steep, inaccessible slopes primarily covered by gorse (Figure 21).

The headwaters of Colma Creek and the botanically-rich Saddle bog area are located on the western side of the unit bordering Guadalupe Canyon Parkway. Extensive freshwater marsh and riparian wetlands occur in the central portion of the bog. Colma Creek drains southward and under the Guadalupe Canyon Parkway. A headwaters restoration project to remove eucalyptus trees is being conducted through a California State Parks Grant, and managed by CNPS "Heart of the Mountain" and the San Mateo County Parks Division. Through a separate State Parks Grant, the Saddle has had approximately 50 acres of gorse controlled. The current estimate of gorse in the unit is 34 acres (2007). Approximately 30% of this unit is within the Priority 1 management area (Figure 22).

<b>Resource</b>	<b>Habitat Value</b>
Mission Blue	Moderate
Callippe Silverspot	Moderate
San Bruno Elfin	Not Present
Bay Checkerspot	Low
Native Plant Community Diversity and Dominance	Moderate

The central and western portions of the saddle consist of gradual slopes and were used for farming in the past. The eastern slopes are much steeper and were likely used for cattle grazing. A park visitor's area, parking lot, and picnic area are located in this unit just north of Guadalupe Canyon Parkway. HCP approved developments were built along Carter Street adjacent to Daly City housing. This unit receives most of the visitor usage in the Park, in the form of hiking, jogging, and picnicking. This site has patches of gorse on the north side of the Saddle that needs to be managed for fire hazard reduction.

Management under the HCP has focused on controlling gorse, Himalaya blackberry, iceplant, pampas grass, and cotoneaster. One mission blue habitat island has been created within a former gorse patch in the central saddle.

### Conservation Needs and Prescription

Managing the areas of gorse and coastal scrub in the eastern Saddle is a high priority and these areas need continued maintenance. In addition, habitat areas on the eastern

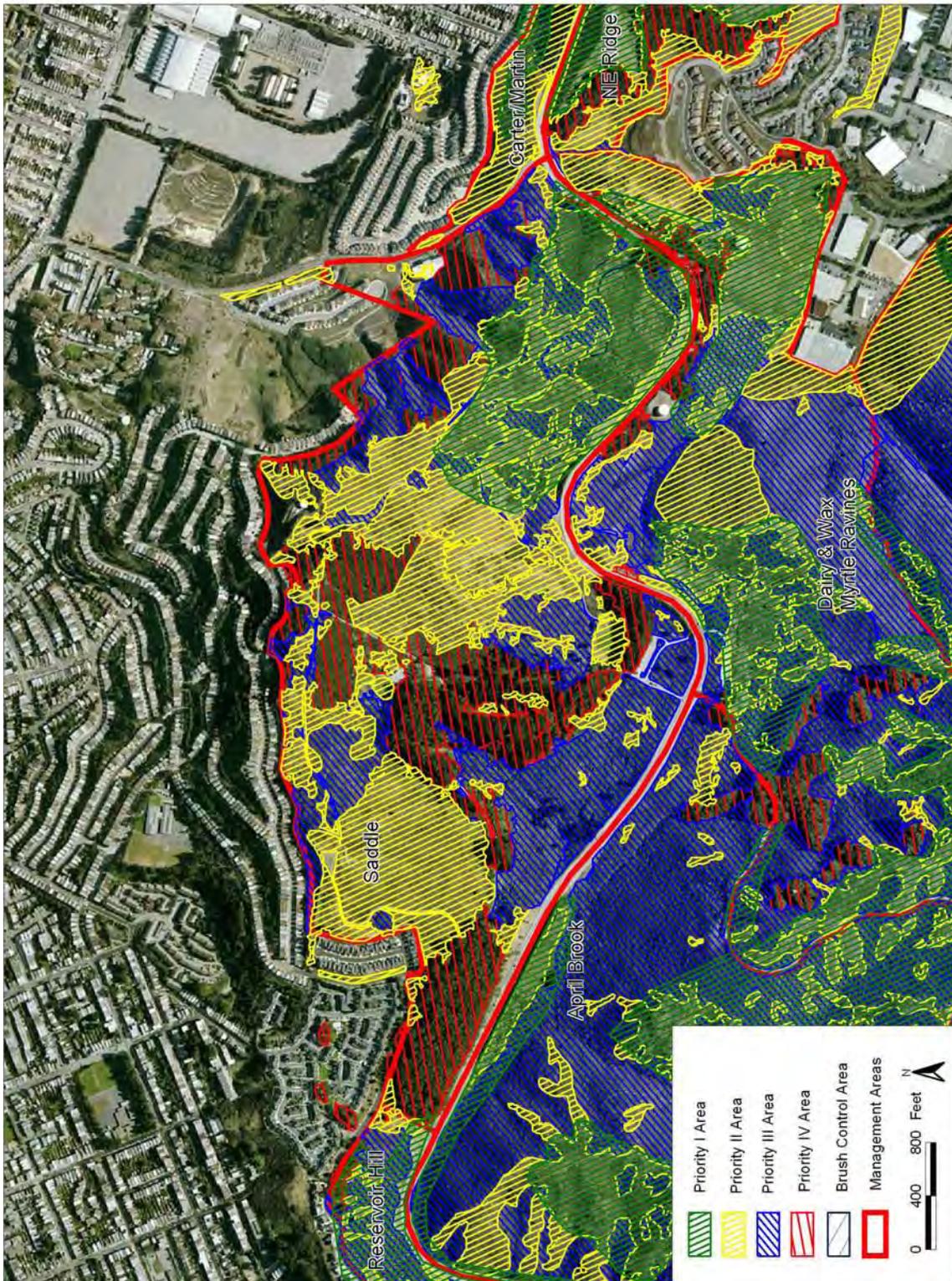
slopes for callippe silverspot and mission blue are threatened by coastal scrub expansion. Focus should be on maintaining habitat areas on the eastern slope through prescribed burning.

Burns and grazing may be important for managing brush and thatch within grasslands but significant follow-up efforts are necessary to control the high number of gorse seedlings that recruit immediately after disturbance. The Saddle needs to be managed to control species such as English ivy, Monterey cypress, Cape ivy, pampas grass, iceplant, velvet grass, Harding grass, orchard grass, cotoneaster, and Himalayan blackberry to restore native diversity and plant community structure. This work should be done in coordination with previous grant-funded projects in the central Saddle and Colma Creek.

Figure 21. Saddle, Invasive Species Map



Figure 22. Saddle, Priority Management Areas



### 13. Reservoir Hill (127 acres)

#### Figures 23 and 24

This management unit is bordered by Guadalupe Canyon Parkway on the east and the cities of Daly City and San Francisco on the west and north respectively. Plant communities include northern coastal scrub, coastal terrace prairie, Eucalyptus forest, central dune scrub, and non-native grassland (Figure 23). Special-status plants found on Reservoir Hill include San Francisco lessingia (*Lessingia germanorum*; FE, CE, CNPS 1B), and San Francisco spineflower (*Chorizanthe cuspidata* var. *cuspidata*; CNPS 1B). Reservoir Hill has a high habitat value for mission blue butterflies. The Pointe Pacific development, which was built in the early 1980's as part of the HCP occupies the central and western portions of the unit. On the western side the unit has large expanses of coastal scrub with patches of grassland that extend from Guadalupe Canyon Parkway to the Pointe Pacific Development and Crocker Avenue to the north. A 4-H Club is located at the base of the unit along Guadalupe Canyon Parkway. Approximately 30% of this unit is within the Priority 1 management area (Figure 24).

Resource	Habitat Value
Mission Blue	High
Callippe Silverspot	Low
San Bruno Elfyn	Low
Bay Checkerspot	Low
Native Plant Community Diversity and Dominance	Moderate

The unit is composed of mostly steep slopes with the exception of the Pointe Pacific development, which is located on a plateau area. A large water tank is located on the highest peak within the development. The land was primarily used for cattle grazing and for water storage for the city of Daly City. Local residents and visitors use the area for hiking.

Large stands of coastal scrub exist down slope of the Pointe Pacific development and adequate fire buffers need to be maintained to protect the residential areas from wildfire. Eucalyptus groves occur within portions of this unit.

#### Conservation Needs and Prescription

Expansion of coastal scrub within this unit in the absence of burning and/or grazing has reduced the amount of grassland to small isolated patches. These grasslands should be opened up through manual removal of scrub or grazing, while existing butterfly habitat is maintained. Also important is the maintenance and restoration of existing portions of dune scrub and associated rare plant species. This rare community and its plant populations are threatened by iceplant (*Carpobrotus* sp.) and other non-natives. Management techniques such as herbicide application should be used to control non-natives. Logging and manual removal of eucalyptus is also recommended. This management unit could also be considered for the establishment of habitat islands.

Figure 23. Reservoir Hill, Invasive Species Map

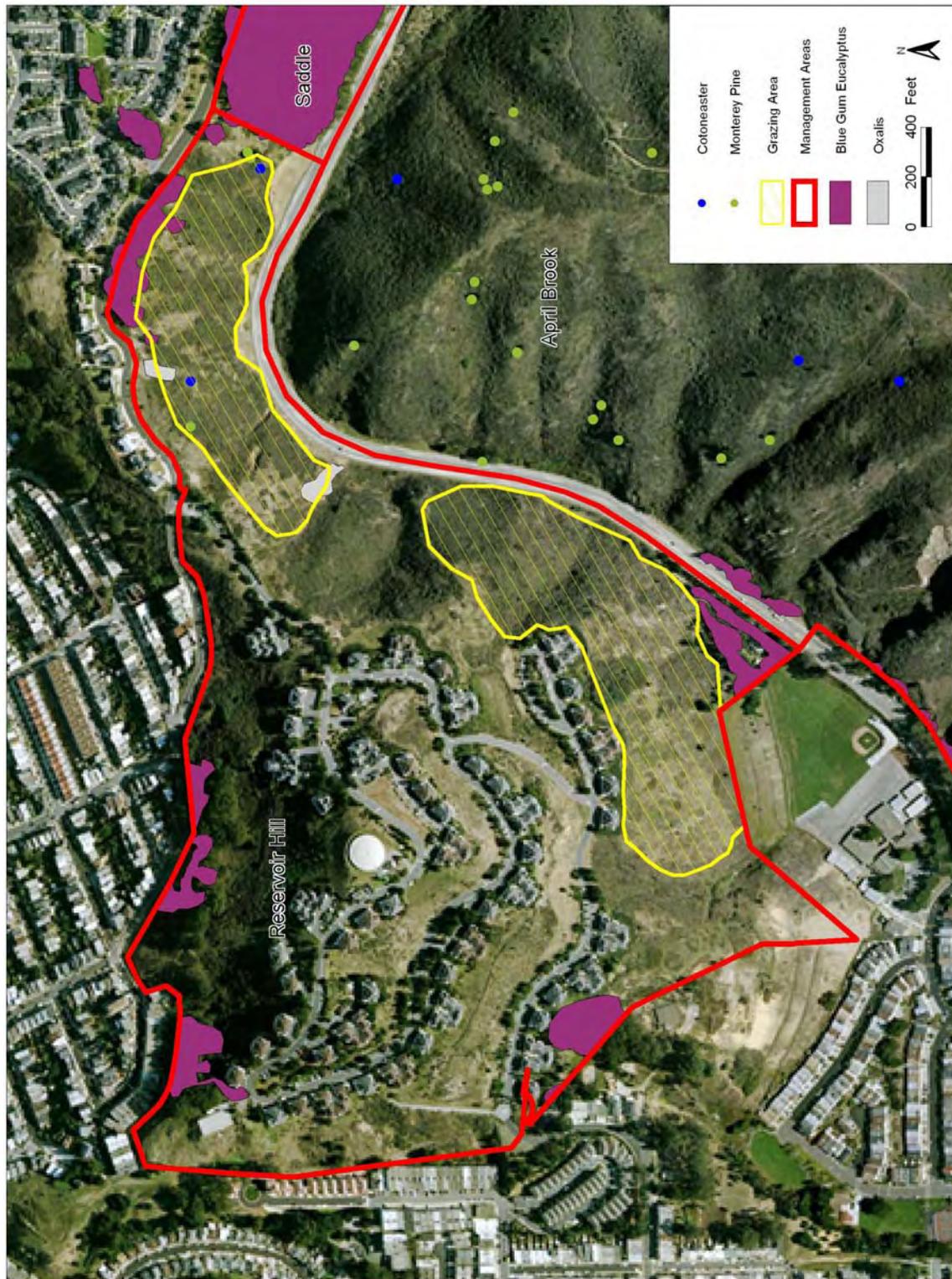
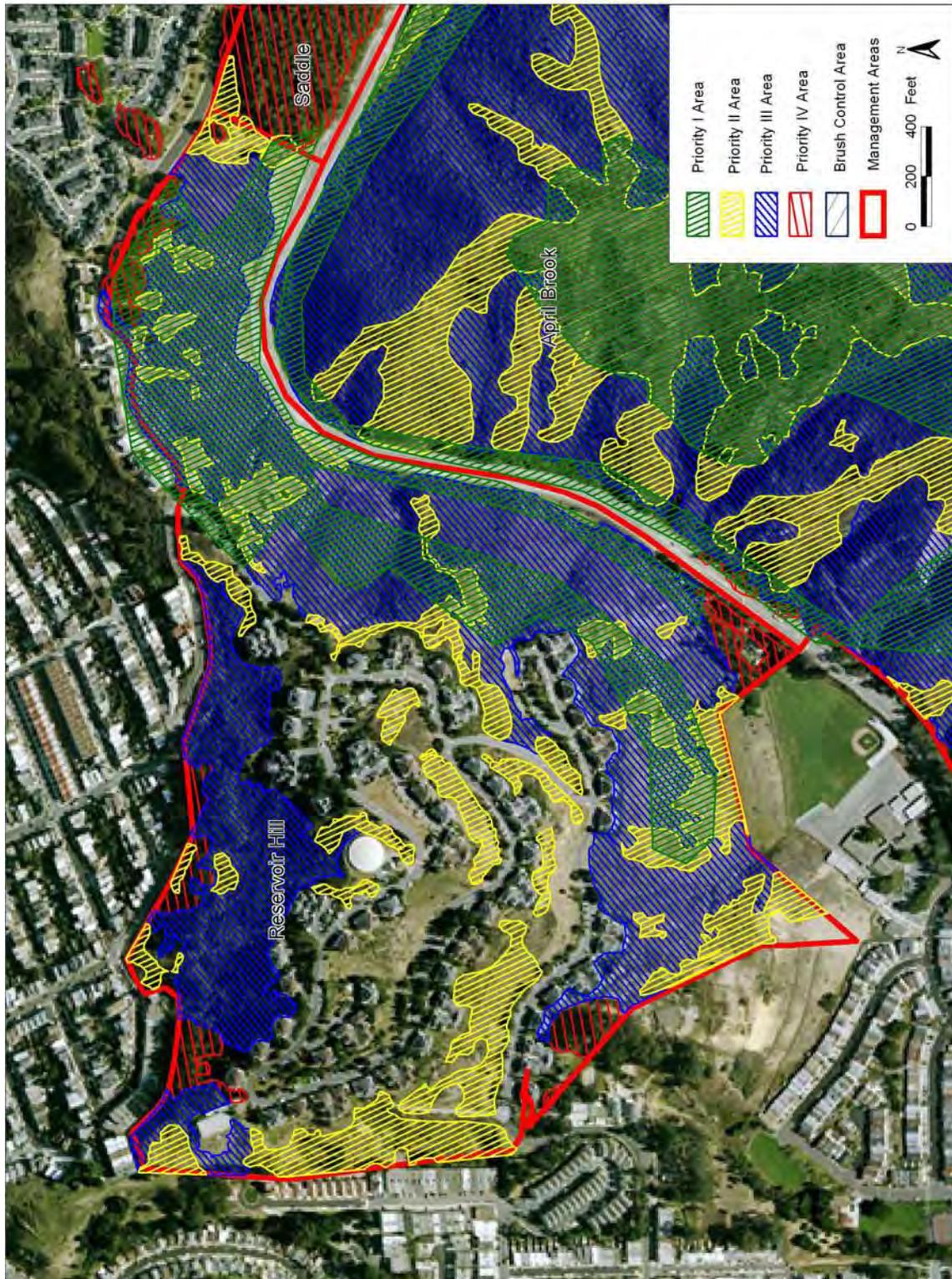


Figure 24. Reservoir Hill, Priority Management Areas



### Guadalupe Quarry

The Guadalupe Quarry (96 acres) is operated by California Rock and Asphalt and is not a current participant to the San Bruno Mountain HCP. California Rock and Asphalt is responsible for vegetation management as part of their mining permit requirements under the jurisdiction of the County of San Mateo. Slopes on the upper benches and above the active mining area of the Quarry, have habitat for the mission blue, callippe silverspot, and San Bruno elfin. If these lands are dedicated to the HCP area in the future, then HCP habitat management would be expanded to include this area.

<b>Resource</b>	<b>Habitat Value</b>
Mission Blue	Moderate
Callippe Silverspot	High
San Bruno Elfin	High
Bay Checkerspot	Moderate
Native Plant Community Diversity and Dominance	Moderate

**APPENDIX C**

**Special Status Species Lists for San Bruno Mountain**

**Appendix C. Special Status Species Lists for San Bruno Mountain****Table 1. Comprehensive list of Special Status Species on San Bruno Mountain**

<b>Name</b>	<b>Listing Status</b>	<b>Status on Mountain</b>
Mission Blue butterfly <i>(Icaricia icarioides missionensis)</i>	Federal endangered	Present
San Bruno Elfin butterfly <i>(Callophrys mossii bayensis)</i>	Federal endangered	Present
San Francisco Garter snake <i>(Thamnophis sirtalis tetrataenia)</i>	Federal endangered	Not Present
Callippe Silverspot butterfly <i>(Speyeria callippe callippe)</i>	Federal endangered	Present
Bay Checkerspot butterfly <i>(Euphydryas editha bayensis)</i>	Federal threatened	No records since mid-1980's (Extirpated)
California Red-legged frog <i>(Rana aurora draytonii)</i>	Federal threatened	No records since 1970's (Extirpated)

**Table 2. Host and Nectar Plant Species for Special Status Butterfly Species**

<b>Butterfly Larval Food* and Adult Nectar Plants on SBM</b>	<b>Species</b>
* <i>Sedum spathulifolium</i>	SBE
* <i>Lupinus albifrons var. collinus</i>	MB
* <i>Lupinus formosus var. formosus</i>	MB
* <i>Lupinus variicolor</i>	MB
* <i>Viola pedunculata</i>	CS
* <i>Plantago erecta</i>	BC
* <i>Castelleja densiflora</i>	BC
<i>Lomatium utriculatum</i>	SBE
<i>Chrysopsis villosa</i>	MB
<i>Eriogonum latifolium</i>	MB
<i>Brodiaea pulchella</i>	MB
<i>Carduus pycnocephala (E)</i>	CS, MB
<i>Silybum marianum (E)</i>	CS, MB
<i>Monardella villosa</i>	CS, MB
<i>Horkelia californica</i>	CS, MB
<i>Cirsium quercetorum</i>	CS, MB
<i>Scabiosa atropurpurea (E)</i>	CS

**Table 3. Other Sensitive Animal Species on San Bruno Mountain**

<b>Animals</b>	<b>Listing Status</b>	<b>Status on Mountain</b>
Solitary bee ( <i>Dufourea stagei</i> )	Not proposed for listing	Unknown
San Francisco Tree Lupine moth ( <i>Grapholita edwardsiana</i> )	Proposed Federal threatened, expired 1980	Unknown

**Table 4. Rare Plant Species on San Bruno Mountain**

<b>Rare Plants</b>	<b>Listing Status</b>	<b>Status on Mountain</b>
<i>Arctostaphylos imbricata imbricata</i>	FE, SE, CNPS 1B	Present, mapped in 2002
<i>Arctostaphylos montaraensis</i>	CNPS 1B	Present, mapped in 2002
<i>Arctostaphylos pacifica</i> (regarded as hybrid of <i>A. uva-ursi</i> & <i>A. glandulosa</i> )	Not listed.	Present, mapped in 2002
<i>Arctostaphylos uva-ursi</i>	No status	Present, mapped in 2002
<i>Chorizanthe cuspidate cuspidata</i>	CNPS 1B	Present, unmapped.
<i>Grindelia hirsutula maritima</i>	CNPS 1B	No records
<i>Helianthella castanea</i>	CNPS 1B	Present, mapped in 2001
<i>Lessingia germanorum</i>	FE, SE	Present, mapped in 2003.
<i>Pentachaeta bellidiflora</i>	FE, SE, CNPS 1B	No confirmed records
<i>Plagiobothrys chorisianus</i>	CNPS 1B	Unknown
<i>Silene verecunda verecunda</i>	FSC, CNPS 1B	Present, mapped in 2001
<i>Tanacetum camphoratum</i>	No status Not historically present.	Present, mapped in 2003 (only 2 plants, both transplanted).
<i>Triphysaria floribunda</i>	CNPS 1B	Not observed on SBM since 1960's.
<i>Vaccinium caespitosum</i>	No status	Present, rare, mapped in 2002

**Table 5. Plant Species of Special Significance**

<b>Range Limit Plants</b>	<b>Listing Status</b>	<b>Status on Mountain</b>
<i>Arabis blepharophylla</i>	CNPS 4	Present, common
<i>Castilleja franciscana</i>	No status	Present, common
<i>Cirsium quercetorum</i>	No status	Present, common
<i>Clarkia rubicunda</i>	No status	Present, common
<i>Erysimum franciscanum</i> var. <i>franciscanum</i>	CNPS 4	Present, common
<i>Heterotheca villosa</i>	No status	Present, common
<i>Lathyrus vestitus</i>	No status	Present, common
<i>Layia hieracioides</i>	No status	Unknown
<i>Ligusticum apiifolium</i>	No status	Present, common
<i>Maianthemum kamtschaticum</i> ( <i>dilatatum</i> )	No status, range limit	Unknown
<i>Ribes menziesii</i> var. <i>leptosmum</i>	No status	Unknown
<i>Sambucus callicarpa</i>	No status	Present, common
<i>Senecio aronicoides</i>	No status	Present, common
<i>Silene scouleri grandis</i>	No status	Present, uncommon

# **San Bruno Mountain Habitat Management Plan 2007**

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## **APPENDIX D**

### **Site Activity Permit Form**

**COUNTY OF SAN MATEO**  
**Parks and Recreation Division**  
**County Government Center**  
**Redwood City, CA 94061**

**When completed FAX to:**  
**Thomas Reid Associates (TRA) (650) 327-4024**  
**Sam Herzberg, San Mateo County (650) 599-1721**

**SAN BRUNO MOUNTAIN**  
**HABITAT CONSERVATION PLAN SITE ACTIVITY PERMIT**

*\*not a valid permit until approved below\**

PROJECT: \_\_\_\_\_ LEAD AGENCY: \_\_\_\_\_

PROPERTY OWNER: \_\_\_\_\_ DATE: \_\_\_\_\_

APPLICANT: \_\_\_\_\_ CONTACT PERSON: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

PHONE: \_\_\_\_\_ EMAIL: \_\_\_\_\_

HCP Administrative Parcel Number: \_\_\_\_\_

**Project Description** (include site maps - 1" = 200 ft. - discuss access, parking, equipment storage, spoils disposal, etc.): Attach maps, and a separate sheet or report if necessary.

Equipment required: \_\_\_\_\_

Personnel required: \_\_\_\_\_

Onsite contact (name, telephone): \_\_\_\_\_

Job schedule (daily): \_\_\_\_\_

Scope of impact to habitat and proposed protective measures: \_\_\_\_\_

**If applicant and property owner are not the same, attach a copy of a document showing proof of the property owner's concurrence with or permission for the project, or initiation of the project, including a contract or other signed statement.**

Applicant's Signature/Title: \_\_\_\_\_

\*\*\*\*\*

**FOR STAFF USE ONLY**

**PERMIT VALID UPON APPROVAL BELOW**

County Contact: \_\_\_\_\_ Phone: \_\_\_\_\_

Conditions of Approval:  Inform TRA and San Mateo County when work is completed or stopped

Signature/Title: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: Use Additional Pages for Further Description

TRA: (01/06/2002)

*This permit does not absolve applicant of responsibility to obtain all other applicable permits; this permit grants HCP Habitat Manager approval to projects within the San Bruno Mountain HCP. Other permits may be required.*