SAN BRUNO MOUNTAIN
HABITAT CONSERVATION PLAN

Year 2014 Vegetation Management Activities Report
for Endangered Species Permit PRT-2-9818

Prepared by;
West Coast Wildlands, Inc.
Pacifica, CA 94044

For:
San Mateo County Parks Department
Redwood City, CA

February 2015

TABLE OF CONTENTS

List of Figures and Tables

Report Prepared by:
West Coast Wildlands, Inc.
PO Box 1057
Pacifica, CA 94044
(650) 355-3589

Cover photo:
View of Coyote brush removal at Buckeye Ridge and Ridge Trail. Photos by:
Todd Shreiner, West Coast Wildlands, Inc.

SUMMARY VEGETATION MANAGEMENT

Invasive Weed Control and Restoration

The primary focus of habitat management activities on San Bruno Mountain State and County Park since the inception of the San Bruno Mountain HCP in 1982 and the renewal of the HCP in 2013 has been the control of invasive species within prime butterfly habitat and restoration in planned areas where plants were removed. Habitat management activities conducted on San Bruno Mountain in 2014 were done in accordance with the goals and objectives listed in the FY2013/2014 and FY2014/2015 San Bruno Mountain Operating Budget and Work Scope.

In 2014, 535 acres of invasive plants were treated using hand control, mechanical tools, and herbicide applications. There are 32 subunits within 13 management units (Figure 1). The greatest efforts went into treating invasive species listed in Table 1. The high priority management map (TRA 2008) was referenced for weed control within the following management units**:** South Slope, Northeast Ridge, Owl and Buckeye Canyons, the Saddle area, Juncus Ravine, the Ridge Trail, Pointe Pacific, the Hill West of Quarry, West Peak, and Wax Myrtle Ravine (Figure 2).

FIGURE 1: San Bruno Mountain Management Units and Subunits

Oxalis Control

Oxalis is still prolific on San Bruno Mountain and its ability to form dense mats that are able to out-compete native species required additional effort to control. The scope of work to manage the Tank/Juncus Bowl oxalis was increased in 2014 (Figure 10) to treat the ongoing threat.

Coastal Scrub Reduction

The focus is the removal of invasive shrubs that pose the greatest threat to displace endangered butterfly and grassland habitats. The 2014 emphasis was placed on the areas that are considered Priority 1 and 2 Vegetation Management sites. Shrub encroachment was controlled by removing coyote brush (*Baccharis pilularis*) individuals or clusters in these priority areas.

Habitat Restoration

Habitat restoration was provided by the volunteer group San Bruno Mountain Watch (SBMW) within the oxalis and coyote brush reduction plots in Owl and Buckeye canyons and eastern Ridge trail. The planting efforts and restoration are discussed in detail Section III-A and B.

INTRODUCTION

This report describes the effort for invasive species management throughout the year that includes both FY2013/2014 and FY2014/2015 Habitat Management Vegetation Plans. West Coast Wildlands, Inc. is the primary contractor implementing the 2014 Vegetation Management Plan. Our main effort of invasive species work was targeted to improve mission blue (MB), Callippe silverspot (CS) and/or San Bruno elfin (SBE) habitat. The effort and methods to treat different habitats are discussed in each Management Unit's work and Appendix 1. The Management units (MU) are highlighted by a red boundary line and Subunits (SU) by red polygons to reflect general treatment areas.

Our invasive plant control was also augmented by volunteer groups, local homeowner's associations and private landowners. Current groups involved are: Myer's Development Group, San Bruno Mountain Watch, Friends of San Bruno Mountain, Toll Bros. Inc and Terra Bay Master HOA.

The habitat management involved removal of high priority invasive pest plants in order to maintain or enhance existing native plant communities. The primary purpose of invasive weed control is to protect and maintain mission blue and Callippe silverspot butterfly habitat. There was also control work applied to native habitat areas on San Bruno Mountain that do not support the butterflies but are hosting particularly noxious weeds that have the potential to migrate into their habitat.

San Bruno Mountain invasive species control work occurs throughout the approximately 2,200 acres that make up the park and is prioritized based on the level of threat to sensitive habitat areas:

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

The established priority areas for management of invasive species are outlined in the Figure 2: Work was conducted in Priorities I-III. No work was done in Priority IV.

A list of SU plots treated by Priority Areas follows. (Note: some SU plots share Priority Areas).

Priority I: 1, 2, 3, 4, 5, 6, 9, 10, 12, 13, 14, 16, 17, 19, 20 25, 28, 29, 30 31, 32

Priority II: 4, 8, 20

Priority III: 12, 26, 27

Below are maps delineating transects in MB and CS habitat and SU IDs where treatment was focused.

FIGURE 2: Mission blue Transects

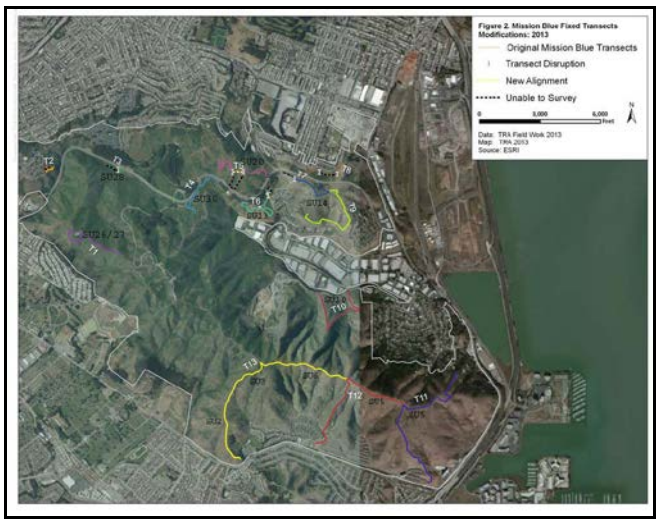
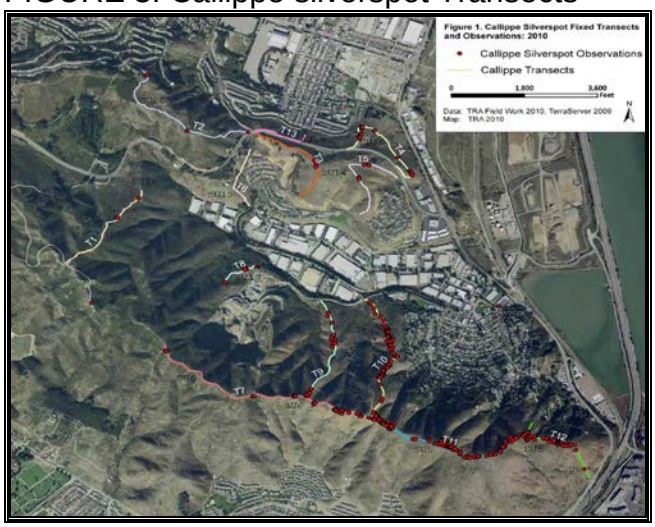


FIGURE 3: Callippe silverspot Transects



Butterfly Species	**Acres Treated**
Mission blue/Callippe silverspot	431
Mission blue (Exclusive)	104

- There is coexistence between Callippe with Mission Blue Butterfly habitat in many control areas and the two species were grouped together for this graph.
- San Bruno Elfin (SBE) habitat has been self sustaining and no treatment has been conducted there.

FIGURE 4: Priority Vegetation Management Units on San Bruno Mountain

Priority I, II, III and IV Management Areas on San Bruno Mountain

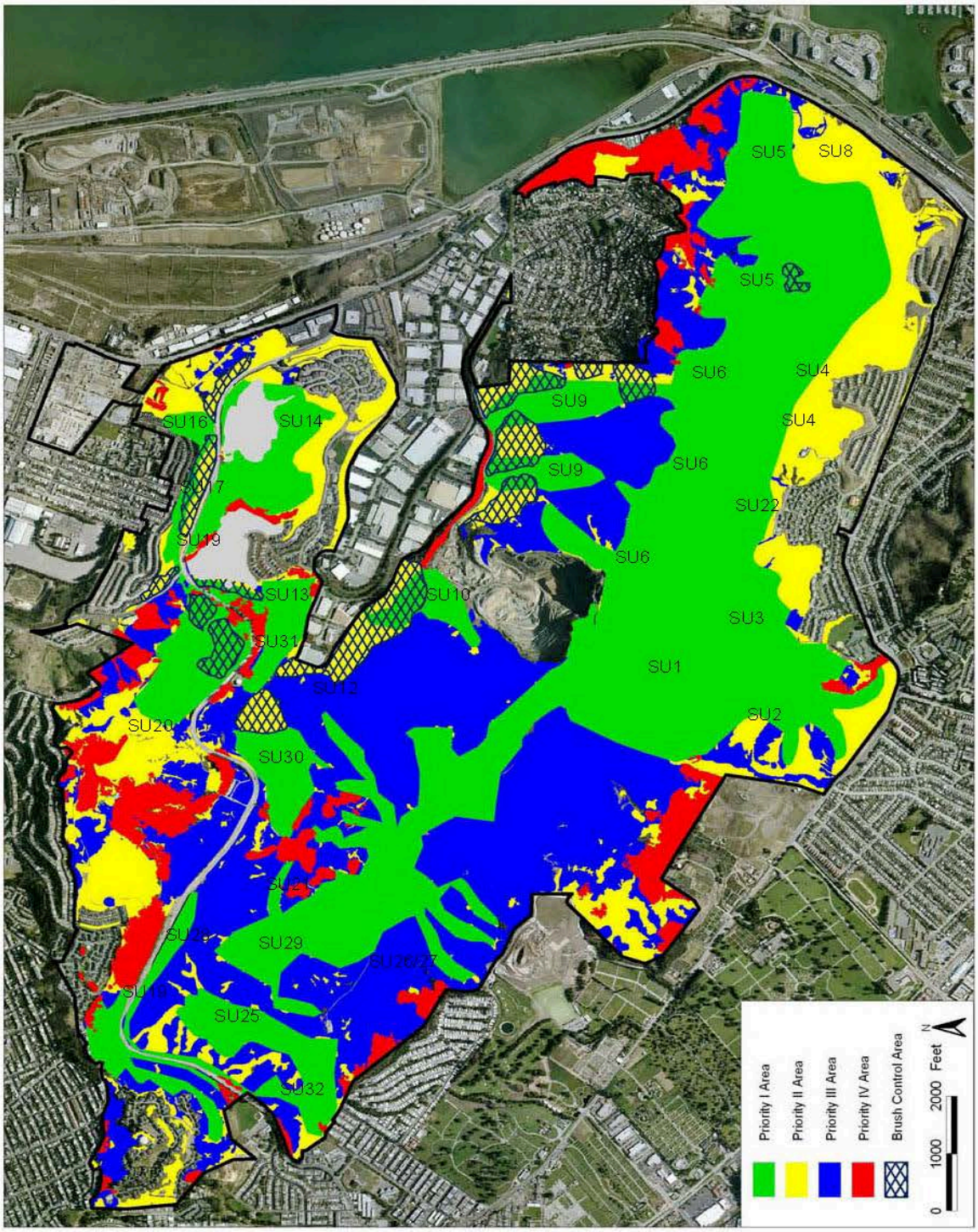
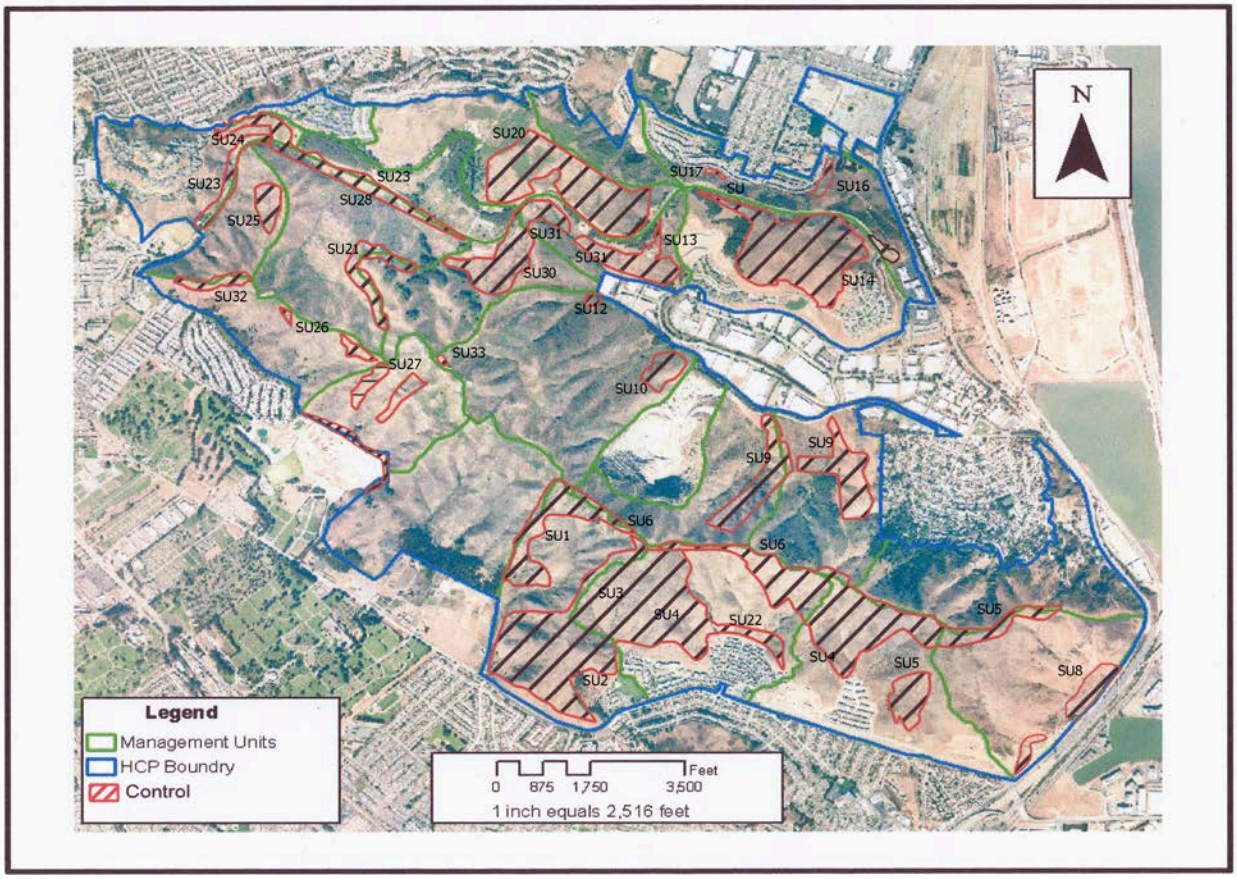


FIGURE 5: Treated Weed Management Areas



Invasive species management unit and subunit, type of butterfly habitat, treatment area, and method are located in Appendix 1: Master Table of Invasive Species Treatment.

METHODS

Methods used to control the invasive species are handwork, mechanical, and selective herbicides. Table 1 includes treatment timing. Appendix 1 includes specific treatment method by plant.

Handwork: Seedlings and saplings are pulled from the crown upward to reduce soil disturbance is most effective with plants that have shallow roots. Hand tools include a Polaski or axe mattock, pruning saw and loppers are necessary in removing whole plants and their root system. The disturbed soil is tamped after weed removal. Species include fennel, broom (all species), eucalyptus, coyote brush, and Armenian blackberry.

Mechanical Equipment: A brush cutter is used for either mowing or cutting weeds. A weed whip head mows soft forbs and grasses. The metal triple blade on the weed whip is used to cut through woody tissue plants and tall seed stalks to access the root crown. The two treatments based on size include 1) cut stump treatment at the base of larger (> 2 in DBH) stumps removed by chainsaws and 2) foliar application to secondary growth on smaller plants (<2 in DBH). Species include coyote brush, fennel, cotoneaster, broom (all species), eucalyptus, and acacia.

Herbicides: Some weedy species are treated with an herbicide solution using foliar,

basal bark and cut stump methods.

The two herbicides applied are Garlon 4 Ultra® (Trichlopyr ester) and Aquamaster® (glyphosate). These herbicides are used due to their high effectiveness, low toxicity rating, and short half-life in the soil. Garlon 4 Ultra® herbicide is the preferred chemical for broadleaf weeds and has little effect on monocots (grasses). Aquamaster is an aquatic herbicide applied to plants adjacent to creeks or in areas subject to seasonal runoff. The herbicide application type and method depends upon the species and location.

Application Type:

Foliar: Full cover application on the plant leaf using backpack sprayers and cone/jet tips. The spray tips are designed to adjust and allow target specific applications. Species include listed annuals and perennial plants discussed above.

Cut stump: The trunk is cut 1-2 inches above soil surface and treated with a 25% solution mixed with an aquatic vegetable oil. Species include the woody plants and trees listed above.

West Coast Wildlands, Inc maintains daily data sheets with aerial site maps for all invasive species work conducted on San Bruno Mountain. The treatment sites are noted on the daily worksheet with the treatment method, work effort, weather data, and work site. The back of the daily worksheet is a topography map showing the treatment areas highlighted in red. The work areas were visited 1 to 4 times during the year for initial and follow up control of various annual weed species and secondary growth of perennial species.

The control results are based on visual observations, photos documentation, and GPS mapping.

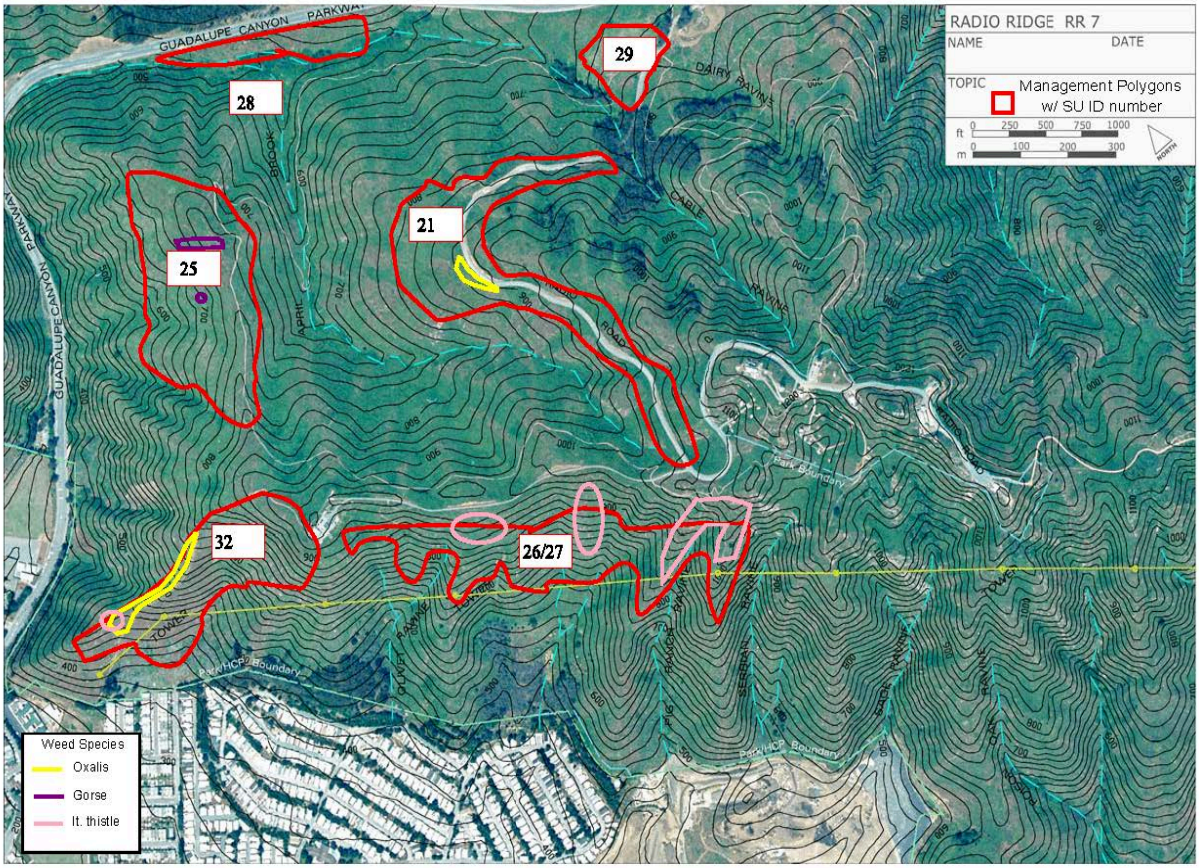
II INVASIVE SPECIES CONTROL BY MANAGEMENT UNIT

A. April Brook (273 Acres)

The sub-units are SU (23) Guadalupe Canyon Pkwy, SU (25) Bitter Cherry Ridge, and SU (28) Colma Creek. The area is predominately coastal scrub with non-native oxalis, gorse, cotoneaster, fennel and jubata grass as the main invaders. The weeds are treated with a combination of hand tools and aquatic herbicide applications. There is also a restoration-planting island for the mission blue butterfly within the SU (29) April Brook. The control of additional invasive species focused outside the island included French broom, radish, Italian thistle and cotoneaster. Cotoneaster seedlings on the eastern margin of the grassland were removed adjacent to a small patch of *Lupinus formosus* (host plants for the mission blue butterfly).

There has been continuous control of weeds such as gorse, cotoneaster, Italian thistle, and oxalis from the April Brook Trail to Bitter Cherry Ridge. The mature gorse plants have been absent for many years with seedlings still emerging annually from the reduced seed bank. The jubata grass adjacent to the creek was treated with an aquatic herbicide along with fennel and Italian thistle. The control area within the management unit was 4.5 acres.

FIGURE 6: April Brook Treated Subunits



B. Saddle (320 Acres)

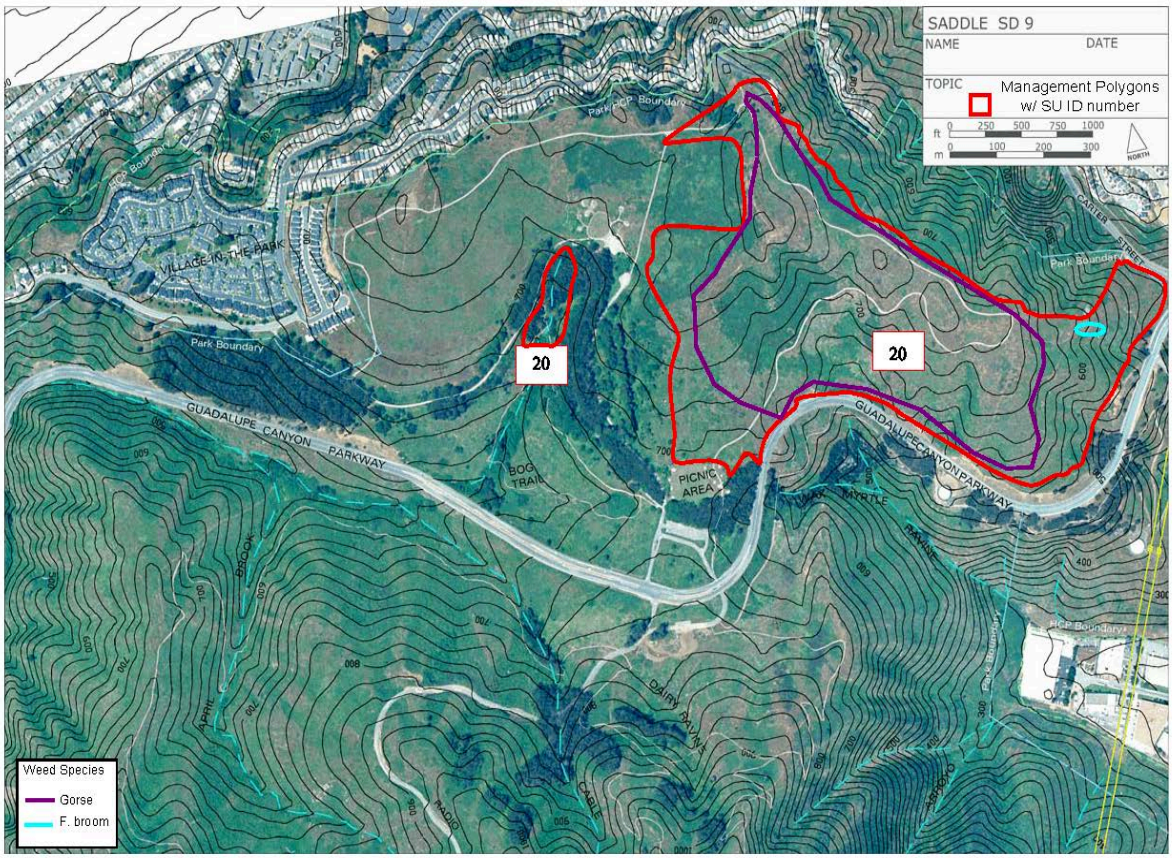
The subunits in the Saddle MU are SU (20) Saddle Ridge and Western Outlier, and SU (28) Colma Creek Bog. The Saddle Trail contains populations of *Viola pedunculata*, the host plant for the endangered Callippe silverspot (CS) butterfly. These populations are located along the East Ridge and mission blue (MB) transect T5. 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 and drains southward and under the Parkway.

Weed management has focused on controlling gorse, Armenian blackberry, jubata grass, and cotoneaster in habitat areas on the Saddle Trail for Callippe silverspot and mission blue butterflies. The primary non-native species has always been gorse in the Saddle Trail area.

Gorse seedlings are viable for over 20 years and the site is visited 2-3 times per year to control the seedlings before they flower and set seed. There is a small

population of French broom on the northeast edge of SU (20). The two main invasive weeds encroaching in the Colma Creek Bog restoration wetland area are Armenian blackberry and cape ivy. Additional non-native plants monitored within this area include purple loosestrife, jubata grass, and eucalyptus saplings. Outplanting efforts are proposed for this eastern Saddle Trail Ridge site. A total of 45.2 acres are treated within the management unit.

FIGURE 7: Saddle Treated Subunits



C. Dairy and Wax Ravines (214 Acres)

The Subunits in this MU are SU (19) Old Ranch Rd, SU (6) Ridge Trail W, Brisbane Water Tanks (13), Guadalupe Canyon Parkway SU (17), SU (30) Dairy Ravine, SU (31) Wax Myrtle Ravine, and SU (33) Kamchatka Point.

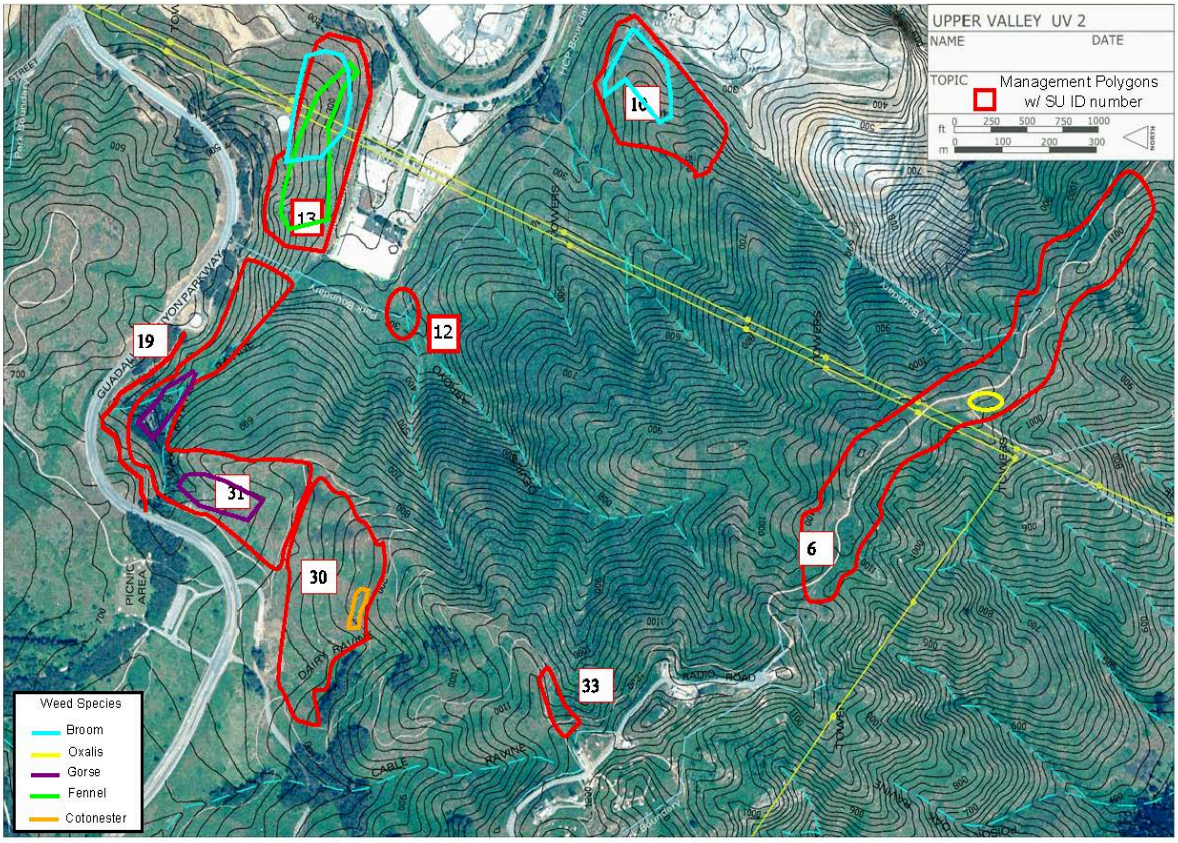
Our weed control focused on fennel, gorse, French broom, cotoneaster, and oxalis. The oxalis was treated with a 2% aquatic herbicide. The fennel was brush cut and treated with 2% Garlon 4 Ultra (Trichlopyr) herbicide when the plants leafed out along with the gorse and F. broom. The treated area covered 25 acres.

D. Devils Arroyo (268 Acres)

This MU (See Figure 8) has the following Subunits: SU (6) Ridge Line W, SU (10) Hill W of Quarry, and SU (12) Devils Arroyo. The northern grassland habitat has MB

host plants, summer lupine (*Lupinus formosus*), surrounded by French and Portuguese broom. There are very few summer lupines located at the NW corner in this MU and are vital for maintaining a MB colony. The mature stand of broom has been controlled and this year's effort was aimed at managing the seed bank. Herbicide, hand control, and mowing are part of the removal methods applied at the site.

FIGURE 8: Dairy and Wax Myrtle Ravine Treated Subunits



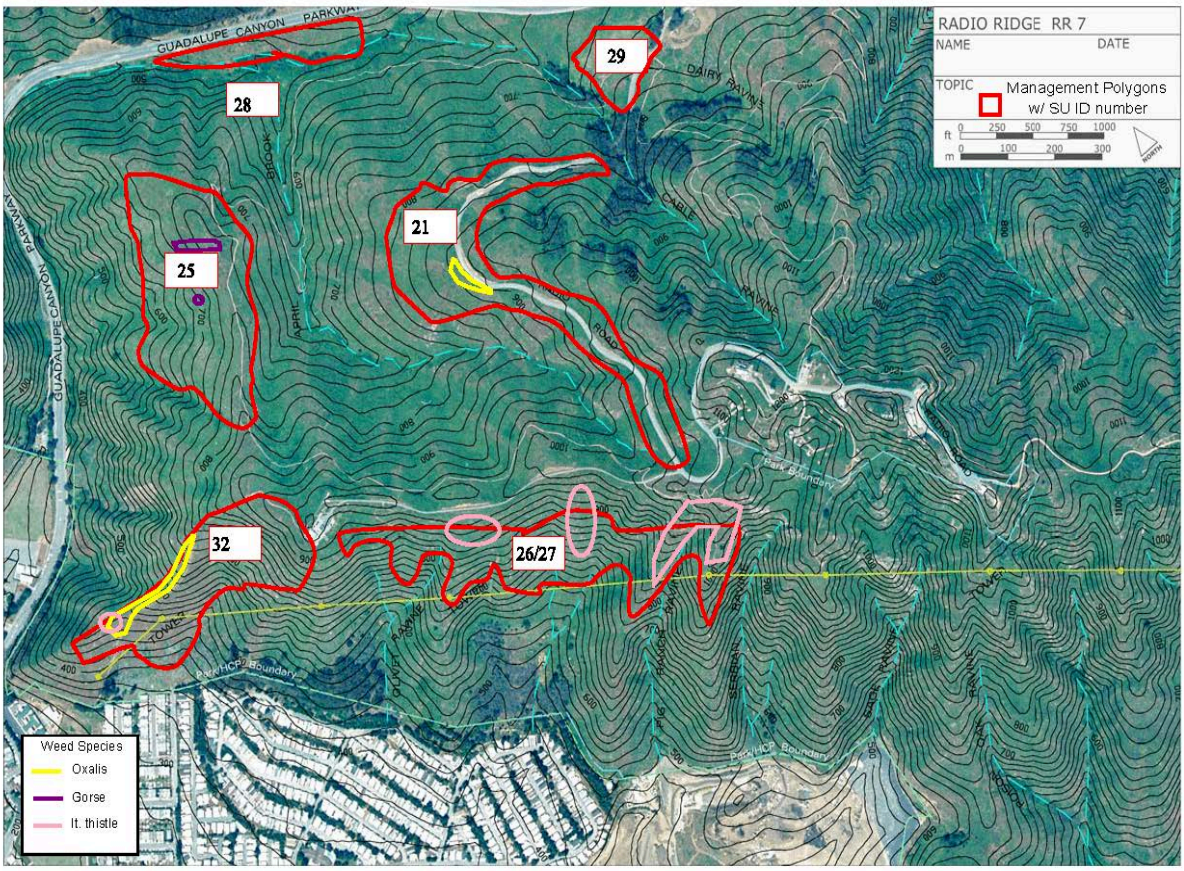
Weeds controlled were broom and fennel. The broom was sprayed with a foliar application of 2% Garlon 4 Ultra herbicide. Fennel is mowed to the root crown and secondary stem growth is treated at a later date using the same solution. The control area within the management unit was 8.1 acres.

E. Southwest Slope (436 Acres)

The Subunits in the MU are SU (26) Ridge Lines West Peak, Olivet, Pig Ranch, and SU (27) Serbian Ridge Lines, and SU (32) Hoffman St Ridge. The sub-ridges in this MU have endangered CS, MB, and SBE butterfly habitat. The weed control was directed around the MB and CS butterfly habitat in the upland grasslands while the SBE butterfly habitat has remained self sufficient. The federally endangered San Francisco campion (*Silene verecunda ssp. verecunda*) is located within this unit on the upper slopes near Radio Road at American Tower. Mission blue habitat is scattered within patches of grassland and the fire road along the ridge line.

The typical weeds controlled are oxalis and Italian thistle. The 2014 funding was increased in this MU to contain the spread of the oxalis in SU (32). The largest concentration of oxalis is adjacent to the County Park boundary within Holy Cross property, leased to Pacifica Nurseries, crosses both SW Slope MU and Tank/Juncus MU. Both hand and herbicide methods are used along the SBM and HCP boundary. The control area within the management unit was 17.9 acres.

FIGURE 9: Southwest Slope Treated Areas



F. Hillside/Juncus (217 Acres)

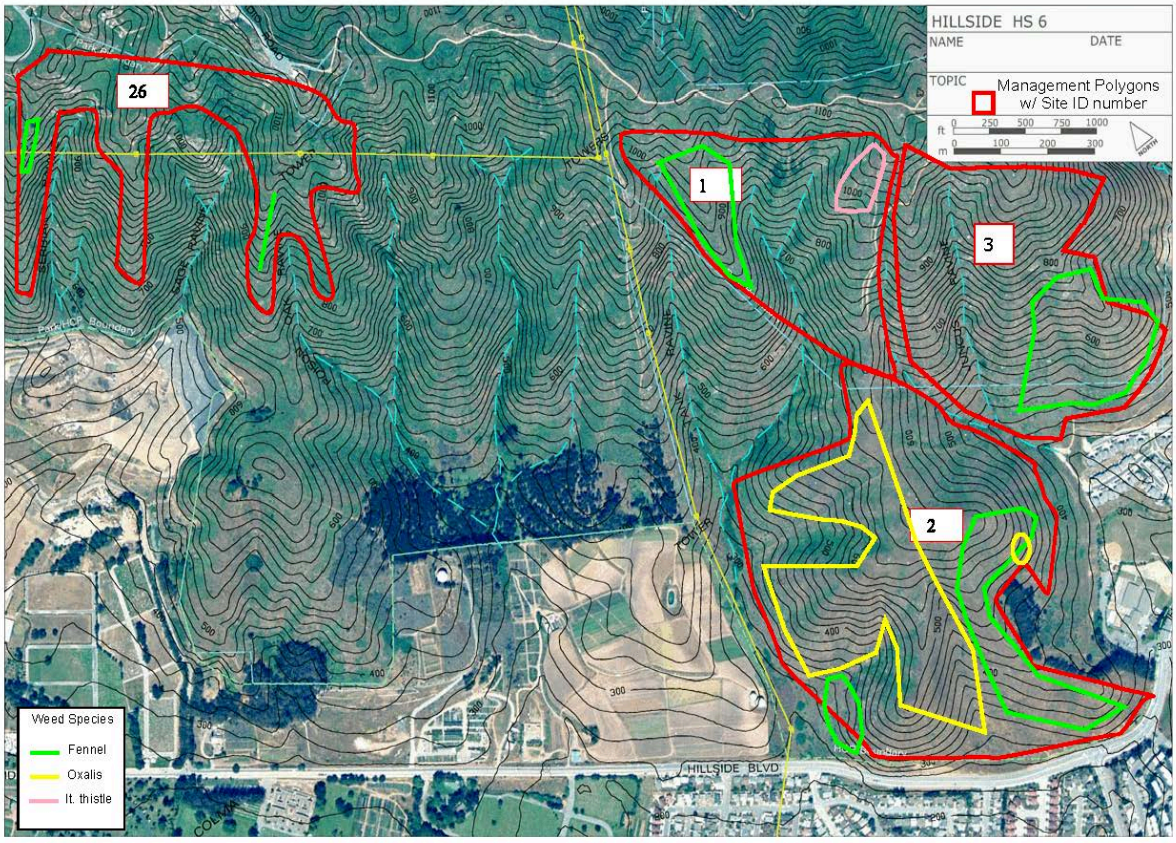
The Subunits in the MU are SU (1) Tank Ravine, SU (2) Hillside, and SU (3) Juncus Ravine. The 2014 effort has been increased in the MU to treat the oxalis infestation and reducing the coyote brush. The oxalis surrounds the endangered butterfly host and nectar plants. Hand removal is performed within the 3-ft buffer zone

The two main weed species are fennel and oxalis. The mature fennel was mowed from the roadside upslope to the Ridge Trail followed with polaski hand tools to remove all the remaining tap roots. Secondary growth at the root crown was treated with 2% Garlon 4 Ultra herbicide. That allowed the surrounding native perennial grasses to volunteer into the weedy sites.

Oxalis was treated from late January through February with a combination of 1%

Aquamaster and 2% Garlon 4 Ultra. The 2014 drought reduced its presence and only 10% of last years stands were visible for an herbicide application. The total acreage treated throughout the year was 214.8 acres.

FIGURE 10: Hillside/Juncus Ravines Treated Areas



G. Carter/Martin (129 Acres)

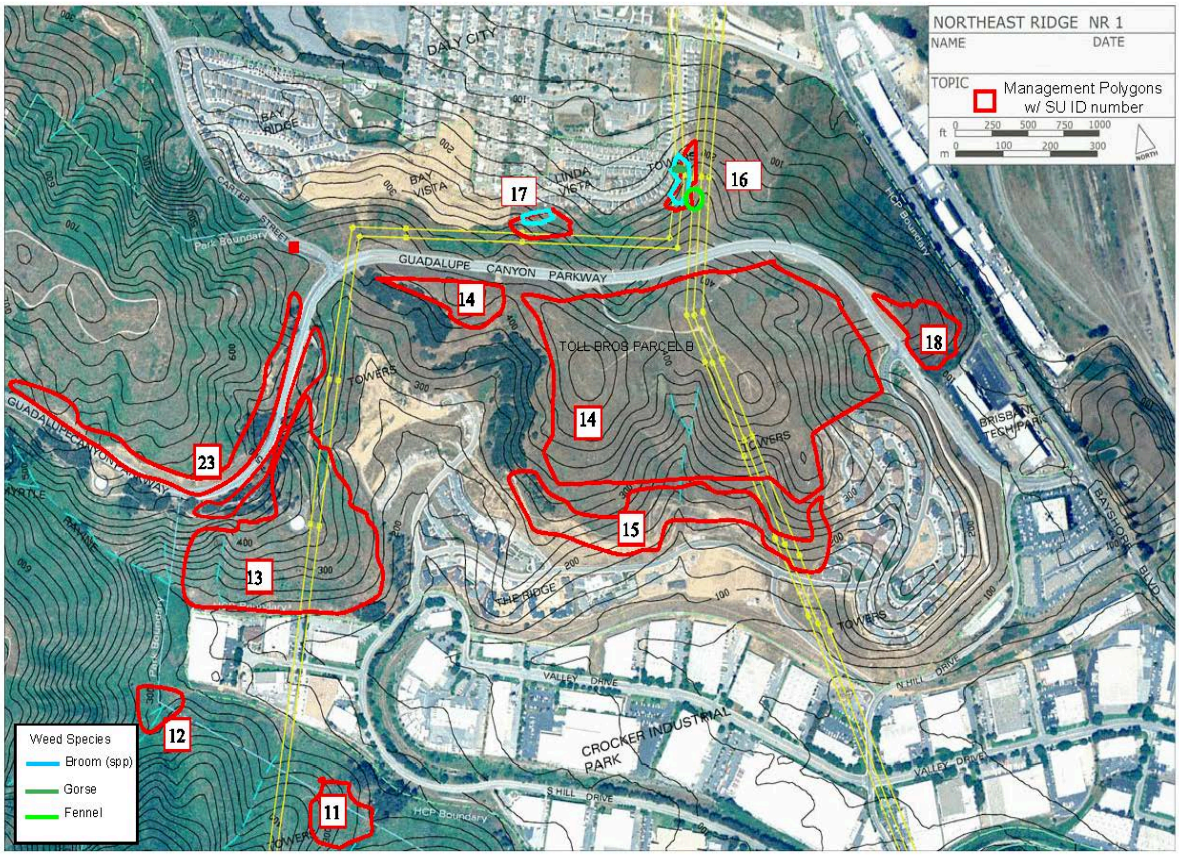
The Carter/Martin MU is located at the northeast end of San Bruno Mountain State and County Park and has both MB and CS butterfly habitat. The sub-unit areas are SU (16) Linda Vista East, SU (17) Linda Vista West, and SU (18) Brisbane Office Park.

The unit contains habitat for the mission blue and Callippe silverspot butterflies. Areas of restoration, via planting islands, are present and provide host and nectar plants within this management unit. The connectivity to surrounding Northeast Ridge grasslands is an important vegetation management site due to the presence of mission blue butterflies.

Our focus each year was the maintenance of established mission blue butterfly habitat located behind the Bay Vista and Linda Vista Development. The weeds of concern, fennel and French broom, were managed using hand work, mowing, and herbicide applications.

In SU (16) and SU (17) the highest species density was French broom seedlings within the established mission blue butterfly host and nectar plant area found throughout the cut slopes. The French broom is primarily removed by hand surrounding these plants. The control area within the management unit was 3.2 acres.

FIGURE 11: Carter/Martin Treated Areas



H. Northeast Ridge (214 Acres)

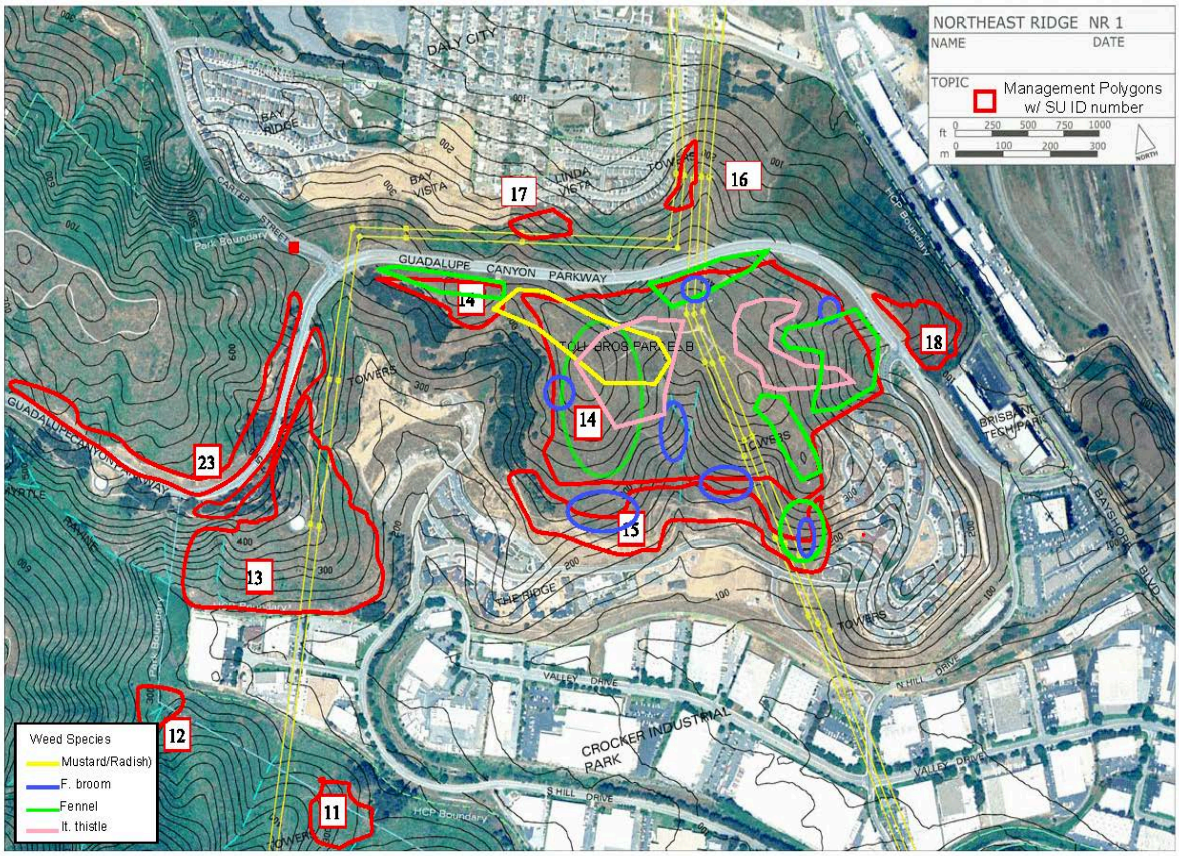
The subunits for the Northeast Ridge MU are SU (14) Parcel B NER and SU (15) NER Fence line. It is abundant with *Viola pedunculata,* the host plant for the endangered Callippe silverspot butterfly. Parcel B is privately owned by The Toll Brothers, Inc. This parcel is planned for dedication to San Mateo County Parks Department as part of the San Bruno Mountain Habitat Conservation Plan. The Toll Brothers contracted with West Coast Wildlands, Inc. to implement a 5-year vegetation management plan.

The plan was initiated in September 2012 and will continue through 2017. The site is divided into three management units with two subunits (See Figure 12) controlling French broom, fennel, Italian thistle, wild radish, summer mustard, and eucalyptus seedlings.

In 2014 the weed species with the highest density was Italian thistle, wild radish, and

summer mustard. Control work on French broom, eucalyptus, and fennel has been effective over the treatment period. However, non-native annual grasses and weeds such as Italian thistle and wild radish pose potential threats to the quality of the grassland habitat for the listed species.

FIGURE 12: NER Treatment Areas



Fennel was mowed on slopes facing Guadalupe Canyon Pkwy and along the ridge of site. Portuguese and French broom was treated with a foliar application of 2% Garlon 4 Ultra solution; mature stands were cut with chainsaws and stumps were treated with a solution of 25% Garlon 4 Ultra cut stump application. Dense patches of summer mustard and wild radish were also treated with a 2% foliar application of Garlon 4 Ultra.

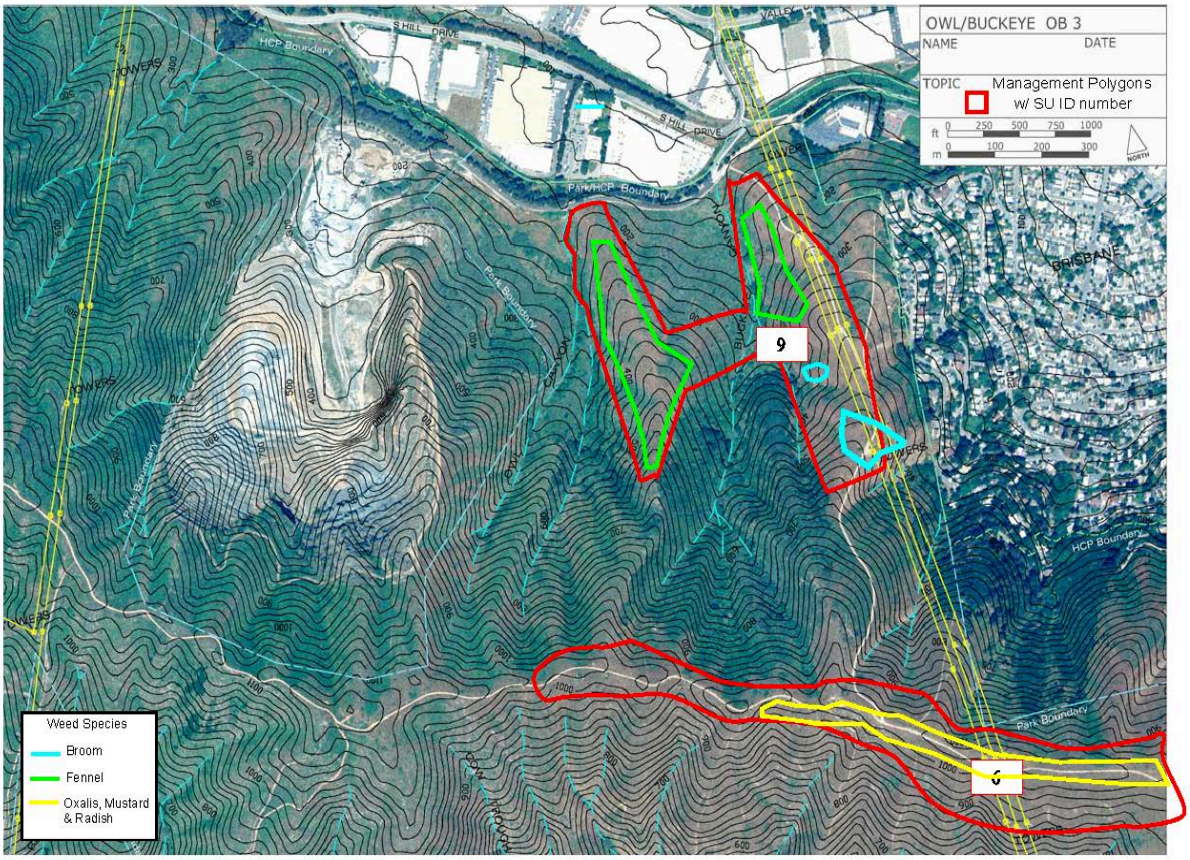
Four eucalyptus saplings along the western boundary were cut at the base and treated with a 25% solution of Garlon 4 Ultra using cut-stump method. The Parcel B has been visited 4 times since the start of the contract in 2012 and is showing decrease of up to 85% in the mature listed weed species.

The French broom was cut using hand tools and treated with a 25% solution of Garlon 4 Ultra using the cut stump method. The fennel was removed using hand tools followed by 2% herbicide foliar application when the plant leafed out. The control area within the management unit was 62.1 acres.

I. Owl and Buckeye Canyons (294 Acres)

Owl and Buckeye canyon MU consists of SU (9) Owl/Buckeye and SU (6) Ridge Trail. The weeds of concern treated were bristly ox-tongue, fennel, summer mustard, wild radish, and French Broom. During 2014 hand work, mowing and herbicide applications methods were used. The species density was highest in fennel, wild radish, and summer mustard along the Ridge Trail. French broom was scattered along the northeastern section adjacent to the water tank to the foot trail. A patch of *Oxalis pes-caprae* located west of Owl Canyon was discovered in 2011 and treated in the spring of 2014 and only a trace of the original stand persists. A total of 59.9 acres were treated in 2014.

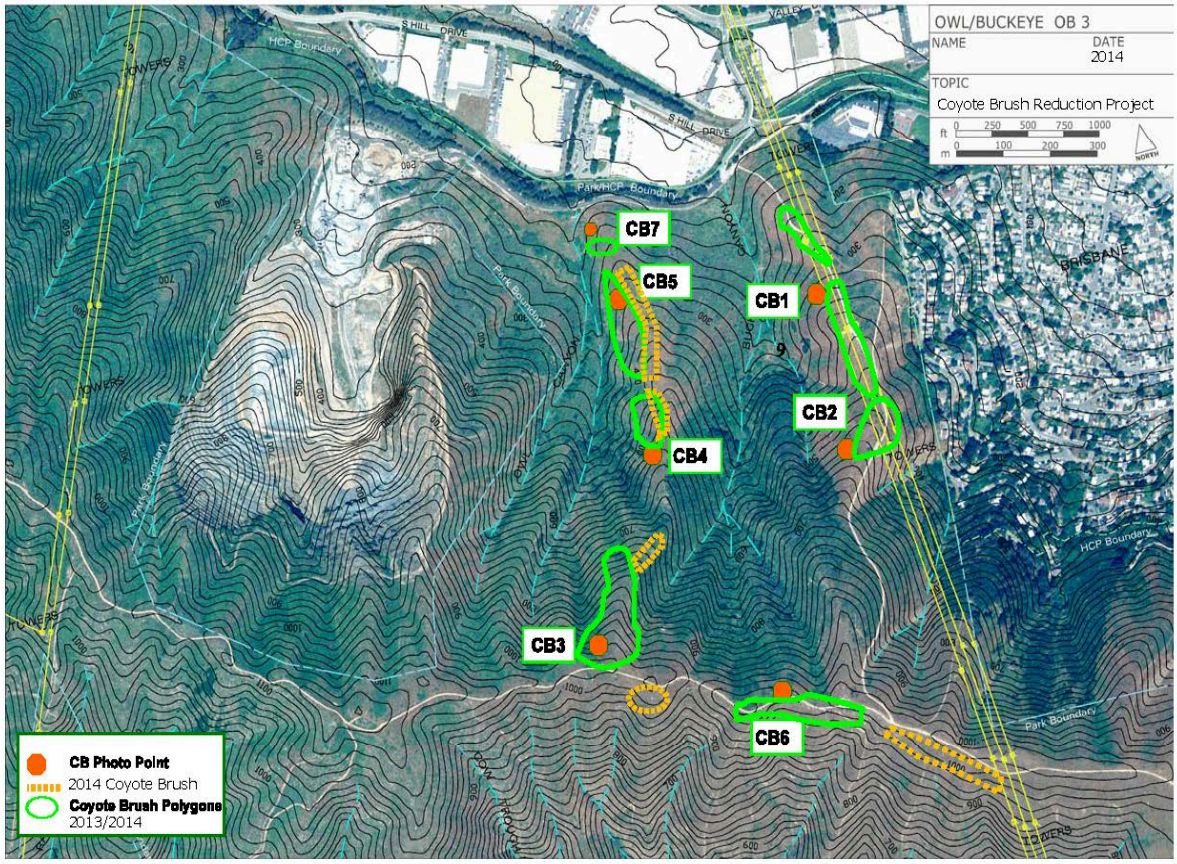
FIGURE 13: Owl/Buckeye Weed Treatment Area



The Ridge Trail and the north facing sub-ridges are part of the Coyote Brush Removal and Grassland Re-vegetation Projects. Coyote brush was cut an additional 30 ft of between the two sub-ridges and the upper Ridge Trail. The coyote brush removal plots are noted by their polygon ID names: CB1-7 in Figure 14. The stumps were treated with 25% Garlon 4 Ultra® by cut stump treatment

The additional coyote brush removal plot CB7 was established at the base of Owl Canyon sub-ridge and a San Bruno Mountain Watch volunteer group outplanted with native grasses and forbs. The Habitat Islands were expanded within the Oxalis Control and the Coyote Brush Removal Projects as the coyote brush was removed.

FIGURE 14: Coyote Brush Removal Project

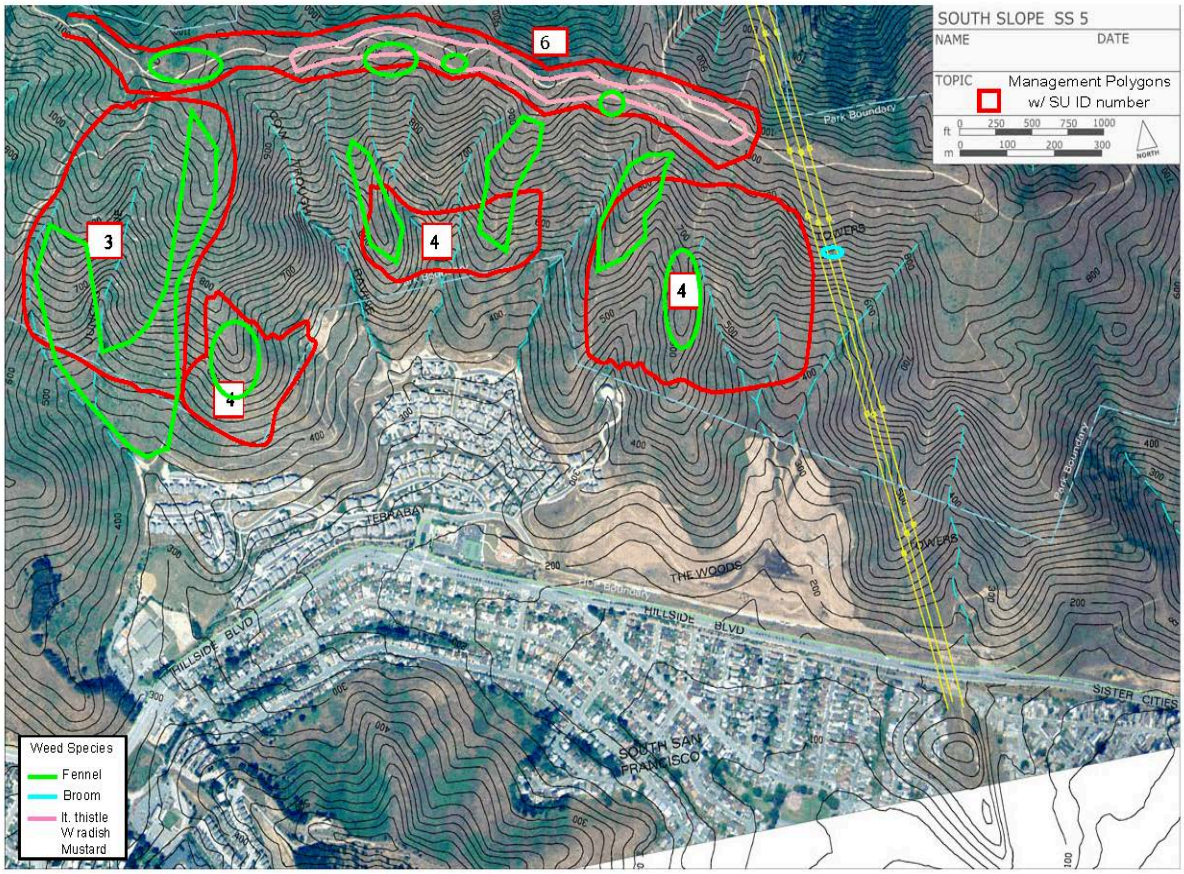


J. Brisbane Acres (152 Acres)

The subunit in Brisbane Acres is SU (6) Ridge Lines and CS butterfly habitat is located along the sub-ridges of this MU (See Figure 3). The main weeds targeted included wild radish and Italian thistle. These plants are treated with an herbicide in the spring when they appear.

The 2014 weeds of concern were fennel, summer mustard and wild radish. The weeds were managed using hand tools, brush cutters, and herbicide applications. A total of 7.4 acres were treated within the management unit.

FIGURE 15: Brisbane Acres and South Slope Treatment Areas



K. South Slope (477 Acres)

South Slope (SS) MU has subunits SU (4) Terra Bay Upper, SU (5) Southeast Ridge, and the SU (22) Woods Remainderlands. The sites contain primarily native perennial grassland habitat for mission blue and Callippe silverspot butterfliest. The weeds of concern treated during 2014 using hand work, mowing, and herbicide included bristly ox-tongue, fennel, summer mustard, jubata grass, wild radish, and French broom. The species density was highest in fennel, wild radish and summer mustard along the Ridge Trail. There is French broom and fennel scattered up slope of the Terra Bay Phase II Project drainage sites and old fire trails.

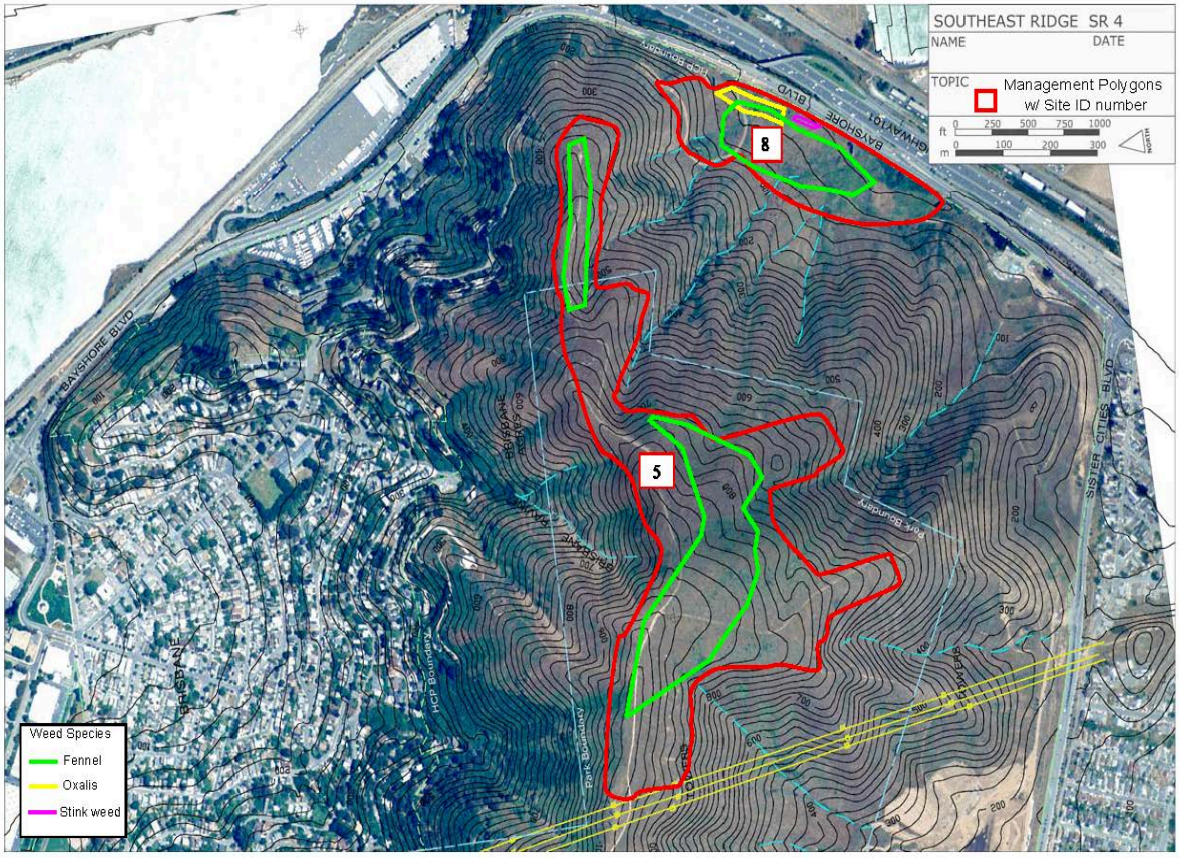
The highly invasive species *Oxalis pes-caprae* was found in the winter of 2010. Through a cooperative project with San Bruno Mountain Watch and Mission Blue Nursery in 2015 this area will be outplanted with native host and nectar plants for endangered butterflies on the south facing slopes totalling 3000 square feet. (See Table 2) The area managed within the MU was 55 acres.

L. Southeast Ridge (191 Acres)

The Southeast Ridge (SER) MU has subunits SU (8) Preservation Parcel and SU (5) Southeast ridge. The Southeast Ridge (Figure 16) is located on the far eastern edge of San Bruno Mountain and is bordered by Bayshore Boulevard and Highway 101 on the east and south and the Ridge Trail on the north.

The weeds of concern treated during 2014 were fennel, summer mustard, wild radish, and French broom using hand pulling, brush cutters and herbicide applications methods. The species density was highest in fennel, wild radish, and summer mustard along the Ridge Trail and towards East Point.

FIGURE 16: Southeast Ridge Treatment Areas



The fennel along the southeastern sub-ridges was cut at the crown to remove the new and old seed stalks. This stimulates secondary growth and force the plant to leaf out. This new growth is treated with a foliar herbicide application using Garlon 4 Ultra. A total of 13 acres were managed using this method.

The French broom control under the eastern transmission towers had a 95% reduction in mature plants using a basal bark treatment and the *Oxalis pes-caprae* located on the south slope near Army Rd. was reduced by approximately 65% using the foliar herbicide method. Preservation Parcel also showed a 75% reduction of

Oxalis pes-caprae following an herbicide foliar application in the month January of 2014. A small patch of stink weed (*Dittrichia graveolens*) found along the eastern fence line of Preservation Parcel by Doug Allshouse, San Bruno Mountain Chair with CNPS, was treated for seedlings in February 2014. The managed area in 2014 was 55 acres.

III. ADDITIONAL TASKS

A. HCP Oxalis Control Project

The Oxalis Control and Restoration projects are a cooperative effort between San Bruno Mountain Watch (SBMW) and West Coast Wildlands, Inc. (WCW, Inc.). WCW, Inc. treated two infestations of oxalis with herbicide foliar application. SBMW with WCW, Inc. planted native grasses after both treatments. Plants were spaced on one foot centers. The area covered was one half acre. Table 3 contains species planted. The sites were monitored and treated for oxalis re-growth twice.

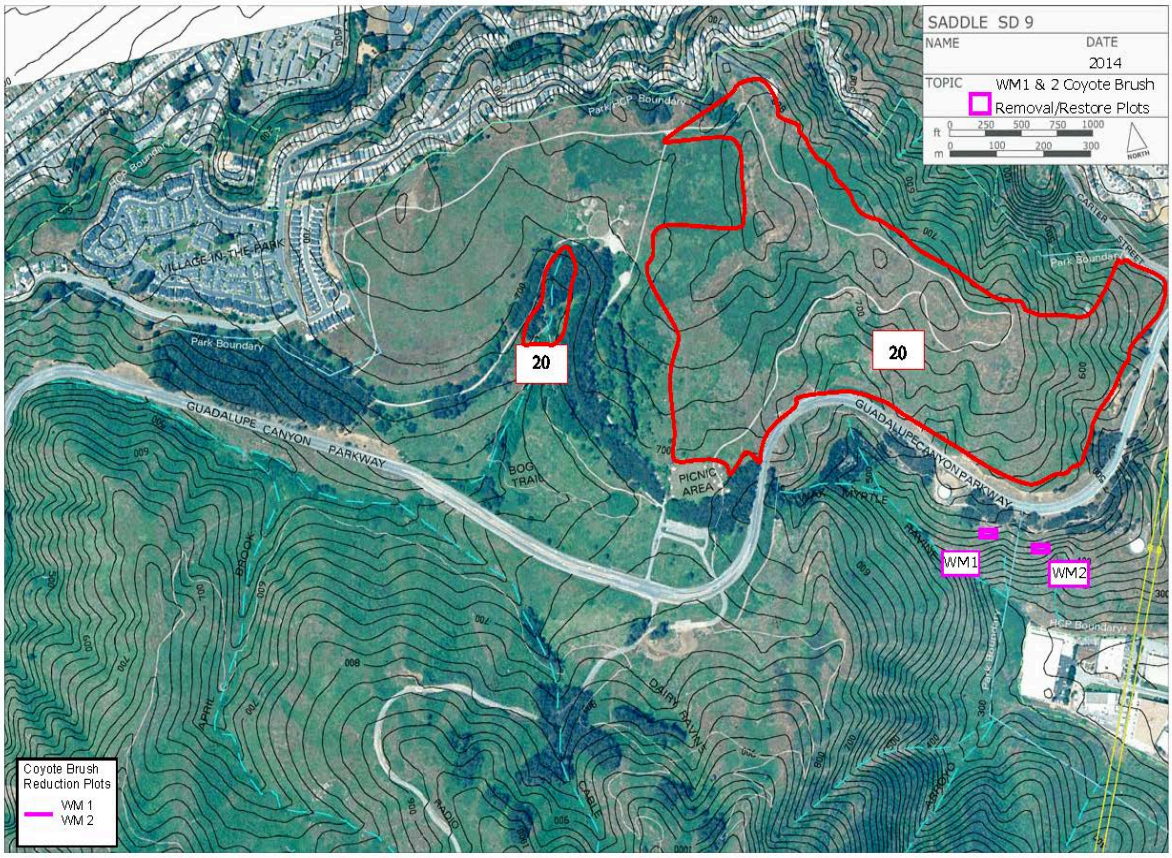
B. Owl and Buckeye Canyons/Wax Myrtle Ravine Coyote Brush Removal Project and Habitat Restoration

The coyote brush/scrub removal project focused on restoring grassland, mission blue and Callippe butterfly habitat. The Owl and Buckeye Canyon sub-ridge treatment plots (CB1-5) and the Ridge Trail (CB6) plot were expanded an additional 30 feet on either side of the current removal boundaries. CB7 point is the new brush reduction plot added in 2014. Three acres of invasive brush was removed for planting.

Revegetation by the San Bruno Mountain Watch volunteers involved hand broadcast and outplanting a mix of native grasses and perennial forbs (Tables 3 and 4) including butterfly host plants (two species of lupines for the mission blue butterfly) as well as nectar plants.

SBMW will monitor the Scrub Removal/Grassland Restoration Project sites WM1 & 2 in Wax Myrtle Ravine SU (31) in 2015 to assess the effectiveness of this revegetation (See Figure 17). This will consist of setting up plots within the revegetated areas to monitor the percent survival of perennial grasses and forbs, the percent cover of seeded annuals, and the percent cover of non native weed establishment following scrub removal and revegetation. SBMW will present the results to the TAC.

FIGURE 17: Wax Myrtle Ravine Coyote Brush Removal and Restore Plots



IV. Special Projects

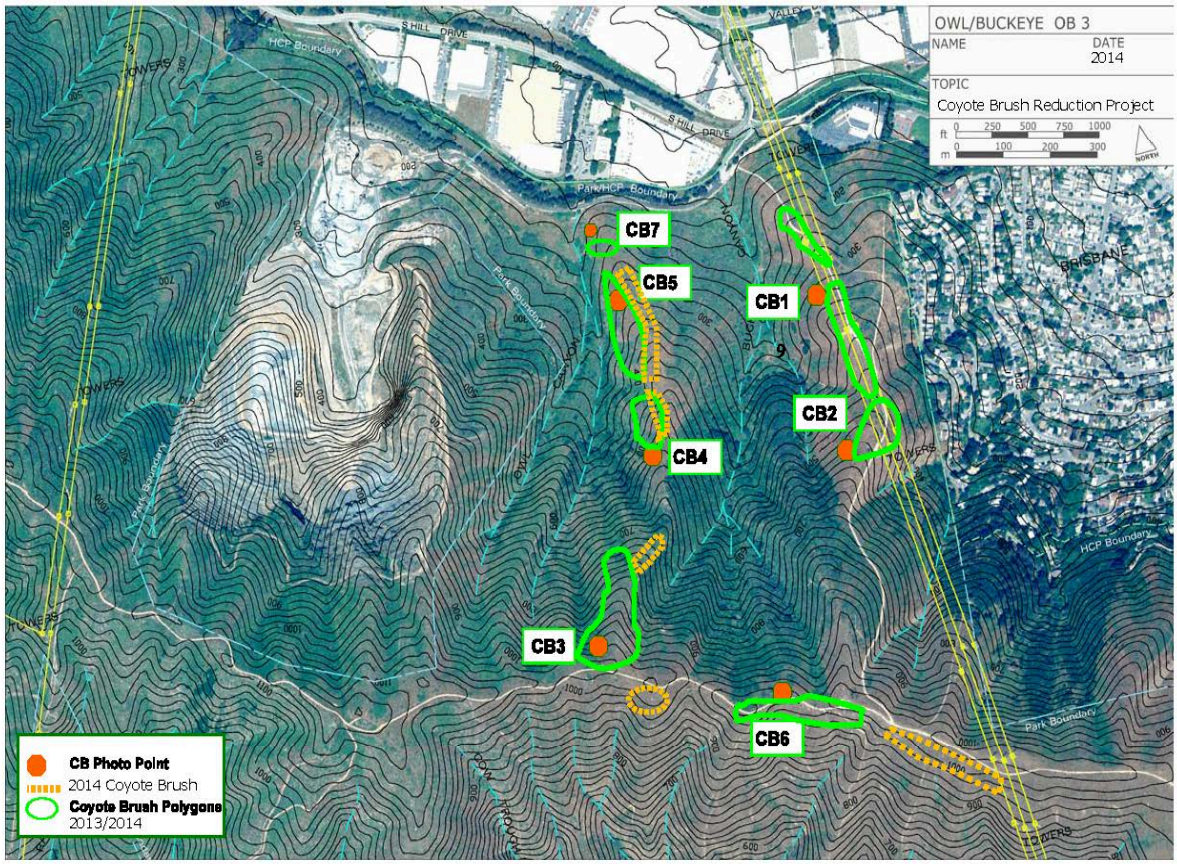
Two restoration projects are a cooperative effort between WCW Inc. and San Bruno Mountain Watch. These projects are funded by the HCP Trust Fund.

FIGURE 18: Coyote Brush Removal on Buckeye Sub Ridge (before and after).

A. The first project: Coyote brush removal along the Main Ridge Trail and

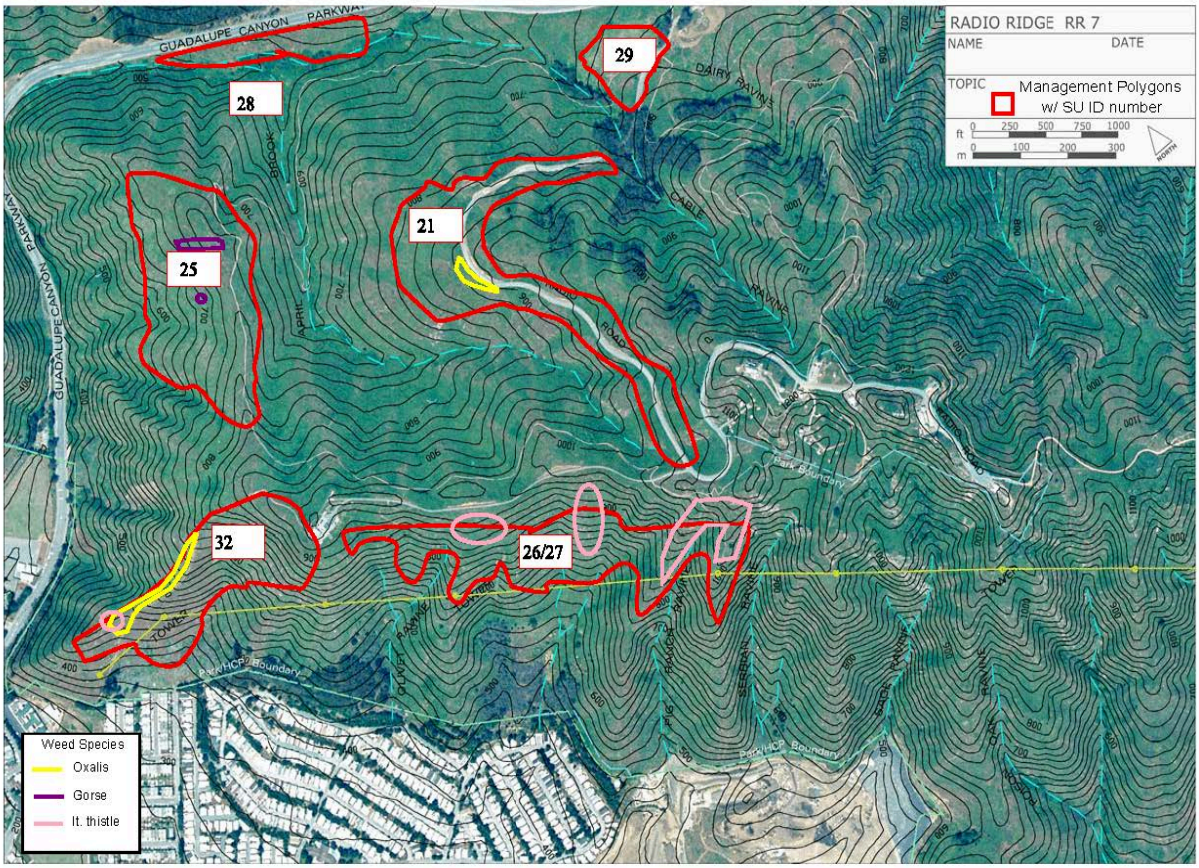
Owl/Buckeye Canyon ridge (Figure 19) are in MU: Owl/Buckeye Canyon and South Slope. The brush removal sites were re-seeded using native perennial grass (Table 2).

FIGURE 19: Coyote Brush Reduction Project



B. The second project: planting butterfly host and nectar plants in oxalis control plots located in both the South Slope and Southwest Slope MU. Both projects were included in the FY 2013/2014 San Bruno Mountain State and County Park Vegetation Management Plan and out-planting was performed in the fall 2013 and the spring 2014 by the SBMW volunteer group. The Oxalis Treatment and Restoration Plot is outlined in yellow (See Figure 20, SU (32)).

FIGURE 20: Southwest Slope Treated Areas



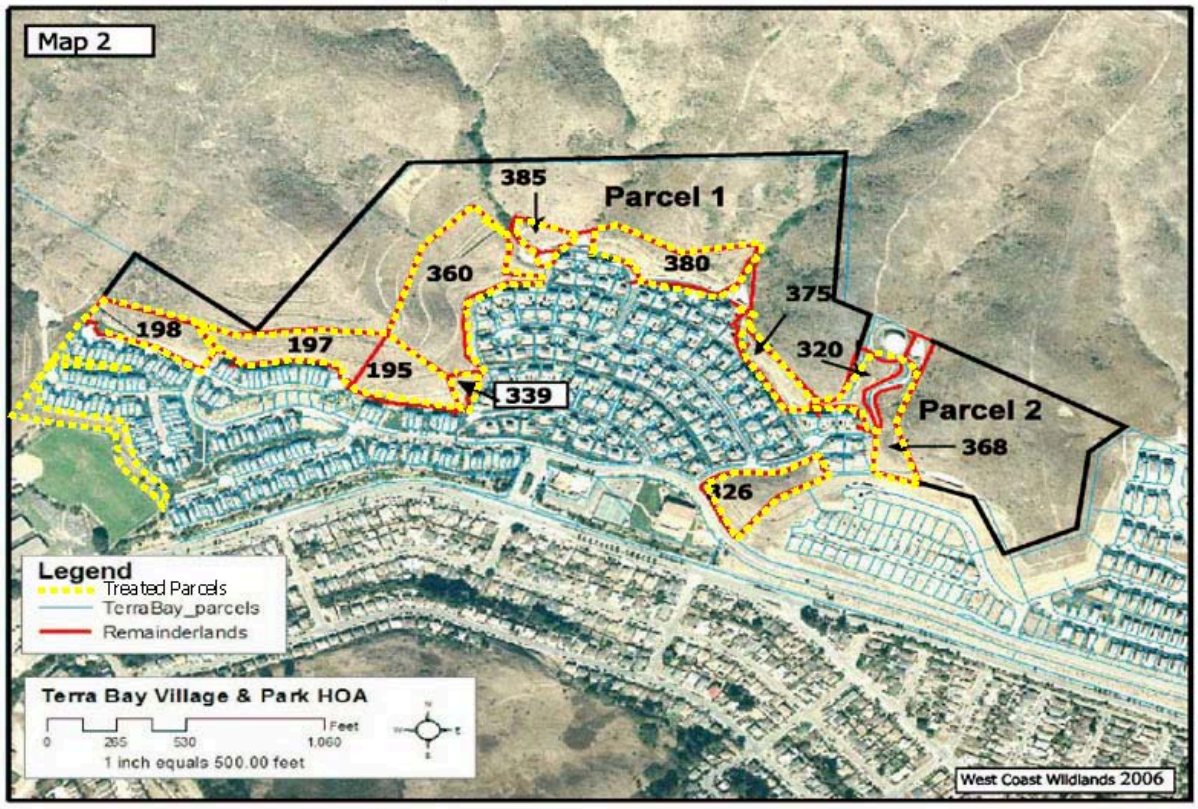
V. Invasive Species Control Work (not funded by the HCP)

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

A. Terra Bay Master Homeowners Association Invasive Control Project

The Terra Bay Homeowners Association contains eleven parcels of open space within the HCP boundary and boarders San Bruno Mountain State and County Park on the western, southern, and eastern boundaries. The members of the TBHOA Council accepted a bi-annual maintenance program to remove additional weeds to be funded on an annual basis. West Coast Wildlands, Inc. continues to treat invasive weed species with two visits per year; once in the spring and once in the fall. The weed species controlled were bristly ox-tongue, fennel, French broom, summer mustard, oxalis, jubata grass, and wild radish.

FIGURE 21: Terra Bay Masters HOA



The eleven parcels were brush cut to remove fennel seed stalks during the late spring removing dead material to expose weedy root stems. This initiates secondary growth and the emerging leaves are treated with herbicide. The fennel seedlings were removed with a Polaski hand tool.

Weed species within 24 inches of mission blue and/or Callippe silverspot host and nectar plants were removed using hand tools with little disturbance to the soil. The jubata grass was treated with 2% Aquamaster herbicide. The fall 2014 treatment showed a 99% reduction of mature fennel and broom. The jubata grass seedlings are on the western edge of the site and cover 100 ft.

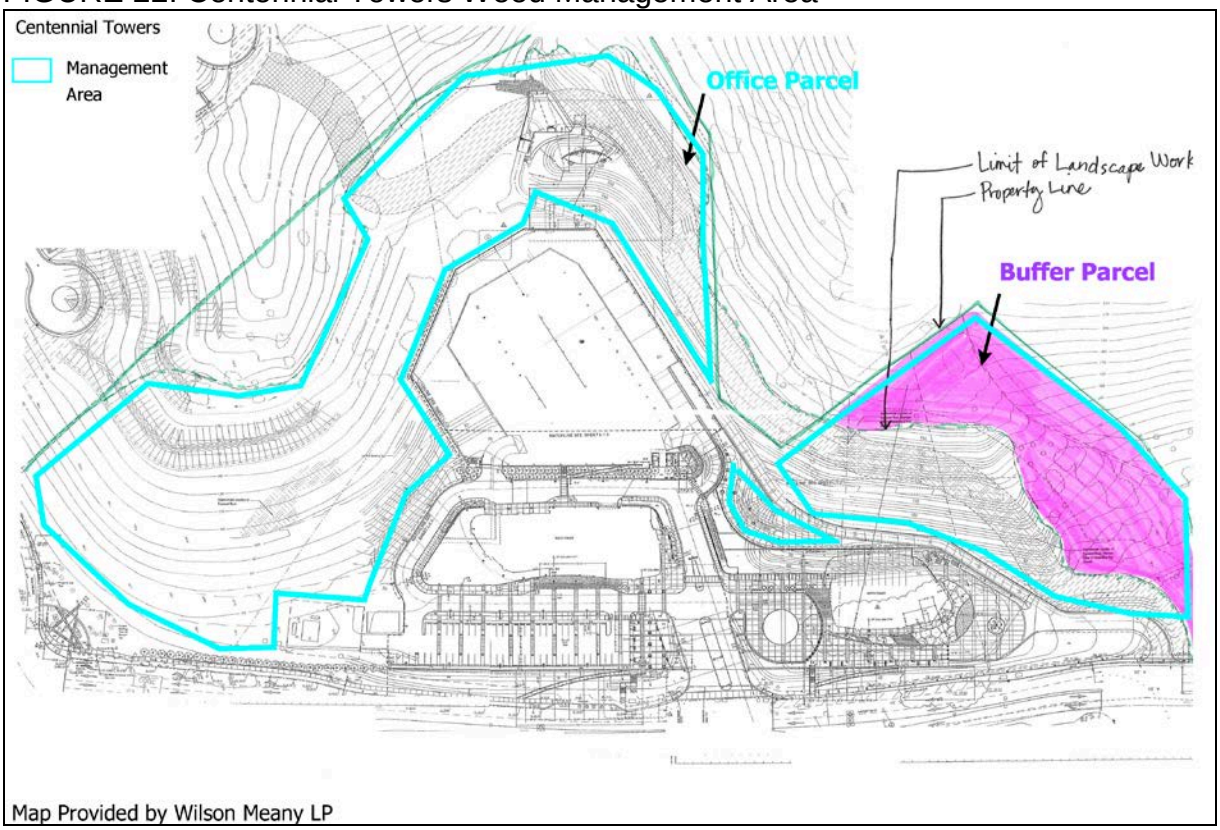
B. Myers Peninsula Venture, LLC., Parcels Exotics Control Project

In September 2009, Myers Peninsula Venture, LLC., hired West Coast Wildlands, Inc. to write a 3 year Exotics Control Plan and a contract was approved. WCW, Inc., was hired to treat weed species on two parcels that are adjacent to San Bruno Mountain State and County Park through the Fall 2011. The two sites total 21 acres and the treated area consists of 15 acres. The Mandalay Point property managers, Wilson, Meany LLC, have continued a bi-annual maintenance program to remove additional weeds funded on an annual basis.

The main weed species treated are fennel, summer mustard, wild radish, French broom, jubata grass, and oxalis.

The site was visited twice annually, once in the spring and fall. The current status of weed control is a 99% reduction of the primary mature weeds of fennel, F. broom and jubata grass. There is ongoing control of these seedlings, wild mustard and Italian thistle. The effort has been reduced to four hours of management per visit for maintenance.

FIGURE 22: Centennial Towers Weed Management Area



C. San Bruno Mountain Watch Exotics Control & Restoration Projects

South San Francisco Weed Warriors Program (Part of SBMW)
In June, a weeding group was formed to work along Hillside Trail in South San Francisco. The group meets twice a month for three hours. The weeds targeted were: *Carduus pycnocephalus*, Italian thistle; *Raphanus staves*, wild radish; *Crepis viscera*, hawksbeard; *Plantago lanceolata*, English plantain; *Erodium betrays*, long-beaked storksbill; *Silybum marianum*, milk thistle; *Sonchus oleraceus*, sow thistle; *Hypochaeris radiate*, wooly cat's ear; *Rumex acetosella*, sheep sorrel; *Foeniculum vulgare*, fennel; *Senecio vulgaris*, common groundsel; and *Oxalis pes-caprae*.

Volunteer Hours
There were 200 SBMW volunteer visits to the mountain, resulting in 1600 hours of work for the oxalis and coyote weed management and restoration projects.

VI. Restoration of Habitat

Restoration is important to enhance special status species. The first priority should always be to protect the existing habitat, because that is the best use of current funds for ensuring the long-term survival of both MB and CS on San Bruno Mountain (Biological Program, HCP Volume I, 1982).

Restoration is a measurement used by the County of San Mateo for their Outcome Based Management. A strategy of creating small habitat islands (up to approximately 1/2 acre in size) was developed. Maintaining these sites over time requires ongoing management to control invasive species and brush succession. The Planting Islands have been slow to germinate additional host and nectar plants from the seeds within the islands.

A. **Colma Creek & Saddle Bog Trail Watershed Project**

The project is currently overseen by the San Mateo County Parks Department and managed according to the 2008 San Bruno Mountain Habitat Management Plan (HMP). There is a maintenance program aimed at controlling invasive Aremenian blackberry within the Bog area (See Figure 20, SU (28)).

B. ***Oxalis pes-caprae* Restoration Project**

This project is a cooperative working group between West Coast Wildlands, Inc., and the SBMW volunteers. Two oxalis treatment sites were chosen that have mission blue (MB) Callippe silverspot (CS) butterfly observations annually. The first site contains MB butterfly habitat at the western end of the Hoffman Ridgeline, and the second site contains CS habitat along the eastern Ridge Trail and is found 300 ft. from the eastern transmission towers. Oxalis is treated during the December/January months of 2013/2014 and SBMW planted native perennial native grasses after weed dieback (Figure 20 & Table 3).

VII. Discussion & Recommendations

The weed management of the sites covers existing weed threats surrounding and within the endangered butterfly core habitat. Current funding limits our effort to about 600 managed acres each year and tries to place those efforts that best suit the maintenance of those core habitats. As the high priority weeds are removed the secondary invaders become our next weed management problem to control. This limits how much additional weed managed sites and effort is added to the overall annual butterfly habitat maintenance and/or enhancement plan. The TAC is advised of the current status of each management areas, the presence/absence of weeds in the management units and a discussion of how best to apply the funds. The consensus was to add more effort to the Brush Reduction and Oxalis Control Projects.

The additional tasks included removing coyote brush and out planting in managed scrub plots but, had a 75% planting mortality rate. Lack of natural precipitation was a problem. There was significant hand watering done in the late winter to early spring months of 2014 by SBMW. Those plants that were successful tended to be herbaceous while the native grasses tended to die off more quickly. The revegetation areas with easier access also did better in establishing growth than those that were in more remote areas. The current brush reduction and restoration sites were placed closer to trails to improve watering during periods of low rainfall or coastal fog drip.

Oxalis emerged at a later time and with less foliage in the early winter months of 2013/14 due to the drought conditions. The late emergence of oxalis may have resulted from the lack of precipitation. We subsequently observed a super bloom over one month instead of four months. This resulted in less treatment time which affected desired dieback rates.

VII. Recommendations

There has been a significant reduction in many of the invasive weeds with exception of oxalis and fennel. Conversely the coastal scrub, primarily coyote brush, encroachment remains high. Attention to further removal of the targeted invasive species needs to be addressed. All 13 management units and their subunits should be walked to assess current status of butterfly and grassland habitat. The 30-year Assessment of the vegetation management by Creekside Science provides many vegetation management recommendations and funding ideas for invasive species control to improve grassland habitat for the listed butterfly species.

VIIII. References

County of San Mateo, 1982. San Bruno Mountain Habitat Conservation Plan, Volume I and II. Prepared by Thomas Reid Associates.

Thomas Reid Associates. September, 2007. San Bruno Mountain Habitat Management Plan 2007: Prepared by TRA Environmental Sciences: Patrick Kobernus.

San Mateo County Department of Parks, 2014. San Bruno Mountain Vegetation Management Plan 2014. Prepared by West Coast Wildlands, Inc.

Thomas Reid Associates. January, 2010. San Bruno Mountain Activities Report for Special-Status Species: Prepared by TRA Environmental Sciences: Autumn Meisel

Thomas Reid Associates. January, 2014. San Bruno Mountain Activities Report for Covered Species: Prepared by TRA Environmental Sciences: Autumn Meisel

Creekside Science. 2015. DRAFT: Assessment Of The Last 30 Years Of Habitat Management And Covered Species Monitoring Effects Associated With The San Bruno Mountain Habitat Conservation Plan. Prepared by Creekside Science.

TABLES

Table 1: Invasive Species treated on San Bruno Mountain by West Coast Wildlands

Plant Species	**Species ID**	**Treatment Schedule**
Acacia sp. (acacia)	ACME	Year Round
Carduus pycnocephalus (Italian thistle)	CAPY	Year Round
Cortaderia jubata (Jubata grass)	COJU	Year Round
Cotoneaster sp. (cotoneaster)	COLA	Year Round
Cytisus scoparius (Scotch Broom)	CYSC	Year Round
Cytisus striatus (Portuguese broom)	CYST	Year Round
Delairea odorata (Cape ivy)	DEOD	Year Round
Eucalyptus globulus (blue gum tree)	EUGL	Year Round
Foeniculum vulgare (fennel)	FOVU	Fall, Spring
Genista monspessulana (French broom)	GEMO	Year Round
Hirschfeldia incana (mustard)	HIIN	Spring
Leucanthemum vulgare (ox-eye daisy)	LEVU	Spring
Oxalis pes-caprae (Bermuda buttercup)	OXPE	Winter
Picris echioides (bristly ox-tongue)	PIEC	Spring
Raphanus ssp. (radish)	RASA	Spring
Rubus armeniacus (Armenian blackberry)	RUAR	Year Round
Ulex europaeus (gorse)	ULEU	Year Round

Table 2: Native Grass and Forb Species planted within the coyote brush removal and the Oxalis Control Revegetation areas on San Bruno Mountain in 2014 by San Bruno Mountain Watch

2014 Scrub Removal and	Oxalis Revegetation Projects		
Grassland Perennials:		%	3000 plants
Scientific name	Common name:		
Acaena pinnatifida	Acaena	8	120
Achillia millefolium	common yarrow	8	120
Agoseris grandiflora	large flowered agoseris	7	105
Eriogonum latifolium	coast buckwheat	8	120
Erysimum franciscanum	Franciscan wallflower	7	105
Grindelia hirsutula maritima	coast gumplant	7	105
Heterotheca sessiflora bolanderi	golden aster	7	105

Horkelia californica var californica?	Horkelia	5	75
Lomatium dasycarpum	lace parsnip	8	120
Lupinus albafrons	silver lupine	3	45
Lupinus variicolor	varied lupine	3	45
Monardella villosa villosa	coyote mint	3	45
Phacelia californica	California phacelia	8	120
Sisyrinchium bellum	blue-eyed grass	8	120
Solidago canadensis elongata	meadow goldenrod	8	120
Wyethia angustifolia	mule ears	2	30
	Total:	100	1500

Native Grasses:			
Scientific name	Common name:	%	
Bromus carinatus	California brome	20	300
Danthonia californica	California oat grass	10	150
Elymus glaucus	Blue wildrye	20	300
Festuca rubra	red fescue	15	225
Koeleria macrantha	June grass	10	150
Melica californica	California melic	5	75
Nassella pulchra	purple needlegrass	20	300
	Total:	100	1500

Table 3: Native annual and perennial seed mix hand broadcast by SBMW Volunteers at Coyote Brush Removal and Oxalis control plots

Native Grassland Annusla		
Scientific Names	Common Names:	Units grams)
Castilleja exserta	purple owl's clover	10
Lasthenia californica	California goldfields	10
Navarretia squareosa	skunkweed	10
Amsinckia intermedia	Intermediate Fiddleneck	10
Daucus pusillus	Wild carrot, rattlesnake weed	10
Clarkia rubicunda	Farewell to Spring	10
Plantago erecta	Dwarf plantain	10
		70 grams

Appendix 1:

MU	(SU #)	SU Area (a)	CS/MB/SBE Habitat	Inv. Target	Treatment (a)	% cover	Treatment Methods
Hillside/Juncus Ravines	1	101.5	CS/MB	FOVU	40.4	4	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	1		CS/MB	OXPE	22.5	5	Foliar application w/Garlon 4 Ultra 2%- 3 visits
	2	105.8	CS/MB	BAPI	2.0	2	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	2		CS/MB	FOVU	22.6	2	Foliar application w/Garlon 4 Ultra 2% - 2 visit
	2		CS/MB	FOVU	10.3	1	Brush cut seed stalks for secondary growth - 1 visit
	2		CS/MB	OXPE	116.2	7	Foliar application w/Garlon 4 Ultra 2%- 5 visits
	6	10.1	CS/MB	FOVU	1	1	Foliar application w/Garlon 4 Ultra 2% - 2 visit
South Slope	3	76.5	CS/MB	FOVU	49.5	2	Foliar application w/Garlon 4 Ultra 2% - 4 visits
	3		CS/MB	OXPE	31.6	5	Foliar application w/Garlon 4 Ultra 2% - 4 visits
	3		CS/MB	BAPI	2.0	2	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	4	56.9	CS/MB	FOVU	18.6	3	Brush cut seed stalks at the soil surface – promote secondary growth for Foliar application – 3 visits
	4		CS/MB	FOVU	9.7	3	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	22	72.2	CS/MB	FOVU	3.2	1	Brush cut seed stalks for secondary growth - 1 visit
	22		CS/MB	FOVU	37.6	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	22		CS/MB	GEMO	0.2	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit

South Slope	22		CS/MB	HIIN	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
Southeast Ridge	5	87.6	CS/MB	BAPI	3.5	2	Cut stump – treated w/Garlon 4 Ultra 25% - 1 visit
	5		CS/MB	FOVU	49.1	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	5		CS/MB	HIIN	2.4	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	5		CS/MB	GEMO	3.5	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	5		CS/MB	OXPE	1.5	4	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	8	11.9	CS/MB	DIGR	0.2	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	8		CS/MB	FOVU	3.7	1	Brush cut and Hand remove - 1 visit
	8		CS/MB	FOVU	2.1	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	8		CS/MB	GEMO	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	8		CS/MB	HIIN	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	8		CS/MB	OXPE	1.3	8	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	8		CS/MB	RASA	0.2	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
Brisbane Acres	5	31.3	CS/MB	FOVU	1.1	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	5		CS/MB	GEMO	0.5	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	6	59.9	CS/MB	BAPI	0.5	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit

MU	(SU #)	SU Area (a)	CS/MB/SBE Habitat	Inv. Target	Treatment (a)	% cover	Treatment Methods
Owl/Buckeye Canyon	9		CS/MB	FOVU	20.6	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	9		CS/MB	GEMO	4.5	1	Foliar application w/Garlon 4 Ultra 2% - 3 visits
	9		CS/MB	HIIN	10.1	3	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	9		CS/MB	BAPI	7.2	5	Cut stump - treated w/Garlon 4 Ultra 25% - 4 visits
	9		CS/MB	FOVU	27.7	1	Foliar application w/Garlon 4 Ultra 2% - 3 visits
	9		CS/MB	GEMO	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	9	59.9	CS/MB	HIIN	1.3	1	Foliar application w/Garlon 4 Ultra 2%- 1 visit
Devils Arroyo	10	12.3	CS/MB	COLA	0.1	1	Cut stump - treated w/Garlon 4 Ultra 25% - 2 visits
	10		CS/MB	FOVU	7.6	1	Brush cut seed stalks for secondary growth - 1 visit
	10		CS/MB	GEMO	0.1	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	12		CS/MB	FOVU	0.1	1	Brush cut seed stalks for secondary growth - 1 visit
	12		CS/MB	EUEU	0.1	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	33	9.8	CS/MB	DEOD	0.1	3	Foliar application w/Garlon 4 Ultra 2%- 1 visit
	13	22.3	CS/MB	COLA	0.01	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	13		CS/MB	CYST	0.1	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	13		CS/MB	EUEU	0.1	2	Foliar application w/Garlon 4 Ultra 2%- 2 visits

Dairy/Wax Myrtle Ravine	13		MB	FOVU	10.8	1	Foliar application w/Garlon 4 Ultra 2%- 1 visit
	13			FOVU	8.1	1	Brush cut seed stalks for secondary growth - 1 visit
	13		MB	GEMO	0.2	1	Foliar application w/Garlon 4 Ultra 2%- 2 visits
	30	17.9	MB	ACME	0.1	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	30		MB	COLA	0.1	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	30		MB	EUEU	0.2	1	Foliar application w/Garlon 4 Ultra 2%- 2 visits
	30		MB	FOVU	0.1	1	Brush cut seed stalks for secondary growth - 1 visit
	30		MB	GEMO	0.1	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	30		MB	LEVU	0.2	1	Foliar application w/Garlon 4 Ultra 2%- 1 visit
	31	32.2	MB	COJU	0.1	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	31		MB	EUEU	0.8	1	Foliar application w/Garlon 4 Ultra 2%- 2 visits
	31		MB	EUGL	0.1	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	31		MB	FOVU	5.5	1	Brush cut seed stalks for secondary growth - 1 visit
	31		MB	FOVU	5.5	1	Foliar application w/Garlon 4 Ultra 2%- 2 visits
	31		MB	GEMO	0.5	1	Cut stump - treated w/Garlon 4 Ultra 25% - 3 visits

MU	(SU #)	SU Area (a)	CS/MB/SBE Habitat	Inv. Target	Treatment (a)	% cover	Treatment Methods
Carter/Martin	16	3.3	MB	GEMO	0.2	1	Hand remove seedlings in MB butterfly transect – 2 visits
	16		MB	GEMO	2.0	2	Foliar application w/Garlon 4 Ultra 2%- 2 visits
	17	1.7	MB	GEMO	0.1	1	Hand remove seedlings in MB butterfly transect – 2 visits
	17		MB	GEMO	1.0	2	Foliar application w/Garlon 4 Ultra 2%- 2 visits
Saddle	20	86.5	MB	EUEU	45.2	1	Foliar application w/Garlon 4 Ultra 2%- 3 visits
April Brook	23	7.8	MB	COJU	0.1	1	Foliar application w/Aquamaster 2% - 2 visits
	23		MB	COLA	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	23		MB	EUEU	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits 1 visit
	23		MB	FOVU	0.4	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	23		MB	GEMO	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	25	14.8	MB	EUEU	3.2	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	28	6.3	MB	COJU	0.1	1	Foliar application w/Aquamaster 2% - 2 visits
	28		MB	COLA	0.1	1	Cut stump - treated w/Garlon 4 Ultra 25% - 1 visit
	28		MB	FOVU	3.3	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	28		MB	RUAR	1.0	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits

Southwest Slope	26	9.3	MB	EUEU	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	26		MB	FOVU	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	26		MB	OXPE	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	27	8.6	MB	FOVU	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	26	9.3	MB	EUEU	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	26		MB	FOVU	9.5	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	26		MB	OXPE	0.1	1	Foliar application w/Garlon 4 Ultra 2% - 2 visits
	27	8.6	MB	FOVU	20.4	1	Foliar application w/Garlon 4 Ultra 2% - 1 visit
	32	8.1	MB	OXPE	6.2	5	Foliar application w/Garlon 4 Ultra 2% - 1 visit