SAN BRUNO MOUNTAIN
HABITAT CONSERVATION PLAN

YEAR 2015 ACTIVITIES REPORT FOR FEDERALLY LISTED SPECIES AND HABITAT MANAGEMENT

Endangered Species Permit PRT-2-9818

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For:
United States Fish and Wildlife Service

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SUMMARY

This report describes the monitoring and the status of species covered under the San Bruno Mountain Habitat Conservation Plan. In addition this report will also discuss the vegetation management activities carried out to support habitat improvements to benefit covered species. This report is prepared on an annual basis for submission to the U.S. Fish and Wildlife Service. Three endangered species of butterfly are found on San Bruno Mountain and are covered under the San Bruno Mountain HCP: the mission blue, callippe silverspot, and San Bruno elfin butterflies.

In February, 2015, Creekside Science completed the *Assessment of the Past 30 Years of Habitat Management and Covered Species Monitoring Efforts Associated with the San Bruno Mountain Habitat Conservation Plan*, hereon referred to as "the Assessment." The report includes recommendations on butterfly monitoring techniques, including butterfly, habitat, and host plant monitoring. The report further makes recommendations for more focused vegetation management activities that will further efforts to maintain and improve habitat for the covered species.

Of the three covered butterfly species found on San Bruno Mountain State and County Park only mission blue butterflies (MB) were monitored in 2015. There are thirteen fixed transects for MB with two transects designated as presence/ absence only surveys. All transects were surveyed at least once in 2015. Seven of the eleven monitoring transects were surveyed the preferred three times during the flight season beginning in March and extending into May. A total of 59 MB were observed and counted this year. No MB were observed on T-1, T-2, T-3, or T-4. No modifications were made to MB transects in 2015.

The most MB observations occurred along T-13 with eighteen followed by T-11 with thirteen total MB sightings. These two transects are located within the Southeast Ridge and South Slope management units. However, T-7 had a maximum sightings per hour (S/H) with 13.33. T-6 had the next highest observations per hour with 10.33 S/H. These transects are located south of Guadalupe Canyon Parkway. T-7 is located on the Northeast Ridge (NER) on the small ridgeline immediately north of the Toll Brothers development. T-6 is just west of T-7 and located on portions of the McKesson property. Both of these locations are privately owned.

Habitat management activities during 2015 changed through the calendar year. Because the County's fiscal year is July 1 – June 30 and the annual reports are based on the calendar year this report will discuss the changes in approach and the resultant activities under contract with the San Mateo County Parks Department (County Parks). The 2014/2015 contracted activities with West Coast Wildlands (WCW) outlined in the FY2014/2015 San Bruno Mountain Operating Budget and Work Scope, Attachment A and B, were completed by the end of March 2015. New vegetation management activities were implemented for FY

2015/2016 where scrub encroachment was the primary focus.

Vegetation management activities in 2015 had two main objectives, (1) treat and control invasive species in high priority occupied butterfly habitat and (2) scrub removal in high quality grasslands that are currently occupied by covered butterfly species. WCW provided vegetation maintenance services from January through the end of March focusing on fennel and oxalis with additional control efforts focused on broom, gorse, radish, mustard, bitter cherry and brush and completing the 2014/15 scope of work. WCW diligently worked in accordance with the goals and objectives outlined in the FY2014/2015 San Bruno Mountain Operating Budget and Work Scope.

The 2015/ 2016 fiscal budget was reduced to $85,000 for all SBMHCP area activities including monitoring. Based on the Assessment by Creekside Science scrub removal in occupied high quality mission blue and callippe silverspot habitat was prioritized for the remainder of 2015. This additional work to support a more aggressive native scrub removal program was carried out by Shelterbelt Builders Inc. from September through December 2015. Shelterbelt treated approximately 53 acres out of the 103 acres targeted for treatment during the 2015/ 2016 fiscal year. Scrub control is targeted to fully remove young new encroachment into high quality grasslands and prairies in areas designated as "Essential" habitat by the Assessment. Older scrub that was also treated with herbicides but not fully removed.

Secondary control of invasive species as part of the scrub removal is a part of this new vegetation management paradigm. Fennel and oxalis control in high quality habitat continues to be a priority. Due to funding constraints very limited exotic control was prioritized outside of what was identified in the WCW FY 2014/ 2015 Operating Budget and Work Scope.

I. INTRODUCTION

This report describes the status of federally listed species and monitoring results that took place within the San Bruno Mountain Habitat Conservation Plan (SBMHCP) area under Endangered Species Act Section 10(a)(1)(B) Permit PRT 2-9818 for the 2015 calendar year. Listed butterfly species on San Bruno Mountain include the mission blue (*Icaricia icarioides missionensis,* MB), callippe silverspot (*Speyeria callippe callippe*, CS) and San Bruno elfin (*Callophrys mossii bayensis*, SBE) butterflies, all of which are listed as endangered.

The San Bruno Mountain HCP and Endangered Species Act Section 10(a) permit was adopted in November 1982. The 30-year permit was renewed in March 2013. Annual monitoring and reporting of federally-listed species is conducted as part of SBMHCP implementation, and this report is presented to the U.S. Fish and Wildlife Service for review.

Federally listed species that are monitored on San Bruno Mountain include the three listed butterflies. For the last several years each butterfly species is monitored every other year, which historically allowed limited funding resources to be allocated to control of non-native vegetation in butterfly grassland habitat. Beginning in 2015 the limited funding available for active habitat management has been prioritized for use in both native and non-native scrub reduction in the highest priority occupied butterfly habitats. This will be discussed in further detail in the habitat management section. In 2015, mission blue were monitored.

San Bruno Mountain also supports federally listed plants and in 2015 San Mateo County Parks Department (County Parks) initiated a rare plant survey to document and map all populations of federal and state listed plants as well as those considered locally rare. A final report is expected to be completed in the first quarter of 2016. County Parks will use this report to provide critical baseline data for developing a management plan for locally rare, threatened, and endangered (RTE) plants in the future. In addition County Parks is determining an appropriate monitoring interval for RTE plants located on its properties as a whole, including San Bruno Mountain State and County Park (SBM). At this time plant monitoring is not included in the current SBMHCP monitoring program or budget due to funding constraints.

In spring 2015 Creekside Science completed the *Assessment of the Past 30 Years of Habitat Management and Covered Species Monitoring Efforts Associated with the San Bruno Mountain Habitat Conservation Plan*, hereon referred to as "the Assessment." The purpose of the report is to "focus on the recent past and look forward to both the near term (5 years) and longer term (30 years) to plot a course that will lead to thriving populations of the covered species in conserved habitat." The Assessment includes recommendations on butterfly monitoring techniques, including butterfly, habitat, and host plant monitoring. These recommendations are addressed in the following report.

Anyone interested in accessing raw data or other information collected by MIG | TRA Environmental Sciences should contact Ramona Arechiga, Natural Resource Manager with the San Mateo County Parks Department at (650) 599-1375 or trarechiga@smcgov.org.

II. STATUS OF SPECIES OF CONCERN

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

The mission blue butterfly is the most widespread of the endangered butterfly species within SBMHCP area, and its distribution corresponds closely to the distribution of its host plants. The host plants for the mission blue butterfly are three perennial lupines: silver lupine (*Lupinus albifrons* var. *collinus*), summer lupine *(L. formosus* var. *formosus)*, and varied lupine (*L. variicolor*). Mission blues are limited primarily to areas where their host plants and nectar plants are concentrated. Mission blues use a variety of native and non-native species for nectaring (especially thistles), which are found throughout the grassland, coastal prairie, and coastal scrub plant communities found within the SBMHCP area. Protection from wind appears to be an important habitat component for MB and often the species is detected on the leeward side of slopes, or within protected roadcut areas where host plants are present in suitable densities. Mission blues have been found to move up to approximately 0.25 miles between habitat patches (Thomas Reid Associates 1982), though the species is likely to move further when dispersing between habitat areas. It is unlikely that MB are capable of immigrating to, or emigrating from, San Bruno Mountain due to the urbanization barriers surrounding the mountain.

Mission blues utilize silver lupine and summer lupine as their primary host plants, and utilize varied lupine less frequently within SBMHCP area. Silver lupine is the most widespread host plant species within SBMHCP area and grows within dry habitats such as south and east-facing native and non-native grasslands, roadcuts, rock outcrops, fire breaks, ridgelines, erosion rills, and landslide scars. Summer lupine also grows within disturbed soil conditions and colonizes roadways and landslide scars in more mesic areas, where soils are typically deeper and/or sandier. Varied lupine grows in grasslands and along disturbed roadsides, typically within mesic exposures, and is commonly found within north and west facing grasslands. Mission blues tend to utilize larger patches of varied lupine if it is the only lupine species present or smaller patches of varied lupine when found in proximity to silver and/or summer lupine.

Typically, MB butterflies begin adult flight in March and are most abundant in April, however, monitoring lupine phenology is an important component in determining the appropriate timing to implement the adult monitoring season. Observations begin to drop off by late May or early June. The timing and duration of the flight season is influenced by overall seasonal climate as well as microclimate within separate regions of the Mountain. Late spring rains can delay the onset of the flight season throughout the SBMHCP area while hot

spring conditions can mean an early or shortened season. Mission blue colonies on the warmer, dryer south-facing slopes of the SBM begin and end their flight season earlier than colonies on the cooler north-facing slopes.

Established Survey Methodology

In the winter of 2006/2007, 13 new transects were established on SBM for mission blue butterflies (Figure 1). In plotting out the new transects, efforts were made to traverse as much MB habitat as possible. Historic habitat as well as restored or planted habitat was included. Where possible, old MB transects were incorporated into the new, longer transects. Transects vary in length from approximately 500 to 2100 meters and are permanently marked in the field. Of the 13 transects, 11 were established with the intention of being regularly monitored. Two transects (transects 2 and 3) were established as transects to be visited less frequently and only used for presence/ absence detections of the species. Transects 2 and 3 were created to study MB usage of these sites, but these sites are not considered of highest importance in terms of measuring MB abundance within SBMHCP area. Transect 2 is located east of the Pointe Pacific housing development. Transect 3 includes a planting island on the south side of Guadalupe Canyon Parkway between the Parkway and Colma Creek. The newly established MB transects were monitored for the first time in 2007 and again in 2009, 2011, and 2013.

Due to concern for monitor safety, in 2009 transects 4 and 5 were reconfigured so that monitors were no longer crossing Guadalupe Canyon Parkway. Transect 4 now ends at the south side of Guadalupe Canyon Parkway and transect 5 connects to that portion of the old transect 4 that is on the north side of the Parkway (Figure 1). Thus the reconfigured transects 4 and 5 have been monitored since 2009.

The purpose of fixed transects is to provide a means with which to compare MB observations from year to year at specific locations. Fixed transect locations were not chosen randomly but were placed in habitat areas with higher butterfly densities and areas that include a variety of slope exposures, nectar plants, and soil conditions (i.e. road cuts, ravines, and natural slopes). Even within high-density habitat locations it is sometimes difficult to observe enough butterflies for statistical comparison. For this reason, fixed transects were located only in areas where there was a good chance of observing MB.

According to the San Bruno Mountain Habitat Management Plan (HMP) for MB adult butterfly monitoring, each transect is monitored approximately five times per flight season, and once during the estimated adult life span of a single butterfly. For MB this is once every 7-10 days. All transects are surveyed during warm, calm weather conditions within 1-2 days of each other. Specifically for MB transects surveys should only be conducted when temperatures are greater than or equal to 18.0 Celsius (64.4° Fahrenheit) and wind speeds less than 5.0 miles per hour (mph). Due to the high variability of weather on SBM actual

monitoring visits are not this consistent, summertime fog and occasional cool weather days are common during the MB flight season.

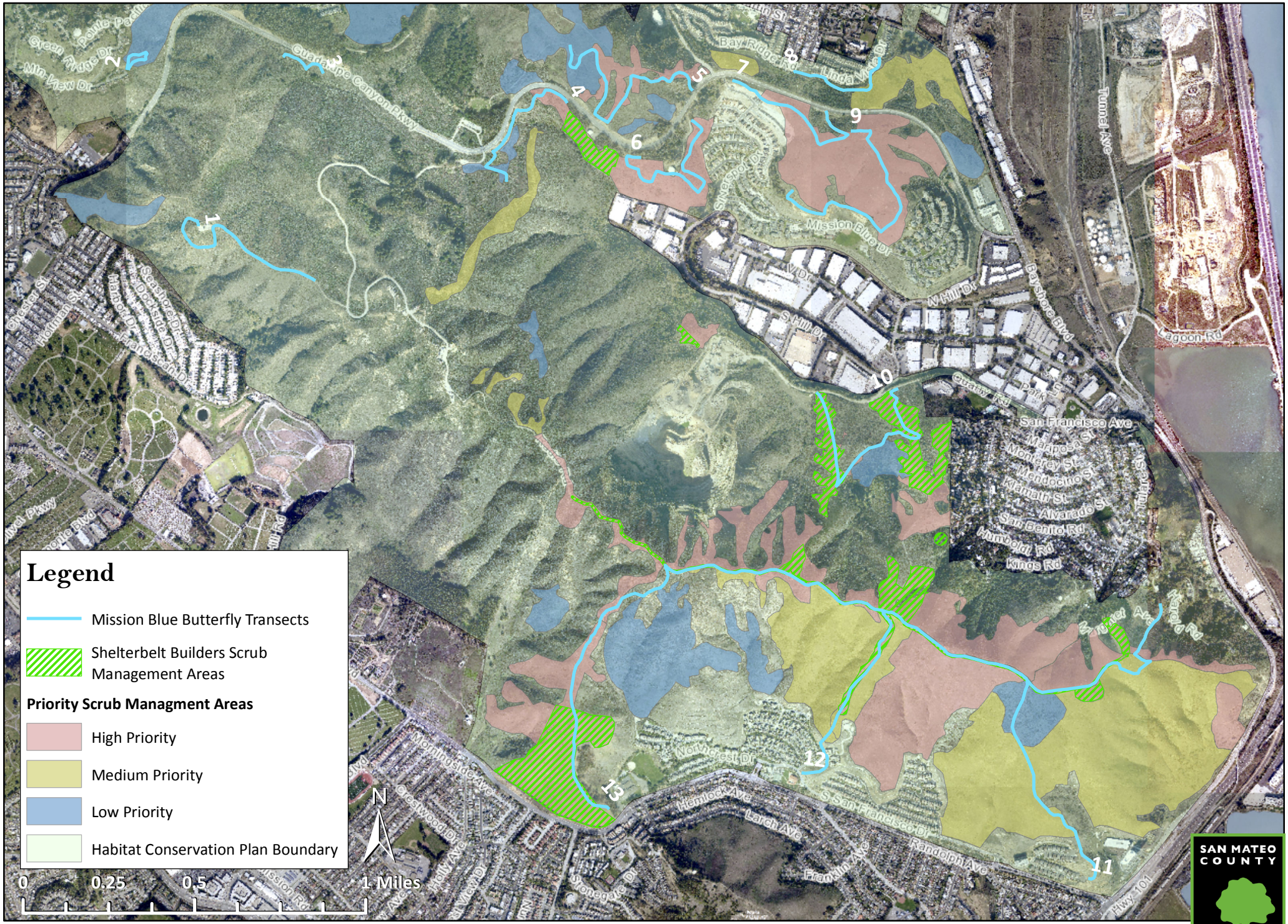
Since 2007 when the HMP was written the monitoring protocol has gone through minor adjustments documented in the annual reports. Monitoring visits shifted to catch the beginning and end of the flight season and to thoroughly document the observations on a weekly or biweekly basis during those periods. The reasoning for this change was to make it more cost effective for monitoring teams to monitor the fixed transects and avoid monitoring prior to species emergence, or to continue monitoring transects after most of the observations have dropped off. As a result, the actual monitoring period does not include the entire flight season for each butterfly species.

Ideally, each transect is monitored approximately 3 times over the peak of the flight season. Monitoring occurs only during warm, calm weather (wind speeds less than 10 miles per hour) when MB are most active. Efforts are made to complete an observation cycle (a survey of all transects) within one to two days. All butterflies observed beyond a specific transect or in the transect vicinity during travel between transects are recorded as incidental observations.

The duration spent walking each transect is recorded by the observer and all MB observed along transects are noted. The location and time of the observation is recorded on a map and in a table on each paper datasheet. The number of MB sightings per hour (S/H) is used for analysis. The number of MB observed on a particular transect is divided by the number of minutes to complete the transect survey. For each year, the average and maximum MB sightings per hour for eleven of the thirteen transects are used to look for upward or downward trends in MB encounter rates among and within transects. The average S/H on a given transect is calculated from the total number of butterflies counted on that transect during all surveys over the total minutes spent on that transect. The maximum value is the highest S/H recorded on each transect in a given year. The maximum S/H is a useful variable for analysis. By looking at only the maximum S/H, the S/H measurements captured at the beginning or end of the flight season that may be of lower value do not skew the data.

County Parks will be conducting all butterfly monitoring in 2016 with some help from California Department of Fish and Wildlife staff. Some of the methodological changes outlined above will be corrected to be more consistent with the protocols outlined in the HMP.

<u>Survey Methodology Changes implemented in 2013 and continued in 2015</u>
Coastal scrub, including poison oak, has encroached on some transects, making complete coverage of these transects difficult if not impossible. Modifications made to these transects are described here. The original 13 transects are shown in Figure 1.



San Bruno Mountain: Mission Blue Butterfly Transects & Scrub Management Areas

SAN MATEO COUNTY PARKS

Transect 2 (T-2): This transect originally looped first through a grassy knoll, then back through scrub to hit a small population of lupine that had been planted by the Point Pacific Homeowners Association. Because the scrub has become too dense to pass through, the grassy knoll was surveyed as an out and back in 2013 (See 2013 Covered Species Annual Report, Figure 2). Do to the alteration of this transect and the short time it took to survey, the survey was not timed, but instead was surveyed for presence.

Transect 3 (T-3): The majority of MB habitat on this transect occurs at its eastern end. Only a small number of plants are found at the western end and the route between these areas above the road cut supports coastal scrub. That scrub has become increasingly dense. As a result only the eastern end was surveyed in 2013 (See 2013 Covered Species Annual Report, Figure 2). Due to the significant alteration of this transect in only visiting the eastern end, the survey was not timed but instead was surveyed for presence.

Transect 5 (T-5): Much of transect 5 follows an established trail. However, the transect departs from this trail and makes a U-turn through scrub in order to include MB habitat at the top of a road cut above Guadalupe Canyon Parkway. Coastal scrub on this route has become too thick to allow passage. In 2013, the U-turn was removed from this transect and it now continues along the Saddle Loop Trail (See 2013 Covered Species Annual Report, Figure 2).

Transect 6 (T-6): Most of this transect is accessible and supports high quality MB habitat. Only the northern end of this transect has become impassible with scrub and poison oak. Therefore, monitors have modified this transect to end right before the impassable scrub (See 2013 Covered Species Annual Report, Figure 2).

Transect 7 (T-7): The northwest portion of this transect is within the Toll Brothers development, and since 2011 has been fenced off and then later disturbed by grading. Transect 7 now ends at the Toll Brothers fence as shown in the 2013 Covered Species Annual Report, Figure 2.

Transect 8 (T-8): When last monitored in 2011, the middle of this transect had become difficult to pass due to scrub, including non-native gorse and French broom. In 2013, this transect was monitored in two sections, one on either side of the impenetrable scrub (See 2013 Covered Species Annual Report, Figure 2). Time was not kept due to the short length of these surveyed areas in 2013 or 2015. Butterflies observed were recorded and mapped.

Results

A total of 62 mission blue butterflies were observed in 2015 which is far less than MBs counted in previous years (2013:133 MB; 2011: 209 MB; 2009: 188 MB; and 2007: 200 MB). Of the 62 observed MB only four of these were incidental observation, meaning they were not observed during the specific transect

survey, therefore there were only 58 MB observed during transect surveys. Mission blue butterflies were observed on nine of the eleven transects surveyed during 2015 including incidental transects. Figure 2 shows all 2015 observations and Figure 3 shows 2015 and 2013 observations.

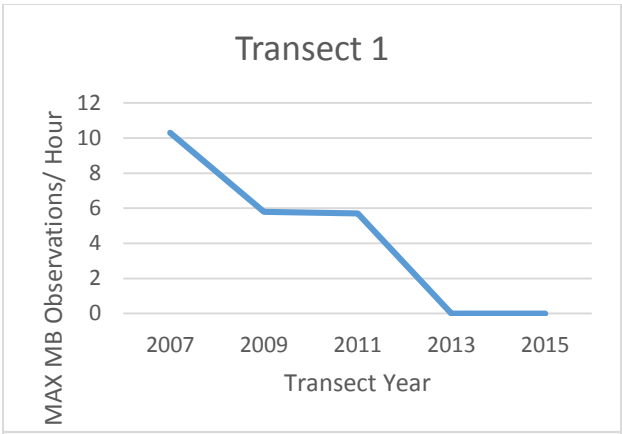
T-2 and T-3 are presence/ absence surveys were only visited once and no observations were made on these transects. T-1, T-7, T-8, and T-10 were surveyed twice. T-4, T-5, T-6, T-9, and T-11 were surveyed three times. T-12 and T-13 were surveyed four times in 2015.

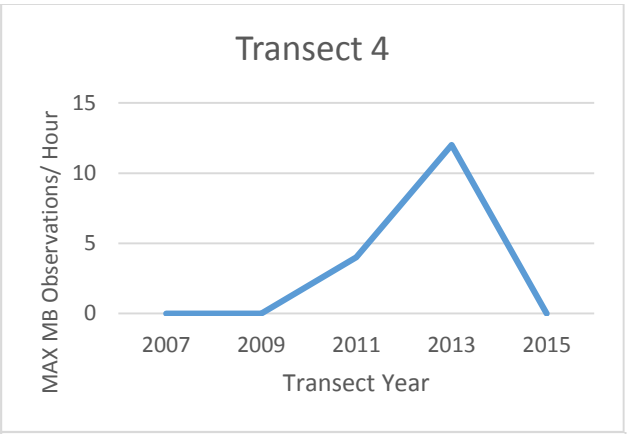
Transects 1-4 had no observations during the 2015 monitoring season. Transects 5, 8, and 9 only had MB one observation. Transects 6 and T-10 had seven MB observations. T-12 had four observations and one incidental observation. T-7 had five MB sightings down from 15 in 2013. T-6 and T-10 has a total of seven MB observations each. T-11 had thirteen MB observations while T-13 had a total of eighteen MB observations during 2015. Figure 3 shows all MB observations along transects in 2015.

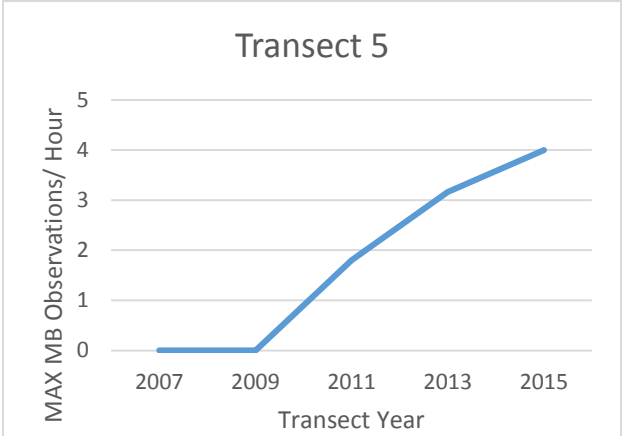
Table 1. Average/Maximum S/H on each Transect: 2007 - 2015

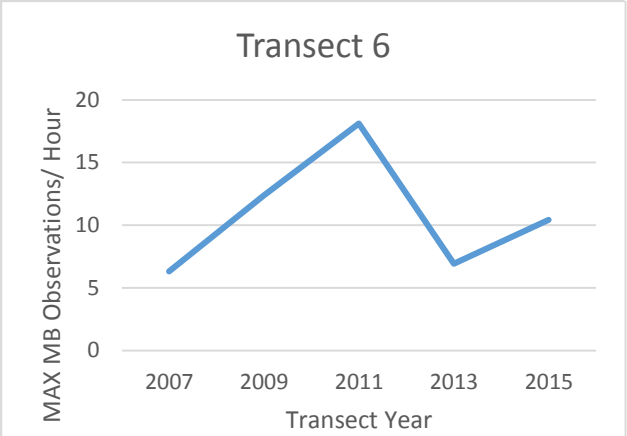
Year/ Transect	Average Values					Maximum Values				
	2007	2009	2011	2013	2015	2007	2009	2011	2013	2015
1	2.4	3.57	3.9	0	0*	10.3	5.8	5.7	0	0*
2	0	3	-	0	NA	0	3	-	0	NA
3	7.1	22.5	0	0	NA	7.1	22.5	0	0	NA
4	N/A*	0	2.7	4.86	0	N/A*	0	4	12	0
5	N/A*	0	1.7	1.32	0.98	N/A*	0	1.8	3.16	4
6	2.8	9.68	15.3	4.02	4.94	6.3	12.4	18.1	6.92	10.43
7	3.9	6.18	0.8	13.04	10.95	10.3	9.5	2.4	20	13.33
8	0.6	0	0	NA	NA	3.5	0	0	NA	NA
9	4.6	4.5	2.7	1.31	NA	7.6	6.9	5.6	3.33	NA
10	4	1.15	7.6	5.27	4.38	8.7	1.2	14.4	7.74	7.64
11	11.3	15.04	15.2	10.73	3.32	20.6	25.8	21.3	29.41	5.54
12	6.5	14.21	5.1	6.32	1.22	14.1	20.4	7.4	9.38	5.22
13	2.2	13.33	11.1	12.52	4.11	6	20	19.4	17.89	6.82

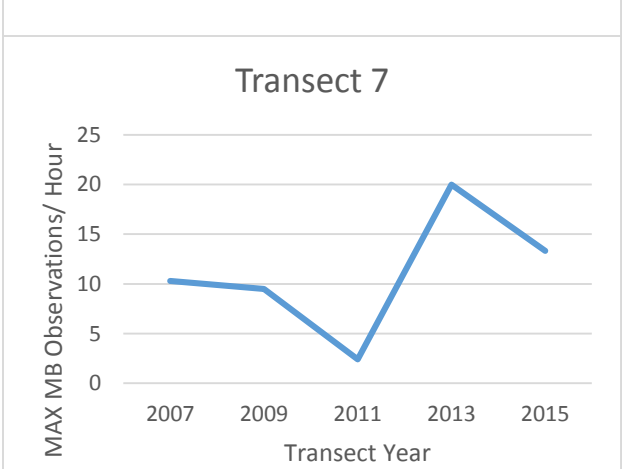
*Indicates that datasheets were not complete
NA indicates that there was not sufficient data to calculate maximum observations
N/A* transects were reconfigured in 2009 and cannot be compared to 2007 data

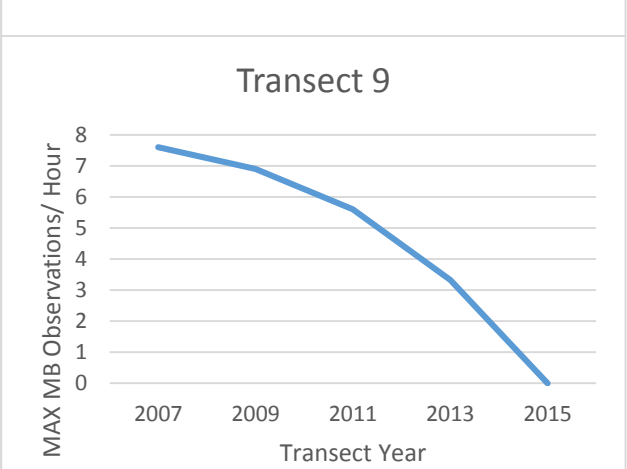

Transect 1
MAX MB Observations/ Hour
12
10
8
6
4
2
0
2007
2009
2011
2013
2015
Transect Year

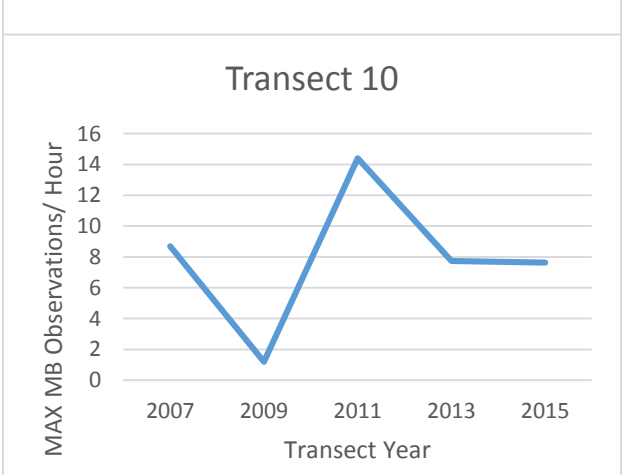

Transect 4
MAX MB Observations/ Hour
15
10
5
0
2007
2009
2011
2013
2015
Transect Year


Transect 5
MAX MB Observations/ Hour
5
4
3
2
1
0
2007
2009
2011
2013
2015
Transect Year


Transect 6
MAX MB Observations/ Hour
20
15
10
5
0
2007
2009
2011
2013
2015
Transect Year


Transect 7
MAX MB Observations/ Hour
25
20
15
10
5
0
2007
2009
2011
2013
2015
Transect Year


Transect 9
MAX MB Observations/ Hour
8
7
6
5
4
3
2
1
0
2007
2009
2011
2013
2015
Transect Year


Transect 10
MAX MB Observations/ Hour
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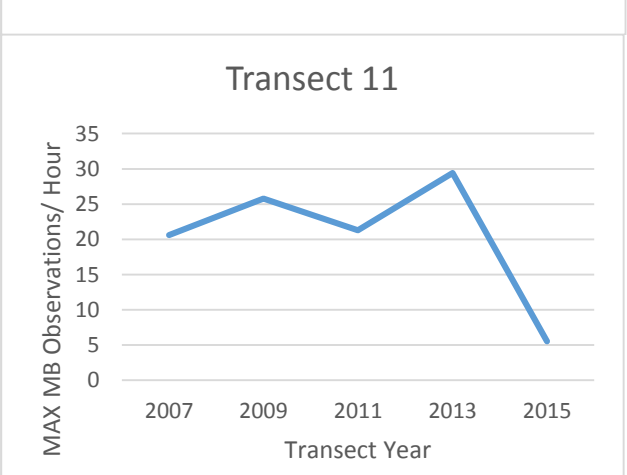
14
12
10
8
6
4
2
0
2007
2009
2011
2013
2015
Transect Year


Transect 11
MAX MB Observations/ Hour
35
30
25
20
15
10
5
0
2007
2009
2011
2013
2015
Transect Year

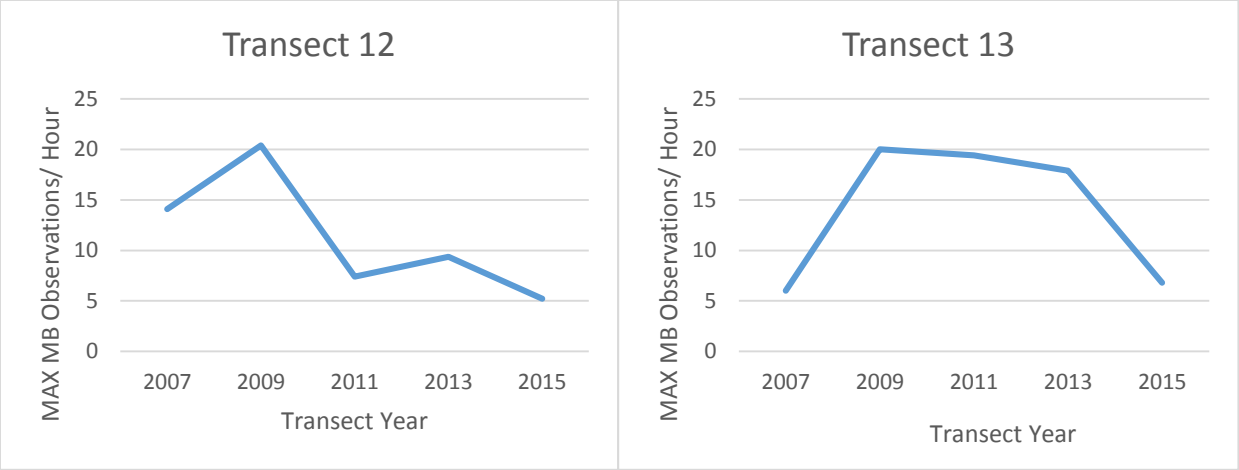


Figure 2. Maximum S/H on each Transect: 2007 - 2015

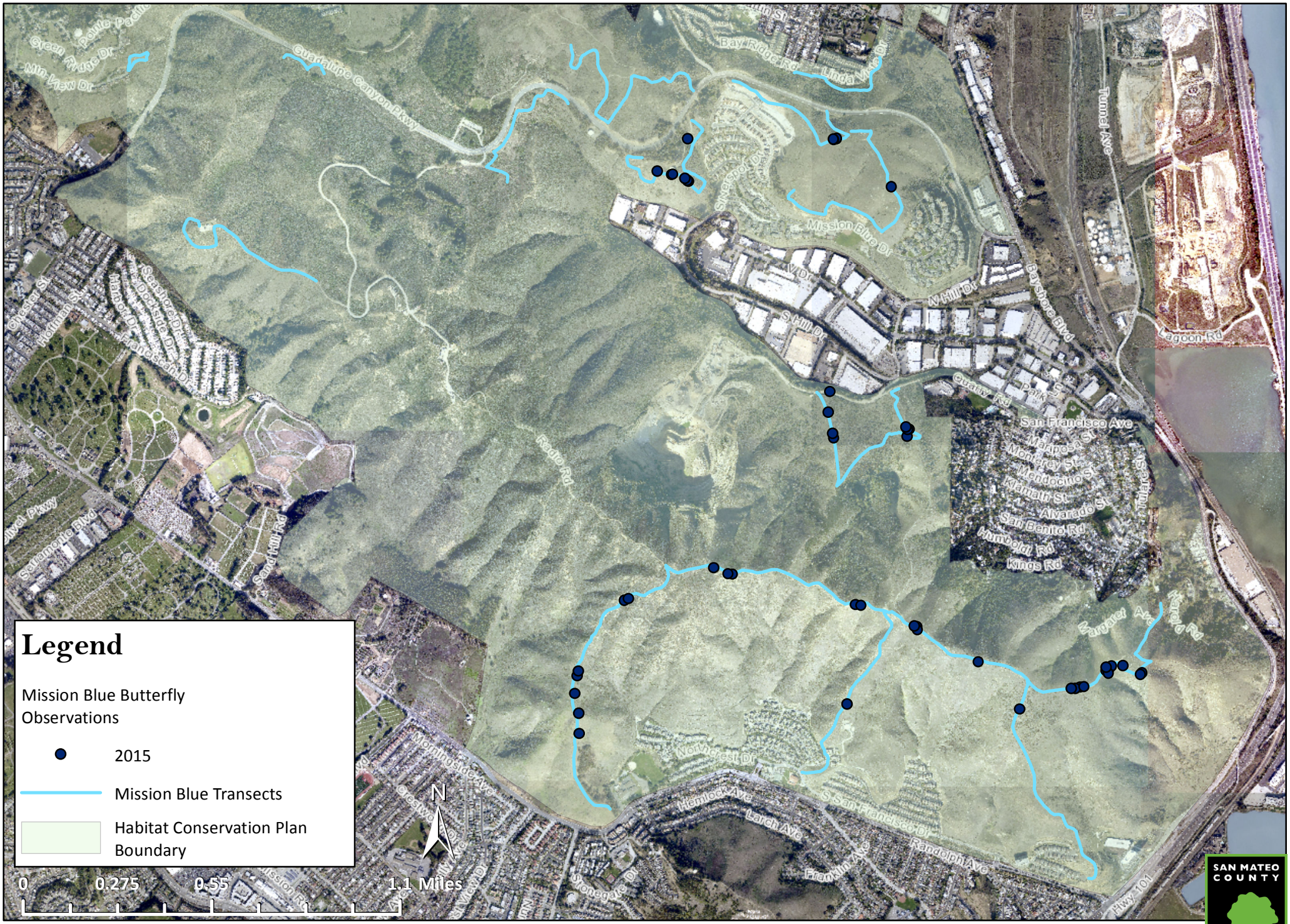
Discussion

No MB were found on T-1 which is located near the Ranger Station on West Peak. MB were detected on this transect in 2009 and 2011. A portion of this transect traverses the Pacific Gas and Electric Company (PG&E) access road was graded in 2012 and approximately 30 mature lupines were destroyed. PG&E replanted at a 3:1 ratio in a location above the access road, however the grading of the road and disruption to the lupines here may have impacted butterfly usage of this area. No MB were seen along the paved road leading to the Ranger Station, where a vigorous stand of lupines persist.

T-2 was visited once in 2015. It is a short transect located within the Pointe Pacific development area. Scrub has made the original transect impassible, therefore this transect was walked as an out and back, rather than a loop (Figure 1). No MB were seen during the one survey conducted in 2013 and again in 2015. The last time MB were recorded here was in 2009 when one MB was seen. This site may still be used by MB, although presumably infrequently or in low numbers. Lupines do persist in the grassland areas.

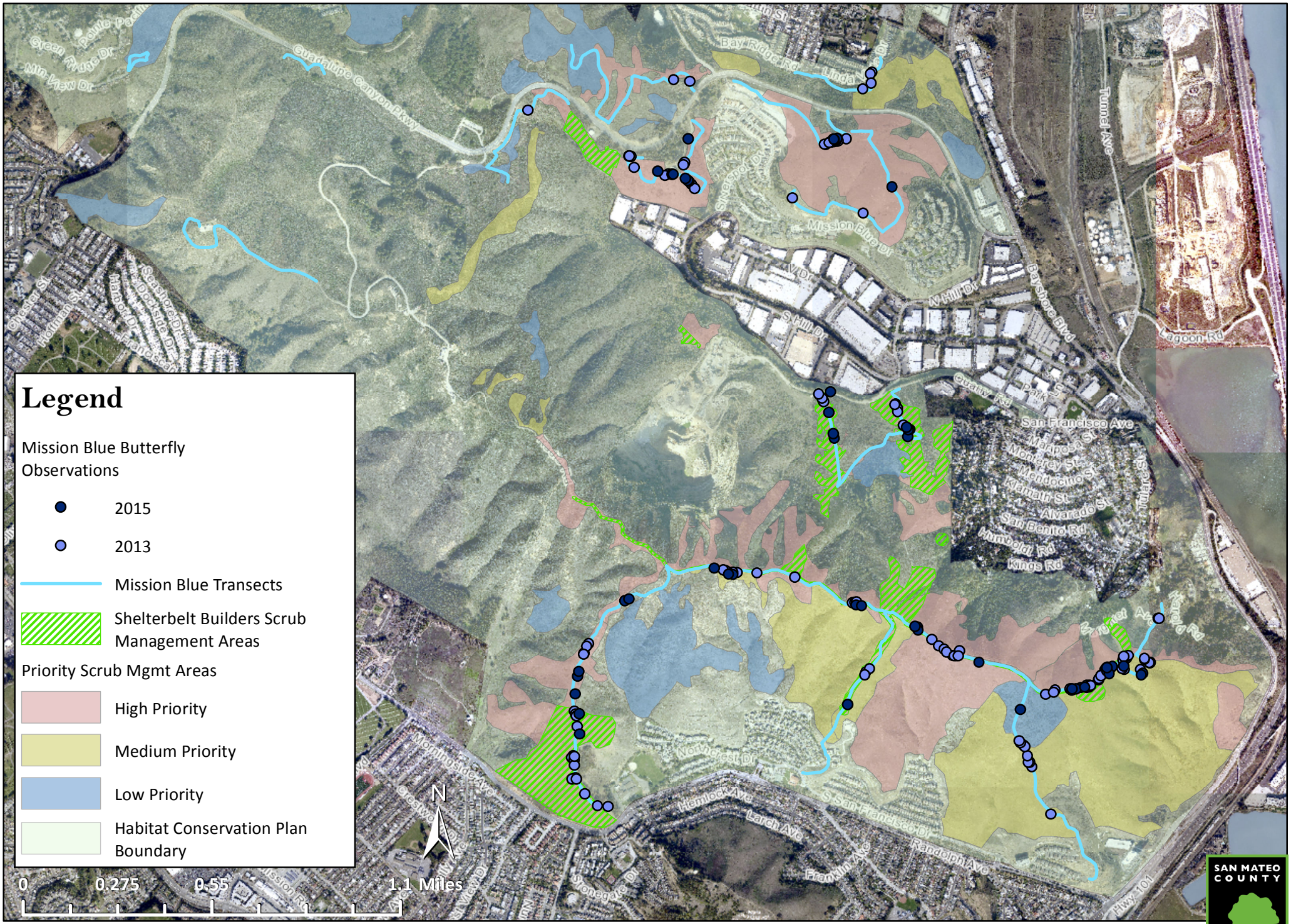
No MB were observed on T-3, for the last three survey cycles (2011, 2013, and 2015). T-3 is a short transect capturing an area that was planted with lupines and nectar plants in 2000. Due to an increase in scrub, only the east end of this transect could be accessed in 2013 and again in 2015. Only a handful of lupine plants are found in this small area of grassland. Surrounding vegetation in this area between Guadalupe Canyon Parkway and Colma Creek is riparian and primarily scrub habitat. It is possible that MB still utilize this habitat patch and simply were not observed during the one survey this monitoring season.

T-4 includes an area that was restored as a planting island in 2000 in the Dairy Ravine Management Unit and traverses dirt service road that supports lupines. This transect was surveyed four times in 2013 and only once in 2015. No MB were seen in 2015 while a total of six MB were observed in 2013.



San Bruno Mountain: Mission Blue Butterfly Observations for 2015

SAN MATEO COUNTY PARKS



San Bruno Mountain: Mission Blue Butterfly Observations for 2013 and 2015

SAN MATEO COUNTY PARKS

T-5 supports both *L. albifrons* and *L. formosus* and is located in the Saddle Management Unit, east of the intersection of Guadalupe Canyon Parkway and Carter Street. The original transect included a road cut above the Parkway, but due thick scrub, this can no longer be accessed and in 2013, this transect was modified to exclude the route to and from the road cut. Since 2013 this transect follows the Saddle Trail (Figure 2). This transect was surveyed three times in 2015 with only one MB observation. The maximum MB S/H for this transect is 4.0 and the average MB S/H is 0.98.

T-6 is located on the Northeast Ridge (NER) in the vicinity of the lower NER water tank. It extends through grasslands on the east side of lower Wax Myrtle Ravine Management Unit. T-6 supports a variety of wildflowers and a vigorous lupine population west of the water tank. The eastern end of this transect has been was modified in 2013 and shortened due to an increase in scrub. In 2015 a total of seven MB were observed on this transect over three surveys. The maximum MB S/H for this transect is 10.43 and the average MB S/H is 4.94.

T-7 is also located on the NER, a portion of which has undergone habitat alteration including the loss of butterfly habitat as part of the approved Toll Brothers development. T-7 traverses what are commonly called Arnold Slope and Callippe Hill. This transect was shortened in 2013 to end at the Toll Brothers development fence line. The habitat along T-7 (outside of the Toll Brothers development) continues to support high quality grassland with host and nectar plants. According to the Assessment scrub encroachment should be viewed as a threat here and potentially prioritized for treatment before acceptance by County Parks. Weeds, although always present, are treated annually and have not been observed by butterfly monitors to displace butterfly host plants to date. A total of five MB were observed on T-7 with a maximum MB S/H of 13.33 and the average MB S/H of 10.95.

T-8 is located above the Linda Vista residential community. This transect contains an old restoration site that was replanted with lupines in the mid-1980's. The habitat around T-8 has seen a significant increase in scrub, including non-native species such as French broom (*Genista monspessulana*) and gorse (*Ulex europaeus*). T-8 has become increasingly difficult to walk and a portion of this transect was excluded from monitoring in 2013 and again in 2015. One MB was observed in 2015. No time was recorded for this transect in 2013 or again 2015 and therefore observations cannot be used to determine S/H.

T-9 is also located on the NER southeast of T-7. Since 2007, the maximum S/H has declined each year. However, with only four data points (maximum S/H each sampling year), this does not necessarily represent a downward trend in MB abundance. While grassland habitat along T-9 is fairly intact much of the habitat has sparsely distributed lupines. An exception is at the northern end of this transect where a robust population of lupines are found around the PG&E tower where scrub can be seen starting to expand into grassland habitat just to the

west and south of the towers. The southeast corner of T-9 also contains numerous lupines. Only one MB was observed during three surveys, time was only kept on one of these visits so maximum and average MB observations could not be calculated.

T-10 is located at the foot of Owl and Buckeye Canyons within the California Department of Fish and Wildlife lands. This transect traverses open high quality prairie and grassland habitat with diverse nectar sources and scattered lupines along both ridgelines. A total of seven MB were observed over the two surveys, and a maximum S/H of 7.64 and an average of 4.38 in 2015. This is similar to the average of the maximum S/H of the previous three years.

T-11 is located within the Southeast Ridge Management Unit and begins at a previously disturbed slope above Sisters City/Hillside Boulevard that supports lupines. This transect follows the Ridge Trail and includes a portion of the Brisbane Acres Management Unit. T-11 intersects some of the SBM's best lupine habitat with abundant nectar sources. Unlike 2013 and 2011 fewer MB were observed here as in 2015. A total of thirteen MB were observed over the three surveys, and a maximum S/H of 5.54 and an average of 3.32.

T-12 is located within the South Slope and Southeast Ridge Management Units and follows the ridgeline from the Terrabay water tank to the Ridge Trail. Similar to other locations along the South Slope and Southeast Ridge, the habitat here is extensive and continues to support annual grasses, nectar sources, and lupine host plants. Four MB were observed along T-12 in 2015 with a maximum S/H of 5.22 and an average of 1.22.

T-13 follows the Ridge Trail and then drops down a ridgeline to Hillside Blvd. T-13 is located on the south facing slope of SBM where conditions are the most dry and sunny. While scrub encroachment has been largely ignored on these slopes due to the slower rate of expansion as compared to the more mesic north and east facing slopes this is a concern in 2015. Grassland habitat supporting lupines along T-13 continue to support high MB observations during transect surveys despite lower numbers than in 2013. In 2015, 18 MB were recorded on T-13 with a maximum S/H of 6.82 and an average of 4.11. Lower numbers this year may reflect a lag for lupine and nectar plant recover after an approximately 42-acre fire burned a lower part of T-13, consuming butterfly habitat supporting lupines and nectar sources in September 2013. However, as noted in the 2013 report both T-11 and T-13 again had the highest number of MB observations in 2015.

In 2015 mission blue observations were much reduced from previous years and there are a number of potential contributing factors. Of the eleven transects that have been traditionally been used to calculate S/H only seven of these transects were visited the preferred three times in the 2015 flight season. Additionally, there were consistent issues with datasheets in 2015, one monitor inconsistently recorded survey stop times. The lack of information concerning

survey end or stop times translates to the simple fact that sightings per hour cannot be calculated without this information.

Again datasheet incompleteness related to weather conditions was also inconsistently recorded by one monitor. This may reflect the challenges in conducting surveys during consistently warm calm days, when mission blues are most likely to be active. However, over the last several years there has been a slight shift away from the more stringent climatic constrains documented in the HMP. This could be negatively impacting surveyors from having appropriate conditions in which to observe mission blues. In 2015, five transects were surveyed with a starting temperature lower than 64.4 degrees Fahrenheit and with wind speeds over 5 mph and 4 of the monitoring surveys along transects had gust that exceeded 10 mph. According the GGNRA website adult mission blues hide out under vegetation when weather conditions are rainy, cool, windy, or foggy.

According to Stuart Weiss, the earliest mission blue flight years on record include1984, 1985, 1994, and 1997. These flight years correspond to high numbers of MB observations in March (personal communication 1/11/2015). With 2015 being the warmest winter on record it is possible that the flight season for mission blues came earlier than anticipated and SBM monitors missed the majority of the flight season; there were only two survey dates in March 2015. Weiss further reviewed preliminary data from SBMHCP area and found that on April 17, 2015 observations appear to fall at the lower end of the historical range of variability. However, it is important to note that SBM calculations are based on total transect minutes and observations and not on a single survey visit.

Contacts at Golden Gate National Recreation Area and San Francisco City and County who also monitor mission blue populations also recorded lower numbers of mission blue observations in 2015 (personal communications 1/11/2015 and 1/12/ 2015). Weiss concluded that it is possible that many monitors missed a portion of the flight season in 2015 (pers. com. 1/11/2015)

CONCLUSIONS

Mission blues are found in relatively low densities (as is typical for most Lycanidae species), but are widely distributed on San Bruno Mountain. The distribution of mission blues observation in 2015 on San Bruno Mountain is similar to those in 2013, however, the number of mission blues observed is much lower, Figure 4. North to south this species continues to be found in a wide variety of microclimates and slope exposures within SBMHCP area, although in significantly varying densities. The total observed number and calculated sightings/hour of MB in 2015 was lower than that of the previous 4 years of monitoring, but does not necessarily signal a downward trend in MB abundance as year to year variation has been observed on San Bruno Mountain since 1981 when studies of this species began.

The western portion of SBM has not seen any reliable observations of MB in either 2013 or 2015. This could be due to the combination that high quality habitat was found in smaller habitat patches and continued, unabated scrub encroachment into grassland areas. Additionally, with the drought 2015 was the warmest winter on record and it is possible that the MB flight season arrived earlier than anticipated and was not adequately captured in the 2015 monitoring season. Weather variability on SBM also plays a role in monitoring and it can be difficult to schedule butterfly monitoring visits during ideal monitoring conditions, warm and calm weather days.

The Golden Gate National Recreation Area has also found significant variation in MB abundance from year to year on their lands (Mission Blue Butterfly Symposium, Fort Mason, 2/7/2012). Conversations with GGNRA staff concerning the 2015 MB flight season also reported low observation numbers at their MB sites. San Francisco City and County Parks also monitors mission blue populations and reported lower numbers of both evidence of post diapause feeding and egg counts in 2015 compared to 2014 observations (personal communication, 1/12/2016).

As documented over the past 30 years of butterfly monitoring on SBM, the Southeast Ridge and South Slope continue to provide the largest contiguous patches of high quality habitat for mission blue butterflies. Mission blues are widely distributed on San Bruno Mountain, but it is only on the South Slope and Southeast Ridge that MB are consistently found in high densities. The South Slope contains large areas of contiguous grassland, and is located on south-facing aspects of San Bruno Mountain as is therefore drier and warmer. Historically coastal scrub succession has been less of a threat than on the south facing slopes, but with little natural disturbance (fire) and absence of grazing these areas are beginning to see more scrub encroachment into grassland areas.

The recent Assessment conducted by Creekside Science provides clear guidance concerning grassland evaluation in light of scrub encroachment. Grassland quality, specifically with respect to host and nectar plant distribution and abundance, are important considerations for healthy mission blue populations. While the HMP and the HCP documents both identified scrub encroachment as threats to MB neither document provided clear guidance concerning how to define grassland quality or levels of scrub encroached grasslands with quantifiable definitions and actionable thresholds. The lack of a clear definition and SMART (specific, measurable, achievable, results-focused, and time-bound) goals and objectives coupled with limited resources have delayed meaningful management activities targeting this threat.

RECOMMENDATIONS

SCRUB ENCROACHMENT

Scrub encroachment is a serious threat to the quality of grasslands and prairie habitats that support mission blue butterfly populations scattered throughout

SBMHCP area. Scrub has been identified as a threat to covered species throughout the HCP and in all documents that provide habitat and vegetation management suggestions. Scrub within the SBMHCP area consists of both native and exotic species. Habitat management must now balance native scrub control, continued containment of noxious exotic plants (gorse, fennel, broom, eucalyptus), and continued treatment of invasive plant species that have the potential to impact covered species habitat.

Scrub encroachment should be a primary focus for budget expenditures related to habitat management. Using the Assessment, areas designated as "essential" should be prioritized for treatment as a starting point. San Mateo County has already initiated treatment of approximately 100 acres of scrub removal in areas designated as essential habitat for the 2015/2016 fiscal year. This work includes continued exotic control in these areas. Areas undergoing scrub removal may also require additional restoration work including host and nectar plantings. Restoration plantings will help increase density and distribution of host and nectar plants in essential habitat.

MB MONITORING

Due to lower mission observations in 2015 it may be time to evaluate the monitoring protocol. It is likely time to research and review the monitoring requirements outlined in relevant USFWS documents and the HMP as they pertain to the SBMHCP area and other agency monitoring protocols who also support MB populations. At this time review of the stricter weather-related monitoring restrictions should be seriously considered in order to ensure appropriate observation conditions for monitoring surveys. Lastly, MB monitoring should be initiated based on appropriate weather conditions for flight season and potentially host plant phenology. Butterfly monitors should have the additional responsibility to regularly visit SBMHCP area up to a month or more prior to the traditional flight season. This responsibility will help monitors appropriately determine when the monitoring season should begin. This effort will hopefully minimize the potential to miss future early flight seasons.

MB HOST AND NECTAR PLANT MONITORING

Mission blue host and nectar plant monitoring has not been a recent priority, as a result of budget constraints and increasing costs associated with exotic species control and butterfly monitoring. MB host plants and nectar plants are a critical part of the MB lifecycle and intimately tied to the health of the population. One step in refining covered species management would be to implement host plant monitoring at regular intervals, perhaps every five-years. Monitoring of MB host plants and potentially associated nectar plant densities within host plant patches is one way to help clarify habitat management activities including scrub management. By initiating host and nectar plant monitoring it should be possible to define high, medium, and low quality MB habitat. While we do know what areas have repeatedly high observations of MB there is no vegetation data beyond occasional anecdotal observations rather than a methodology associated with these areas. Over the next several years

and funding permitting, host plant monitoring should become part of the SBMHCP monitoring program and clear definitions of habitat quality should be created.

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

Transect monitoring of callippe silverspot butterflies was not conducted in 2015. Data and analysis of the 2014 MB transect monitoring data are available in the 2014 Activities Report for Covered Species (TRA 2014). In summary, transects were surveyed for CS three times during the peak of the flight season in May and June. A total of 594 CS were counted, which is 300 more butterflies than was counted in 2012 (the last time CS were surveyed), when 294 CS were observed. Callippe silverspots were observed on 12 of the 13 transects. The total average sightings/hour (S/H) for all transects combined in 2014 was 48.6, which is considerably higher than any S/H recorded in past years.

Callippe silverspot transect monitoring will be conducted in the spring of 2016.

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

Monitoring of San Bruno elfin butterflies was not conducted in 2015. Data and analysis of the 2014 SBE transect monitoring data are available in the 2014 Activities Report for Covered Species (TRA 2014). In summary, a total of 98 larvae were counted during the first round of surveys, performed at six points, and 47 were counted during the second round of surveys at all eight points. These numbers are lower than the numbers counted during the last surveys in 2010, when 308 larvae were counted during the first survey, and 364 during the second survey. However, the number counted in 2014 is still within the range of variance that has been recorded on SBM. Data collection on San Bruno elfin larvae in 2014 was timed to the peak sedum bloom; however, the low number of larvae observed indicates that SBE larval abundance may have peaked prior to the sedum bloom. This phenomenon may have been influenced by the 2014 drought.

San Bruno elfin monitoring will be conducted in the spring of 2016.

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

A small population of the Bay checkerspot butterfly (BCB) was present near the summit of San Bruno Mountain up until the mid-1980's. This species has not been observed on SBM in almost 30 years. No BCB larvae or adults were observed on San Bruno Mountain by field crews while conducting biological activities and overseeing development activities in 2015. In October 2000, the U.S. Fish and Wildlife Service (USFWS) proposed critical habitat for the BCB, followed by a Final Rule issuance on the critical habitat designation in April 2001. The critical habitat designation includes the historic BCB habitat on the main ridge of San Bruno

Mountain. This species must be taken into account when planning any activities that could impact BCB habitat.

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

The San Francisco garter snake (SFGS) was identified in the San Bruno Mountain HCP (1982) as having potential habitat on San Bruno Mountain. No SFGS were observed on the Mountain by field crew while conducting biological activities and overseeing development activities in 2015. There have been no confirmed observations of SFGS on San Bruno Mountain in over 30 years of the HCP monitoring program. Based on the lack of significant ponds and other aquatic habitats, this species is unlikely to be present.

F. California Red-legged Frog (*Rana draytonii*)

The California red-legged frog (CRLF) shares similar aquatic habitat with SFGS. Though it was not identified as a sensitive species at the time of the HCP, CRLF has since been listed as a Federally Threatened species. No CRLF were observed on San Bruno Mountain by field crews while conducting biological activities and overseeing development activities in 2015. There have been no confirmed observations of CRLF on San Bruno Mountain in over 30 years of the HCP monitoring program. Based on the lack of significant ponds and other aquatic habitats on San Bruno Mountain, it is unlikely this species is present.

G. Plants of Concern

County Parks initiated a rare, threatened, and endangered (RTE) plant survey in 2015. Funds to support this effort were provided through the Measure A and approved by the San Mateo County Board of Supervisors. The survey targeted twenty species and the final report is due out in spring 2016. The survey implemented a systematic approach to locate and map all twenty species if possible, and complete California Natural Diversity Database forms complete with photographs. The goal would be to find ways to incorporate protection and appropriate habitat management that will benefit not only the protected butterfly species but rather the whole of the diversity found within SBMHCP area. Where covered butterfly species habitat management is complementary to RTE habitat management attempt to include RTE management considerations.

Based on the survey, it is likely that *Pentachaeta bellidiflora* has been extirpated from the SBMHCP area. There is hope that a few of the other species that were not located in this survey may not have been seen due to the on-going drought conditions during the survey year. Additional targeted searches should be conducted when conditions are good for *Amsinckia lunaris*, *Plagiobothys chorisianus* var. *chorsianus* and *Silene verecunda* spp. *verecunda*. Many other species can be incorporated into ongoing management and restoration activities including the special manzanitas that are found within the SBMHCP area.

Creekside Science provided the table, below, presented to the TAC on December 10, 2015.

Table 2. Rare, Threatened, Endangered Species within SBMHCP area

Scientific Name	Common name	Taxon found (X = not found, C = commonly observed, R = restricted)	Stewardship Priority (3 is highest, 0 indicates no action recommended)
Amsinckia lunaris	Bent-flowered Fiddleneck	X	1
Arabis blepharophylla	Coast Rock Cress	C	1
Arctostaphylos imbricata	San Bruno Mountain Manzanita	R	3
Arctostaphylos montarensis	Montara Manzanita	R	3
Arctostaphylos pacifica	Pacific Manzanita	R	3
Arctostaphylos uva-ursi forma coactilis	Bearberry Manzanita	R	3
Arctostaphylos uva-ursi forma leobreweri	Bearberry Manzanita	R	3
Arctostaphylos uva-ursi forma subiorbiculata	Bearberry Manzanita	R	3
Chorizanthe cuspidata	Spine-Flower	R	2
Collinsia multicolor	San Francisco Collinsia	R	3
Erysimum franciscanum var. franciscanum	San Francisco Wallflower	C	1
Grindelia maritima	San Francisco Gum Plant	C	0
Helianthella castanea	Diablo Rock Rose	R	3
Iris longipetala	Coast Iris	C	1
Lessingia germanorum	California Lessingia	R	2
Pentachaeta bellidiflora	White-Rayed Pentachaeta	X	2
Plagiobothrys chorisianus var. chorisianus	Popcorn Flower	X	1
Silene verecunda ssp. verecunda	San Francisco Campion	X	1
Tanacetum camphoratum	Dune Tansy	X (see ind. species acct.)	2

III. VEGETATION AND HABITAT MANAGEMENT

This section describes efforts to control and treat invasive species as part of the FY2014/2015 Habitat Management Vegetation Plan submitted by West Coast Wildlands, Inc. (WCW) and the new more narrowly focused habitat management Scope of Work (SoW) initiated in FY 2015/ 2016 and implemented by Shelterbelt Builders Inc. (Shelterbelt). WCW worked from January through March and Shelterbelt worked from October through December on vegetation and habitat management activities to support improvement of covered species habitats located throughout the SBMHCP area.

WCW primary focus for the last few decades has been invasive species work to improve mission blue (MB), callippe silverspot (CS) and/or San Bruno elfin (SBE) habitat. The effort and methods to treat different target species are discussed in broad terms under the section vegetation management methods. Over the last several years some targeted scrub removal and revegetation with native host and nectar plants for the covered butterfly species has occurred. However, beginning July 1, 2016 scrub removal became one of the highest priorities for habitat management in the SBMHCP area.

Habitat management focused on removal of high priority invasive plants in order to maintain or enhance existing native plant communities in occupied

covered species habitat, specifically mission blue and callippe silverspot butterfly habitat. Some weed control work was implemented areas that are adjacent to occupied habitat but currently do not support covered species. These areas were targeted to prevent noxious weed invasion into the adjacent higher quality occupied habitat.

Invasive plant control has been augmented by volunteer groups, local homeowner's associations and private landowners throughout the life of the HCP. Current groups involved are: California Native Plant Society volunteers, Myer's Development Group, San Bruno Mountain Watch, Toll Brothers Inc., and Terra Bay Master HOA.

Vegetation Management Methods

Three primary methods are employed for invasive species control, these include handwork, mechanical, and selective herbicide applications. Table 1 includes treatment timing.

Table 3. 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

Handwork

Seedlings and saplings are pulled from the crown upward to reduce soil disturbance. This approach is most effective with plants that have shallow root systems. Hand tools used to remove the whole plant and root systems for this method include Polaski or axe mattock, dandelion weeder, hori hori knives, pruning saw and loppers. If soil is disturbed when target is removed then it is tamped down with a foot or the tool after weed removal. Species targeted for this method include fennel, broom (all species), eucalyptus, coyote brush, and Armenian blackberry.

Mechanical
A brush cutter is often used for either mowing or cutting weeds. A weed whip head mows soft forbs and grasses, where a metal triple blade on the same stock is used to cut through plants with woody stem tissue and tall seed stalks. The triple blade is used to gain access the root crown and is often followed by an herbicide application if the species is known to sprout.

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.

Three application treatments (foliar, cut-stump, and thin-line) are used within SBMHCP area. Foliar treatment is when the whole of the plant's canopy and leaf area are targeted 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 in Table 1. Cut-stump treatments are when the trunk is cut 1-2 inches above soil surface and treated with a twenty-five percent mixed solution with an Aquamaster and vegetable oil. Species include the woody plants and trees listed in Table 1. Thin-line treatments are considered a low volume application and is used primarily on trees and shrubs less than six inches in diameter. A thin stream of undiluted or highly concentrated herbicide is applied in a horizontal line around each stem.

Sites targeted for work are visited at least twice annually and in some cases up to four times. Progress for WCW is denoted on daily data sheets with an aerial photo. These data sheets reflect treatment management units, treatment method, work effort, weather data, and specific work sites denoted on the aerial photo/map for each day. Shelterbelt employs a digital mapping approach were daily "tracks" of employees are digitally recorded along with shrub/ scrub points. These GIS files were provided to County Parks to overlay on our management priority polygons to determine where Shelterbelt has completed work thus far under the FY 2015-16 contract.

Over one thousand man hours were spent on weed and scrub removal in 2015. Based on the WCW daily logs just over 840 man-hours were spent treating

invasive species and scrub in the first quarter. Figure 5 shows the progress made by Shelterbelt implementing the scrub management work beginning in October 2015.

San Bruno Mountain: Shelterbelt Builders Scrub Managment 2015 Treatments

SAN MATEO COUNTY PARKS

Vegetation Management Discussion by Management Unit

There are thirteen official management units (MU) contained within the SBMHCP. Not all MUs were prioritized for vegetation management activities as some units do not support occupied habitat for the covered butterfly species. Below is a brief summary of each MU that underwent vegetation management activities to support MB, CS, or SBE habitat enhancement or protection. See Figure 6 for locations of individual management units.

1. SOUTHEAST RIDGE (191 acres)

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. The Southeast Ridge MU is considered high habitat value for the mission blue (MB), callippe silverspot (CS) and moderate habitat value for native plant diversity and dominance according to the SBM HMP (2008). San Bruno elfin (SBE) butterfly habitat is not present. The Southeast Ridge contains 14.7 acres, only 7.4 percent of this MU, identified by the Creekside Assessment (2015) as essential habitat that should be considered and prioritized for scrub control to maintain grassland habitat for MB and CS butterflies. There are 130.3 acres (the largest acreage) considered valuable and 11.7 acres identified as potential habitat; as funding becomes available these areas should be considered for treatment.

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.

This MU only had a limited amount of work implemented due to funding constraints, however, additional work is anticipated in 2016. Fennel and French broom were the main targets in the large open grasslands of this MU using herbicide and handwork methods. A small patch of coyote brush was targeted and removed using manual and mechanical methods along the Ridge Trail in this MU to release silver lupine populations that support occupied MB habitat. San Bruno Mountain Watch (SBMW) planted this area with native host and nectar plants for covered species. This area will be replanted again in 2016 and continue to undergo scrub reduction activities. Scrub control in the essential grassland areas should be prioritized and expanded in occupied habitat as funding becomes available in 2016. Additional invasive species control will be necessary in the next two years to protect highest quality occupied habitat from

San Bruno Mountain: Management Units and Priority Scrub Management Areas

degradation. Additional funds are anticipated in 2016 and will be likely directed to contain the large fennel infestation, Italian thistle, and broom species that are encroaching on occupied habitat patches.

2. BRISBANE ACRES (190 acres)

The Brisbane Acres MU is considered high habitat value for the mission blue (MB), callippe silverspot (CS), low habitat value for SBE and high habitat value for native plant diversity and dominance according to the SBM HMP (2008). 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). Brisbane Acres contains 53.4 acres of essential habitat, this is approximately 40 percent of this MU. Much of this essential habitat should be considered and prioritized for scrub control to maintain grassland habitat for MB and CS butterflies. This MU contains the fifth largest acreage of essential habitat for grassland management and protection.

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. 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.

This MU had a limited amount of work implemented in the unit due to funding constraints, however, a two acre patch of high quality habitat was targeted for scrub treatment in the upper grasslands below the Ridge Trail. Seventy percent of this area was treated with the thin-line method of herbicide application in 2015 and the work will be completed in early 2016. Mustard, radish, oxalis, and thistle were the main targets along the Ridge Trail in this MU. These areas were targeted to protect patches of silver lupine and viola populations that support occupied MB and CS habitat. Annually, North County Fire initiates a fuel reduction project adjacent to Brisbane homes along Trinity and Kings Road to reduce annual grass height and contiguous ladder fuels, total area for this work was approximately two acres in 2015.

County Parks initiated two coordination meetings with the City of Brisbane, including a presentation to their Open Space and Ecology Committee. Brisbane conducts limited vegetation maintenance in this MU annually. As more funding becomes available expanded efforts in occupied essential habitat should be

prioritized. Additional coordination with the City of Brisbane will be a priority in 2016 to ensure SBMHCP vegetation and habitat management objectives are aligned to support biological objectives.

3. SOUTH SLOPE (477 acres)

This MU has high habitat value for MB, CS and native plant community diversity and dominance according to the SBM HMP (2008). SBE habitat is not present. This unit has significant callippe silverspot and mission blue habitat throughout the unit, with important habitat along the Ridge Trail. The South Slope contains 76.5 acres of essential habitat or stated differently 22.9 percent of this MU is considered essential grassland habitat and should be considered and prioritized for scrub control to maintain grassland habitat for MB and CS butterflies. South Slope contains 121.9 acres of valuable habitat and 51.8 acres of potential habitat and as funding allows should be considered for scrub treatment activities in the future This MU contains the second largest acreage (76.5 acres) of essential grassland habitat in the SBMHCP area.

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 surrounding the Terrabay development have traditionally had lower quality habitat due to infestations of fennel, bristly ox-tongue, pampas grass and non-native grasses and forbs. Higher quality grasslands are found on undisturbed middle and upper elevation grasslands, although these areas are increasingly dominated by non-native annual grasses and undergoing scrub encroachment.

Areas under the jurisdiction of County Parks and private property were treated in this MU. Scrub control was initiated in approximately four acres of occupied habitat and seventy percent was completed with a foliar herbicide application. Work will continue in spring 2016. Additionally invasive species were targeted in 2015 using hand work, mowing, and herbicide. Invasive targets included bristly ox-tongue, Bermuda oxalis, fennel, summer mustard, jubata grass, Italian thistle, wild radish, and French broom. There is French broom and fennel scattered up slope of the Terra Bay development and drainage sites and along the old fire roads/trails. Treatment of these areas was initiated by the development and carried out by WCW.

4. OWL AND BUCKEYE CANYONS (294 acres)

This is an important MU as it has high habitat value for MB, CS, SBE, and native plant community diversity and dominance. 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. Older road-cuts are found on the upper slopes on the west side of Owl Canyon, some of which provide habitat for the San Bruno elfin butterfly. This MU contains 81.2 acres of essential habitat, the largest acreage of essential habitat in all of the SBMHCP area. As a result this area has been a continually targeted for vegetation and invasive species management for a number of years.

The Owl and Buckeye Canyons management unit is partially owned by the California Department of Fish and Wildlife and is managed collaboratively with the County of San Mateo's Parks Department. It is located along the southern and western border of the City of Brisbane. Quarry Road leads to one of the only developed or significantly altered areas within this unit and provides access to the quarry operations. Additionally, the PG&E transmission lines pass through the eastern slope of this management area.

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 vegetation management initiated by volunteer groups such as San Bruno Mountain Watch. Owl and Buckeye Canyons MU has been consistently prioritized by SBMHCP TAC and habitat managers.

The FY 2015/16 Scope of Work included approximately seventeen acres of scrub treatment. All areas in this MU had at least 60 percent of the polygons treated for scrub control using foliar and thin-line herbicide applications as well as cut and paint. In 2015 SBMW planted over1500 host and nectar plants in this MU with the help of volunteers. These efforts were supported by scrub removal efforts. Fennel, French broom, Monterey pine, and native scrub were targeted by volunteers and contractors alike in this MU. In 2015 a total of 270 volunteer hours were spent restoring and weeding the highest quality patches in Owl and Buckeye Canyons. Scrub control in the essential grassland areas should continue as a management priority for 2016 and the next several years since these areas support occupied habitat. As funding becomes available additional efforts can be expanded to continue to remove fennel, Italian thistle, and broom species that also are found within the grassland of this MU.

5. NORTHEAST RIDGE (214 acres)

The Northeast Ridge or the Guadalupe Hills are considered high habitat value for MB and CS and low habitat value for native plant community diversity and dominance. SBE are not present in this MU. This 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. The Northeast Ridge contains 69.8 acres of essential grassland habitat, approximately 57 percent of the MU. These areas are currently privately owned, but should be prioritized for scrub control and ongoing invasive species management when accepted into the County Parks system through the dedication process. The Northeast Ridge contains the fourth largest acreage of essential grassland habitat according to the Creekside Assessment.

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. WCW carries out vegetation management activities for the private landowner within this MU. In 2015 WCW continued to control fennel, French broom, Italian thistle, mustard, and oxalis. A combination of herbicide and manual methods were implemented. Due to the extensive work many of these populations are close to eradication or full control. Diligence will be needed to ensure that the remaining populations of these problematic weed species are not allowed to rebound. Scrub will need to be prioritized moving forward in this MU to protect the quality and extent of MB and CS habitat.

6. HILLSIDE/ JUNCUS (217 acres)

Hillside/ Juncus MU contains high habitat value for MB, moderate habitat value for CS and native plant community diversity and dominance, and low habitat value for SBE. 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. This area contains 76.2 essential grassland habitat, approximately 34 percent of the MU, and is the largest extent of essential habitat in the southwestern portion of the SBMHCP area.

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 and a new valve lot was installed adjacent to Hillside Blvd on land owned by Holy Cross Church and partially within the SBMHCP in 2015. Revegetation of this area is still underway and ongoing weed management of this area was a condition of the installation of the valve lot and began in 2015.

During 2015 this area was treated for fennel and oxalis primarily through herbicide control and historically has undergone scrub removal to facilitate host

and nectar restoration plantings. Hillside/ Juncus MU has two dedicated site stewards (Chuck and Loretta Heimstadt) that have been diligently working to improve both occupied butterfly habitat and native plant diversity for several years. In 2015 the Heimstadt's contributed approximately 100+ man hours plus the unaccounted hours of their volunteers. They are authorized to lead small volunteer groups in weed management activities and have contributed to the control of fennel, radish, mustard, and thistle within this MU.

On May 10, 2015 an eight acre grassland fire burned through the east facing slope above the Tank/ Juncus Bowl. It was a fast moving fire and was contained within hours, Figure 7. Other areas in this MU that have experienced fire have recovered well and we have anecdotally seen increase in lupine germination. In 2016 additional funding will be directed to combat any invasive species that appear as a result of the fire. With the combination of rainfall this winter and the fire it is possible that 2016 will be a good lupine germination year in the fire area. As needed scrub control in the essential grassland areas should be considered a management priority for 2016. Continued oxalis control in high quality occupied butterfly habitat patches will continue as a priority in 2016.

7. DEVIL'S ARROYO (268 acres)

This MU contains high value habitat for SBE and native plant community diversity and dominance. Devil's Arroyo supports two rare CNPS 1B.2 manzanita species, the largest colony of San Bruno manzanita and Montara manzanita. This MU has moderate habitat value for MB and CS covered species. Relatively small yet botanically diverse grassland patches are found on ridgelines and bald areas on the upper slopes of this unit. This area supports 8.8 acres of essential habitat and 8.9 acres of valuable grassland habitat.

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 nonnative grassland. 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.

A small area just west of the Quarry has been targeted for coyote brush removal and restoration. SBMW volunteers planted 1000 host and nectar plants in this area. This restoration and brush clearing project is anticipated to continue into 2016. This area supports high biodiversity, is occupied habitat, and the infusion of funding to restore the adjacent privately-held property make this area a good investment for HCP funding. Additional work in Devil's Arroyo included fennel,

San Bruno Mountain: Location of 2015 Fire in Hillside/Juncus Management Unit

mustard and gorse control. Select portions of this area will continue to need treatment to effectively contain gorse populations and maintain and improve occupied habitat for listed butterfly species. Manual, mechanical, and herbicide methods were used for invasive and scrub control.

PG&E contains a gas line easement through the lower eastern slope of the management area to the west of the Quarry. PG&E initiated work in this MU in December to clear the woody species along their gas pipeline. A requirement of this work is ongoing weed management in the cleared areas to avoid potential invasive species recolonization. This vegetation clearance continues into portions of Southwest Slope and Hillside/ Juncus management units. All areas were held to the same standard for ongoing invasive weed monitoring and treatment.

8. DAIRY AND WAX MRYTLE RAVINE (214 acres)

Dairy and Wax Myrtle Ravines have a moderate MB, CS, and native plant community diversity and dominance and high value habitat for SBE butterfly. This MU contains a combination of high quality native habitats and disturbed restoration areas. 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. 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. This MU contains 35.2 essential grassland habitat, approximately 15 percent of the MU.

Most of this MU is owned by the County Parks, with lower elevation portions in the north of this unit are owned by McKesson, Inc. WCW has been working with McKesson to develop and implement a weed management and habitat restoration plan to improve and restore high quality habitat that will be dedicated to County Parks. The approach for this plan was presented to the TAC in December 2015 for input and will be finalized in 2016. In 2015 Monterey pine, gorse, fennel, and broom were targeted for ongoing control using all available methods. Native scrub removal followed by restoration plantings by SBMW have occurred in this MU to increase MB host and nectar plants. Over 1000 plants were installed in 2015. Due to the funding anticipated from the McKesson dedication, additional SBMHCP funds will be directed to augment these efforts in adjacent County lands. It is anticipated that some level of funding will continue to be needed to contain gorse and other noxious species found in this unit.

9. SOUTHWEST SLOPE (436 acres)

Southwest Slope contains high value habitat for MB and native plant community diversity and dominance and moderate habitat value for CS and SBE. Mission

blue habitat is scattered within patches of grassland and on fire roads along ridgelines. The federally endangered San Francisco Campion (*Silene verecunda* ssp. *verecunda*) is located within this unit on the upper slopes near Radio Road. This unit has only very small patches of habitat for the San Bruno elfin and callippe silverspot butterflies. The western low elevation grasslands are dominated by purple needlegrass and fescue bunchgrasses. The MU 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 Southwest Slope contains only 2.5 acres of essential grassland habitat and 10.4 acres of potential habitat.

The management unit is bordered by the Cypress AMLOC landfill, the Cypress golf course and residential development within the City of Colma. 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, although this is unused at this time. The lower slopes have been disturbed from farming and horticultural practices on lands above Pacific Nursery.

PG&E contains a gas line easement through this eastern portion of this MU and a new valve lot was installed along Hillside Blvd. PG&E initiated work to revegetate the valve lot and have initiated a weed management plan for this new development. In December PG&E initiated a project to clear woody species along their gas pipeline throughout the SBMHCP area. A requirement of this work is ongoing weed management in the cleared areas to avoid potential invasive species recolonization. This vegetation clearance continues into portions of Devil's Arroyo and Hillside/ Juncus management units. All areas were held to the same standard for ongoing invasive weed monitoring and treatment.

A volunteer tocolote (*Centaurea melitensis*) removal project was initiated in this MU as an early detection rapid response to a recent increase in this species along the Ridge Trail. The Ridge Trail supports some of the highest value habitat for covered species in this MU. Over 3000 individuals were removed during six visits to locations scattered along the Ridge Trail. Additional control efforts occurred in January for gorse and oxalis in this management unit. Control was a combination of manual and herbicide for gorse and herbicide only for oxalis.

10. APRIL BROOK (273 acres)

The April Brook MU 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. This management area has very limited mission blue and callippe silverspot habitat and is classified by the HMP as low habitat value for these species. However it provides moderate San Bruno elfin habitat, and contains large expanses of pristine grasslands and coastal scrub. A

single dune tansy (Tanacetum camphoratum) plant is present within this unit. It has high habitat value for native plant community diversity and dominance and moderate value for SBE habitat. 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. This unit does not contain any essential or valuable grassland habitat and only contains 0.2 acres of potential grassland habitat that could support MB or CS butterflies.

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.

Only a minimal amount of work was initiated in this MU in 2015. Invasive species were treated in February using hand herbicide applications to control fennel, cotoneaster, Italian thistle, mustard, and jubata grass. It is unlikely that this MU will be prioritized for treatment in 2016 using HCP funds.

11. SADDLE (320 acres)

The Saddle MU contains moderate habitat value for MB, CS, and native plant community diversity and dominance. The eastern slopes provide important grassland habitat for the callippe silverspot and mission blue butterflies. SBE are not present in this management unit. The northern portion of the Saddle is mostly made up of steep, inaccessible slopes primarily covered by gorse. 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 with an extensive freshwater marsh and riparian wetlands. The central and western portions of the Saddle MU 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. The essential grasslands located within this unit are estimated at 13.2 acres and mainly occur in the northeastern areas of this MU. This unit contains the most potential grassland habitat with approximately 70 acres, primarily to the west of the habitat classified as essential.

It is bordered by Guadalupe Canyon Parkway on the south and east, and the City of Daly City on the north and west. 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 the 2007 estimate of gorse in this unit was 34 acres (HMP 2008). Continued gorse containment lines should be used and prioritized, however this was not funded in 2015 due to

budget constraints. Vegetation management activities in 2015 focused on fennel and French broom. As funding allows scrub removal should be considered for the essential grassland areas that are occupied and support both MB and CS populations.

Table 4. Scrub Treatment by Management Unit Polygon

Shelterbelt Builders Scrub Treatment 2015				
Management Unit		*Acreage*	*% Treated*	*Treated Acreage*
BA-01	Brisbane Acres	2.03	70	1.42
DA-01	Devil's Arroyo	0.94	60	0.56
DW-01	Dairy & Wax Myrtle Ravines	6.5	70	4.55
HJ-01	Hillside / Juncus	37.78	40	15.11
OB-01	Owl & Buckeye Canyons	16.96	70	11.87
OB-02	Owl & Buckey Canyons	10.97	60	6.58
OB-03	Owl & Buckey Canyons	10.33	75	7.75
OB-04	Owl & Buckeye Canyons	2.1	60	1.26
OB-06	Owl & Buckeye Canyons	0.67	100	0.67
RT-01	Ridge Trail	9.18	0	0
SR-02	Southeast Ridge	2.07	40	0.83
SS-01	South Slope	4.05	70	2.84
SUM		103.58		53.44

CONCLUSIONS

Vegetation and habitat management underwent a transition in 2015. The habitat management paradigm re-focused efforts to address natural patterns of scrub succession in the absence of disturbance on the mountain. Historically, grazing and fire provided punctuated disturbance within the SBMHCP lands. These historic disturbance events provided the mosaic of scrub and grassland habitats found on the mountain today. Grassland requires regular return intervals of disturbance in natural or semi-natural habitats in order to remain free from scrub; fire is often the agent of disturbance. In more managed habitats a combination of grazing and fire are often used to prevent scrub encroachment. In the last thirty years, the SBMHCP area has not been grazed beyond a small experiment and there has been a significant reduction in fire events. The absence of these disturbances has resulted in a steady decline in high quality grassland and prairie habitat able to support mission blue and callippe host and nectar plants.

Based on the Assessment by Creekside Science, the 2014 corrected grassland acres were estimated to be 944 acres ± 188 (826-1062 acres). The 2008 HMP

established an acceptable range of grassland based on historical fluctuations to be between 1200 and 1800 acres. This information provides a clear directive for habitat management activities within the SBMHCP- control scrub encroachment in high quality occupied grassland habitats. The Assessment provided clarity on where to focus immediate efforts to secure and protect high quality or "essential" grassland habitats against scrub encroachment within the SBMHCP. Creekside Science estimates essential grasslands as approximately 431 acres. The Scope of Work (SoW) for FY 2015/2016 prioritized 103 acres out of 431, approximately twenty-four percent of essential grasslands, for scrub control. Of the 103 acres slated for treatment fifty percent of these acres have been treated in 2015 with the balance scheduled for treatment in the first half of 2016.

Areas targeted for treatment in the 2015 SoW were identified based mission blue and callippe silverspot observation data as well as historical maps of host plant locations. Areas immediately adjacent to populations of host plants for MB and CS were further prioritized for full scrub removal. Areas within essential grassland habitat that were not immediately adjacent to host plant populations were treated to halt scrub encroachment through herbicide applications. Diligent efforts to stop scrub encroachment into the essential grassland areas and active scrub removal in areas adjacent to host plant populations will help bring grassland acres into the acceptable historic range between 1200-1800 acres. Scrub control cannot be obtained in one or two years, therefore, a commitment of resources for the next several years will be necessary to bring grassland acres back up to 1200 acres.

Despite the prioritization of scrub control over invasive species management in the FY 2015/2016 budget, funding will still be necessary to prevent habitat degradation due to invasive species infestations. The first part of 2015 efforts to continue to treat invasive species provided more flexibility to focus on scrub control in the latter half of the year. However, in 2016, additional funds will be allocated in the FY 2016/2017 budget to treat the most noxious species threatening high quality habitats. Part of the focus will be to continue containment of significant populations of highly noxious species such as gorse. Balance and careful consideration will be necessary to properly evaluate the risks and benefits for prioritizing invasive species treatments over scrub control moving forward.

SBMHCP area benefits greatly from volunteer habitat management activities. Volunteer-based projects are actively contributing to habitat enhancement and protection of high quality butterfly habitat. Volunteer efforts supplement the work done by professionals and complements contractor work by often providing the detail work in and around host plants where time and care are of upmost importance. The sheer size of SBMHCP area makes it very difficult to hire contractors to carry-out the final control of certain species due to the high mobilization costs associated to track down the last dozen fennel sprouts in a 20-acre area. This is where volunteers shine! They want to contribute and have the time to chase down the last few offending plants in a large parcel. Additionally,

this type of work provides a real sense of accomplishment for volunteers and should be encouraged.

RECOMMENDATIONS

Habitat management actions are most effective when based in relevant and applicable data. Many of the recommendations outlined in the Covered Species section of this report are relevant to determining appropriate habitat management activities in the near and mid-term.

SCRUB ENCROACHMENT

Scrub encroachment is a serious threat to the existence and quality of grasslands and prairie habitats that support mission blue and callippe silverspot butterfly populations scattered throughout SBMHCP area. Scrub within the SBMHCP area consists of both native and exotic species. A lack of disturbance has contributed to native scrub encroachment into covered species grassland habitat.

Scrub encroachment should be a primary focus for budget expenditures related to habitat management. Using the Assessment, areas designated as "essential" should be prioritized for treatment as a starting point. Efforts should be made to evaluate the threat of climate change in covered species habitat management and prioritization. As an example, MB observations along T-1 in 2015 indicate that these areas may no longer support a MB population or a reduced population. This transect represented the westernmost occurrence of MB on the mountain. It may be wise to prioritize habitat management activities here to improve this "potential" grassland habitat in light of the high concentration of habitat in the eastern portions of the SBMHCP. Investing in recovering this area with a systematic approach before it degrades further will be easier than attempting to recover this area after further decline. These scenarios are worthy of robust discussion to determine appropriate prioritization and consideration of unknown future conditions.

Scrub encroachment should continue to be prioritized until grassland habitat increases to the minimum threshold of grassland acres to 1200 acres. Clear definitions of grassland suggested by the Assessment should be reviewed and incorporated into the HMP. This will enable consistent grassland analysis to ensure that grassland habitat is sufficient to support robust populations of MB and CS butterflies and remain within the historical range identified in the 2008 HMP. Grassland acres should be evaluated at a regular interval to ensure the minimum threshold is retained.

INVASIVE SPECIES CONTROL

Invasive species management is a difficult aspect of habitat management. It often seems as soon as you are able to control, eliminate, or contain one problematic species, a new one is identified. Marginal habitats adjacent to urban areas are most at risk for continued invasion by non-native plants and animals. Not all non-native plants are immediate threats to habitat quality or

biodiversity, while others that may not appear to be significant threat and exist at low levels can suddenly reach a threshold where the population explodes. Invasive species are a very site specific problem. Invasive species lists and priorities must be evaluated from time to time to ensure that the most appropriate approach is taken based on available information.

It is time to re-evaluation the Invasive Priority Plant List found in Appendix E of the HMP. Species should be prioritized based on threat and further classified for treatment approach. Species can be categorized into classifications such as control, contain, and eradicate. Additional guidance is provided in the Assessment and this information should be considered when revising the list. With scrub control as a clear priority funding will be even more limited to address invasive species control. Therefore, a systematic approach should be developed with SMART (specific, measurable, achievable, results-focused, and time-bound) goals for the top five to ten invasive species found within the SBMHCP area and occurring in the covered species habitat as a starting point.

HOST AND NECTAR PLANT MONITORING

As discussed in the monitoring recommendations host and nectar plants are a critical link to determining habitat management needs. By initiating host and nectar plant monitoring appropriate data can be collected to enable the Habitat Supervisor to define high, medium, and low quality MB and CS habitat. These classifications can help in determining priorities for scrub removal, invasive species treatments, and when weighing two different areas for prioritization. Lastly, this will clearly guide where revegetation is needed to augment host and nectar populations to better support MB and CS. Host and nectar plant monitoring protocol testing should be initiated in 2016 and refined over the next two years.

REVEGETATION AND RESTORATION

Grassland management in the absence of fire and grazing can be challenging. The covered species rely on primarily low-growing host and nectar plants. In habitats adjacent to urbanized areas these host and nectar plant populations are often more at risk to invasive species invasion. Both scrub and invasive species can overtop the host and nectar plants critical for MB and CS butterfly lifecycles, making it harder to locate food and egg deposit locations. Additionally, scrub and non-natives potentially outcompete and can reduce the density of host and nectar plants in occupied habitats.

Continued experimentation concerning different techniques to control tall competing vegetation should be implemented when and where appropriate. It may be best to test methods in unoccupied habitat first to see how the target plants respond. Weed whips, scything, and mowing if done at the right time of year can reduce weed populations and provide additional resources to host and nectar plants. In some areas experiments with grass-specific herbicides have proven effective in developing a more robust herbaceous layer in bay checkerspot habitat at Coyote Ridge (personal communication Niederer 2015).

If definitions of high, medium, and low quality habitat for MB and CS are associated with density of these resources this could also be used as a management tool to inform and guide where additional revegetation is needed. All of these techniques can contribute to the restoration of covered species habitat and should be considered for implementation when adequate funding is available to initiate a project for multiple years.

VOLUNTEER PROGRAMS
SBMHCP should continue to encourage and collaborate with interested and knowledgeable volunteers. Weed work and restoration events utilizing volunteers have proven an effective restoration tool and should continue with appropriate oversight and guidance.

IV. COVERED SPECIES AND VEGETATION MANAGEMENT PARTICIPANTS

Annual report prepared by San Mateo County Parks' Natural Resource Manager, Ramona Arechiga, with contributions by Senior Biologist Autumn Meisel of MIG | TRA Environmental Sciences.

2015 TRA Environmental Sciences Field Crew: Autumn Meisel, Lauren Huff (MIG) and Ranit Cohen (Coast Ridge Ecology).

2015 West Coast Wildands Field Crew: Mike Forbert, Todd Shreiner, Q. Bell, D. Bell, and B. Whitcomb.

2015 Shelterbelt Builders Mark Heath and Field Crew.

San Bruno Mountain Watch Staff: Joe Cannon, Iris Clearwater, Ariel Cherbowsky, Ildiko Polony, and countless dedicated volunteers.

CNPS Volunteers: Chuck and Loretta Heimstadt and countless weeding volunteers, Doug Allshouse, David Nelson.

REFERENCES

Arnold, 1983. Ecological studies of six endangered butterflies (Lepidoptera, Lycaenidae): island biography, patch dynamics, and design of habitat preserves. Univ. of Calif. Publications in Entomology. 99:1-161.

Niederer, C., 2015. Personal communication concerning Envoy herbicide application to improve herbaceous cover for bay checkerspot butterfly habitat. Phone conversation, date unknown.

Thomas Reid Associates, 1982. Endangered Species Survey San Bruno Mountain. Biological Study 1980-1981. Prepared for San Mateo County.

TRA Environmental Sciences, 1983-2014. San Bruno Mountain HCP Annual Activities Reports. Prepared for the County of San Mateo.

TRA Environmental Sciences, 2008. San Bruno Mountain Habitat Management Plan. Prepared for the County of San Mateo.

Weiss, S.B., 2016. Personal Communication concerning mission blue flight season. Email January 12, 2016.

Weiss, S.B., Naumovich, L. and C. Niederer. 2015. Assessment of the past 30 years of habitat management and covered species monitoring associated with San Bruno Mountain habitat conservation plan. Prepared for the San Mateo County Parks Department.

West Coast Wildlands, 2014. San Bruno Mountain HCP Annual Activities Report. Prepared for the County of San Mateo.

All TRA documents/ resources available from MIG | TRA Environmental Sciences Inc. or the County of San Mateo Parks Department.

Appendix A

SAN BRUNO MOUNTAIN AREA
HABITAT CONSERVATION PLAN

OPERATING BUDGET AND WORK SCOPE

FOR HABITAT MAINTENANCE, RESTORATION AND EXOTICS CONTROL EFFORTS

FISCAL YEAR: JULY 1, 2014 - JUNE 30, 2015

Prepared by:

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FINAL

June 2014

Submitted To:

San Bruno Mountain Area
Habitat Conservation Plan Trustees

PROPOSED WORK SCOPE FISCAL YEAR 2014/2015

A description for each task within the work program to be completed by West Coast Wildlands, Inc. is provided below. See Exhibit B: 'Cost Summary for Fiscal Year 2014/2015 for the proposed budget of each task. West Coast Wildlands, Inc., (WCW) billing rates are provided at the end of this document.

A. PROGRAM MANAGEMENT

A.1. Administration and Project Supervision

Tasks under Administration and Project Supervision include all hourly time required to attend meetings, respond to requests for information, communicate with the Habitat Manager and other contractors, and prepare the annual budget. Tasks will be completed primarily by a Biologist ($55/hour), with support from the Senior Biologist ($75/hour).

This budget includes time for attendance to: the annual HCP Trustees Meeting, four TAC meetings, and four field meetings. If attendance to more than the above stated meetings is requested by the Project Manager (San Mateo County Department of Parks), a separate contract on a time and materials basis will be needed. Other tasks include the Administration and Project Supervision for preparation of WCW's annual budget and invoicing.

A.2. Annual Report Preparation and Data Analysis

The Section 10(a)(1)(B) Permit requires the submission of an annual report describing activities conducted under the permit for the calendar year. WCW will prepare and submit the annual report to the USFWS by January 31, 2015. WCW will prepare and submit an annual report to the Habitat Manager (County of San Mateo) by December 31, 2013. This report will include invasive control work, restoration work, vegetation changes, and all other significant activities on the Mountain that relate to the HCP habitat management program for the calendar year 2014 . This report can be included in the required Annual Permit Report sent to the USFWS by January 31, 2015.

West Coast Wildlands' preparation and data analysis for the Annual Permit Report is completed by a Biologist ($55/hour), with support from the Senior Biologist ($75/hour).

A.3. Supervise Invasive Plant Control Work

WCW will supervise day-to-day operations of the invasive plant control program on San Bruno Mountain (Figure 1). Tasks include planning invasive plant control, directing hand and herbicide work, and meetings with subcontractors, County staff, and San Bruno Mountain volunteers. Invasive plant control work through the use of herbicide and hand weeding has been the primary tool for protecting and restoring the plant communities of San Bruno Mountain. Weed control for most areas are conducted 2-3 times per year, with an initial treatment, a 3-6 weeks follow-up treatment, and a third follow-up 4-6 months as

necessary. Monitoring at individual sites will determine the appropriate specific timing for follow-up treatments.

A.4. West Coast Wildlands Integrated Pest Management (IPM) Plant Control

The greatest portion of the FY2014/2015 budget will be allocated to invasive plant species control administered by West Coast Wildlands and complies with the current County of San Mateo IPM Policy and methods (See Attachment A: San Mateo Countywide IPM Policy).

West Coast Wildlands' IPM field methods include using manual tools, mechanical equipment and the lowest toxic herbicides to effectively treat the pests. Hand tools are used on non-native plants that are within sensitive habitats, an isolated individual or clusters and running or seasonal water sites. This method becomes very effective when the large mature stands of many invasive plants have been reduced by 90% and native plants have migrated into the treated site.

Mechanical mowing is a method used to control non-native annuals prior to seed-set such as thistles mustards. These species are often found along the Ridge Trail where the endangered Callippe silverspot butterfly is often monitored. The 2014/2015 2012 Habitat Maintenance and Exotics Plan increased the hand and mechanical efforts by another 20% from the previous year as noted in the Budget Table (Exhibit B).

Herbicide recommendations are written by at licensed DPR Pest Control Advisor (PCA) and Monthly Use Reports (MUR) are submitted to the San Mateo County Agriculture and Weights Department. Herbicide applications are used to treat the plants such as gorse, F. broom, Bermuda buttercup and eucalyptus that are difficult to control using the other methods. Disturbing the soil using mechanical tools in large weed infested areas can create an opportunity for other non-native plants to migrate onto the site.

The two herbicides used on San Bruno Mountain are very low in toxicity, most effective in treatment and least harmful to employees. The first is Aquamaster that is aquatic approved and mixed with an aquatic non-ionic silicone surfactant or spreader. This herbicide is applied to monocots such as non-native grasses or plants that are close to seed-set rendering the seeds immature. The second herbicide is Garlon 4 Ultra that is

used on woody or broadleaf plants and mixed with vegetable oil. Garlon 4 Ultra is an auxin mimic, a plant hormone, which burns up the sugars in the roots. This herbicide's selectivity to dicotyledons allows treatment of plants within native perennial grassland habitat.

The three types of herbicide application methods are foliar, basal bark and cut-stump. A foliar application covers an area with 0.25 to 2.0% solution rate and the selective basal bark or cut-stump application rates range from 5-25% solution rate. Backpack or spray bottles are used to apply the herbicides that have selective tips for target location. Spray equipment accessories include buckets or shields to cover non-target plants. A no-spray buffer area is always required in sensitive areas. Buffer areas are always created via

manual labor or hand tools. The herbicide training emphasizes treatment applied to the primary target species.

A.5. Technical Advisory Committee (TAC)

The Technical Advisory Committee is comprised of representatives of the San Mateo County Parks Department, San Bruno Mountain volunteer groups, contractors and habitat management biologists. The group meets four times per year with one day in the field during the spring months to observe the working sites and discuss the upcoming fiscal year management plan. The draft vegetation management plan is reviewed by the TAC prior to finalizing the proposed effort in May.

B. HABITAT MAINTENANCE AND ENHANCEMENT BY MANAGEMENT UNITS

The San Bruno Mountain State and County Park is divided into thirteen Management Units (Figure 1) each with a specific name representative of their location. The Management Units from East to West are: Reservoir Hill, April Brook, Saddle, Dairy and Wax Ravines, Devils Arroyo, Southwest Slope, Hillside/Juncus, Carter/Martin, Northeast Ridge, Owl and Buckeye Canyons, South Slope, Brisbane Acres and Southeast Ridge.

Habitat maintenance and enhancement in the management units are highlighted by a red polygon within each MU map showing the main treatment areas numbered (Exhibit B). The management involves removal of high priority invasive pest plants in order to maintain or enhance existing native plant communities. Although the primary purpose of invasive weed control is to protect and maintain the best possible butterfly habitat, control work is also done in native habitat areas that do not support the butterflies but are hosting particularly noxious weeds that can migrate into their habitat. The areas adjacent to the Park boundary are seed sources for the weeds being controlled within the Management Units (MU) and there will always be some effort required to maintain a weed-free butterfly habitat.

For the past 29 years, the invasive weed control program has gradually expanded to cover most of the grassland habitat on the Mountain and includes other biological significant areas. Our efforts will continue in areas that had ongoing weed control work and in areas that support important habitat for the endangered species, rare plants, and special status plant communities. The Invasive control effort is proposed in 27 specific sites spread throughout the Mountain's MU (see attached budget spreadsheet at the end of the document). We treated approximately 650 acres in FY 2013/14. The management areas will be concentrated to more specific sites in FY 2014/15 for additional brush reduction.

Our Invasive plant control efforts are also augmented by volunteer groups, local homeowner's associations and private landowners. Current groups involved are: Myer's Development Group, San Bruno Mountain Watch, The Friends of San Bruno Mountain, The Toll Bros., Terra Bay Master HOA, Hillside Landfill and San Mateo County Parks. In 2014/2015, WCW will provide technical and administrative support for local agencies and groups conducting invasive plant control and restoration work.

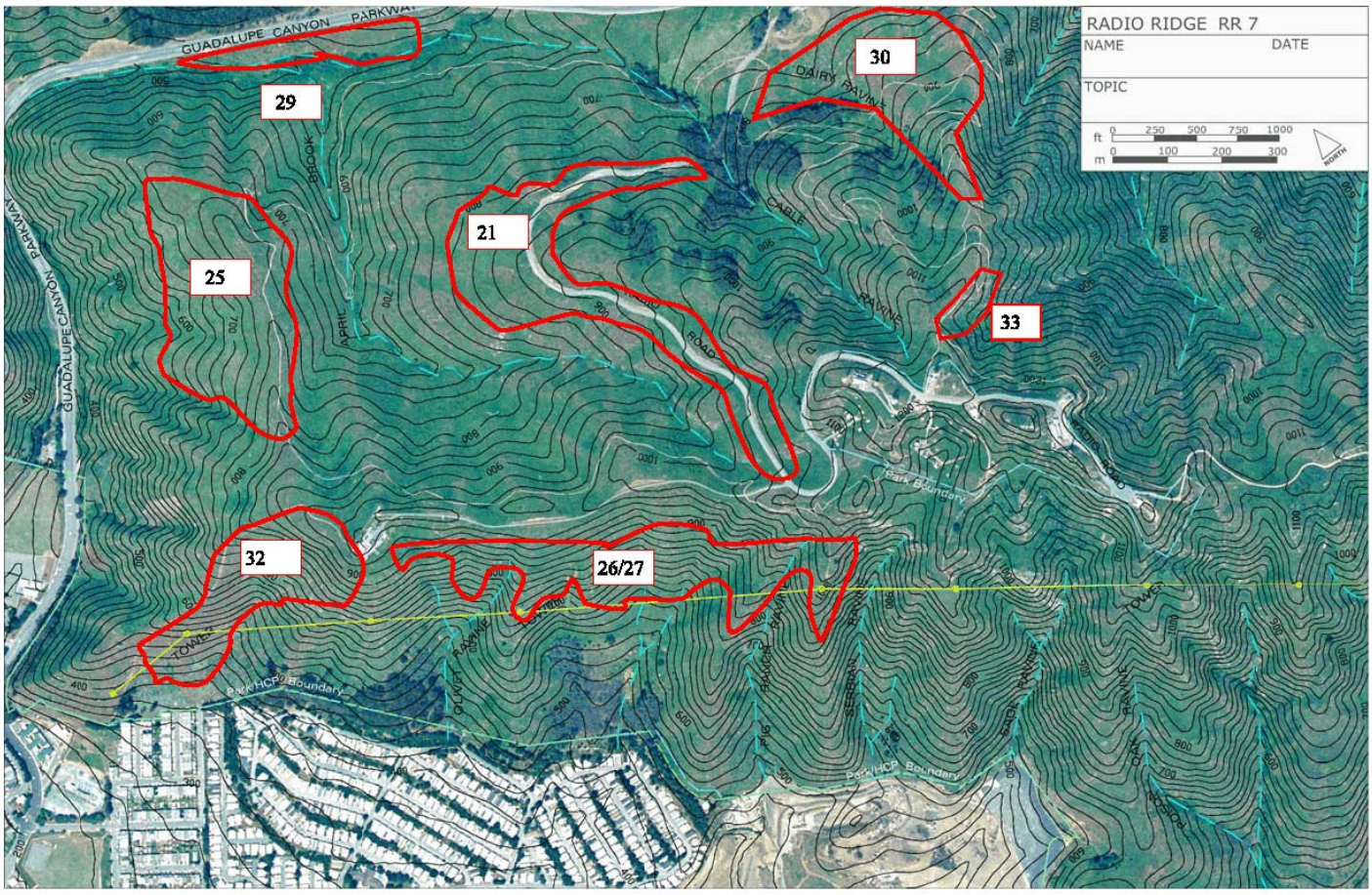
B.1. Description of Effort within each Management Unit on San Bruno Mountain

Reservoir Hill (127 Acres)

The eastern section of this MU has F. broom and Oxalis present. Both non-native species were moving towards the endangered Mission blue butterfly (MB) habitat located south of the residential area. The Homeowners Association has planted both nectar and hosts plants on their property adjacent to the County Park boundary. No effort is proposed for this management unit in the upcoming fiscal year

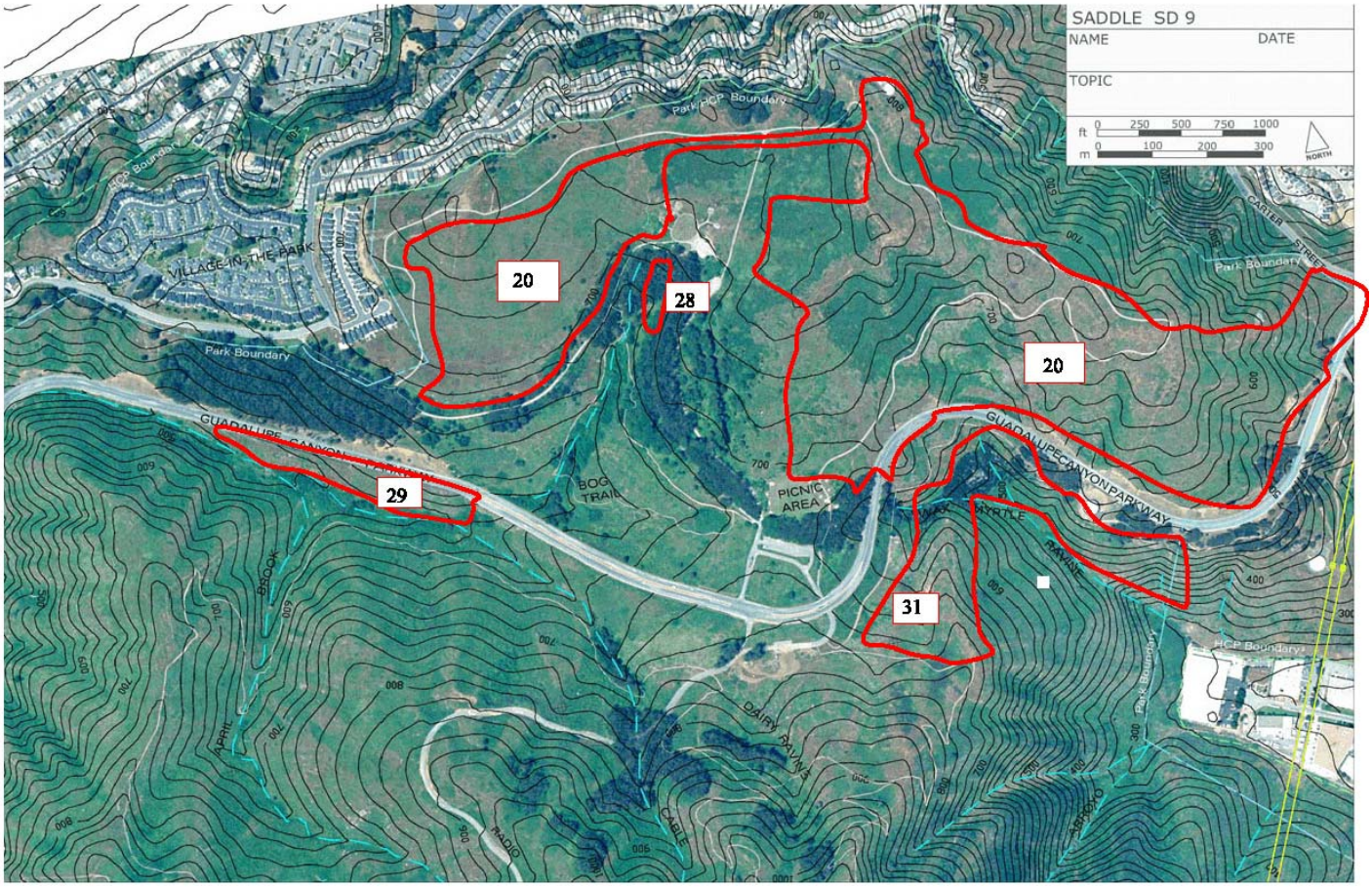
April Brook (273 Acres)

The Subunit (SU) polygons areas Radio Road (21), Guadalupe Canyon Pkwy (23), Bitter Cherry Ridge (25) and April Brook (29). The area is predominately coastal scrub with non-native Oxalis, Gorse, Cotoneaster, Fennel and Pampas 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 sub unit 29 and focus surrounding the island has been to control or eradicate additional invasive species that include French broom (*Genista monspessulana*), radish (*Raphanus* sp), Italian thistle (*Carduus pycnocephalus*) and cotoneaster (*cotoneaster* sp). Cotoneaster seedlings on the eastern margin of the grassland are manually removed adjacent to a small patch of *L. formosus* (host plants for the Mission blue butterfly). Mission blue transects T1 & T3 are in this MU.



Saddle (320 Acres)
The Subunits in The Saddle MU are The Saddle Ridge and Western Outlier (20) and the Colma Creek Bog (28)The Saddle Trail has the host plant, *Viola pedunculata*, for the endangered Callippe silverspot (CS) butterfly located along the East Ridge and Mission blue (MB) transect T5. The primary non-native species has always been Gorse (*Ulex europaeus*) in the Saddle Trail area. The seedlings are viable for over 20 years and the site is visited 2-3 times per year to control the seedlings before they flower to seed.

There is a population of F. broom on the NE edge of the Saddle that will be managed and the Velvet grass (*H. lanatus)* Within the Saddle MU is the Bog area where additional species are monitored for control or eradication. These non-native plants include poison hemlock (*Conium maculatum*), A. blackberry (*Rubus armeniacus*), P. loosestrife (*Lythrum salicaria*), J. grass (*Cortaderia jubata*) and Eucalyptus saplings. Additional outplanting efforts are proposed for this eastern Saddle Trail Ridge site. A total of 75 acres are treated within the management unit.

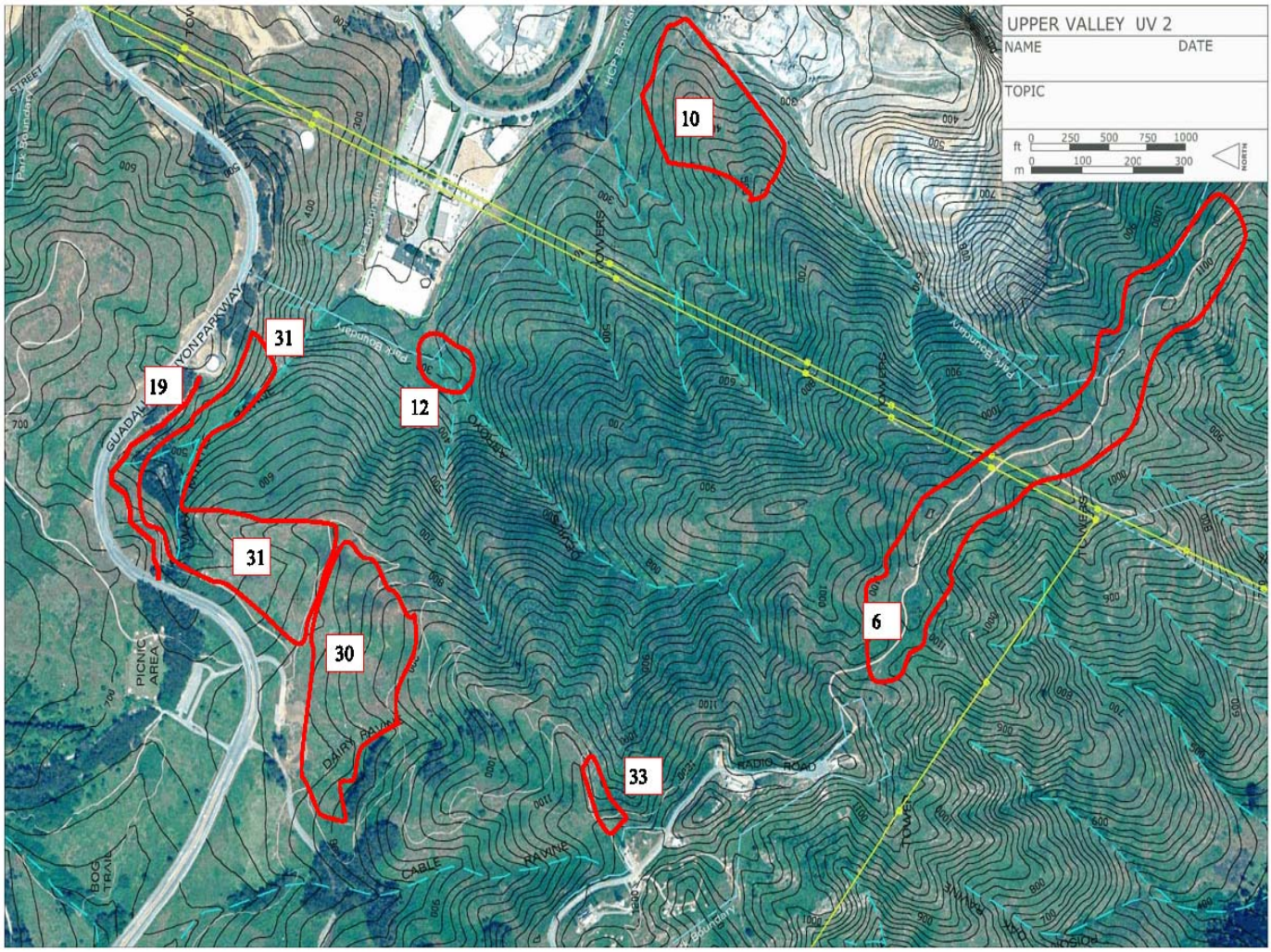


Dairy and Wax Ravines (214 Acres)
The Subunits in this MU are Old Ranch Rd (19), Ridge Trail W (6), Brisbane Water Tanks (13), Guadalupe Canyon Parkway (13), Dairy Ravine (30), Wax Myrtle Ravine (31) and Kamchatka Point (32).

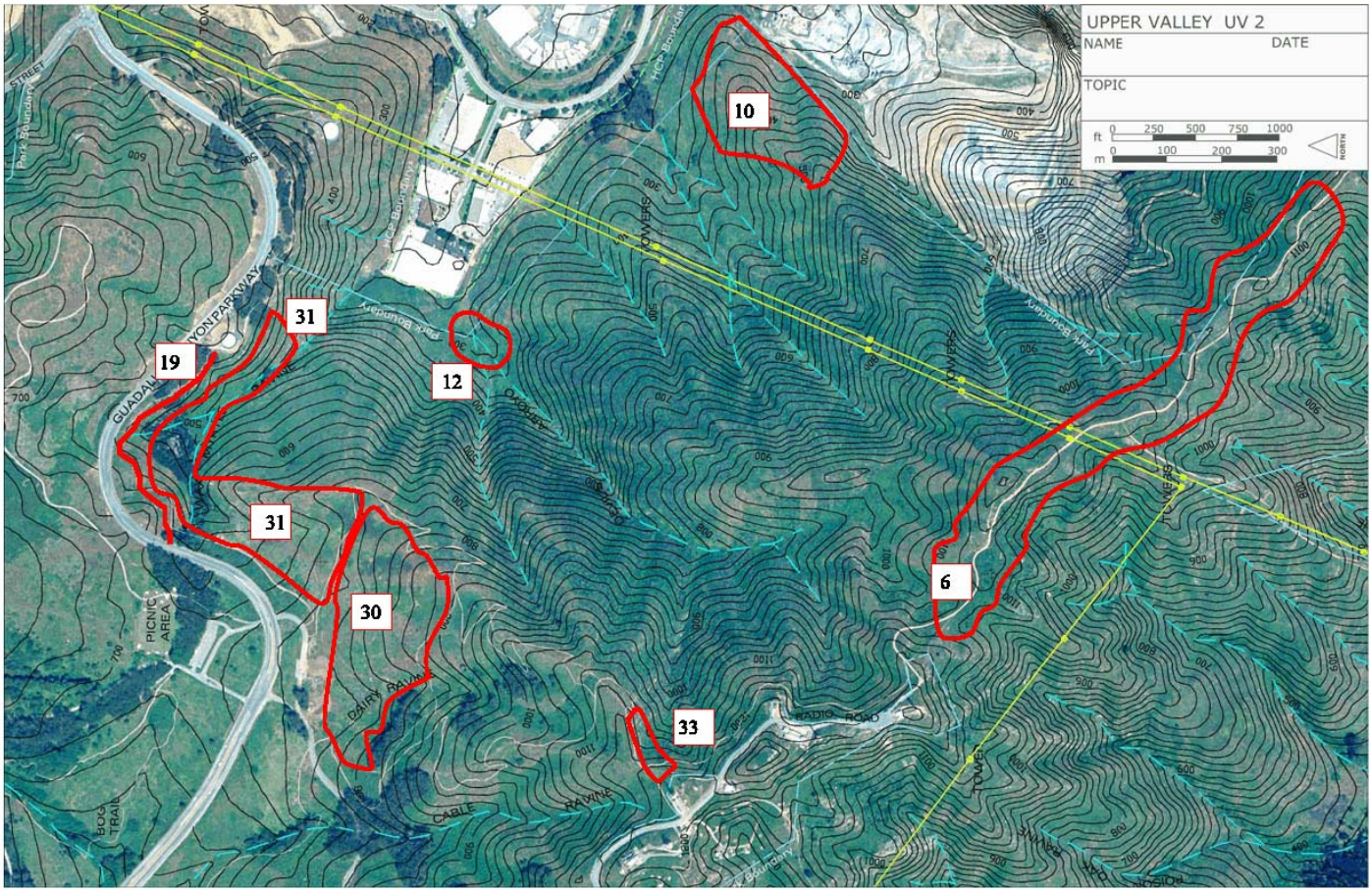
The main invasives are J. grass, Cape ivy (*Delairea odorata),* Eucalyptus, Gorse, Cotoneaster, Ox-eye daisy (*Leucanthemum vulgare*) and A. blackberry have been the primary non-native weeds.
The control of the weeds, mainly Gorse, within the ravines is to allow the site to return to some coastal scrub and grassland habitat. Thee reduction of Coyote brush islands with native grass outplanting is an ongoing project to enhance the grassland habitat in the upper areas. The Mission blue butterflies are found within Dairy Ravine.

A total of 50 acres will be treated within the management unit. Reduction of the Coyote brush (*B. pilularis*) encroaching within the 9 fern Rock sub-ridge, located along the eastern border of SU 31 was recommended at the March 2012 TAC Field meeting and included in the FY2014/2015 budget. The reduction of the brush was expanded an additional 20 meters in FY 2013/14.

The addition of Bermuda buttercup (*Oxalis pes-caprae*) to this section's weed list is located inside and adjacent to the County Park boundary on McKesson Parcel 1. The McKesson Parcel is currently being assessed for Exotics control with at 3-year initial Weed Maintenance Plan and a 2-year follow up plan and waiting for approval.



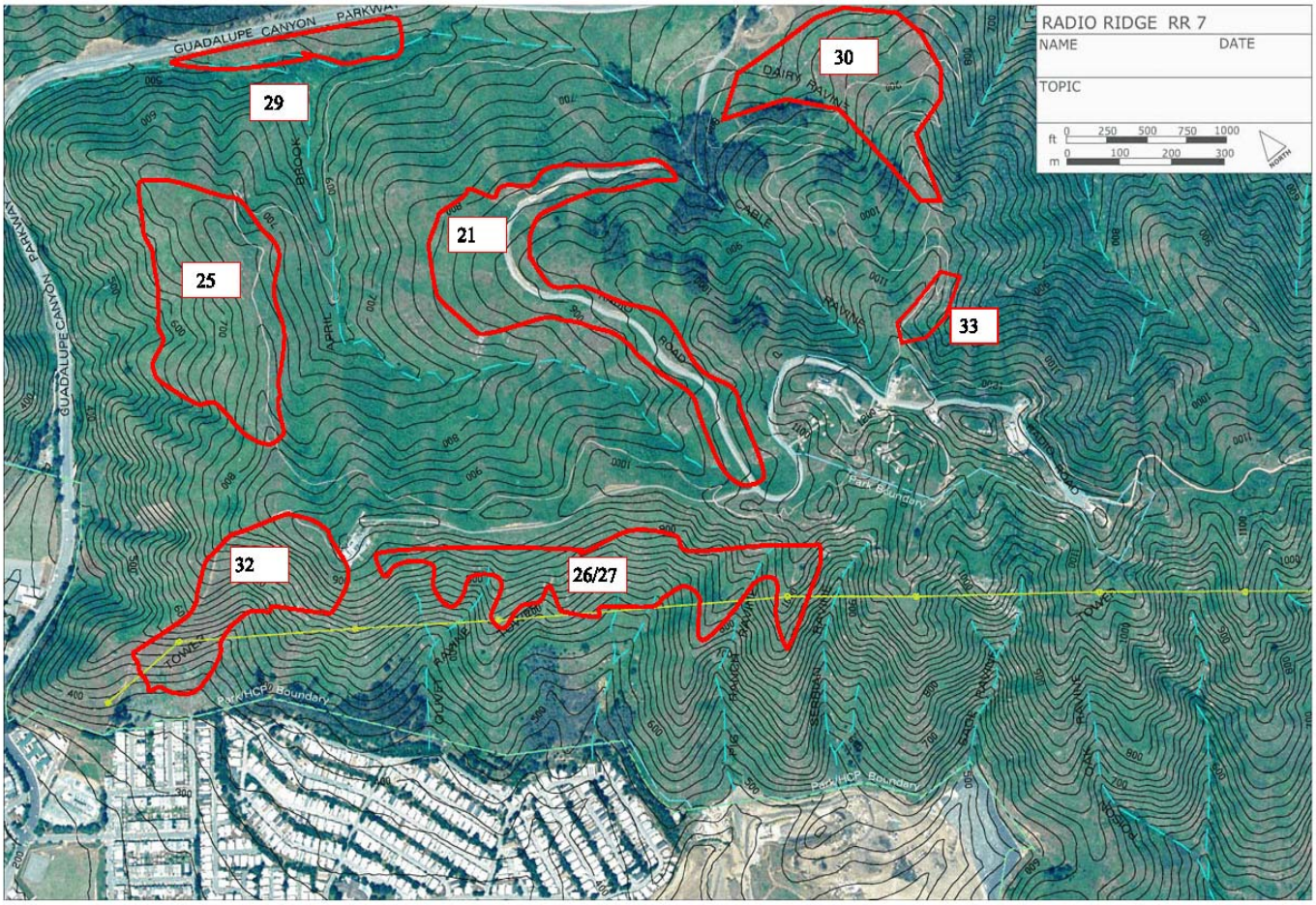
Devils Arroyo (268 Acres)
This MU has the following Subunits Ridge Line W (6), Hill W of Quarry (10) and Devils Arroyo (12). The northern grassland habitat has MB host plants, *Lupinus formosus*, surrounded by French (*Genista monspessulana*) and Portuguese broom (*Cytisus striatus*). There are very few *L. formosus*, located at the NW corner, in this unit and is vital for maintaining a MB colony. The mature stand has been controlled and the current effort is reduction on the seed bank. Herbicide, hand control and mowing are part of the removal methods applied at the site. Devil's Arroyo (SU12) funding will be transferred to the Hill W of Quarry (SU10) Coyote brush reduction and restoration Project.



The Coyote Brush has started to encroach into the grassland and MB habitat. Ninety-eight percent of the invasive perennial weeds have been controlled and brush succession has occurred. Out plantings by San Bruno Mountain Watch and the Mission Blue Nursery will include host and nectar plants will occur after the brush has been removed.

Southwest Slope (436 Acres)
The Subunits in the MU are Ridge Lines West Peak (26), Olivet, Pig Ranch and Serbian Ridge Lines (27) and Hoffman St Ridge (32). The sub-ridges in this MU have endangered CS, MB and San Bruno Elfin (SBE) butterfly habitat. The weed effort primarily surrounds the endangered butterfly habitat and non-native weeds that threaten these areas.

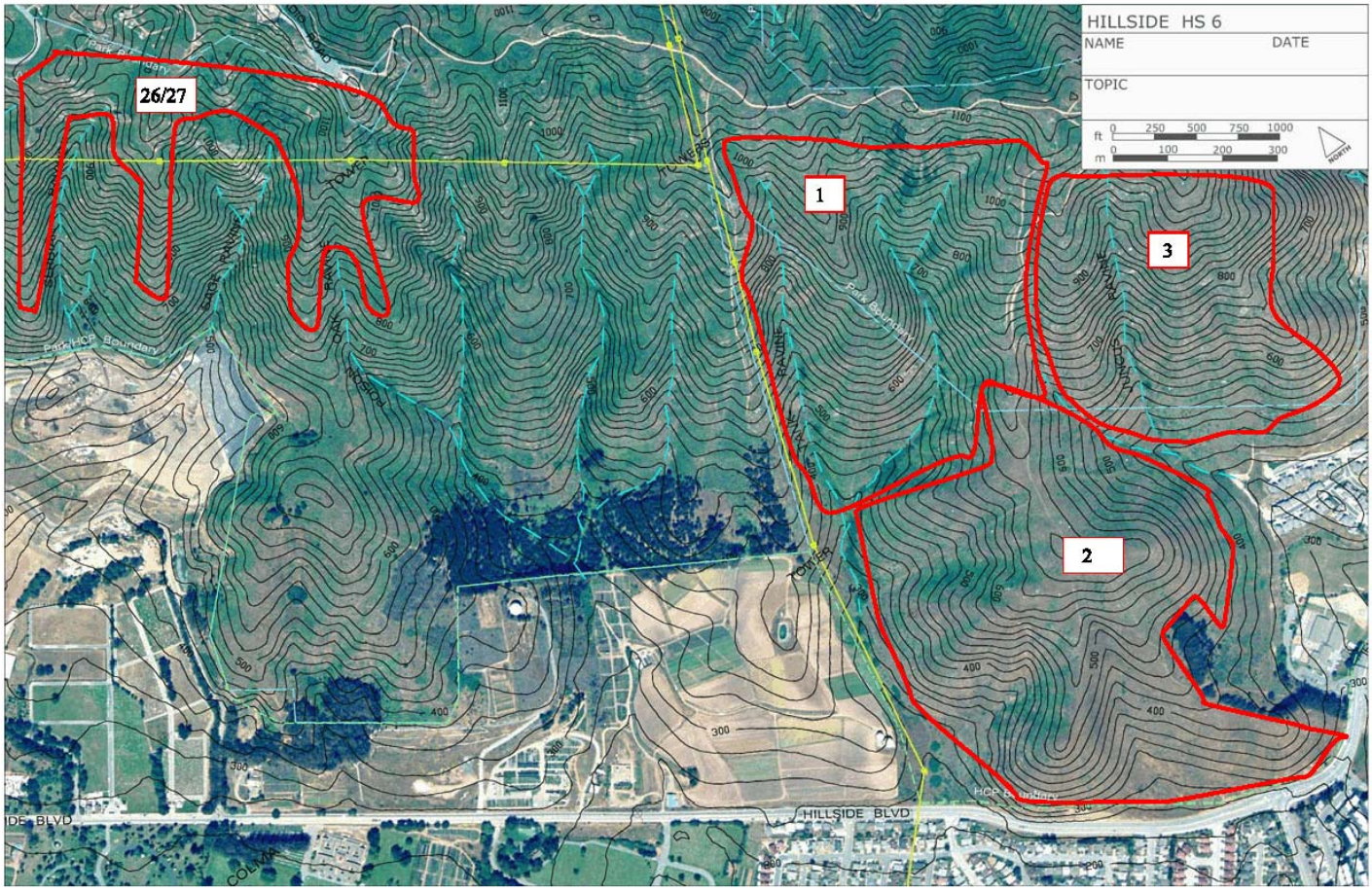
The typical weeds controlled are mustard, W. radish, fennel (*Foeniculum vulgare*), Italian thistle (*Carduus pycnocephalus*) and some F. broom. The funding was slightly increased for this section to contain the spread of the Oxalis in SU32 and Hillside/Juncus MU SU1. The largest concentration of Oxalis is adjacent to the County Park boundary within Holy Cross property, leased to Pacifica Nurseries, crosses both SWS MU and Tank/Juncus MU. Both hand and herbicide methods are used along the SBM and HCP boundary. A total of 100 acres will be treated within the management unit.



Hillside/Juncus (217 Acres)

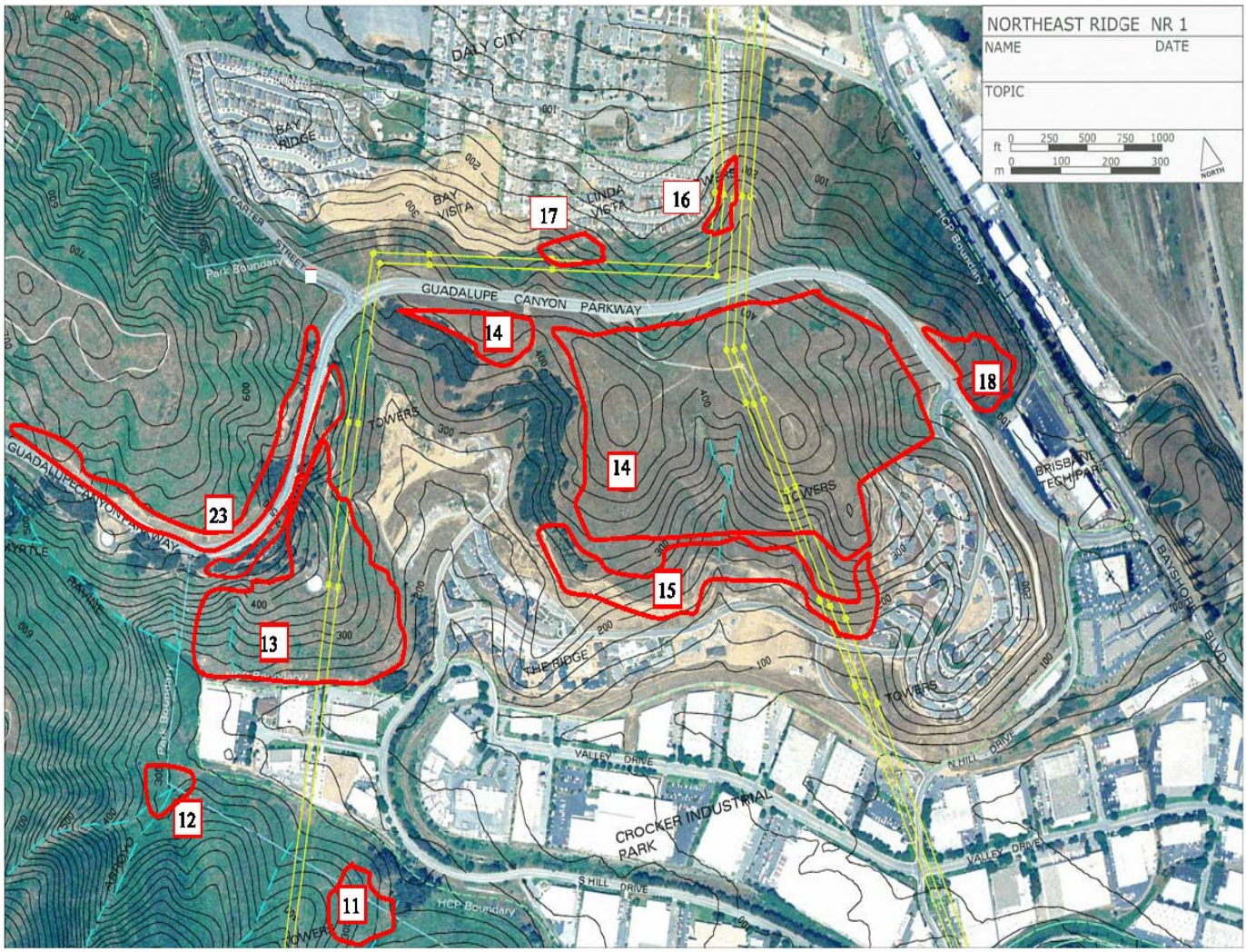
The Subunits in the MU are Tank Ravine (1), Hillside (2) and Juncus Ravine (3). The prominent weeds are Fennel, W. mustard, J. grass and Oxalis are present and the main species of control. Lower Tank and Juncus ravines were added to the parkland in 2009. A large infestation of Oxalis is within Mission blue butterfly habitat and is treated on an annual basis. There was a fire within this parcel (Site 2 in previous map) in September 2013 and burned off most of the thatch, coyote brush and non-native annual grass. It exposed an additional 2 acres of Bermuda buttercup that is now part of the management area. The fire also allowed access to controlling the Coyote brush that is encroaching into perennial grassland habitat. The FY2014/2015 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 1 meter buffer zone. A total of 100 acres will be treated within the management unit.



Carter/Martin (129 Acres)
The Carter/Martin MU is located at the NE end of San Bruno Mountain State and County Park and has both MB and CS butterfly habitat. The sub-unit areas are Linda Vista East (16) Linda Vista West (17) and Brisbane Office Park (18). Linda Vista has the MB transect T8 and CS transect 4. The weed species managed onsite are Gorse, Fennel, J. grass, F. broom and W. radish. The weed effort for these sites is on hold waiting for the butterfly counts in the Spring 2015.

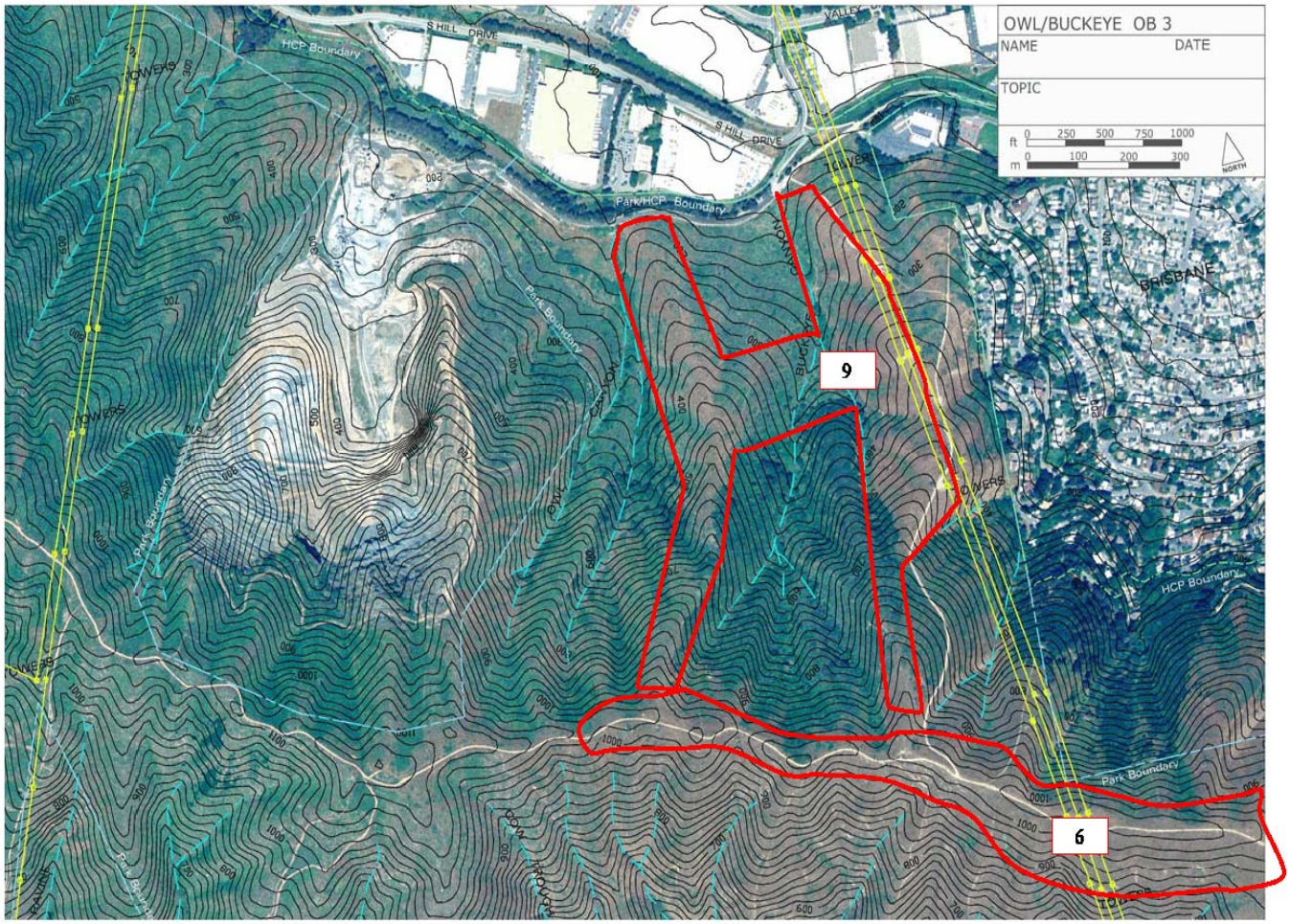
Northeast Ridge (214 Acres)
The Subunits for the Northeast Ridge MU are Parcel B NER (14) and the NER Fenceline (15). It is abundant with *Viola pedunculata* the host plant for the endangered Callippe fritillary butterfly. The funding remains the same for the NER fence line and their remainder lands that are adjacent to Callippe Hill (Toll Bros. Parcel B). The main weed species are French and Portuguese broom and Italian thistle. It is abundant with *Viola pedunculata* the host plant for the endangered Callippe fritillary butterfly. CS transect 5 and MB transect T5 are in this MU. A total of 50 acres will be treated within the management unit.



Owl and Buckeye Canyons (294 Acres)

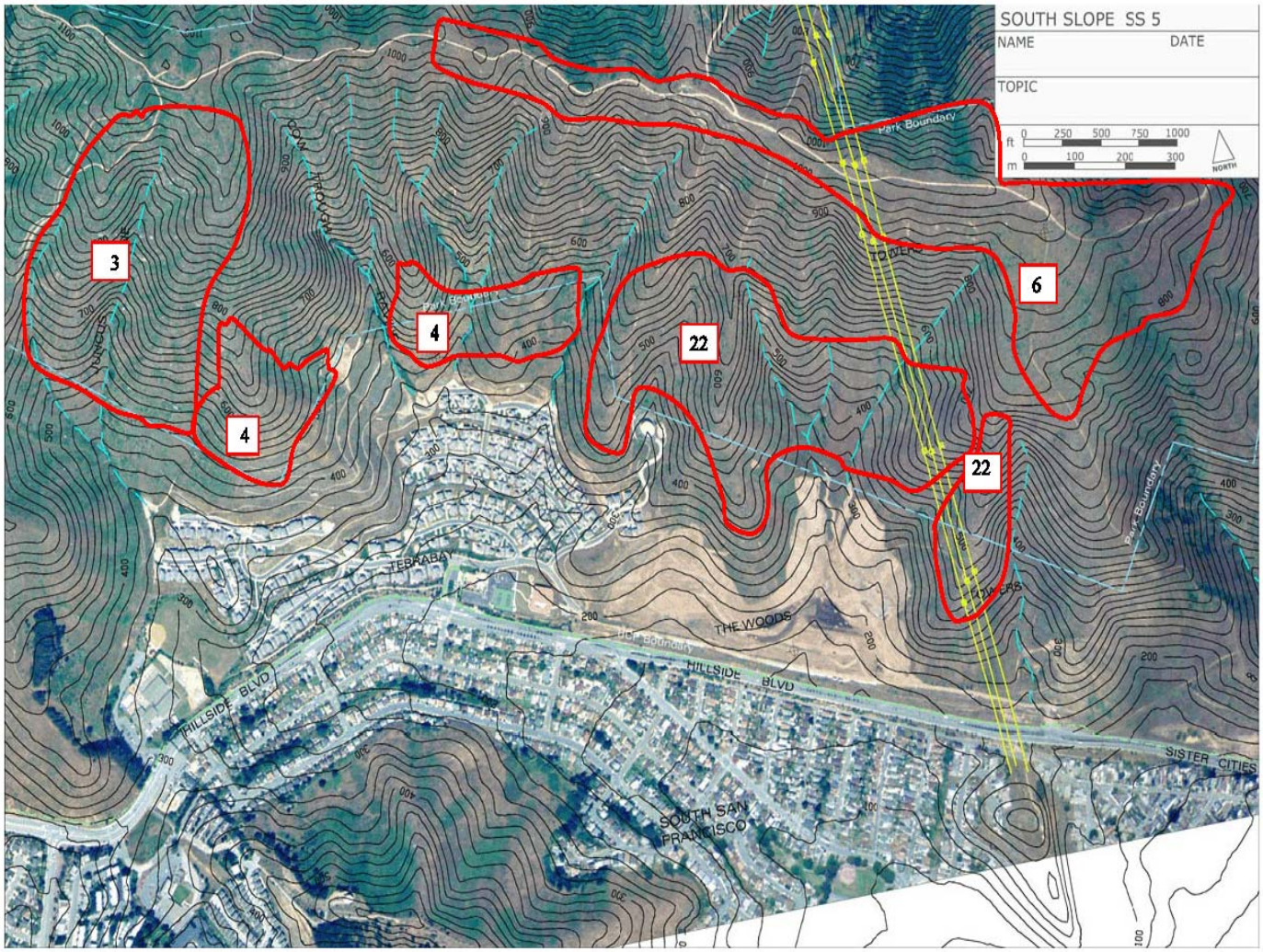
Owl and Buckeye canyon MU consists of sub-ridge SU9 the Ridge Trail E (6). The MU was originally grassland habitat and now has been overtaken by the coastal scrub, mainly coyote brush, moving in from the surrounding areas until the Brisbane burn in 2008. Twenty meters of living coyote brush was removed along the ridgelines and outward in FY13/14 to allow the native grasses, forbs and herbaceous species the opportunity to re-colonize. The brush reduction in 2014/2015 will be expanded another 10 meters on both sides of the control area.

An additional coyote brush reduction plot CB7 (Figure 4) was established at the base of the sub-ridge and San Bruno Mountain Watch in a cooperative project with West Coast Wildlands, Inc. has overplanted with native grasses and forbs. Weed control will be included within the plot as part of the annual vegetation management**.** MB transect T10 and CS transects 9 & 10 are located within this unit. A total of 50 acres were treated during the fiscal year.

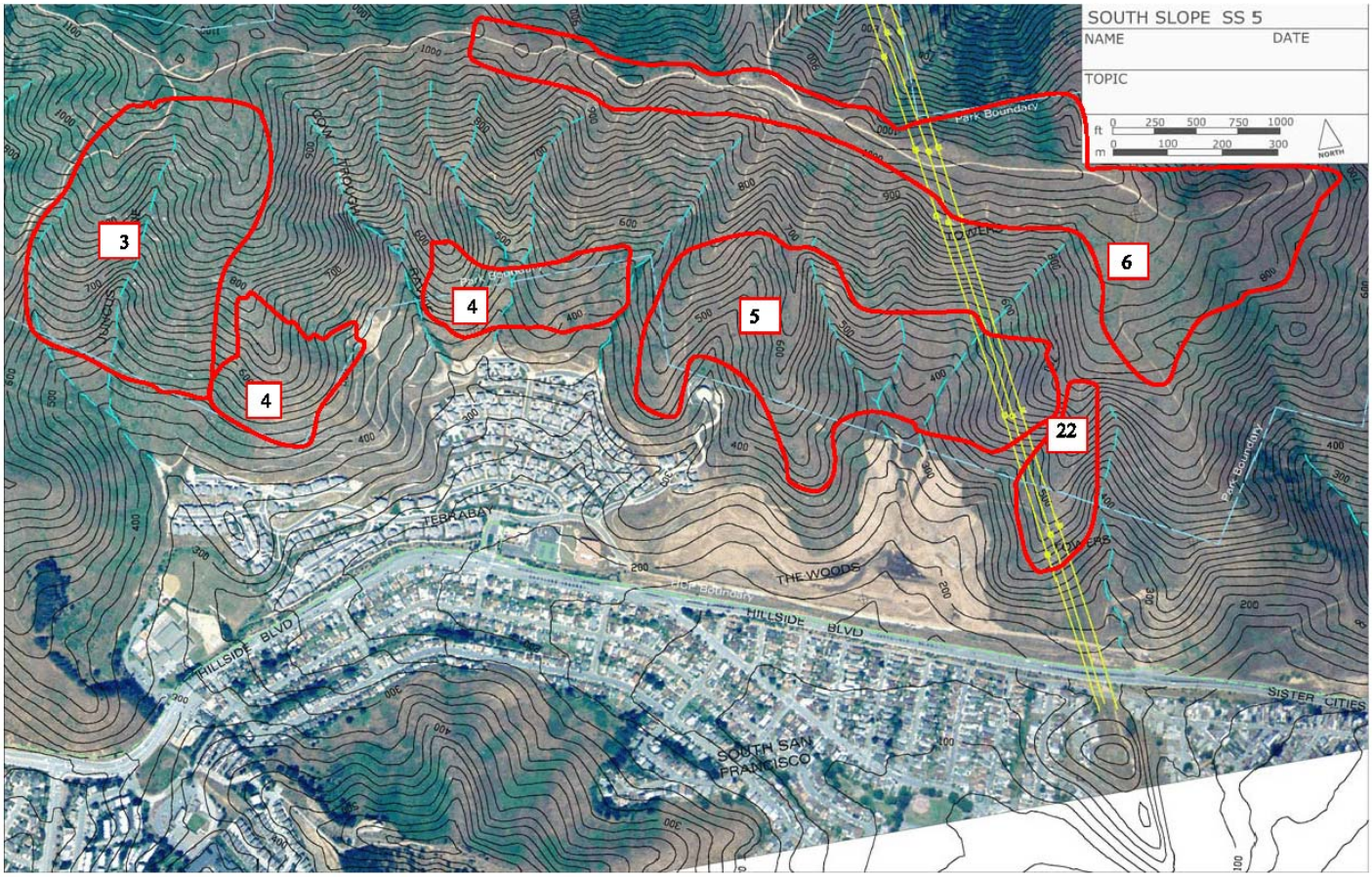


Brisbane Acres (152 Acres)

The Subuint for Brisbane Acres is Ridge Lines (6) and CS butterfly habitat is located along the sub-ridges of this MU. The main weeds to control within the area are W. radish and I. thistle. The non-native plants are treated with an herbicide in the spring when they appear. There was a 2008 fire in the area and invading shrubs moving into the grassland habitat were treated two months later when the scrub began to leaf out. The additional brush encroachment will be reduced along the ridge to encourage native grasses, forbs and herbaceous plants to volunteer within these areas. A cooperative project with San Bruno Mountain Watch and Mission Blue Nursery will outplant native host and nectar plants for endangered butterflies on the north facing slopes. A total of 30 acres will be treated within the management unit and 3000 square feet will be outplanted.



Southeast Ridge (191 Acres) & South Slope (477 Acres)
The SER MU has Subunits Preservation Parcel (8) and SER (5). South Slope (SS) MU Has Subunits Terrabay Upper (4), Ser (5) and The Woods Remainderlands (22). The sites are primary native perennial grassland habitat that are excellent Mission blue and Callippe fritillary butterfly habitat. The invasive weeds moving into these grasslands areas are Bermuda buttercup (Oxalis pes-caprae) thistles (i.e. Italian and Bristly ox-tongue) and mustards (i.e. W. radish. and M. mustard). The highly invasive species Oxalis pes-caprae or Bermuda buttercup was found in the winter of 2010. The site was treated over 3 months during the winter months, January through March, and will receive the same follow up this fiscal year. A cooperative project with San Bruno Mountain Watch and Mission Blue Nursery will outplant native host and nectar plants for endangered butterflies on the south facing slopes and 3000 square feet will be outplanted with host and nectar plants for the endangered butterfly habitat. A total of 110 acres of weed management will be treated within the management unit.


SOUTH SLOPE SS 5
NAME
DATE
TOPIC
3
4
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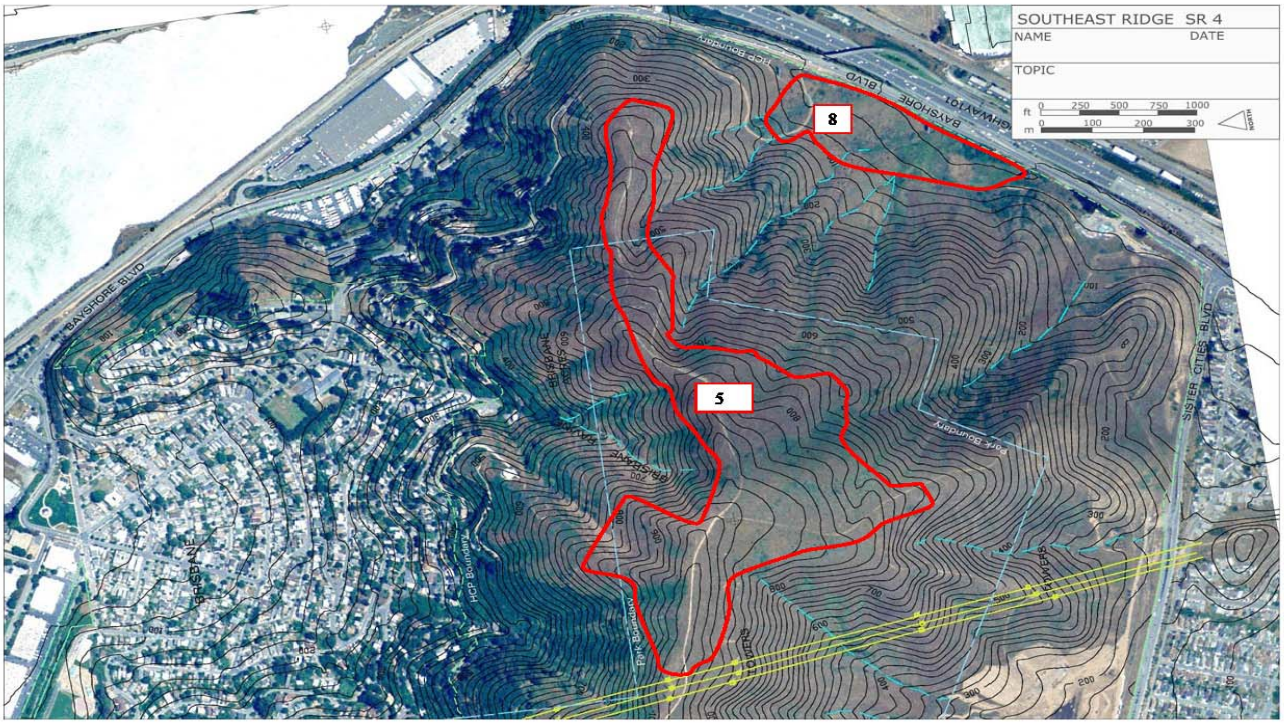
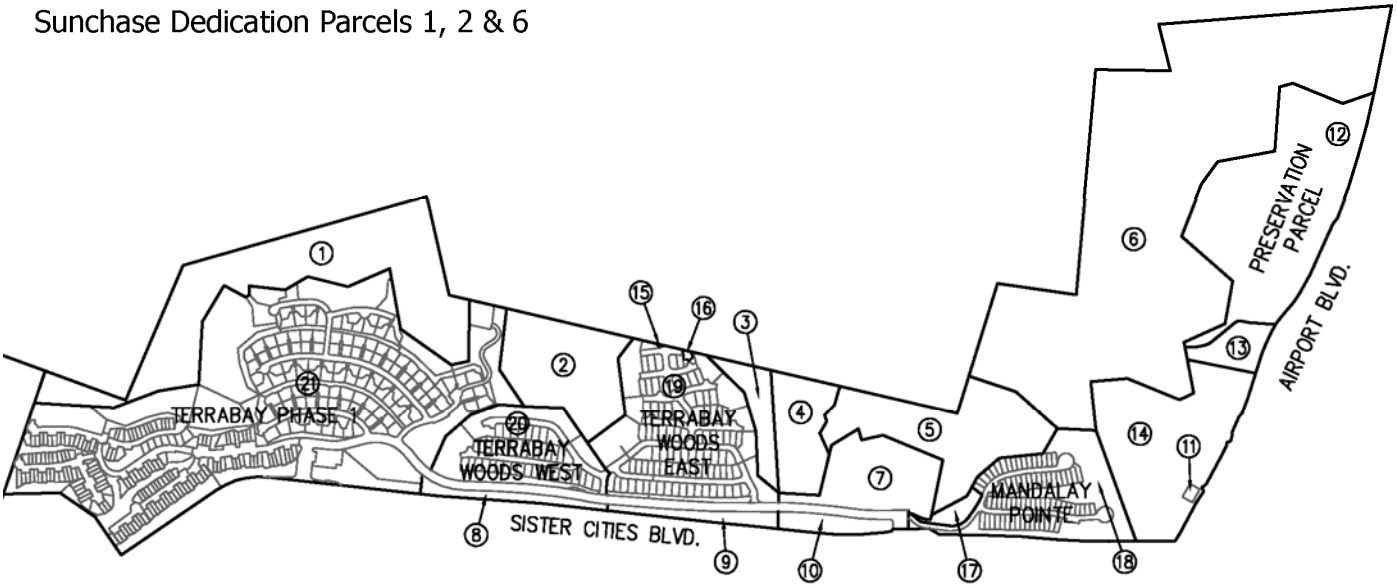
22
Park Boundary
HILLSIDE BLVD
THE WOODS
SISTER CITIES
SOUTH SAN FRANCISCO


SOUTHEAST RIDGE SR 4
NAME
DATE
TOPIC
8
5
BAYSHORE BLVD
SISTER CITIES BLVD
HCP Boundary
Park Boundary

This Management Unit also Includes Parcels 1, 2 and 6 of the Sunchase dedication lands to the San Mateo County Parks Department and is part of the Vegetation Management Plan scope-of-work. The weed management funding of the sites are spread across Map ID numbers 4, 5, 6, 8 and 22 associated with line items 4, 5, 6, 8 and 22 of the Exhibit B Budget Table FY 2014/514. The total effort to fund these areas is $19,952.50.

Sunchase Dedication Parcels 1, 2 & 6



B.2. Oxalis pes-caprae Control

Oxalis pes-caprae is a low growing rhizomatous plant that has the potential to decimate perennial grasslands where most of the endangered butterfly habitat host and nectar plants are located. Common names are Bermuda buttercup or sour grass. The plant does not spread by seeds and have small bulblets that over winter. These bulblets are consumed by rodents or are washed down slope during the rainy season. The plants can occur in new areas of open space without known vectors or source of spread. The plants biggest threat is the suppression of native grasses, forbs and herbs when an infestation moves into an area. This has a direct effect on the endangered butterfly's host and nectar plants on San Bruno Mountain.

The greatest concentration of Oxalis, on San Bruno Mountain, is found in the Hillside management areas (which includes the Tank Ravine management area). Oxalis is also found along the Ridge Trail growing under scrub vegetation, South Slope Ravine and along a ridge trail from the Ranger's Station to the terminus of Hoffman Street (Daly City). Other, smaller infestations (Dairy Ravine, Radio Road, and below Brisbane Water Tank) are already treated as part of the general budget and work plan. Treatment is scheduled for all previously treated sites, as well as new sites observed down slope of the Ridge Trail in South Slope Ravine and the Remainder lands.

The Oxalis control project treated a total of 15 acres in the winter of 2014 and saw an increase in the Tank/Juncus bowl area that had burned in September 2013. The increase

in area treated may be due to plants not observed under the non-native annual grasses that emerge in late winter to early spring. The drought had an effect on when the Oxalis normally emerge during December but, finally emerged in February. This caused a super bloom over one month instead of four months. The effort to manage the Tank/Juncus Bowl has increased this upcoming year (Figure 2).

C. Coyote Brush Reduction Restoration and Oxalis Control Projects

The Oxalis Control and Restoration projects was a cooperative effort between San Bruno Mountain Watch (SBMW) and West Coast Wildlands, Inc. (WCW, Inc.). WCW, Inc., treated 2 infestations of Oxalis and SBMW with WCW, Inc., planted native grasses after treatment. The sites are still monitored for weeds and most of the funding for the upcoming year has shifted to expand the brush removal along the Ridge Trail East, designated scrub removal areas in Owl and Buckeye Canyon ridges, Old Ranch Road and monitor the Oxalis control within the planted native grass plot RPB (Figure 3).

The Coyote brush/scrub removal project (Figure 4) focused on the areas that previously burned in 2008 at Buckeye canyon and expanded beyond the burn site along the ridge (CB3-5) within Callippe butterfly habitat. The Owl/Buckeye Ridge (CB1-2) and the Ridge Trail (CB6) brush reduction points will be expanded an additional 10 meters on either side of the current removal boundaries. CB7 point is the new brush reduction plot added in 2014.

There are many areas on the mountain partially covered in scrub with relatively intact native grassland habitat that still supports one of the three endangered butterfly species. We have observed from following past Coyote brush removal in areas with deeper soils, the sites either return to native scrub species or to aggressive invasives such as mustard due to the richer soils. The expansion of coastal scrub has been estimated to be eliminating 5 acres of grassland habitat on San Bruno Mountain In the absence of fire (Kobernus, 2007) per year. Therefore we propose to expand the re-vegetation of the areas where scrub is being removed adjacent to butterfly habitat in thinner soil areas closer to the ridge tops.

Revegetation will involve the planting a mix of native grasses and perennial forbs (Table 1) including butterfly food plants (two species of *lupines* for the Mission blue butterfly) as well as the nectar plants. It will also include the seeding of native annuals (Table 2) to compete with potential reestablishment of non-native grasses and forbs.

Monitoring the Scrub Removal/Grassland Restoration Project sites is part of the project to assess the effectiveness of this revegeation. 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. Two 8 hour days will be dedicated to monitor all of the plots for these two projects and 8 hours for the report. The results will be reviewed and report will be presented.

The project monitoring and assessment funding is $720. Site visits will occur in May/June of 2015. Funding for monitoring, plants and labor to revegetate 12,000 sq. ft. of scrub removal area is $9200 (Figures 3 & 4).

Table 1: List of native perennials for grassland restoration and the relative numbers for 2,000 sq. ft.

Winter 2014/2015			
Grassland Perennials:		%	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	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 2: Native Annuals gathered on San Bruno Mountain and farmed at the Mission Blue Nursery. This price includes the cost of gathering, weeding the seed plots, seed harvest, processing and dispersal.

Native Grassland Annusla		
Scientific Names	Common Names:	
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
		$350

Table 3: Revegetation numbers and costs (12,000 sq. ft.)

total plants	**3,000 plants**	cost per	plant cost	planting labor	labor costs	total costs
native grasses	1,500	$ 1 per	$1,500	$ 480/500 plants	$1,440	$2,940
native forbs	1,500	$ 2.50 per	$3,750	$ 480/500 plants	$1,440	$5,190
		total	$5,250		$2,160	$8130
				$350 for annuals		**$8,480**

D. Additional Tasks – PG&E Line 132 Valve Lot Butterfly Habitat Funding

PG&E is currently in the process of replacing and relocating sections of Line-132 (L-132), a 30-inch diameter high pressure gas transmission line. In 2012, PG&E replaced 1.7 miles of L-132 in South San Francisco and is planning to replace an additional 0.7 miles in 2014 (Figure 5). To support these replacements PG&E must relocate its existing valve station and vent presently located south of Hillside Boulevard (near the intersection of Hillside Blvd and Holly Ave) to the north side of Hillside Boulevard on the slope of San Bruno Mountain within unincorporated San Mateo County neighborhood. PG&E will pay $6,930 to the San Bruno Mountain Habitat Conservation Plan for mission blue and Callippe silverspot butterfly restoration activities. The $6,930 shall only be used for "on the ground" restoration for the benefit of the mission blue butterfly and Callippe silverspot butterfly at San Bruno Mountain

The funding will be divided into four brush reduction sites and restoration via outplanting of larval host and nectar plants as a cooperative project between WCW, San Bruno Mountain Watch and Mission Blue Nursery.

The four sites will include South Slope (SU4), Saddle (SU20) Brisbane Acres (SU6) and Hill West of Quarry (SU10). The coyote brush removal will be the isolated individuals and clusters within the perennial grassland. Weed management will by provided by WCW.

Grassland/Seasonal Wetland Restoration Winter 2014/2015:

All grassland revegetation will involve the planting a mix of native grasses and perennial forbs (table #4) including butterfly food plants (two species of *lupines* for the Mission blue butterfly) as well as the nectar plants. Cost includes growing locally collected native plants and the labor for outplanting the plants. The three grassland sites to be revegetated will be "hill west of the quarry" with 540 native plants, "Brisbane Acres" with 720 native plants and "South Slope" with 720 plants. Saddle seasonal wetlands will be revegetated with 300 native seasonal wetland woody overstory species (Table #3) that will ideally outcompete herbaceous weeds.

Table #4: Seasonal wetland woody overstory species

Scientific name	**Common name:**	**# of plants**
Lonicera involucrata	Twinberry	50
Morella californica	California Wax Myrtle	100
Sambucus nigra	Blue Elderberry	50
Sambucus racemosa	Coast Red Elderberry	100
Salix lasiolepis	Arroyo Willow stakes	300

Table #5: List of native perennials for grassland restoration

winter 2014/2015			
Grassland Perennials:			
Scientific name	**Common name:**	**%**	**# of plants**
Acaena pinnatifida	Acaena	3	30
Achillia millefolium	common yarrow	7	70
Agoseris grandiflora	large flowered agoseris	5	50
Cirsium quercetorum	Brownie Thistle	3	30
Eriogonum latifolium	coast buckwheat	7	70
Erysimum franciscanum	Franciscan wallflower	7	70
Grindelia hirsutula maritima	coast gumplant	7	70
Heterotheca sessiflora bolanderi	golden aster	7	70
Horkelia californica	Horkelia	5	50
Lomatium dasycarpum	lace parsnip	7	70
Lupinus albafrons	silver lupine	7	70
Lupinus variicolor	varied lupine	7	70
Monardella villosa villosa	coyote mint	7	70
Phacelia californica	California phacelia	7	70
Sidalcea malviflora	Checker Bloom	5	50
Sisyrinchium bellum	blue-eyed grass	3	30
Solidago canadensis elongata	meadow goldenrod	3	30

Wyethia angustifolia	mule ears	3	30
	Total:	**100**	**1000**
Native Grasses:			
Scientific name	**Common name:**	**%**	**# of plants**
Bromus carinatus	California brome	20	200
Danthonia californica	California oat grass	10	100
Elymus glaucus	Blue wildrye	20	200
Festuca rubra	red fescue	15	150
Koeleria macrantha	June grass	10	100
Melica californica	California melic	5	50
Nassella pulchra	purple needlegrass	20	200
	Total:	**100**	**1000**

Summary of Scope-of-Work Changes for FY 2014/2015

1. So. West Slope: The Oxalis control and Coyote brush reduction funding has increased after the 2013 fire. Oxalis Control Restoration Project at Hoffman Ridge (RPA) and Ridge Trail site (RPB).efforts will be reduced but, maintaining the control of invasive species. Restoration efforts will be increased using the PG&E funding.

2. Owl and Buckeye Canyons: The Brush Reduction and Restoration Project will be expanded an additional 10 meters from the ridge. Table 1 lists the native plants outplanted for the upcoming fiscal year.

3. Southeast Ridge: Additional funds have been added to remove Fennel and Coyote brush encroaching on perennial grassland habitat that has both Mission blue and Callippe silverspot habitat. Restoration efforts will be increased using the PG&E funding.

4. Hill West of Quarry: The coyote brush removal will be the isolated individuals and clusters within the perennial grassland and outplanting will be funded using the PG&E contribution

5. The effort has been reduced or eliminated in Devil's Arroyo (SU12) due to lack of habitat along with Dairy Ravine (SU30) and Linda Vista (SU 16 & 17). These funds have been redistributed to MB and CS Habitat that are improving and their added enhancement per TAC recommendations.

FIGURE 1: San Bruno Mountain Management Units

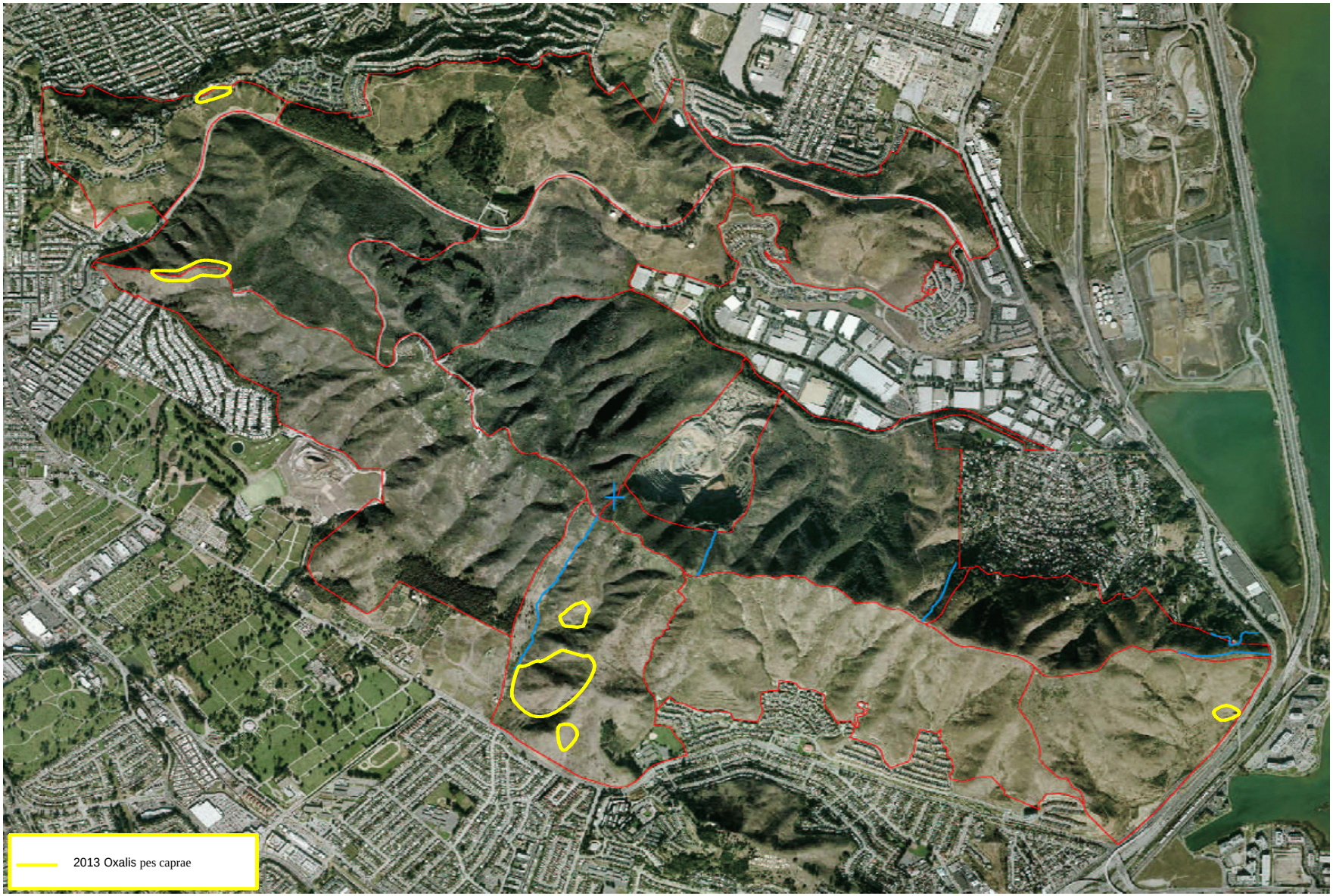
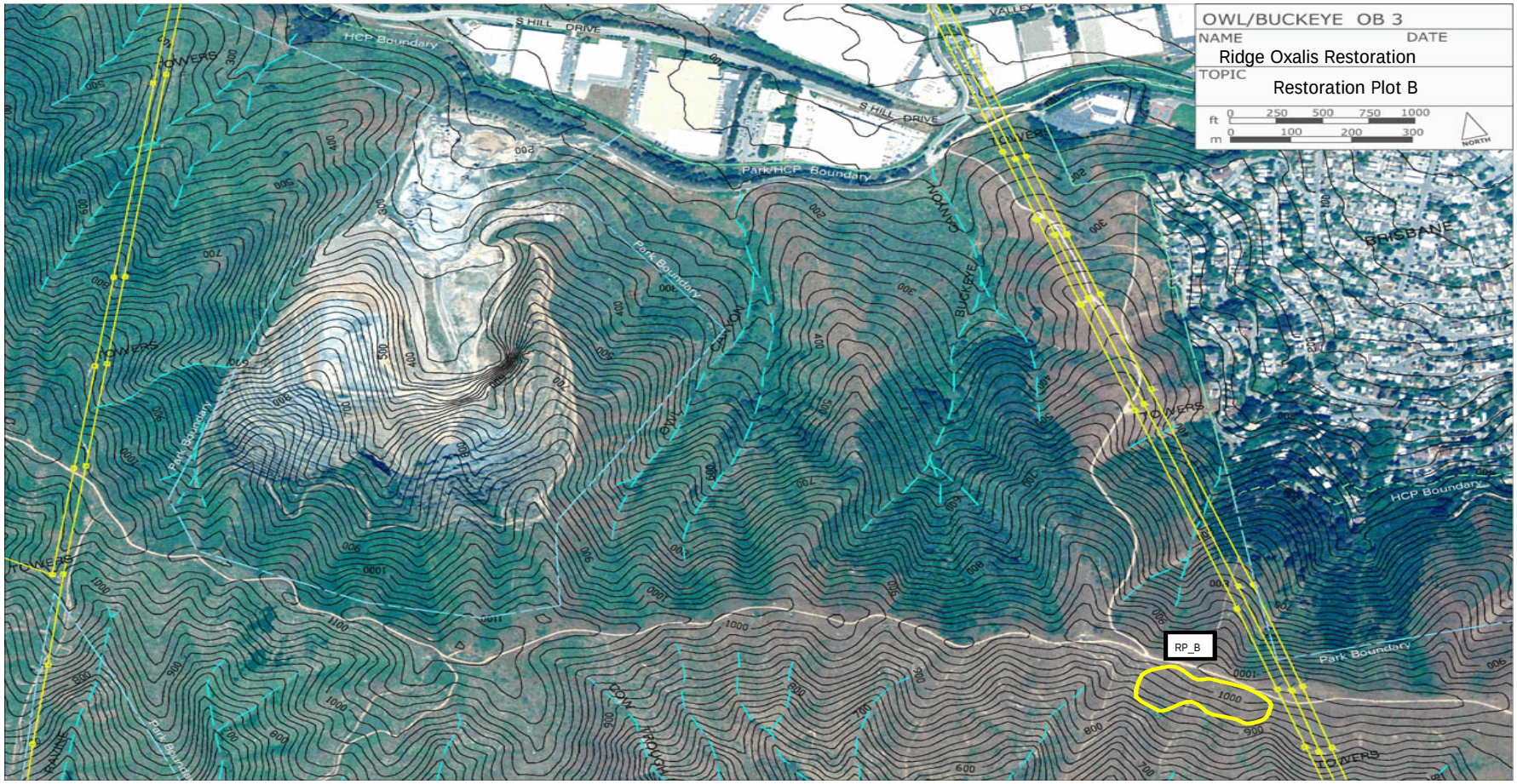


FIGURE 2: 2014 Oxalis pes-caprae Treatment Sites

FIGURE 3: San Bruno Mountain Watch Oxalis Restoration Plots



Ridge Trail East Oxalis Restoration Plot B (RPB)

FIGURE 4: Owl/Buckeye Canyon Coyote Brush Removal and Re-vegetation Plot (CB7)

PG&E Line 132 Valve Lot and Blow Out construction Site

FIGURE 5: PG&E Line 132 Management areas

Exhibit B: WCW COST SUMMARY FOR FISCAL YEAR 2013/2014
San Bruno Mountain Habitat Conservation Plan

A. PROGRAM MANAGEMENT

WCW:		
1	Administration and Project Supervision	3,500
2	Data Analysis and Annual Report Preparation	3,500
3	Coordinate and Manage Invasive Control Work	2,000
	Subtotal	**$9,000**

B. INVASIVE PEST PLANT CONTRACTOR

WCW		
1	West Coast Wildlands Invasive Plant Control	81,455
	Subtotal	**$81,455**

C. INVASIVE PEST PLANT CONTRACTOR

WCW & SBMW Cooperative Projects		
1	Coyote Brush Reduction and Restoration Projects	9,200
	Subtotal	**$9,200**

GRAND TOTAL $99,655

D. ADDITIONAL TASK (See Section D.1)

D.1.	PB&E Line 132 Valve Lot	
	Weeding and out planting	6.930
	Total	**$6930**

Exhibit B: WCW Billing Rates -- Fiscal Year 2014/2015

Unless specified otherwise by prior agreement, invoices are submitted monthly showing time and charges for professional services by staff category and a separate figure for expenses. Invoices are payable upon receipt. Invoices unpaid past 45 days are subject to interest at 1 1/2% per month.

West Coast Wildlands (includes all overhead)

STAFF BILLING RATES

CATEGORY	$/HR
Principal/Consulting	100.00
Staff Scientist	75.00
Project Manager	75.00
GIS	75.00
GIS/Staff	58.00
Field Biologist	55.00
Field Supervisor	50.00
Spray Supervisor	50.00
Technician - Laborer	50.00
Spray Crew	50.00
Field Crew	50.00
Staff Assistant/Data Entry	35.00

EXPENSES

CATEGORY	BASIS
Commercial travel	cost+5%
Automobile travel	Per IRS reimbursement rate
Photocopy (A and B sizes)	$0.10/image
Commercial report reproduction	cost+10%
Subcontractors	cost+10%
Other (lab, aerial photos, etc.)	cost+10%

West Coast Wildlands, Inc.
Budget Table, FY2014/2015

	Site	Hours	Hand Work and Restore		Outplanting	Hours	Spray Rig		Hours	B.P. Spray		Gals	Garlon	Gals	Garlon 25%	Gals	Aqua		Cost/Site
Cost Basis			***$50.00***		***PG&E Funded***		***$ 55***			***$50.00***			***$ 3.75***		***$ 90.00***		***$ 2.75***		
1	Tank/Upper Slope	10	500.00	*		35	$ 1,925	*	50	2,500.00	*	200	$ 750.00		$ 0.00		$ 0.00	*	$ 5,675.00
2	Hillside/Upper Slope	60	3,000.00	*		35	$ 1,925	*	50	2,500.00	*	200	$ 750.00	2	$ 180.00		$ 0.00	*	$ 8,355.00
3	Juncus/Upper Slope		0.00	*		25	$ 1,375	*	50	2,500.00	*	150	$ 562.50		$ 0.00		$ 0.00	*	$ 4,437.50
4	Terrabay	20	1,000.00	*	*SBMW*		$ 0	*	35	1,750.00	*	75	$ 281.25		$ 0.00		$ 0.00	*	$ 3,031.25
5	SER/Summit	70	3,500.00	*		10	$ 550	*	50	2,500.00	*	100	$ 375.00	1	$ 90.00		$ 0.00	*	$ 7,015.00
6	Ridge Trail E & W	70	3,500.00	*	*SBMW*		$ 0	*	45	2,250.00	*	125	$ 468.75		$ 0.00		$ 0.00	*	$ 6,218.75
7	Ice House Hill Preservation																		$ 0.00
8	Parcel	35	1,750.00				$ 0		30	1,500.00		75	$ 281.25		$ 0.00	10	$ 27.50		$ 3,558.75
9	Buckeye/Owl	50	2,500.00	*			$ 0	*	40	2,000.00	*	100	$ 375.00	1	$ 90.00	10	$ 27.50	*	$ 4,992.50
10	Hill W. Quarry	40	2,000.00	*	*SBMW*		$ 0	*	20	1,000.00	*	100	$ 375.00	1	$ 90.00		$ 0.00	*	$ 3,465.00
11	Red Tail Cyn		0.00	*							*							*	$ 0.00
12	Devil's Arroyo		0.00				$ 0			0.00	*		$ 0.00		$ 0.00			*	$ 0.00
13	Bris. Water Tank	40	2,000.00	*			$ 0	*	40	2,000.00	*	100	$ 375.00	1	$ 90.00		$ 0.00	*	$ 4,465.00
14	Callippe Hill		0.00	*				*			*							*	$ 0.00
15	Fence Line NER		0.00	*				*			*							*	$ 0.00
16	Linda Vista E. end		0.00	*			$ 0	*		0.00	*		$ 0.00		$ 0.00		$ 0.00	*	$ 0.00
17	Linda Vista\SBM		0.00	*			$ 0	*		0.00	*		$ 0.00		$ 0.00				$ 0.00
18	Bris Off Park		0.00	*			$ 0	*		0.00	*		$ 0.00		$ 0.00		$ 0.00	*	$ 0.00
19	Old Ranch Rd		0.00	*			$ 0	*		0.00	*		$ 0.00		$ 0.00		$ 0.00	*	$ 0.00
20	Saddle Trail	40	2,000.00	*	*SBMW*		$ 0	*	75	3,750.00	*	50	$ 187.50		$ 0.00		$ 0.00	*	$ 5,937.50
21	Radio Rd		0.00	*			$ 0	*		0.00	*		$ 0.00		$ 0.00		$ 0.00	*	$ 0.00
22	Remainderlands	40	2,000.00	*				*	30	1,500.00	*	50	$ 187.50		$ 0.00		$ 0.00	*	$ 3,687.50
23	Guad Cyn Pkwy	20	1,000.00	*			$ 0	*	40	2,000.00	*	50	$ 187.50	1	$ 90.00		$ 0.00	*	$ 3,277.50
24	Pt. Pacific		0.00	*			$ 0	*		0.00	*		$ 0.00		$ 0.00		$ 0.00	*	$ 0.00
25	Bitter Cherry		0.00	*			$ 0	*	15	750.00	*	15	$ 56.25		$ 0.00		$ 0.00	*	$ 806.25
26	Ridge lines/WP		0.00	*			$ 0	*	35	1,750.00	*	40	$ 150.00		$ 0.00		$ 0.00	*	$ 1,900.00
27	Ridge lines/Hoff		0.00	*			$ 0	*	30	1,500.00	*	20	$ 75.00		$ 0.00		$ 0.00	*	$ 1,575.00
28	Colma Creek	30	1,500.00	*			$ 0	*	40	2,000.00	*	50	$ 187.50		$ 0.00	10	$ 27.50	*	$ 3,715.00
29	April Brook		0.00						10	500.00						10	$ 27.50		$ 527.50
30	Dairy Ravine		0.00	*			$ 0	*		0.00	*		$ 0.00		$ 0.00		$ 0.00	*	$ 0.00
31	Wax Myrtle-Upper	50	2,500.00	*			$ 0	*	40	2,000.00	*	125	$ 468.75	1	$ 90.00	25	$ 68.75	*	$ 5,127.50
32	Hoffman St.		0.00	*			$ 0	*	25	1,250.00	*	25	$ 93.75		$ 0.00		$ 0.00	*	$ 1,343.75
33	Kamchatka								20	1,000.00		25	$ 93.75		$ 0.00		$ 0.00		$ 1,093.75
34	Oxalis Restoration																		
35	Coyote Brush Restor																		$9,200.00

TAC Meetings	25															$ 1,250.00
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Column	600	$28,750.00		105	$ 5,775.00		770	38,500.00		1675	$ 6,281.25	8	$ 720.00	65	$ 178.75	$ 90,655.00
																$ 90,655.00

Appendix B

San Bruno Mountain Scope of Work

Areas identified by the TAC/ HM for treatment within each Management Unit ~ 120 acres of scrub removal. See the map for each Management Unit:

1. **Scrub prescription:**
    a. Remove **all** 1-2 year old scrub in the interior of the assigned polygon - treat and eradicate seedlings and first year plants within core treatment areas and secure the perimeter
        A. Treatment Options:
            1. Hand control and/or
            2. Cut and paint with an EPA-approved herbicide to prevent sprouting
    b. Control **up to 50%** of the polygon interior for single 2-5 year old scrub in the core of the polygon where adjacent to viola and/or lupine points or polygons, see the map.
        A. Treatment Options:
            1. Hand control and/or
            2. Cut and paint with an EPA-approved herbicide to prevent sprouting
    c. Control **up to 25%** of the polygon interior and perimeter for 2-5 year old scrub clusters (≤3 bushes with ≤ 1" DBH) adjacent to the viola and/or lupine points and polygons within the interior or to secure the perimeter.
        A. Treatment Options:
            1. Hand control and/or
            2. Cut and paint with an EPA-approved herbicide to prevent sprouting
    d. Photo-monitor **before** and **after** at the photo points identified in the map.
    e. Follow-up monitoring to determine if a secondary invasion occurs
        A. Eradicate secondary invasion

Scrub includes all woody species including but not limited to: coyote brush, bitter cherry, Indian plum, buckeye, coffeeberry, any and all broom, eucalyptus, and any other woody species within the treatment polygon

2. **Invasive Species prescription:**
    a. Fennel (*Foeniculum vulgare*) – throughout the site
        A. Treatment Options:
            1. Hand control and/or
            2. Cut and paint with an EPA-approved herbicide to prevent sprouting
    b. Oxalis (*Oxalis pes caprae*) - adjacent to the viola and/or lupine points and polygons within the interior or to secure the perimeter.
        A. Treatment Options:
            1. Treat with an EPA-approved herbicide to prevent spread
    c. Mustard and Radish (*Brassica* spp. and *Raphanus raphanistrum*) - adjacent to the viola and/or lupine points and polygons within the interior or to secure the perimeter.
        A. Treatment Options:
            1. Hand control and/or
            2. Apply an EPA-approved herbicide
    d. Italian thistle (*Carduus pycnocephalus*) - adjacent to the viola and/or lupine points and polygons within the interior or to secure the perimeter.
        A. Treatment Options:
            1. Hand control and/or
            2. Apply an EPA-approved herbicide
3. **Restoration Activities:**
    a. Restoration activities in the form of planting native host and nectar plants for the mission blue butterfly (*Icaricia icaricioides missionensis*) and Callippe silverspot (*Speyeria callippe callippe*) will be considered for the following management units:
        A. Owl & Buckeye Canyon:
            1. OB-01
            2. OB-03
        B. Southeast Ridge:
            1. SR-02
        C. Dairy & Wax Myrtle Ravines
            1. DW-01
        D. Devil's Arroyo:
            1. DA-01
        E. Hillside Juncus:
            1. HJ-01

b. See the attached 2015 Restoration Plan Required Components document concerning developing an appropriate plan for these areas and what is expected.

Contractor Requirements:

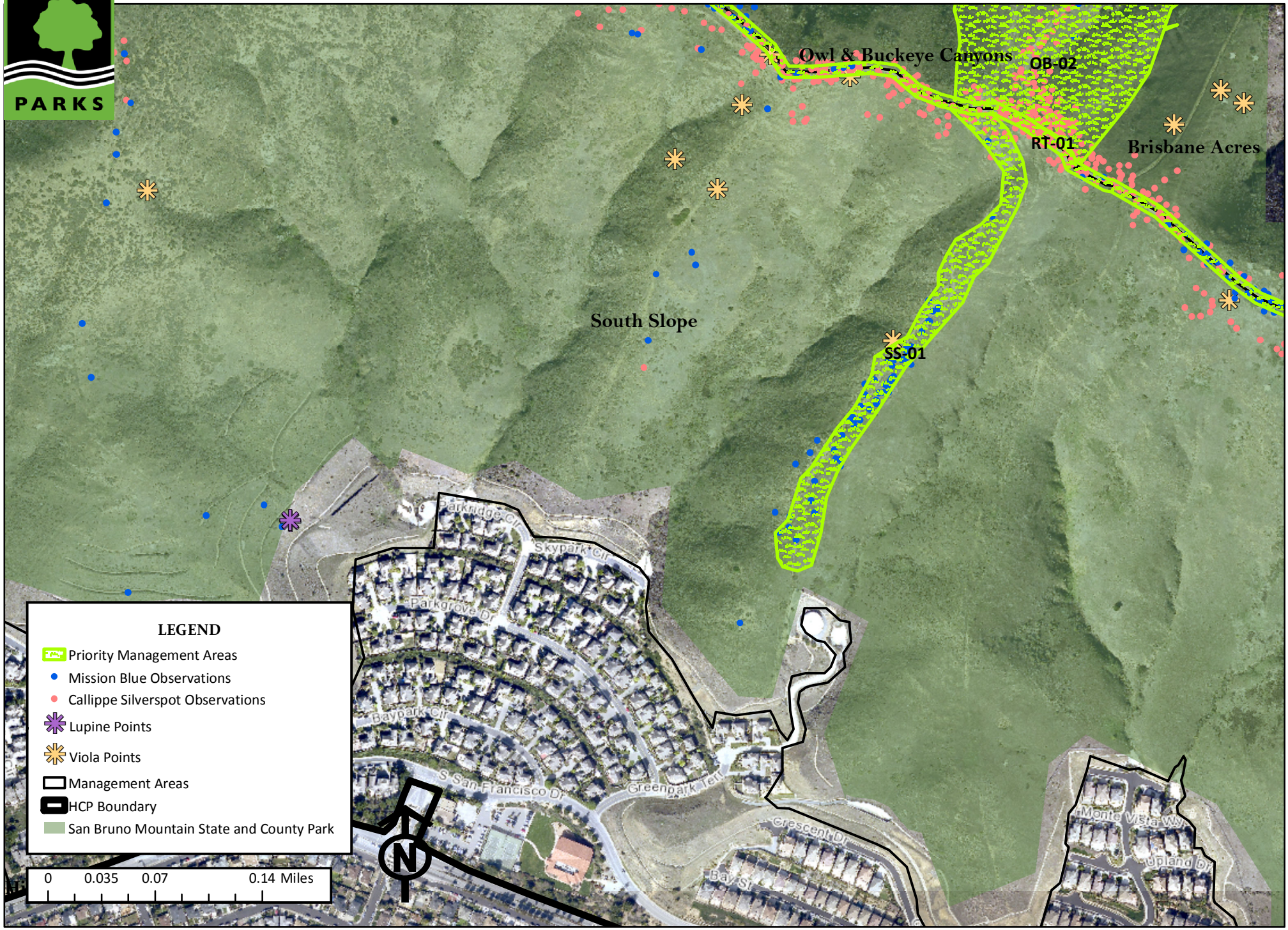
4. **Reporting and Monitoring**:
    a. All treatment areas will be evaluated for baseline condition assessment prior to initiating work. Form will be provided by SMC Parks Department.
    b. Photo monitoring Points
        A. Before treatment
        B. After treatment
    c. Self-evaluation and treatment suggestions
        A. Form will be provided by SMC Parks Department.
5. **Obligations and Qualifications:**
    a. Provide a prescription for all herbicide use by a licensed Pest Control Advisor.
        A. Provide at least one staff person to oversee work on a daily basis that holds a Qualified Applicators License.
        B. Provide quarterly reports concerning herbicide use on San Bruno Mountain State and County Park.
        C. Submit all required paperwork for herbicide applications to the regulatory agency.

Supplementary Documents:

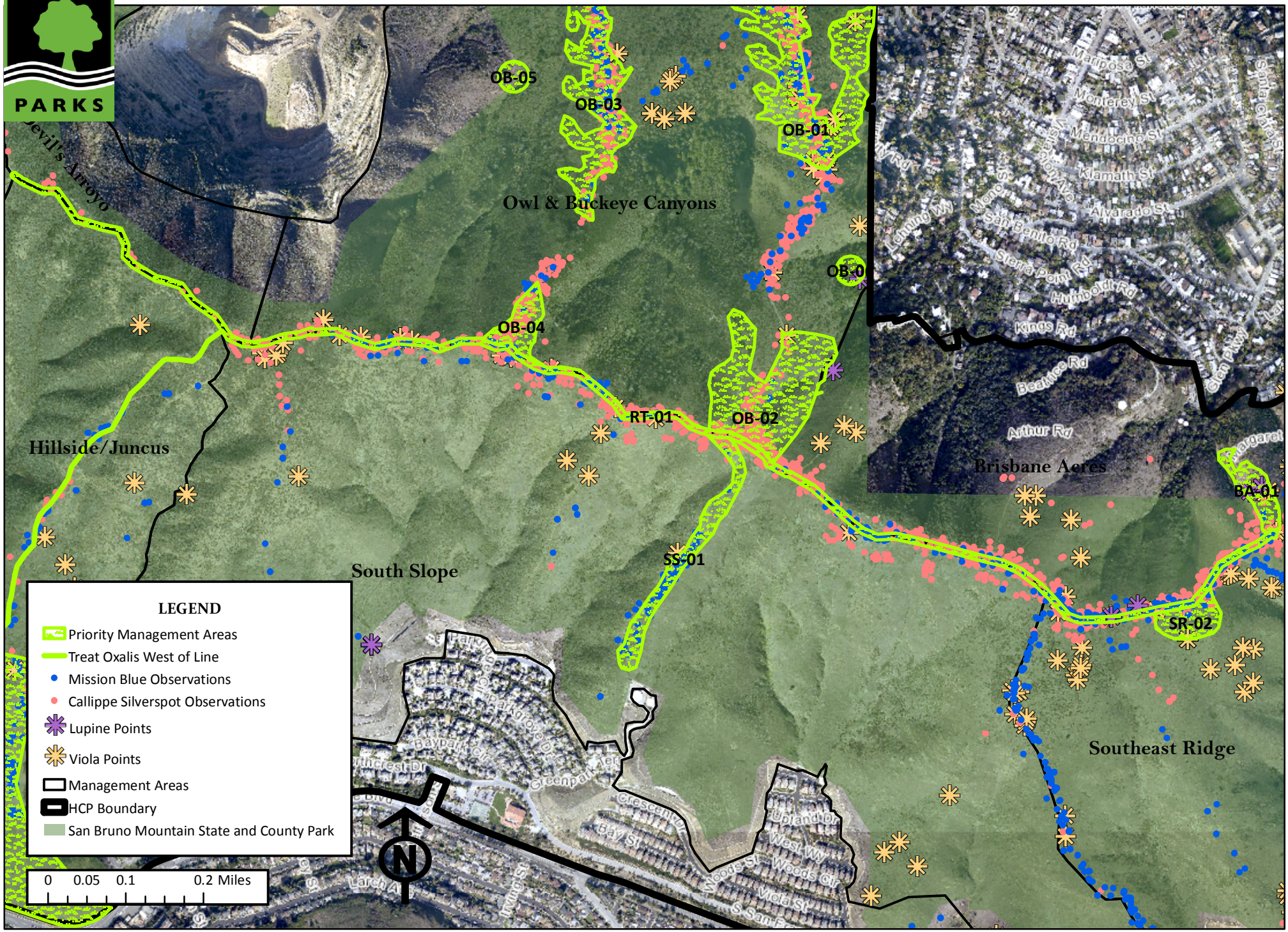
6. **Management Unit Maps** (photo points in parentheses- can be adjusted)
    a. Brisbane Acres (1)
    b. Dairy & Wax Myrtle Ravine (2)
    c. Devil's Arroyo (1)
    d. Hillside Juncus (2)
    e. Owl & Buckeye Canyon (15)
    f. Ridge Trail (5)
    g. South Slope (4)
    h. Southeast Ridge (4)
7. **2015 Restoration Plan Required Components**

Bids are due to the Ramona Arechiga, Natural Resource Manager, by **June 12, 2015 at 5 p.m.** (electronic or hardcopy). A site visit to the management areas will be held on June 5th at 1 p.m., please email Ramona Arechiga to sign up. If enough contractors express an interest in a site visit, an email will be sent to confirm on June 1st. If you have any questions please contact Ramona Arechiga, trarechiga@smcgov.org or 650-599-1375.

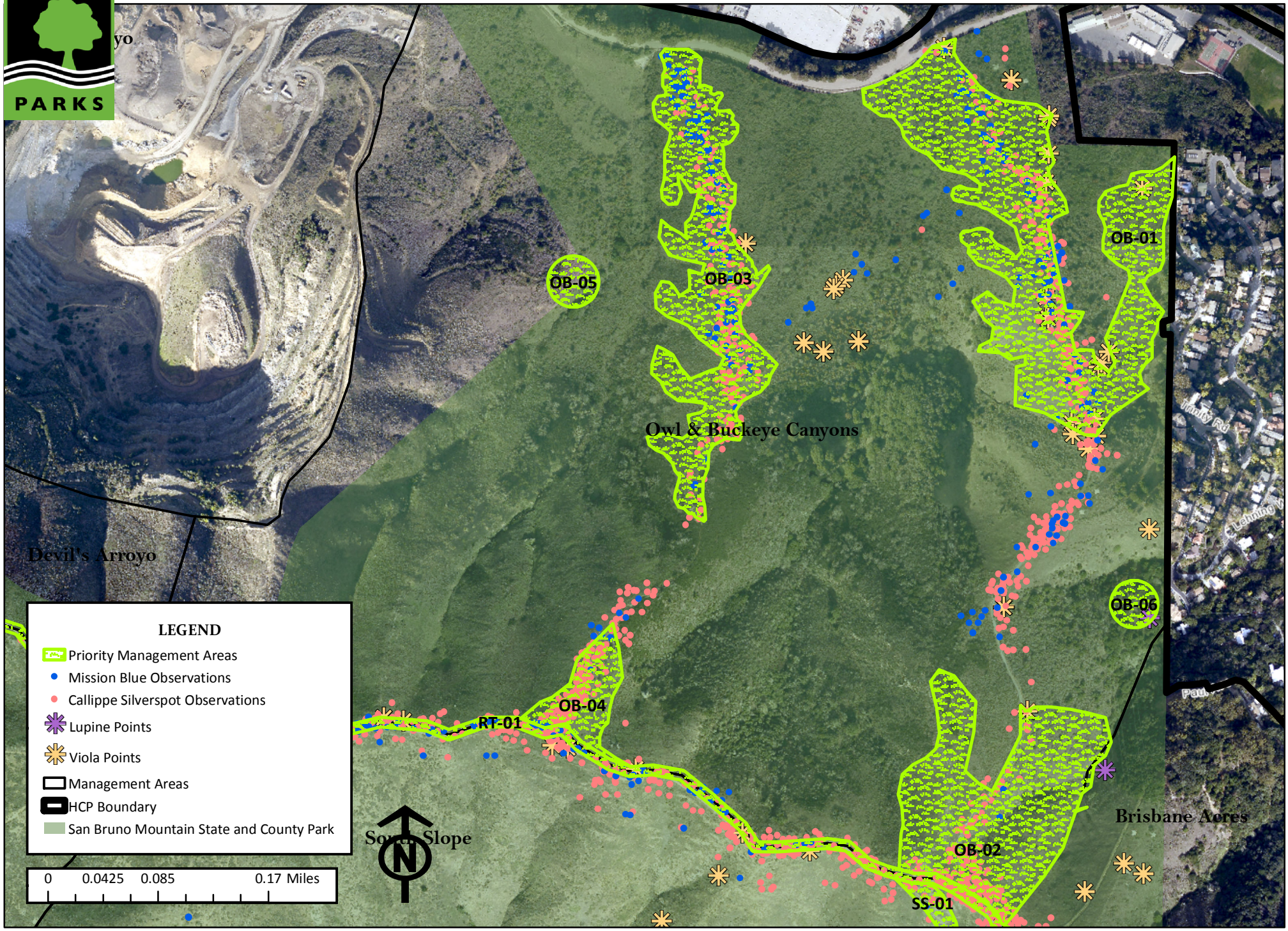
San Bruno Mountain HCP - South Slope



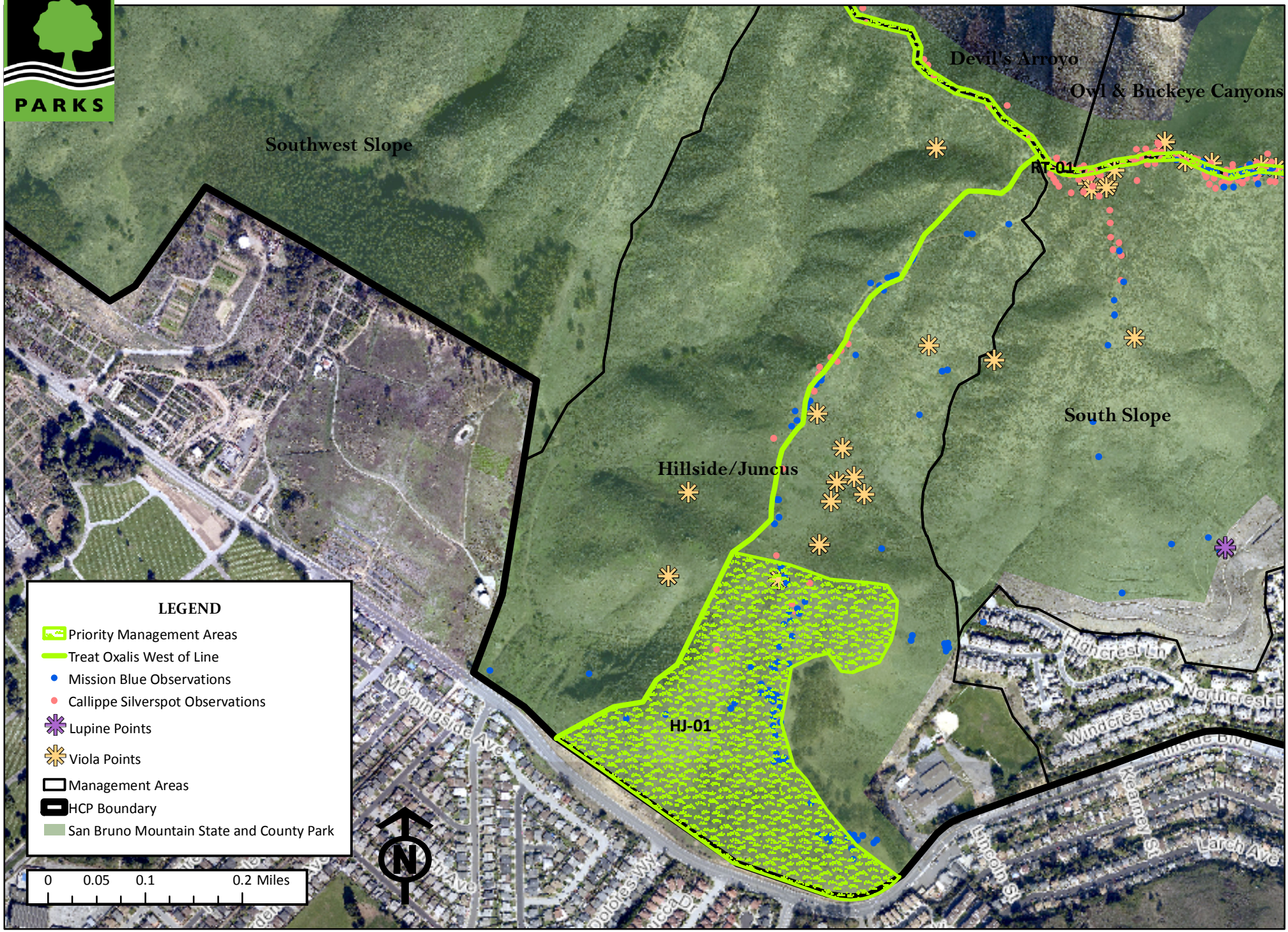
San Bruno Mountain HCP - Ridge Trail



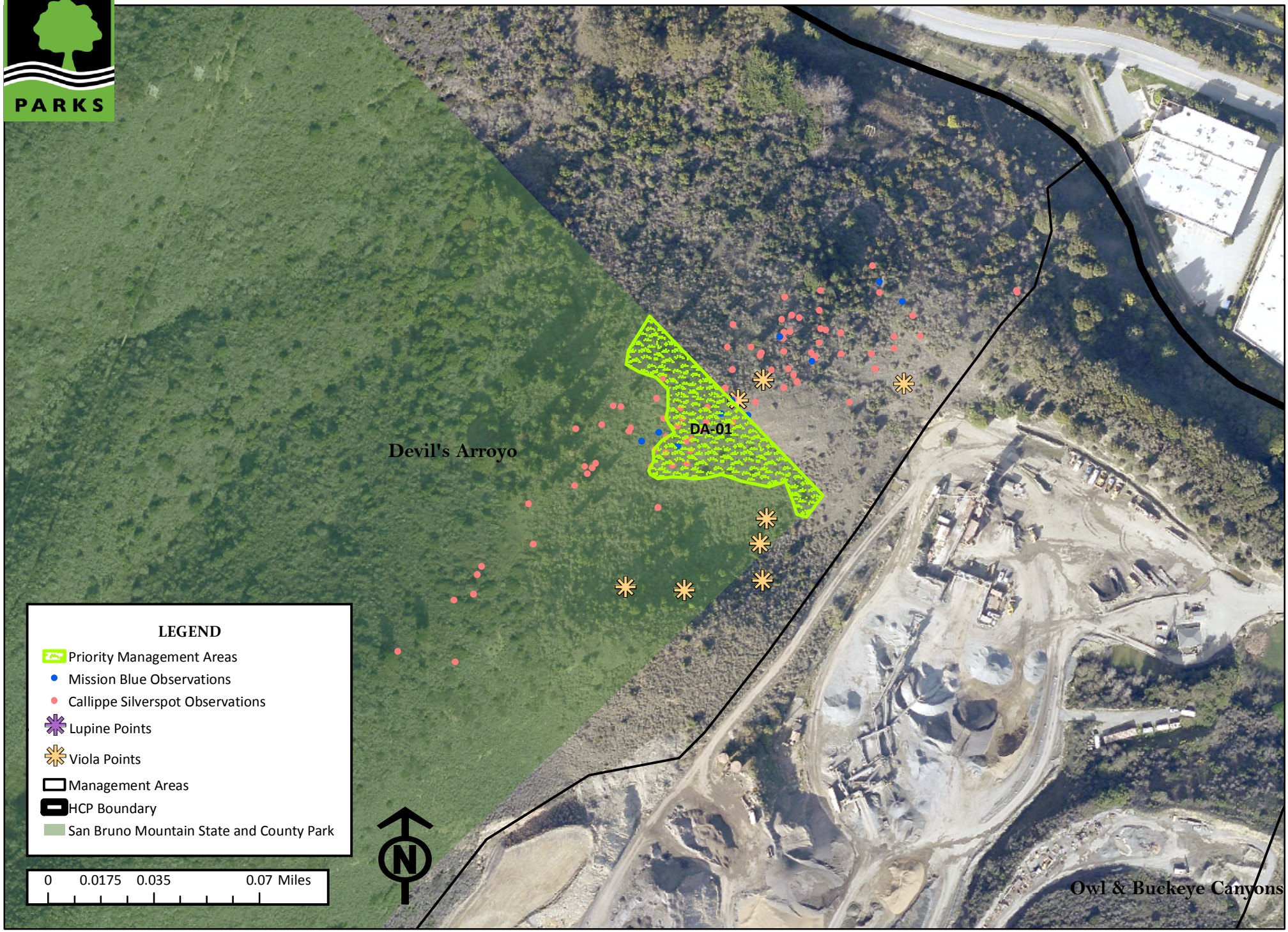
San Bruno Mountain HCP - Owl & Buckeye Canyon



San Bruno Mountain HCP - Hillside / Juncus



San Bruno Mountain HCP - Devil's Arroyo



San Bruno Mountain HCP - Brisbane Acres