Palos Verdes Peninsula Land Conservancy

Comprehensive Management and Monitoring Report 2016-2018

and

2018 Annual Report

For the

Rancho Palos Verdes Draft Natural Communities Conservation Plan and Habitat Conservation Plan

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COMPREHENSIVE MANAGEMENT AND MONITORING REPORT 2016-2018

for the

RANCHO PALOS VERDES DRAFT NATURAL COMMUNITIES CONSERVATION PLAN AND HABITAT CONSERVATION PLAN

Prepared for:

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1.1 INTRODUCTION

This Management and Monitoring Report (Report) for the Rancho Palos Verdes Natural Community Conservation Plan and Habitat Conservation Plan (NCCP/HCP) is the fifth comprehensive report for the Palos Verdes Nature Preserve (PVNP). This report was prepared to document the results of the focused surveys for NCCP/HCP-covered plant and wildlife species within the PVNP, identify potential disturbance factors/threats to NCCP/HCP-covered plant and wildlife species, and to make management recommendations for the preservation of the existing NCCP/HCP-covered plant and wildlife species populations. This report was prepared in accordance with the requirements of the NCCP/HCP for the City of Rancho Palos Verdes (City), California.

The NCCP/HCP was prepared to "maximize benefits to wildlife and vegetation communities while accommodating appropriate economic development within the City and region pursuant to the requirements of the NCCP Act and Section 10(a) of the ESA (URS 2004a)." As a primary component of the Plan, the PVNP was proposed to conserve regionally important habitat areas and provide habitat linkages in order to benefit sensitive plants and wildlife. The final draft of the NCCP/HCP was adopted by the City in November 2019.

The Initial Management and Monitoring Report (Dudek 2007) was authored in 2006/2007 as a baseline report. The comprehensive monitoring report is prepared every three years and will include both a synthesis of all data collected in the preceding three years and an analysis of overall trends in biological resources. This comprehensive report includes the following:

1. Reports that detail surveys and data analysis regarding vegetation mapping, covered plants and wildlife;
2. Habitat management recommendations including implementation of adaptive management activities;
3. A three year Habitat Restoration Plan.

This section of the Report documents an overview of the reporting process and of existing conditions in the PVNP. Section 2 contains covered plant and wildlife monitoring reports. Section 3 is a three year habitat restoration plan. Section 4 covers predator management. Section 5 reports on the Targeted Exotic Removal for Plants Program (TERPP). Discussion and management recommendations are provided in Section 6. The Annual Report for 2018 is in Section 7.

1.2 EXISTING CONDITIONS

The PVNP is located on the southern side of the Palos Verdes Peninsula, north of the Pacific Ocean in the City of Rancho Palos Verdes, California (Figure 1). The approximately 1,400-acre survey area lies in unsectioned lands in the following U.S. Geological Survey (USGS) 7.5 minute topographic maps: Redondo Beach, San Pedro, Torrance and Rancho Palos Verdes quadrangles; Township 5 South, Range 14 West and 15 West.

The PVNP has been divided into twelve Reserve areas consisting of the following subareas: Agua Amarga, Vicente Bluffs, Alta Vicente, Three Sisters, Abalone Cove, Portuguese Bend, Forrestal, San Ramon, Vista del Norte, Malaga Canyon, Filiorum and Ocean Trails. Topography is diverse, ranging from relatively flat lowland areas in the south, above steep coastal bluffs, to very steep slopes, ridgelines and gullies on the slopes to the north. Elevations range from approximately sea level along the coastal edges to approximately 1,300 feet above mean sea level at the northern most parcels. Adjacent land uses include single-family residences on most sides, open space associated with neutral lands on the peninsula, the Pacific Ocean to the south and west, and the Los Verdes and Trump National golf courses near the western and eastern ends of the PVNP.

Plant communities and land covers within the PVNP are representative of those found in this region. Vegetation mapping and coastal California gnatcatcher (*Polioptila californica californica*) (CAGN) and cactus wren (*Campylorhynchus brunneicapillus*) (CAWR) distribution data of the Peninsula used in the NCCP/HCP were prepared by Atwood et al. (1994) and updated and verified by Ogden (1999). Plant community classification in the NCCP/HCP generally follows Holland (1986), with some minor adaptations following Sawyer and Keeler-Wolf (1995). A new vegetation map for the Preserve was prepared in 2009 following the CNPS Vegetation Rapid Assessment protocol and the latest quantitative classification methods. Plant communities and land covers within the PVNP include coastal sage scrub (and coastal sage scrub sub-associations), southern cactus scrub, saltbush scrub, southern coastal bluff scrub, grassland, riparian scrub, exotic woodland, disturbed vegetation, cliff faces and rocky shores, disturbed areas, agriculture and developed areas.

Figure 1. Palos Verdes Nature Preserve.

1.3 SUMMARY OF ACTIVITIES

Habitat Management Plan

The initial Preserve Habitat Management Plan (PHMP) for the Draft NCCP/HCP was created in 2007. A component of the PHMP was the Habitat Restoration Plan for five acres per year for a total of 15 acres over the first three-year period. This plan was completed in April 2007 and concluded that Alta Vicente Reserve in the Preserve ranked the highest in terms of site suitability for an immediate restoration project. The Habitat Restoration Plan for Alta Vicente Reserve outlines appropriate revegetation locations and methodology to adequately comply with the Preserve Management requirements of the Rancho Palos Verdes NCCP/HCP. The Habitat Restoration Plan for Alta Vicente Reserve provides guidelines for the establishment of coastal sage scrub (CSS), coastal cactus scrub (CCS), and PVB butterfly habitat on a total of 15 acres during 3 consecutive years at the Alta Vicente Reserve. However, since a fire occurred at Portuguese Bend Reserve in August 2009, plans were adapted to focus immediate restoration at Portuguese Bend, and only Phase 1 and 2 (10 acres) were implemented at Alta Vicente. The Restoration Plan for Portuguese Bend covers restoration and monitoring of 25 acres over 5 years (2010 to 2015).

In 2015, PVPLC developed new restoration plans to execute the final phases of the restoration at Alta Vicente, and were included in the 2015 Comprehensive Report. Phase 3 was initiated in 2016 and Phase 4 initiated in 2017, with the installation of drip irrigation and coastal sage scrub vegetation species. Table 3 in Section 7 provides the implementation schedule for Phase 3 and 4 at Alta Vicente.

Cactus Wren Enhancements

PVPLC refocused restoration efforts in 2018 to enhance habitat for the cactus wren in response to drastic decline of the peninsula's populations as observed by Cooper (see Section 2.2 for report) and concern from the California Department of Fish and Wildlife. Four locations of quality cactus species populations were targeted and strategically thinned of encroaching vegetation for a total of 7.06 acres. In addition, 371 cactus plants were planted over a 1.14 acre area within the cleared locations. The 2018 annual report provides a location map and a summary of the work performed. The recommended next step is to continue maintaining these thinned areas to protect cactus plants from late successional species encroachment and weed species abundance. Other high priority cactus wren habitat areas are recommended to be targeted, cleared and planted. These projects can be selected based on resources and cactus wren surveys.

Additional Restoration

PVPLC attempts to seek additional funding when possible, to perform restoration on more than the minimum 5 acres required in the NCCP/HCP. Several opportunities of this nature occurred during the reporting period. Detailed information can be found in the 2018 annual report (Section 7). Additional restoration that occurred during this reporting period (2016-2018):

- Abalone Cove: Funding from the National Fish and Wildlife Foundation (NFWF), the Santa Monica Bay Restoration Commission, the Coastal Conservancy, the U.S. Fish and Wildlife Service Coastal Program, and the California Trails and Greenways Foundation provided funding to restore and enhance five acres of coastal sage scrub and coastal bluff scrub. Three acres were planted in 2013, and an additional two acres were restored and enhanced in 2014, 2015, and 2016. Maintenance and fill-in planting continued in 2017 and final project monitoring was submitted to the grantors in 2018.

- Agua Amarga: In September 2011, Los Angeles County Sanitation Districts (LACSD) provided funding to conduct 0.25 acre of riparian scrub restoration at the Lunada Canyon portion of the Agua Amarga Reserve as part of mitigation for one of their projects. A restoration plan was completed in 2011. In 2012, the PVPLC implemented weed and invasive plant removal (castor bean, ice plant, fennel). In Fall 2012, 362 container plants were installed. In Fall 2013, 2014 and 2015 additional plants were installed and maintained by volunteers. The project was monitored in 2016 and again in 2017, and plantings were meeting success criteria.

  In 2012, an additional mitigation project (D&M Eight LTD) funded the planting of 147 riparian plants at Lunada Canyon. The plants were installed in January 2014 and irrigated with a drip irrigation system. Severe rains in 2014 caused torrential stream flows that removed some of the installed plants. PVPLC installed replacement plants and monitored the site's recovery in 2015, 2016 and 2017. The final report was submitted in 2018.

- Vicente Bluffs: In June 2008, a grant agreement was signed with the State Coastal Conservancy to provide habitat restoration at Vicente Bluffs Reserve. PVPLC restored three acres of coastal bluff scrub and El Segundo blue butterfly habitat by removing acacia, pampas grass and ice plant, and installing container plants with coastal bluff scrub and El Segundo blue butterfly host plants. PVPLC added plants to this site in 2013, 2014 and 2015 to fulfill the grant goals. Since then, volunteers have continued the effort to plant host plants and remove weeds through 2018 in order to expand habitat area for the El Segundo blue butterfly.

- Portuguese Bend: In 2012, PVPLC received funding from the Habitat Conservation Fund to create 0.55 acres of trail-side habitat consisting of coastal sage scrub and cactus scrub to close unauthorized trails. The closeout of this grant occurred in 2018.

Figure 2. Locations of 2016-2018 Restoration Activities.

Targeted Exotic Removal Program for Plants

In 2016, PVPLC treated 23 populations of invasive plants across seven reserves, of which 17 populations were *Euphorbia terracina (*Geraldton spurge, Euphorbia). Other treatments included *Coronilla valentina* spp. *glauca* (2), *Arundo donax* (1), *Mesembryanthemum crystallinum* (1), and *Cephalophyllum alstonii* (1). At Vicente Bluffs, one population of *Acacia cyclops* was treated as part of an ongoing removal of what looks to be an expanding population of these species. Follow up site visits will be needed to keep the seed bank from germinating.

In 2017, PVPLC treated 21 populations of invasive plants across eight reserves, of which 19 populations were *Euphorbia terracina* (Geraldton spurge, Euphorbia). Other treatments included *Coronilla valentina* (1), and *Cortaderia selloana*(1).

In 2018, PVPLC treated 21 populations of invasive plants, across seven reserves, of which 18 populations were Euphorbia terracina (Geraldton spurge, Euphorbia). Other treatments included Acacia cyclops(Coastal Wattle) which was in response to native cactus plants being covered by the Coastal Wattle and leading to the decline in Cactus Wren populations in those locations.

Covered Plant Species

Six plant species occurring within the Palos Verdes Nature Preserve are listed as covered species under the NCCP/HCP, due to their rareness or limited distribution: *Aphanisma blitoides* (aphanisma), *Atriplex pacifica* (south coast saltbush), *Crossosoma californicum* (Catalina crossosoma), *Dudleya virens* spp. *insularis* (bright green Dudleya), *Lycium brevipes* var. *hassei* (Santa Catalina Island desert-thorn), and *Suaeda taxifolia* (woolly sea-blight). Under the NCCP/HCP, these species require targeted monitoring to determine whether a population is expanding, stable, or declining, and to provide information for guiding habitat management.

During this triennial monitoring period, the Palos Verdes Peninsula Land Conservancy (Conservancy) conducted covered plant species monitoring during 2017. Previously poorly defined boundaries at the monitoring sites resulted in highly variable year to year counts of the species. To reduce this variability, all sites were mapped using GPS to create GIS maps to develop clearly defined boundaries for this and future surveys. Additional stands resulting from the Conservancy's restoration projects and those found in the Preserve were mapped as a management tool to promote better knowledge of the special status plant species within the Preserve. Results from the survey vary across each species. Large numbers of the annual species *Atriplex* and *Aphanisma* were observed. Both of these species occupy relatively smaller tracts of land but occur in great numbers within their stands, with resulting high density values. Several new stands were mapped, thereby illustrating the extent of these species. The best assessment of the numbers of *Crossosoma californicum* within the very large stand was gained using two merged images viewed in a photoshop program. This resulted in a count of roughly 900 plants at Site Cc3. Similar *Dudleya* counts were obtained in 2017 than 2015, reflecting the issues resulting from poorly defined site boundaries. Additionally, the lack of harmful invasive weeds made the dudleya clumps easier to see. Mapped boundaries of the three stands will aid biologists for consistently determining the extent of the stands for counting. The 2006 count of 3,430 clumps by Dudek (2007) is not held up by the data shown in their maps. The remaining two species' populations were relatively unchanged from those observed during the initial 2006 survey. The count of *Lycium* remained the same. The numbers for *Suaeda* decreased from 528 in 2013-2015, to 295 in 2015-2018 most likely due to the weather conditions during this monitoring period. Threats to all species include encroachment by harmful invasive plants, cliff erosion, long-term drought, and trampling.

The new GIS maps developed in 2015 that identify polygons for each species should be employed in order to provide consistent counts. The inclusion of GPS mapping will enable the tracking of changes in plant stands, especially for annuals like *Aphanisma* and *Atriplex*, and new plant installations in restored sites. Density metrics will enable variation to be measured across all stands, independent of the size and number of stands. Additionally, PVPLC should continue, when possible, to expand covered plant species populations.

Specific recommendations include: utilize methodology described in this report, continue seed collection for plant propagation, install covered plant species in restoration efforts and/or broadcast seed during periods of favorable precipitation, remove encroaching invasive plants with the following priority, and continue to seek restoration funding for enhancing populations of these six species.

Covered Wildlife Species

El Segundo Blue Butterfly

Surveys for the El Segundo blue butterfly (ESB, *Euphilotes battoides allyni*) were conducted within the preserves for which the Conservancy is Habitat Manager under USF&WS Recovery Permit TE-217663-1. The butterfly is listed as Federally Endangered and is included in California's Wildlife Action Plan as a State-Endemic Special Status Invertebrate. Within the Palos Verdes Nature Preserve the butterfly inhabits the steep ocean bluffs around Point Vicente. Due to the ESB's endangered status, it is governed by the Palos Verdes Nature Preserve Natural Community Conservation Planning/Habitat Conservation Plan (NCCP/HCP) that mandates triennial surveys for long-term population trending. New ESB habitat has been added to the Palos Verdes Nature Preserve including Alta Vicente Reserve (2008 to present), Vicente Bluffs Reserve (2012 to present), Pelican Cove (2009), and Abalone Cove Reserve (2013).

In 2016, thirteen sites within the Palos Verdes Nature Preserve were surveyed for ESB presence and the number and phenological status of the ESB host plant sea-cliff buckwheat (*Eriogonum parvifolium*). Two sites lacked sea-cliff buckwheat plants and were not monitored following the initial visit. The total number of ESBs observed, 30, was twice the number seen in 2014, a very encouraging trend. All butterflies observed were seen within the Vicente Bluffs Reserves at Sites 3, 14, and 15. Host plants installed at Sites 14 and 15 in 2013 had gained their mature canopies, hosting numerous individual ESBs as a result.

The El Segundo blue butterfly readily utilizes sea-cliff buckwheat plants when added to areas near existing populations. While the canopies of the host plants had increased, the overall number of plants decreased substantially between 2014 and 2016. The loss was apparently due to drought, underscoring the importance of restoration projects for the butterfly. There was unexplained loss of several productive host plants between 2015 and 2016 at Site 14. Efforts to identify the cause and prevent future loss should be undertaken.

California Gnatcatcher and Cactus Wren

A single-season survey of two sensitive bird species, the (coastal) California gnatcatcher *Polioptila californica californica* (Federally Threatened) and the coastal-slope population of the cactus wren *Campylorhynchus brunneicapillus* (formerly a Candidate for federal listing; now treated as a California Bird Species of Special Concern) was conducted within the Palos Verdes Nature Preserve in 2018 by Daniel Cooper of Cooper Ecological Monitoring. The study area extended across nine reserves covering a combined 1,225 acres of the PVNP. The survey may be compared with previous surveys for these two birds conducted at most of the same sites in 2006, 2009, 2012 and 2015 (Dudek 2007, Hamilton 2009, CEM 2013, CEM 2015), as well as with more limited surveys conducted at various locations on the peninsula since 2010 (e.g., CEM 2011, 2013, and 2014).

For 2018, Cooper estimated 19 territories of California gnatcatcher, and just five territories of cactus wren. Compared with previous surveys, the estimate of California gnatcatcher territories for 2018 is down by roughly half, and for cactus wrens is down roughly 75%. This unprecedented drop is extremely alarming, particularly for cactus wren, which may not survive many more years. Both California gnatcatcher and cactus wren were present together at three reserves early in the year, but only at two reserves, Three Sisters/Filiorum, by late spring (vs. five reserves in 2015). The California gnatcatcher was absent (or presumed absent) at two (vs. one in 2015), and the Cactus wren absent at seven of the nine reserves; and unlike in prior years, neither focal species was detected at Agua Amarga Reserve. We attribute these declines to the combination of prolonged drought, cold/wet spring conditions in 2018, the continued growth of invasive shrubs, and an increase in local predators. However, it is not clear which of these factors is driving the decline, nor is it clear that any change in (human) management of the habitat would be able to reverse it.

Trails

The Palos Verdes Nature Preserve trails fall under the City's Public Use Master Plan (PUMP), which is a NCCP/HCP covered activity and, therefore, must follow certain avoidance and minimization measures and guidelines to protect covered species. City Council approved the updated Preserve Trails Plan in October 2012. The plan included authorized trails and trail user designations for Filiorum Reserve, based on 2010 public workshops and comments. The recommendations for the other Reserves in the PVNP were based on input from the PUMP Committee, the 2011 "State of the Trails" workshop and public comments. Small changes to the Trails Plan have been recommended since then including the removal of Packsaddle Trail at Forrestal and the addition of the Wanderer Trail at San Ramon. These won't officially be changed until City Council reconsiders the PUMP.

From 2016 to 2018, PVPLC staff and volunteers have closed off 243 spur trails throughout the nature preserve. PVPLC held over 167 Rapid Response Volunteer days and 38 Volunteer Trail Crew events to address some larger trail projects in the Preserve.

PVPLC and the City of RPV have collaborated to create a Volunteer Trail Watch program in 2012 to educate the public and improve trail etiquette, protect the natural resources of the Palos Verdes Nature Preserve, enhance the safety of, and promote an enjoyable experience for all Preserve visitors.

SECTION 2

PLANT AND WILDLIFE MONITORING

2.1 COVERED PLANT SPECIES REPORT

Covered Plant Species

2016 – 2018

Prepared By

PALOS VERDES PENINSULA

LAND CONSERVANCY

February 2020






EXECUTIVE SUMMARY

Six plant species occurring within the Palos Verdes Nature Preserve are listed as covered species under the NCCP/HCP, due to their rareness or limited distribution: *Aphanisma blitoides* (aphanisma), *Atriplex pacifica* (south coast saltbush), *Crossosoma californicum* (Catalina crossosoma), *Dudleya virens* spp. *insularis* (bright green Dudleya), *Lycium brevipes* var. *hassei* (Santa Catalina Island desert-thorn), and *Suaeda taxifolia* (woolly sea-blight). Under the Natural Communities Conservation Plan, these species require targeted monitoring to determine whether a population is expanding, stable, or declining, and to provide information for guiding habitat management.

During this triennial monitoring period, the Palos Verdes Peninsula Land Conservancy (Conservancy) conducted covered plant species monitoring during 2017. Previously poorly defined boundaries at the monitoring sites resulted in highly variable year to year counts of the species (PVPLC 2013). To reduce this variability, all sites were mapped using GPS to create GIS maps to develop clearly defined boundaries for this and future surveys. Additional stands resulting from the Conservancy's restoration projects and those found in the Preserve were mapped as a management tool to promote better knowledge of the special status plant species within the Preserve. Results from the survey include:

- Large numbers of the annual species *Atriplex* and *Aphanisma* were observed. Both of these species occupy relatively smaller tracts of land but occur in great numbers within their stands, with resulting high density values. Several new stands were mapped, thereby illustrating the extent of these species.

- The best assessment of the numbers of *Crossosoma californicum* within the very large stand was gained using two merged images viewed in a photoshop program. This resulted in a count of roughly 900 plants at Site Cc3.

- Similar *Dudleya* counts were obtained in 2017 than 2015, reflecting the issues resulting from poorly defined site boundaries. Additionally, the lack of harmful invasive weeds made the dudleya clumps easier to see. Mapped boundaries of the three stands will aid biologists for consistently determining the extent of the stands for counting. The 2006 count of 3,430 clumps by Dudek (2007) is not held up by the data shown in their maps.

- The remaining two species' populations were relatively unchanged from those observed during the initial 2006 survey. The count of *Lycium* remained the same. The numbers for *Suaeda* decreased from 528 in 2013-2015, to 295 in 2015-2018 most likely due to the weather conditions during this monitoring period.

- Threats to all species include encroachment by harmful invasive plants, cliff erosion, long-term drought, and trampling.

The new GIS maps developed in 2015 that identify polygons for each species should be employed in order to provide consistent counts. The inclusion of GPS mapping will enable the tracking of changes in plant stands, especially for annuals like *Aphanisma* and *Atriplex*, and new plant installations in restored sites. Density metrics will enable variation to be measured across all stands, independent of the size and number of stands. Additionally, PVPLC should continue, when possible, to expand covered plant species populations. Specific recommendations include:

1. Utilize methodology described in this report, including
    a. Re-GPS stands to determine where boundaries have changed, especially for the annuals *Aphanisma* and *Atriplex* and the perennial *Suaeda.*
    b. Utilize the GIS maps for locating and counting stands.
    c. Calculate areas for each stand to develop aerial extents for each species
    d. Calculate density for measuring variation within stands for long-term assessments.
2. Continue seed collection for plant propagation
3. Install covered plant species in restoration efforts and/or broadcast seed during periods of favorable precipitation
4. Remove encroaching invasive plants with the following priority;
    a. *Atriplex pacifica*
    b. *Aphanisma blitoides* - at sites Ab 10, 11, 15, 20, 44, 49
    c. *Dudleya virens* spp. *insularis* – At Sites Dv1 and Dv2
    d. *Suaeda taxifolia* - at site St1, 2, 3, 4
5. Continue to seek restoration funding for enhancing populations of these six species.

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1.0 INTRODUCTION

The Natural Communities Conservation Plan and Habitat Conservation Plan (NCCP/HCP) for the Palos Verdes Nature Preserve (PVNP) provides a list of six plant species that are targeted for monitoring by the Palos Verdes Peninsula Land Conservancy (Conservancy) every three years or when rainfall reaches 75% (9.75 inches) of average rainfall for the region. These species, known as covered species, have special status due to their rareness or limited distribution. Five of the six species, *Aphanisma blitoides* (aphanisma), *Atriplex pacifica* (south coast saltbush), *Crossosoma californicum* (Catalina crossosoma), *Dudleya virens* spp. *insularis* (bright green Dudleya), and *Lycium brevipes* var. *hassei* (Santa Catalina Island desert-thorn), are listed by the California Native Plant Society (CNPS) as List 1B plants which are rare, threatened, or endangered in California and elsewhere. The sixth, *Suaeda taxifolia* (woolly sea-blight), is listed as CNPS List 4, which is a plant of limited distribution.

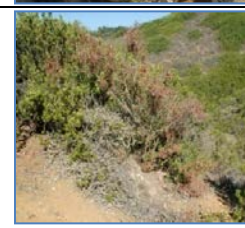
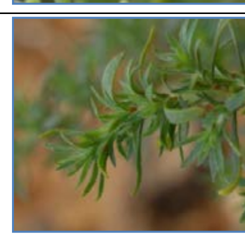
Under the terms of the NCCP/HCP, covered species need to be monitored to determine whether a population is expanding, stable, or declining. In recognition that the species differ phenologically during the year, each species should be monitored at its most appropriate time, generally in spring when the plant is blooming (Table 1). Also, because annual rainfall varies considerably, the monitoring of annual species should be conducted during those years when rainfall exceeds 75% of the long-term average annual precipitation. Longer-lived shrubs typically should be monitored once every three years.

A reconnaissance survey was conducted in 2006 to document the baseline population sizes of covered plant species for the Preserve Habitat Management Plan (Dudek 2007). The reconnaissance survey provided maps of surveyed stands of the covered species as well as three photo point locations to use in subsequent monitoring.

The Conservancy initiated the on-going monitoring in 2007 on a triennial basis, as mandated by the NCCP/HCP. The monitoring consists of collecting photo points at sites specified by Dudek (2007), counting the number of plants, and assessing the habitat at the sites. This report covers the photo point monitoring from 2016 through 2018. This report compares the 2016-2018 data from 2006 (Dudek 2007) and the 2007-09, 2010-12, and 2013-2015 triennial reports (PVPLC 2011, 2013, and 2015). All plant species are referred to by their genus only, unless when compared to a congener.

As recommended in the 2010-12 report and completed in the 2013-2015 report, the species' stands were mapped with a GPS unit for creating GIS maps. The digitized maps provide an accurate value for area and show the location of the photo point relative to the stand for use in data assessment.

Table 1. List of NCCP/HCP covered species, their CNPS status, recommended survey period, and images of the plants.

NCCP/HCP Covered Species	Plant Images
Aphanisma blitoides, aphanisma CNPS List 1 B.2 Annual, survey in April – May	 
Atriplex pacifica, south coast salt bush CNPS List 1 B.2 Annual, survey in April - May	 
Crossosoma californicum, California crossosoma CNPS List 1 B.2 Survey in summer when leaves are red	 
Dudleya virens ssp. *insularis*, bright green liveforever CNPS List 1 B.2 Survey in April – June	 
Lycium brevipes var. *hassei*, Santa Catalina Island desert-thorn CNPS List 1 B. 2 Survey in June	 
Suaeda taxifolia, wooly sea-blite CNPS List 4 Survey in summer	 

2.0 METHODS

Photo documentation for all six NCCP/HCP covered plant species was conducted during 2017 following the methodology and photo points established in 2006 (Dudek 2007).

All stands were digitally mapped using a Trimble GeoXT GPS unit, then transferred into GIS to create digital maps showing the photo point locations and stand areas (Figure 1, Appendix A). Both the original photographs and maps from Dudek (2007) and hand-drawn maps created in 2011-12 were used as references for the 2017 effort. Due to the rugged terrain, not all sites could be entirely walked, so the final polygons were hand-edited in GIS following contours from maps that were hand-drawn during the 2017 effort. Each polygon area was computed to the square meter within GIS. Both the field data sheets and GPS unit collected the same metrics: Photo Number, Phenology, Stand Structure, Recruits (Y/N), Threats, Population Size, Percent Cover for the Species, Other Natives, Non-natives, and Bare Ground. Comments were added to provide descriptive information for the stand.

Supplemental surveys were conducted to track changes in stands of the covered species that are not Reference sites within the Pelican Cove, Abalone Cove, and Ocean Trails Reserves, as well as additional stands of species out-planted by the Conservancy in restoration areas. Photo points were established for all of the supplemental stands except *Dudleya*.

The surveys were conducted by Stewardship Associate Josh Weinik from March 17 to August 6, 2017. The coding system established by Dudek (2007) was followed for new stands. The Reference Sites include all sites established by Dudek 2007; Supplemental Sites 2015 include additional stands that were surveyed in 2017 (Table 1).

For the annuals *Aphanisma* and *Atriplex*, the term "withered" was used for plants that were moribund, but still discernible as an individual for the 2017 season. The large *Crossosoma* stand in eastern Forrestal was viewed from two locations, Cc3 and Cc3 Stitched. It is easier to obtain a full view of the stand from the latter location, but two photographs are required. Because counting the number of plants accurately in the field is impossible, the stitched image was viewed in a photoshop program and individual plants were marked to obtain a total count. *Dudleya* clumps with closely-spaced bases were counted as one individual (Dudek 2007). Best estimates of the number of individuals in the *Lycium* stand were obtained from visual observations following the methodology described in Appendix D.

Table 2. List of sites visited as Reference Sites (Dudek 2007) and as Supplemental Sites.

Species	**Reference Sites**	**Supplemental Sites**
Aphanisma blitoides	Ab44, Ab46, Ab49, Ab50*	Ab10, Ab11, Ab12, Ab13, Ab14, Ab15, Ab20
Atriplex pacifica	Ap1, Ap2, Ap3	Ap10, Ap11, Ap12, Ap30, Ap31, Ap32
Crossosoma californica	Cc1, Cc2, Cc3	Cc4, Cc5
Dudleya virens subsp. *insularis*	Dvi1, Dvi2, Dvi3	
Lycium brevipes var. *hassei*	Lbh1, Lbh2, Lbh3	Lbh 4
Suaeda taxifolia	St1, St2, St3	St4
* No *Aphanisma* identified at site		

Counts of all Reference sites were summed to produce an estimate of the total stand size. The areas computed with GIS were used to develop a measure of the density of each stand (individuals/m^2).

Rainfall data were obtained from the National Weather Service website (www.nws.noaa.gov/climate/index.php?wfo=lox) for the Long Beach Airport station. The annual average rainfall value provided by the NWS for the Long Beach Airport is 13.75", based upon data measured from 1971 through 2000, with monitoring to be conducted during years that exceed 75% of that value (9.05"). All rainfall data are provided in "rain years" from the months of July 1 through June 30, to accurately reflect the rainfall influencing the plant species' subsequent growth. The rain years under consideration include 2016-2017, 2017-2018, and 2018-2019.

3.0 RESULTS

3.1 RAINFALL

The rainfall fluctuated within the monitoring period with 19.98" in 2016-2017, 3.65" in 2017-2018, and 17.62" in 2018-2019. This was a much needed reprieve after the well-documented drought in California. Vegetation responded with solid growth, and surveys were conducted during the highest water year of the monitoring period.

3.2 COVERED SPECIES

In the following results discussion for each species, please refer to Appendix A for the detailed maps, Appendix B for the survey data, and Appendices C and D for the photo point images.

The total area, counts, density and ranges for each species for the Reference sites are shown in Table 3. The density data was calculated for the first time, to aid in the interpretation of long-term trends.

Table 3. Results of Covered Plant Surveys for 2016-2018 (Reference Sites).

Species	**Number of Sites**	**Total Area (m^2)**	**Total Count**	**Density Range (Individuals/m^2)**
Aphanisma blitoides	3	502	310	.03 – 8.33
Atriplex pacifica	3	123	24	0.15 – .46
Crossosoma californica	3	11,220	900±	0.5 – 1.3
Dudleya virens subsp. *insularis*	3	1010	513	0.09 – 1.18
Lycium brevipes var. *hassei*	4	500	630	.07 – 1.31
Suaeda taxifolia	4	469	295	0.1 – 1.6

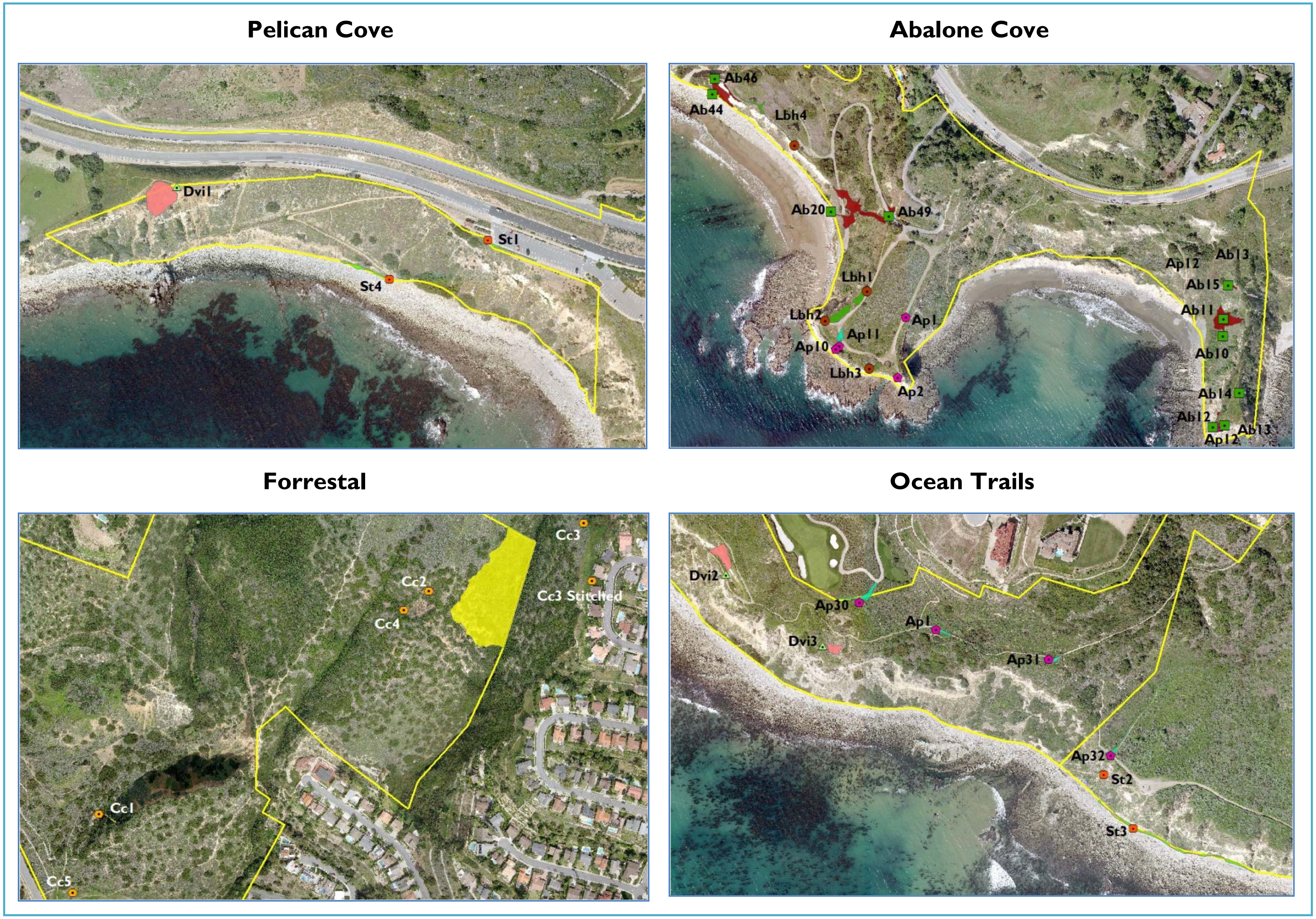


Figure 1. Locations of photo points for covered plant species monitoring. Detailed maps are provided in Appendix A.

3.2.1 COVERED SPECIES ASSESSMENT

Aphanisma – The survey for Aphanisma was conducted during March and April when the plants were red and easily visible. The three Reference sites (Ab44, Ab46, and Ab49) continued to support Aphanisma, with 310 individuals identified collectively across the three sites and a density range of 0.03 to 1.69 individuals/m^2. These estimates are far lower than quantities reported in 2015 (Table 4). Less Aphanisma individuals were also found in Supplemental Sites such as Ab11, which was reported to support ≥1000 individuals in 2015 and only 21 found in 2017.

Atriplex – This plant was surveyed multiple times throughout the survey period at nine sites due to its unpredictable appearance. This is a difficult annual to see, particularly for those plants located at the heavily trampled locations on both Portuguese and Inspiration Point (Figure 2). *Atriplex* plants at the Reference sites had relatively high variation in density (0.15-4.72 indiv/m^2).

The survey for Atriplex was conducted during early July, outside of the recommended April to May survey window. Expected issues with the later timed survey could be lower counts if early stage germinating Atriplex did not survive into the summer months.

Crossosoma – Two supplemental sites were established for this monitoring period: Cc4, previously counted as part of Cc2, was mapped as an individual stand. Several seedlings and young plants were present at Cc4, with a significant increase in number of plants from the previous count. Three *Crossosoma* plants were installed in at the base of Pirate Trail and mapped as Cc5. In 2010, three individuals were counted at Cc1, but only two were seen in 2017. Counting and marking individuals in photoshop for Cc3, which enables one to zoom-in to see the plants in detail, produced roughly the same amount as 2015, roughly 900 individuals. The overall area encompassed by Reference *Crossosoma* stands is large (11,220 m$^{2)}$, and density ranged from 0.5-1.3 indiv/m^2.

Dudleya – *Dudleya* was present at all three reference sites. Site Dv1 is located on top of a steep hill, making the task of counting clumps difficult. A total of 53 clumps were counted at this site. A total of 343 and 117 clumps were counted at Sites Dv2 and Dv3. Plant density ranged from 0.09-1.18 individuals/m^2. Shriveled and clearly dead specimens were observed at all sites (Figure 3).

Lycium – The *Lycium* stands were similar in extent as in previous years (Figure 4). The resulting counts at Lbh3 were much higher than previous counts (30 vs 5 in 2010). As it was in 2015, the dense stands at Lbh1 and Lbh2 were difficult to count with resulting estimates of 200 and 400 plants for Lbh1 and Lbh2, respectively. All stands were dominated by mature plants. A supplemental stand, Lbh 4, was established at a restoration site at Abalone Cove, with 14 plants spread along the bluff edge. The density for the Reference stands ranged from 1.18-1.31 individuals/m^2.

Suaeda – All reference sites were visited in 2017, including St3 where a deeply eroded channel that precluded access in 2010 had weathered to a passable large gully. All contiguous plants at St3 were mapped as a single stand. *Suaeda* grows from numerous small plants into indistinguishable large canopies, creating challenges in counting the number of plants (Figure 5). There were no individuals at the original location for St1, but eight nearby bordering the fence adjacent to the parking lot at Pelican Cove. 110 individuals were observed at both St2 and the supplemental site St4, many of which many were small recruits. The density for the Reference sites ranged from 0.6-1.84 individuals/m^2.

Table 4. Summary of estimated counts from all surveys of the Reference sites conducted since 2006. The Surveys conducted in 2017 utilized the methodology described above.

Species	2006	2007	2008	2010	2011	2015	2017
Aphanisma blitoides	---	---	≥371	≥250	300	2,500	310
Atriplex pacifica	136	0	376	5	17	522	24
Crossosoma californica	540	--	≥198	783		946	900±
Dudleya virens ssp. *insularis*	3,430	550	408	240		527	513
Lycium brevipes var. *hassei*	750	300	---	605		630	630
Suaeda taxifolia	455	55	48	122		528	295

4.0 DISCUSSION

In 2015 GIS sites were created from using GPS shapefiles mapped in the field (Figure 1, Appendix A). The resulting areas shown in the GIS maps closely follow the boundaries used in 2010-2012, a feat aided by having the same biologist conduct the monitoring. A revised methodology, detailing the mapping methods, was produced to insure consistent monitoring into the future (Appendix E). Furthermore, the GIS data generates accurate areal values from which computations, such as density for each stand can be made (Table 3). This methodology was followed again in 2017.

Figure 2. Numerous young *Suaeda* individuals growing amidst mature plants that will eventually coalesce into a large canopy. The grey branches are dead individuals.

The most dynamic plant populations are, of course, the annuals *Aphanisma* and *Atriplex*. The 2017 number of *Aphanisma* observed returned to the 2011 numbers after a huge increase in 2015 where the population was ten times that observed previously at the Reference sites. Similarly, number of *Atriplex* followed the same trend by returning to 2011 numbers. By looking at the density of these two species, we can see that *Atriplex* occupies a small area compared to *Aphanisma*. Both are high density species and, as annuals, should be expected to have varying populations sizes over time, the amount related to rainfall and the amount of weed cover.

The sheer size of the largest stand of *Crossosoma* (Cc3) on the eastern slope at Forrestal renders it impossible to count the hundreds of plants in the field, much less to delineate a subset of the slope that can be easily replicated. However, by counting this stand via merging two photos taken across the canyon, then viewing in photoshop, where zooming in enables one to see individual plants, we now have the best estimate of the number plants in the stand to date: roughly 900 individuals. In 2017, the population at Cc3 was observed via stitched photos and it was estimated that the population has not changed since the 2015 monitoring effort

The entire stand extends beyond the boundaries of the PVNP making this a stand of roughly 1000 individuals. It is the largest known stand of *Crossosoma*, surpassing those found at Santa Catalina and San Clemente Islands significantly, where typical stands consist of 5-7 plants (Kaius Helenurm, University South Dakota, personal communication). The other sites (Cc1, Cc2, Cc4, and Cc5) follow that standard more closely.

While we are confident that counting individuals from three stitched images on a computer screen generated the most accurate count to date for Cc3, it fails to depict seedlings and small plants very well. Continued monitoring at Cc4 will provide insight into the development of adult plants that will be helpful for interpreting the data at the difficult to access Site Cc3.

Lycium numbers were similar to those in observed previously. Dudek (2007) noted 150 individuals at this site within an equivalent area, as shown in their maps (pg 22). This is a difficult species to count because of the dense manner that the plants grow. For example, despite the lack of leaves, it was still extremely difficult to count individuals in the very dense main stands, Lbh1 and Lbh2. However, the stand is consistently sized and was assessed to be the same number of plants. Within the three Reference sites, most specimens are mature. Young plants are now present along the bluff above

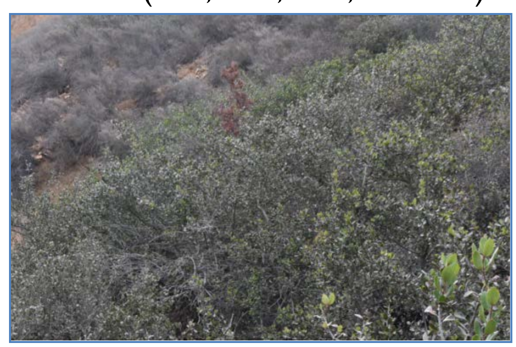



Figure 3. *Upper photo:* Only one canopy is seen at the Cc1 Photo Point (arrow). *Lower photo:* Live, multi-trunked base of a *Crossosoma* at Cc1 that lacked a canopy of leaves.

Abalone Cove Beach where the Conservancy out-planted at a restoration site, resulting in a net increase in *Lycium* coverage within PVNP.

The numbers of *Dudleya* have varied considerably over the years, but the counts from 2007 and 2017 are relatively similar (Table 4). The 2006 count of 3,430 clumps by Dudek (2007) is not held up by the data shown in their maps. The total number of *Dudleya* shown in the Dudek maps is 6,428, including a lumped polygon for Sites Dvi2 and Dvi3 without any individual photo point counts. Since the 2006 survey, counts were conducted at only the Reference sites (Dvi1, Dvi2, and Dvi3) for a much reduced total count. The impact of the drought on *Dudleya* was quite evident. The drought hindered the growth of harmful invasive weeds making observing these plants easier. However, in 2017 the population was found to be similar to pre-drought (2007) numbers.

Over time, the number of *Suaeda* individuals has varied considerably (Table 4). Two factors are in play in the variation: differences in area used for the surveys and ability to access the largest Reference stand, St3. Also, the ability of this plant to quickly colonize new areas, as demonstrated at the site St1, illustrates that stand boundaries are plastic and will change over time. While the GIS maps will aid in providing more consistency in the survey methods, the changing stand boundaries argue for inclusion of density metrics when assessing stand trends.

All surveys have consistently identified erosion as a threat. Competition from native and non-native plants and trampling are also threats. These latter threats can be addressed through the Conservancy's on-going stewardship efforts and public education. However, erosion along steep cliffs, as recognized by Dudek (2007), is unavoidable, given the geology of the Palos Verdes Peninsula. Continued monitoring as the bluff faces retreat is important so that appropriate measures can be taken to ensure the continued presence of these species.

We have observed that *Aphanisma* occurs in areas of steep, bare slopes that are also occupied by crystalline iceplant (*Mesembryanthemum crystallinum*). While normally considered a plant that out competes native species due to its ability to accumulate salt in the soil (Cal-IPC 2013), this plant may provide assistance to *Aphanisma*, possibly via added moisture. Salt should not be a problem for *Aphanisma*, for it occurs in saline wetlands, such as at Talbert Marsh and Upper Newport Bay in Orange County (Merkel & Associates 2004, Baldwin et al. 2012). The presence of crystalline iceplant may indicate suitable sites for out-planting or seeding for *Aphanisma.*

After recovering from the 5 year drought, non-native harmful invasive species were a problem in 2017. Presence of the harmful invasives may have affected the total counts due to the varying visibility of the covered species, especially for the annuals *Aphanisma* and *Atriplex* and also the clumps of *Dudleya.*

4.1 WEATHER AND CLIMATE

Rainfall has been below average for all but two years since the establishment of the Palos Verdes Nature Preserve (Figure 7). By nature, rainfall is highly variable, with wide swings from years with high precipitation to multiple years of below average rain. The 2017 surveys were conducted after four consecutive years of low precipitation, followed by a great rain year in 2016-2017.

There is no apparent loss of number of the covered species plants following the drought. Specific examples of the leafless *Crossosoma* and withered *Dudleya* plants indicate that a degree of stress exists. At this time, predictions cannot be made on how these plants will fare in the future if long periods of low rainfall continue.

While rainfall is episodic in southern California, it also varies locally. Climate change poses a significant threat through reduced precipitation and more episodic rainstorms, heat waves, sea-level rise, and increased wildfires (Walsh et al. 2015). Locally precipitation is expected to decrease by ten percent by late this century (CalEPA 2012) providing challenges for determining the value for 75% of average rainfall for covered plant monitoring purposes.

Season (July 1-June 30)	Total Inches of Rainfall	Inches Above/Below (+/-) Overall Season Average
2019-2020	See month-by-month numbers as season unfolds.	
2018-2019	17.62	+6.28
2017-2018	3.65	-7.69
2016-2017	19.98	+8.64
2015-2016	6.48	-4.86
2014-2015	8.05	-3.29
2013-2014	4.50	-6.84
2012-2013	6.67	-4.67
2011-2012	7.57	-3.77
2010-2011	18.77	+7.43
2009-2010	15.66	+4.32
2008-2009	9.45	-1.89
2007-2008	11.41	+0.07
2006-2007	2.10	-9.24
2005-2006	8.62	-2.72

Figure 4. Precipitation at Long Beach Airport from 2005-2006 to 2018-2019

While long-term drought has the potential to impact the survivorship of the more drought-sensitive species, heat waves and increased temperatures from climate change provide additional stressors. Sea-level rise poses an additional threat to bluff-top species like *Dudleya*, *Lycium*, and *Suaeda*, though bluff erosion. Current predictions for amount of rise by 2100 range from 0.33 to over 1.0 m, and will continue to rise for the next several centuries and beyond (Walsh et al. 2014). Currently the Palos Verdes Peninsula is experiencing low rates of cliff retreat (Hapke and Reid 2007) posing as a lower level, long-term threat.

4.2 MANAGEMENT

While the Conservancy cannot directly mitigate climate change, it is in a good position to monitor the status of covered and special concern species and to increase their populations through stewardship activities. Considerable attention is directed toward collecting seeds for growing individuals for on-site installation or broadcasting seed when weather conditions are amenable.

The addition of special status plants into the Conservancy's restoration projects coupled with natural variation of the plants provides variability that is not captured by the Reference sites. The supplemental sites added to the monitoring in 2015 and 2017 are a valuable management tool for gaining better insight to the special status species, especially when weather conditions are more favorable for the plants.

The Conservancy actively seeks grants for restoration, including projects along the coastal bluffs. Restoration plans starting in 2016 called for expansion of the Abalone Cove Reserve and at Alta Vicente Reserve restorations. Alta Vicente restoration took place again in 2016/2017 and the Abalone Cove restoration was postponed until 2019/2020.

5.0 RECOMMENDATIONS

The GIS maps developed in 2015 and assessment procedures should continue to be employed in order to provide consistent counts. The inclusion of GPS mapping will enable the production of maps showing changes in plant stands, especially for annuals like *Aphanisma* and *Atriplex*, and those resulting from restoration projects. Long-term trends analysis will be greatly aided by including density as a metric because enables variation to be measured across all stands, independent of the total number of stands. Additionally, PVPLC should continue expanding covered plant species populations through its stewardship. Specific recommendations include:

1. Utilize methodology described in this report, including
    a. Re-GPS stands to determine where boundaries have changed, especially for the annuals *Aphanisma* and *Atriplex* and the perennial *Suaeda*.

   b. Utilize the GIS maps for locating and counting stands.
   c. Calculate areas for each stand to develop aerial extents for each species
   d. Calculate density for measuring variation within stands for long-term assessments.
2. Continue seed collection for plant propagation
3. Install covered plant species in restoration efforts and/or broadcast seed during periods of favorable precipitation
4. Remove encroaching invasive plants with the following priority;
   a. *Atriplex pacifica*
   b. *Aphanisma blitoides* - at sites Ab 10, 11, 15, 20, 44, 49
   c. *Dudleya virens* spp. *insularis* – At Sites Dv1 and Dv2
   d. *Suaeda taxifolia* - at site St1, 2, 3, 4
5. Continue to seek restoration funding for enhancing populations of these six species.

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APPENDIX A

Detailed GIS Maps

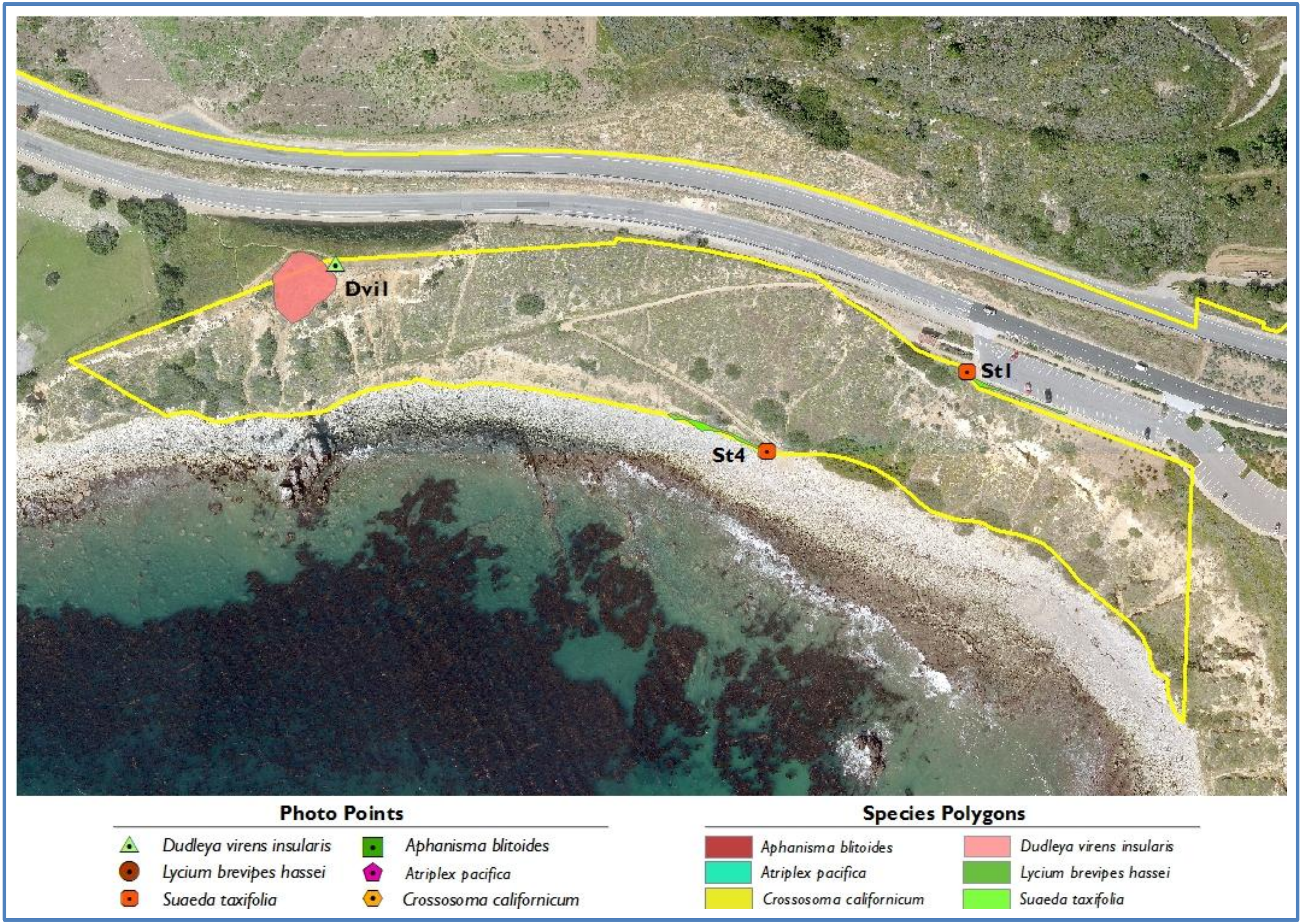


Figure A1. Pelican Cove showing locations of photo points and stand areas for *Dudleya* and *Suaeda* 2015.

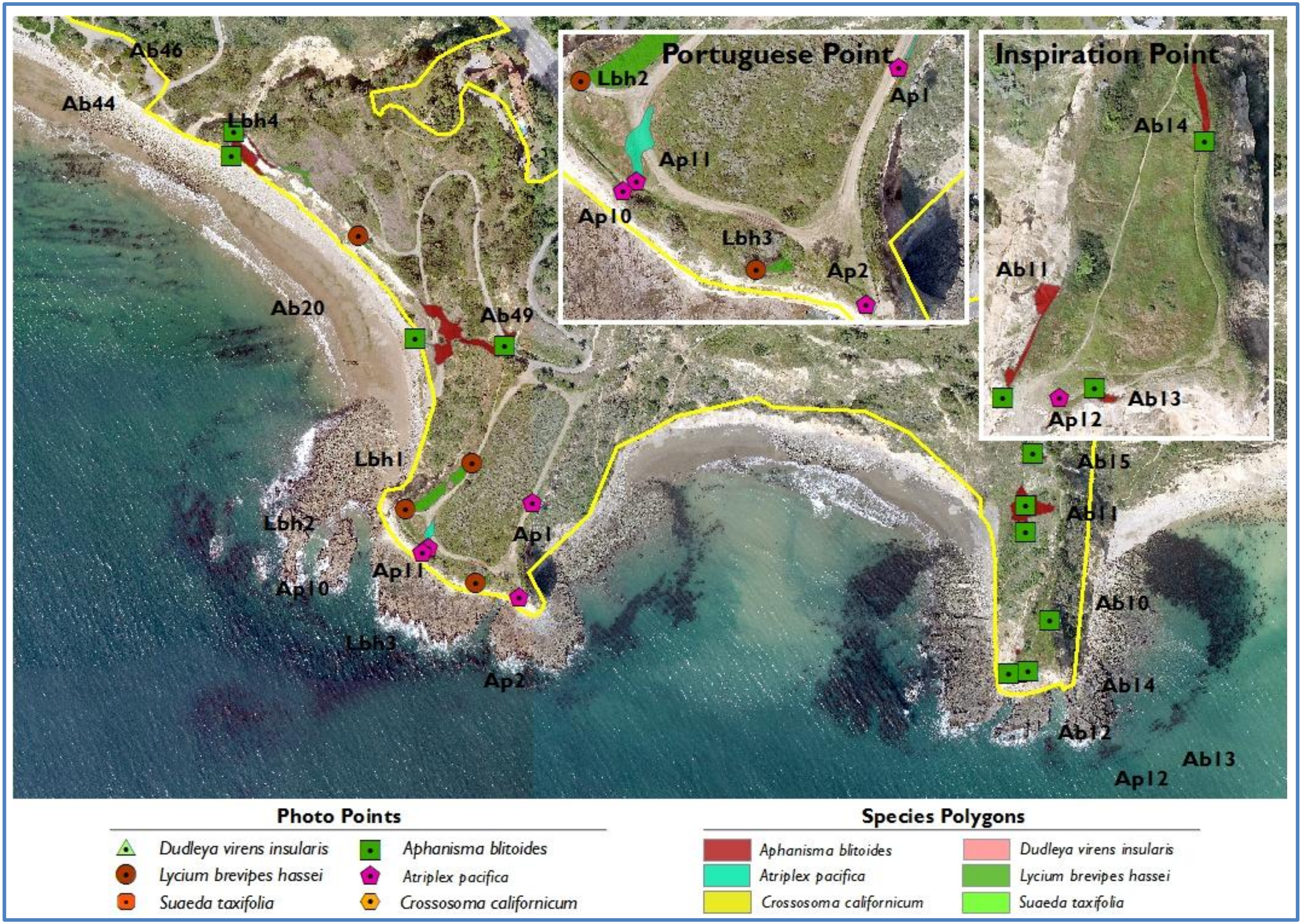


Figure A2. Abalone Cove showing locations of photo points and stand areas for *Aphanisma*, *Atriplex*, and *Lycium* 2015.

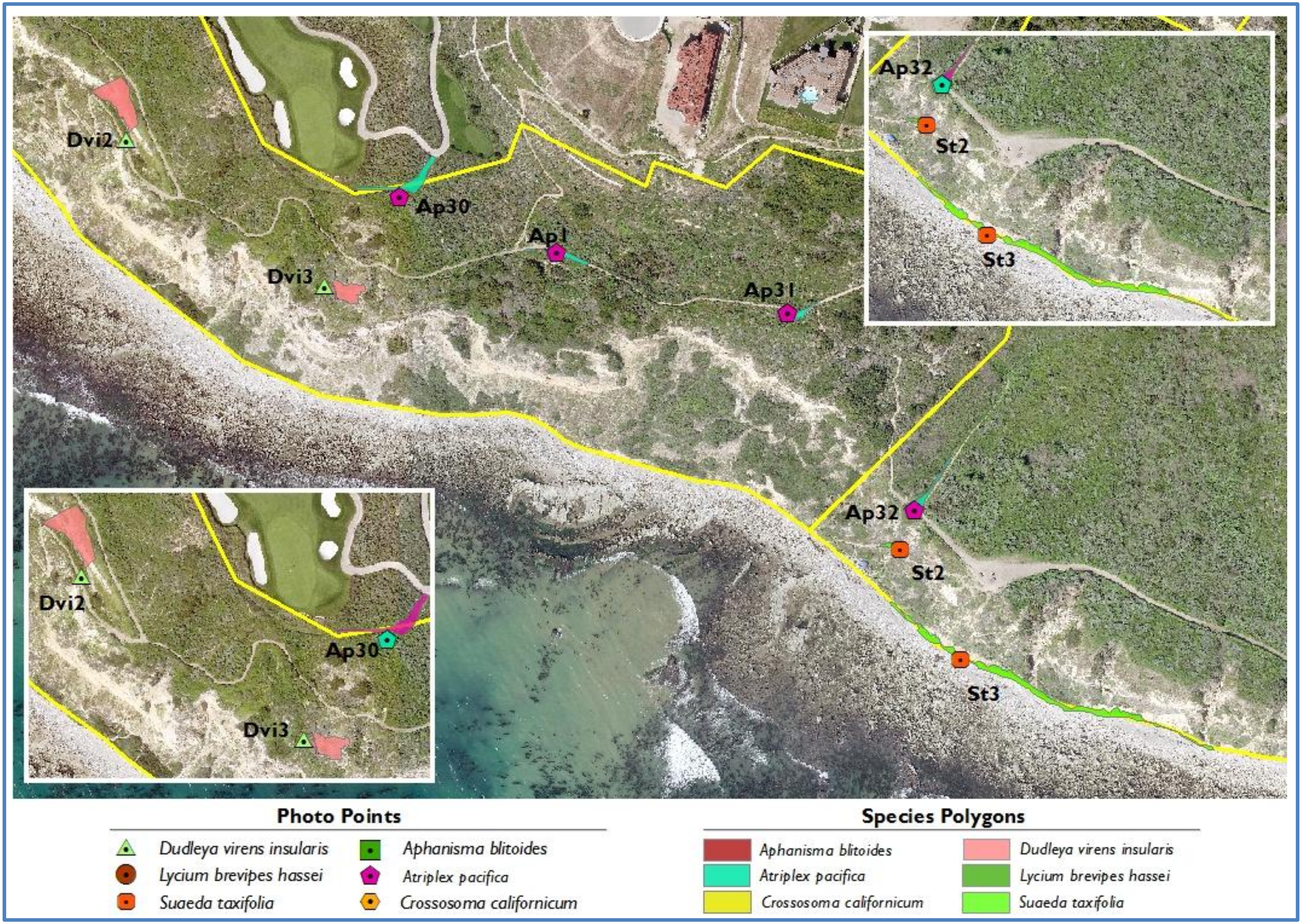


Figure A3. Ocean Trails showing locations of photo points and stand areas for *Dudleya*, *Atriplex*, and *Suaeda* 2015.

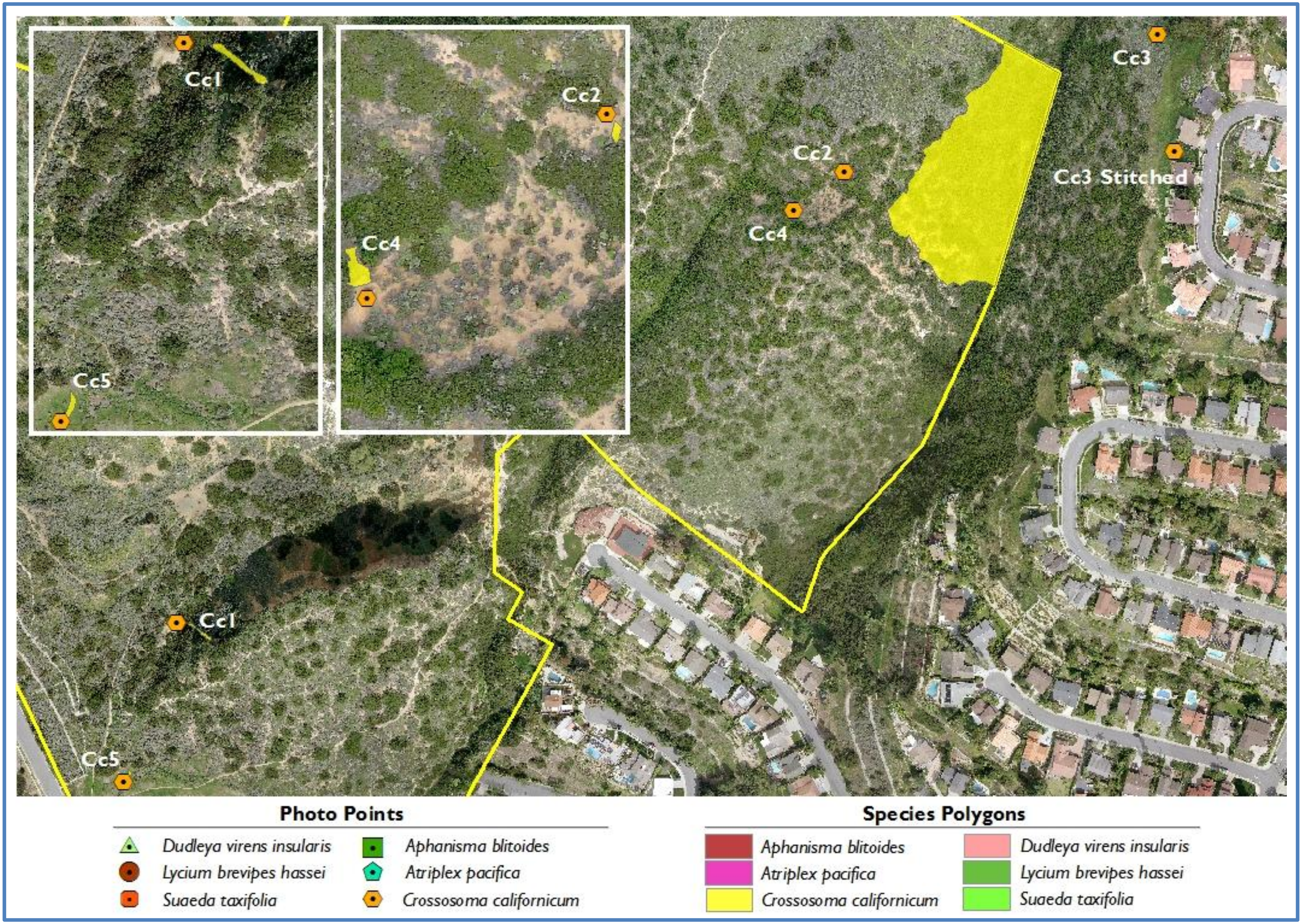


Figure A4. Pelican Cove showing locations of photo points and stand areas for *Crossosoma* 2015.

APPENDIX B

Covered Species Survey Data

Site	Phenology	Stand	Recruits	Area (m2)	Count	Density	%Sp	%Other!	%Non-	%Bare
Aphanisma blitoides NCCP/HCP photo points										
Ab44	Flowering	Mixed	Yes	156	55	0.3526	2	4	34	60
Ab46	Flowering	Mixed	Yes	242	80	0.3306	2	4	34	62
Ab49	Flowering	Mature	Yes	103	175	1.699	12	6	55	27
Ab10	Flowering	Mature	Yes	7	4	0.5714	2	8	70	20
Ab11	Withered	Mature	Yes	653	21	0.0322	5	35	45	15
Ab15	Fruiting	Mature	Yes	50	3	0.06	1	25	60	15
Ab20	Non-floweri	Mixed	Yes	982	300	0.3055	2	4	53	6
Atriplex pacifica NCCP/HCP photo points										
Ap1	Flowering	Mature	Yes	105	16	0.1524	1	10	7	82
Ap2	Non-Flower	Mature	Yes	18	8	0.4444	1	0	1	95
Ap12	Flowering	Mature	Yes	29	23	0.7931	5	5	2	88
Ap30	Flowering	Mixed	Yes	22	14	0.6364	1	3	19	77
Ap31	Flowering	Mature	Yes	16	16	1	2	8	5	85
Ap32	Flowering	Mixed	Yes	26	16	0.6154	2	7	10	81
Dudleya virens spp. insularis NCCP/HCP photo points										
Dvi1	Non-Flower	Mature	No	576	53	0.092	2	14	20	64
Dvi2	Fruiting	Mixed	Yes	292	343	1.1747	25	12	18	45
Dvi3	Fruiting	Mixed	Yes	141	117	0.8298	5	14	10	73
Lycium brevipes var. hassei NCCP/HCP photo points										
Lbh1	Non-Flower	Mature	No	169	200	1.1834	90	0	1	6
Lbh2	Non-Flower	Mature	No	306	400	1.3072	95	0	2	5
Lbh3	Non-Flower	Mature	No	26	30	1.1538	90	5	1	4
Lbh4	Non-Flower	Young	No	197	14	0.0711	0	0	0	0
Suaeda taxifolia NCCP/HCP photo points										
St1	Non-Flower	Mixed	Yes	47	27	0.5745	8	25	52	15
St2	Non-Flower	Mature	Yes	11	21	1.9091	10	10	65	15
St3	Non-Flower	Mixed	Yes	410	247	0.6024	25	15	30	30
St4	Non-Flower	Mixed	Yes	109	189	1.7339	13	2	35	55

APPENDIX C

Reference Site Photo Points

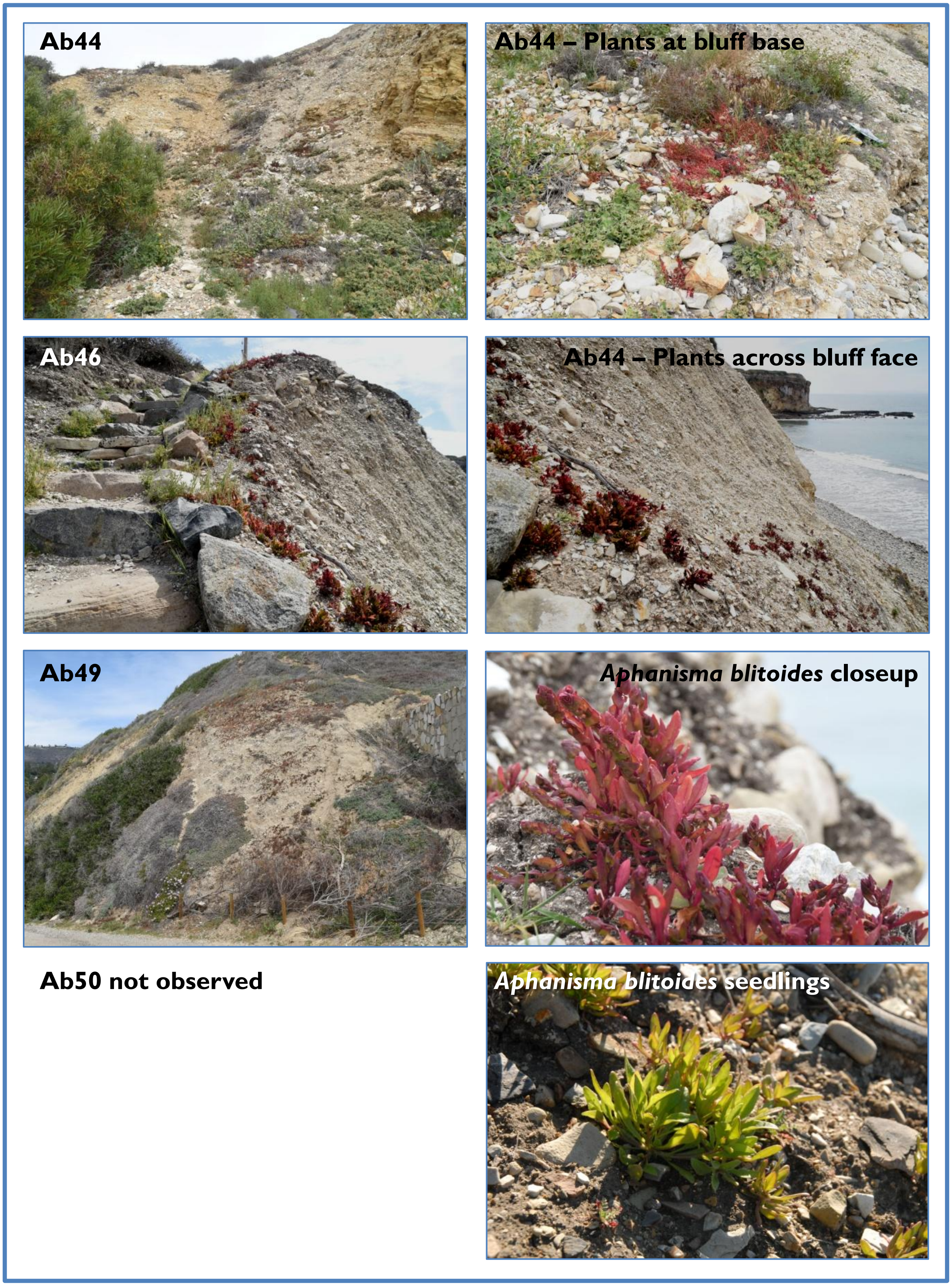


Figure C1. *Aphanisma blitoides* photo points from the 2015 survey.

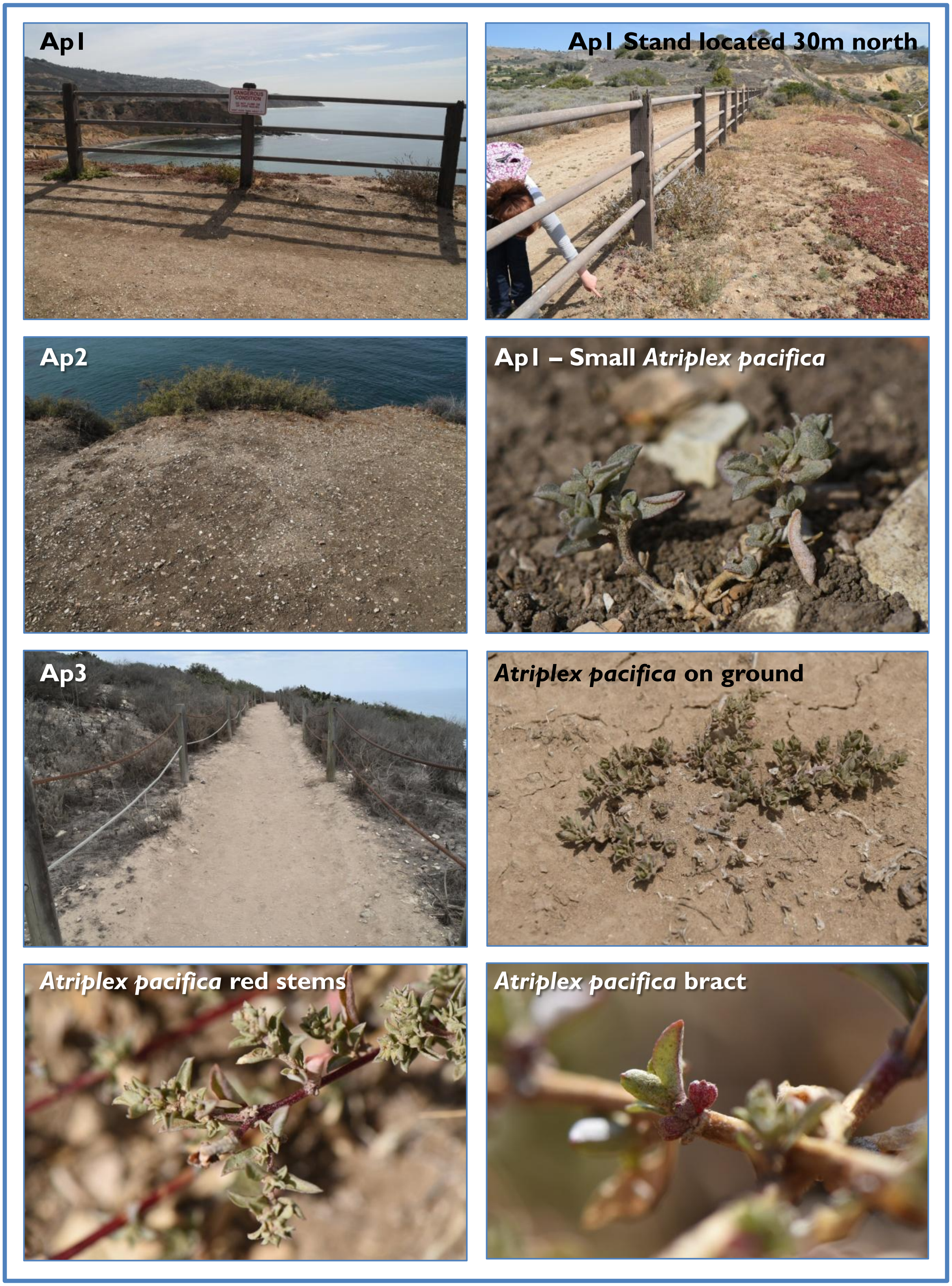


Figure C2. *Atriplex pacifica* photo points from the 2015 survey.

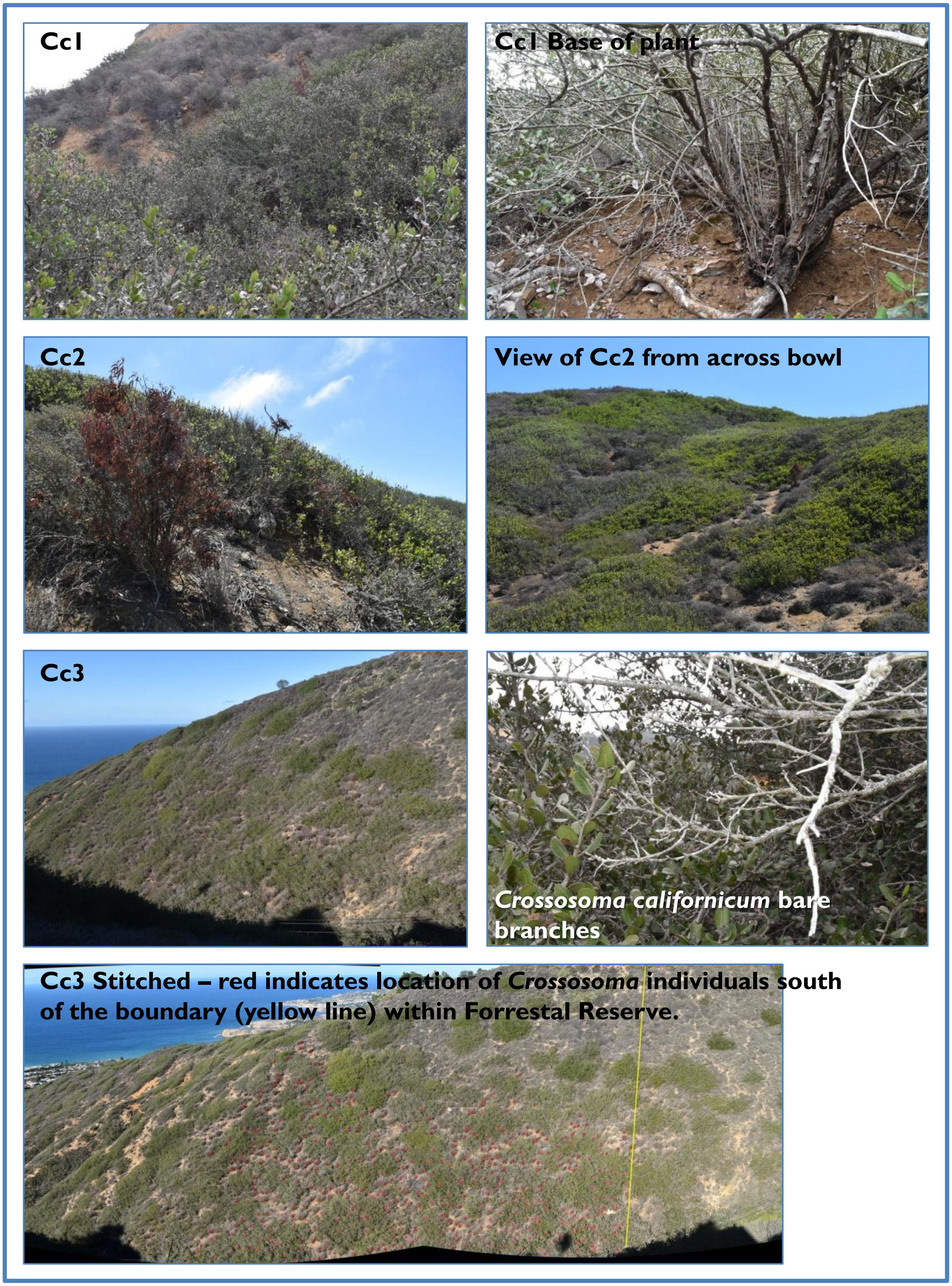


Figure C3. *Crossosma californicum* photo points from the 2015 survey.

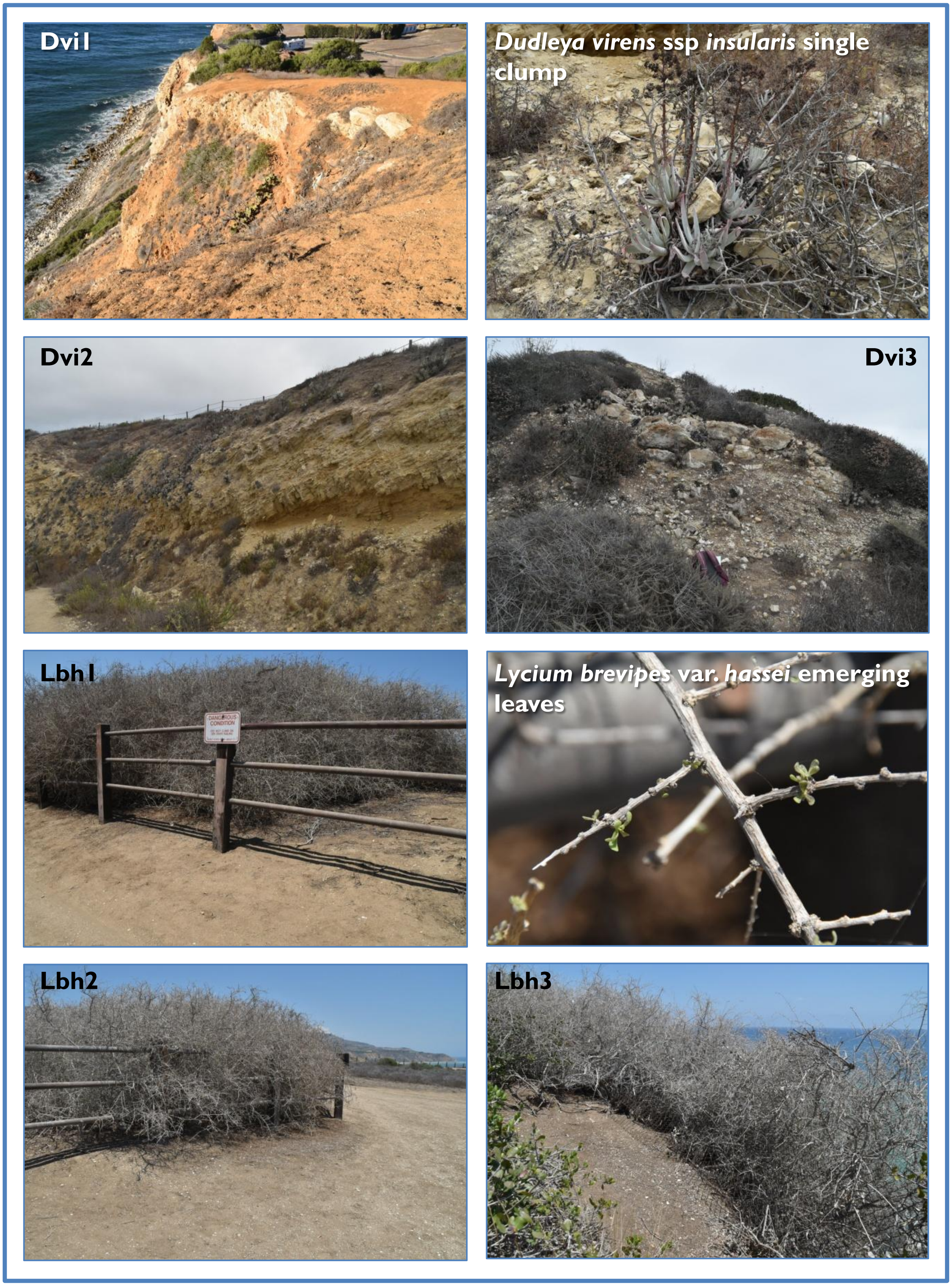


Figure C4. *Dudleya virens* ssp. *Insularis* and *Lycium brevipes* var. *hassei* photo points from the 2015 survey.

Figure C5. *Suaeda taxifolia* photo points from the 2015 survey.

APPENDIX D

Supplemental Photo Points

Figure D1. Additional sites for *Aphanisma blitoides* on Inspiration Point from the 2015 survey.

Figure D2. Additional sites for *Aphanisma blitoides* and *Atriplex pacifica* on Portuguese Point from the 2015 survey

Figure D3. Additional sites for *Atriplex pacifica* in Ocean Trails from the 2015 survey

Figure D4. Additional sites for *Crossosma californicum* from the 2015 survey.

APPENDIX E

Covered Species Methodology

PALOS VERDES PENINSULA
LAND CONSERVANCY

Covered Plant Species Monitoring

January 28, 2016

Covered Plant:
Procedures for field methods, recording measurements, data entry, data QA/QC, and data assessment.





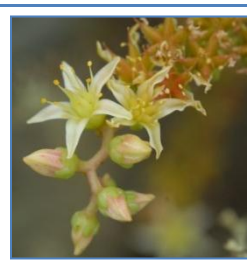
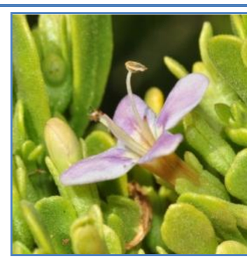

Method Overview

The Natural Communities Conservation Plan and Habitat Conservation Plan (NCCP/HCP) for the Palos Verdes Nature Preserve (PVNP) provides a list of six plant species that are to be targeted for conservation through restoration activities conducted by the Palos Verdes Peninsula Land Conservancy (PVPLC). These species, known as covered species, have special status due to their rareness or limited distribution. Five of the six species, *Aphanisma blitoides* (aphanisma), *Atriplex pacifica* (south coast saltbush), *Crossosoma californicum* (Catalina crossosoma), *Dudleya virens* spp. *insularis* (bright green Dudleya), and *Lycium brevipes* var. *hassei* (Santa Catalina Island desert-thorn), are listed by the California Native Plant Society (CNPS 2010) as List 1B plants which are rare, threatened, or endangered in California and elsewhere. The sixth, *Suaeda taxifolia* (woolly sea-blight), is listed as CNPS List 4, which is a plant of limited distribution.

Under the terms of the NCCP/HCP, covered species need to be monitored once every three years to determine whether a population is expanding, stable, or declining. In recognition that the species differ phenologically during the year, each species should be monitored at its most appropriate time, generally in spring when the plant is blooming (Table 1). Also, because annual rainfall varies considerably, the monitoring of annual species are to be conducted during those years when rainfall exceeds 75% of the long-term average annual precipitation.

A reconnaissance survey was conducted in 2006 to document the baseline population sizes of these species for the NCCP/HCP (Dudek 2007). The reconnaissance survey provided maps of surveyed stands of the covered species as well as three photo point locations to use in subsequent monitoring. These photo point locations provide the location to photograph and assess the respective covered plant species every three years (Figure 1).

Covered plant species monitoring consists of taking a photograph at each photo point, then counting the number of individuals within a specified area at the photo point and documenting conditions of the plant and general habitat. The three year periods began after the 2006 baseline survey: 2007-2009, 2020-2012, 2013-2015, etc. The trigger amount of rainfall for conducting covered plant species monitoring is 9.70", based upon rainfall measured by the National Weather Service at the Long Beach Airport for the period 1971 – 2000, average rainfall is 12.94". If less than 9.70" of precipitation falls during the first two years of the monitoring period, then the monitoring must be conducted in the third year to document the effects of prolonged low rainfall.

Table 1. List of NCCP/HCP covered species, their CNPS status, recommended survey period, and images of the plants.		
Aphanisma blitoides, aphanisma CNPS List 1 B.2 Annual, survey in survey when present in spring and/or summer		
Atriplex pacifica, south coast salt bush CNPS List 1 B.2 Annual, survey when present in spring and/or summer		
Crossosoma californicum, California crossosoma CNPS List 1 B.2 Survey in summer when leaves are red		
Dudleya virens ssp. *insularis*, bright green liveforever CNPS List 1 B.2 Survey in April - Jun		
Lycium brevipes var. *hassei*, Santa Catalina Island desert-thorn CNPS List 1 B. 2 Survey in June		
Suaeda taxifolia, wooly sea-blite CNPS List 4 Survey in summer		

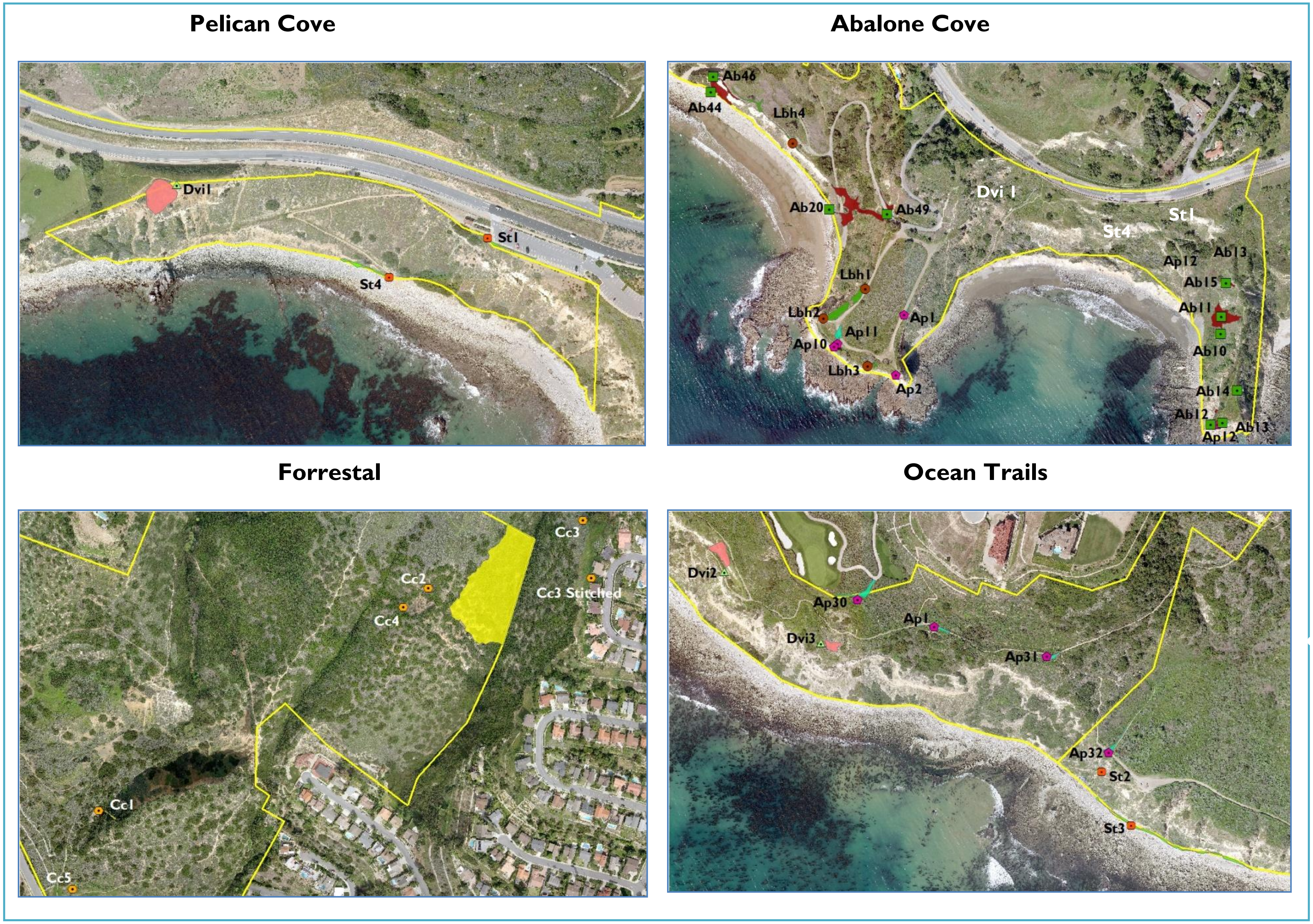


Figure 1. Locations of photo points for covered plant species monitoring. Detailed maps are provided in the Appendix to be used for the field surveys.

Prepare for Covered Species Monitoring

Prepare for field work, performed by the lead for Covered Species Monitoring

1. Print-out the following datasheets and forms found at Stewardship/Monitoring/Monitoring Forms/FieldDataSheets.xlsx
    a. Six copies of the Covered Species form, one for each species (Figure 2).
    b. CNPS Percent Cover Diagrams.pdf
    c. Detailed maps showing locations of the photo points (Appendix A).
    d. Photo point images and data appendix from the most recent Comprehensive Report
    e. Field procedures for covered species monitoring
2. Assemble the following equipment:
    a. Clipboard
    b. Pens and/or pencils
    c. Scratch paper
    d. Camera
    e. GPS unit for mapping cover extent and any additional sites. Use the Habitat Monitoring data dictionary on the Trimble GeoXT.
3. Obtain current rainfall amount for the July 1- June 30 rain year from Long Beach at the NWS' website: http://www.weather.gov/climate/index.php?wfo=lox .
    a. Alternatively, maintain the rainfallyearly.xlsx file in the Covered Species folder.

NCCP Covered Plant Species
Photo Point Monitoring

Species:______________________ Date:______________

Rainfall to date[1]:__________ Comments:______________________

Surveyors:______________________

PP#	**Photo Numbe**	**Phenology**	**Stand Structure**	**Recruits (Y/N)**	Threats: Invasives, Erosion, Other		**Comments:**
Population Size: Area	Number	% Species Cover	% Other Natives	% Non-native	% Bare	Observed changes from previous survey	
PP#	**Photo Numbe**	**Phenology**	**Stand Structure**	**Recruits (Y/N)**	Threats: Invasives, Erosion, Other		**Comments:**
Population Size: Area	Number	% Species Cover	% Other Natives	% Non-native	% Bare	Observed changes from previous survey	

Figure 2. Example of Covered Plant Species Field Datasheet.

Field Methods

1. Safety first: It is best for two people to conduct the surveys together, especially for the difficult species *Crossosoma californicum*.
    a. The lead biologist is responsible for operating the GPS unit, making the assessments, and taking the photographs.
    b. The helper (may be staff or volunteer) is responsible for writing down all observations as dictated by the lead biologist and making sure all entries are complete.
2. Visit sites in the mid-day (9:00 am – 3:00 pm) when shadows are minimal.
3. Fill-out all survey information, including species, date, rainfall to date, surveyors, and any pertinent comments.
4. Take photo
    a. Find previously occupied site by looking at Photo Point location on the map and the images printed from the prior report.
    b. Take photo carefully to include the area shown in the most recent photos, using the original set for comparison in order to insure consistency in photographs.
5. Include all plants observed within the areas depicted in the GIS maps. Whenever possible, walk around the entire perimeter of the stand to insure all plants are counted.
6. Fill-out associated data
    a. Phenology – record the dominant state (>50%) of
        i. Flowering
        ii. Non-flowering
        iii. Fruiting
        iv. Dormant
        v. Dead
        vi. Withered (use for annuals that are spent, but still visible)
    b. Stand Structure – Record maturity of the stand:
        i. Mixed (young and old plants are present)
        ii. Mature (only old plants are present)
        iii. Young (only young plants are present)
    c. Recruits – Yes or No: are recruits present?
    d. Threats
        i. Invasives –invasives are growing over the species
        ii. Erosion –the stand is in an unstable area
        iii. Other – provide a comment
    e. Percent Cover – asses the approximate cover of:
        i. Covered species
        ii. Other native plant species
        iii. Non-native plant species
        iv. Bare ground
    f. Observed changes from previous survey are made comparing viewed conditions to those depicted in images printed from the prior report.
7. Make population estimate

a. Occupy the photo point site as shown in Figure 1 using the GPS unit and accessing the 2015 files: e.g. CoveredSpecies 150429.
    i. If a new site is surveyed, or resurveyed, name the file as: CoveredSpecies yymmdd.
b. Determine area to be counted by referencing photo point maps, GIS maps, images printed from prior report, and conditions on hand
c. Use the area estimates established in 2010 as noted in the 2010-12 Cumulative Report and shown on GIS maps (to be created).
d. Count individuals within the area.

8. If the stand has changed size and location, then map with GPS unit as best as possible. Draw outline on paper map to use when editing the feature later in GIS. This is common for the annuals *Aphanisma blitoides* and *Atriplex pacifica*. It should be anticipated for new stands resulting from restoration efforts.
9. Special considerations
    a. *Crossosoma californicum* – Site 3 (Cc3) is accessed from the utility easement between 30433 and 30443 Ganado Drive (accessed from Crest Drive). While the original photo point was taken north from the easement and is accessed by following a faint coyote trail half-way down the slope, then traversing north to a pine tree stand. This site does not provide an identifiable stand in which individual plants can be counted.
        i. Next, take two photos from the easement to create a panorama image. This image will need to be photo-shopped together, then printed in ledger format for counting the number of plants present. The bright red *Crossosoma* are readily distinguished from *Eriogonum fasciculatum*, which are more rust-red. See the prior Comprehensive Report and archived images.
        ii. Use free, downloadable MicroSoft product (or any other) to stitch the two photos together.
        iii. Using Adobe PhotoShop (available in Development) or double click the image within Windows Explorer for Windows file editing softwer, magnify image to identify plants, covering each one with a **C** to denote a counted plant.
            1. Take care to count only within the preserve boundary
            2. The plants number in the hundreds and individuals are very difficult to distinguish.
    b. *Dudleya virens* ssp *insularis* – Count clumps of plants where pups are merged with adult, as shown in the image at right.

Examples of *Dudleya* clumps containing multiple pups, each clump distinguished by space between adjacent clumps.

GPS Data Transfer and GIS Mapping

1. Compile all files into a single file for the CoveredSpecies map. Although GPS files may be created over a few months during the monitoring, they can be combined into a single shapefile for transferring to GIS using GPS PathFinder Office or within GIS.
2. To combine the files within GIS, seek help for experienced GIS user.
3. To combine the files within GPS PathFinder:
    a. First, transfer all files from the GeoXT and process as normal in Path Finder Office (see directions in SOP GeoXT GPS Use.pdf).
    b. Within GPS PathFinder Office do the following steps
        i. Go to Utilities and select Combine…
        ii. Select Browse and select the Covered Spp yyyy.cor files from the monitoring season
        iii. Click OK to output a compined.cor file.
        iv. Export the new file as a shapefile for GIS.
        v. Rename and project as normal, storing the file in the appropriate folder with the appropriate name.
4. Open the previous Covered Species Map and rename to the year the survey was conducted. Add the newly created Combined Covered Spp yyyy shapefile.
    a. Because it's usually impossible to walk the entire area, the shapes must be edited by hand.
    b. Adjust the shapes using Editor within GIS.

Data Assessment

1. First things first
    a. The survey lead assembles all datasheets and reviews data sheets for completeness.
    b. The survey lead checks the photographs and insures that they were properly placed onto the server into the respective folder: Stewardship/Palos Verdes Nature Preserve/Monitoring/Covered Plant Species Monitoring/Year/Photo Points
        i. At this time, the lead biologist may take the option to rename the photos to indicate their location. Do this prior to deleting the images from the camera to prevent loss of images in the renaming process. Use the following format:
            1. Species abbreviation, Photo point number year (yyyy), photo number

2. Example: Ap3_2010_420.jpg
3. Include any additional photos

2. Access the Attributes Table in GIS and correct any errors in editor mode.
   a. Export data into an Excel file.
3. *Optional* Enter data into the database, open the Monitoring Database.
   i. Under "To enter data" click Covered Plant Species Monitoring
   ii. This will open a form, instructions are provided on the form.
      1. Enter Species name and all survey metadata
      2. Once in the lighter green box, fill out all information for the first Photo Point Number (PP#). Use the tab key to move from one field to the next. When first PP# is complete, tab until subform clears out and then enter the next PP#
      3. Alternatively, click the small asterisk in the light green box to clear the form for new data.
      4. To begin a new species, click the asterisk at the bottom of the dark green box to clear the form for new data.
   iii. When all data are entered, click Return to Main Form to return to the Switchboard form.
   b. When all data are inputted, print-out the QA Covered Plant Species Photo Point report and check entered data against field datasheet for correctness.
   c. Write Data Entered, your initials, and date at the top of the data sheet
   d. At this point, persons that will input data the database and those performing the QA/QC steps should be identified.

4. Quality Assurance
   a. Compare the printed QA report with the information on the datasheet.
   b. Correct any entries with a red pen
   c. Once the data are corrected on paper, then enter the database and to correct the data.
      i. It is best to check off each correction as they are made
      ii. It is important to work carefully as you are working in an application that is very unforgiving. Any changes are permanent and not retrievable.
   b. Write Data QAd, your initials, and date at the top of the data sheet.
   c. File data sheets in a folder marked PVNP Covered Plant Monitoring *Year.*

Data Extraction

Optional if data are archived in GIS.

All data are archived in the Monitoring database, in an Access application. It is easy to run queries if you are familiar with using Access. Do not try to extract the data if you are inexperienced with Access and find someone to help. Access is an unforgiving application which can lead to accidental permanent loss of data.

1. To extract data from the database for transferring to another application, follow these steps
   a. Open the Monitoring database and navigate to the query section. Currently there are no pre-made queries for extracting Covered Species data.

Data Analysis

Follow the format provided in previous formats for reporting on Covered Species. Be prepared to provide an assessment of the density of plants in each polygon for comparison to prior years. An Excel file with computations are provided in the 2015 folder.

Crossosoma californicum – This plant was sampled by Professor Kaius Helenurm, from the University of South Dakota, in 2011 for a genetic variability analysis. Check his university website to see if any results have been published. He indicated at the time of sampling that it will be some time before any results are published.

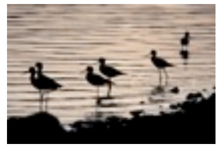
Literature Cited

California Native Plant Society. 2010. Rare Plant Program: http://www.cnps.org/cnps/rareplants/. Accessed July 21, 2010.

CNPS. See California Native Plant Society.

Dudek. 2007. Initial Management and monitoring report for the Rancho Palos Verdes Natural Community Conservation plan. *Prepared for:* The City of Rancho Palos Verdes. *On behalf of:* Palos Verdes Peninsula Land Conservancy. Encinitas, CA. 69 pp. + Appendices.

2.2 CALIFORNIA GNATCATCHER AND CACTUS WREN SURVEYS



Cooper Ecological Monitoring, Inc.
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Stacey Love
Recovery Permit Coordinator
USFWS
2177 Salk Ave., Suite 250
Carlsbad, CA 92008

August 9, 2018

Ms. Love,

I certify that the information in this survey report and attached exhibits fully and accurately represents my work.

Daniel Cooper

Daniel S. Cooper
President, CEM, Inc.
USFWS Permit #TE 100008-3

Palos Verdes Nature Preserve Survey for the California Gnatcatcher and the Cactus Wren
Palos Verdes Peninsula Land Conservancy
Los Angeles County

2018
Final Report

San Ramon Reserve, Palos Verdes Peninsula, Feb. 17, 2018
This image is illustrative of the challenging conditions for the two focal bird species, showing essentially no foliage on the native shrubs (*Encelia californica* in the foreground), no forbs along footpaths and between shrubs, and dried weeds from 2016-17 (here *Brassica nigra*) overtopping the remaining cactus patches

Photo by Daniel S. Cooper

Prepared by:
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916 Silver Spur Rd., Suite 207
Rolling Hills Estates, CA 90274

August 9, 2018

Introduction and Summary

We report on a single-season survey of two sensitive bird species, the (coastal) California gnatcatcher *Polioptila californica californica* (Federally Threatened) and the coastal-slope population of the cactus wren *Campylorhynchus brunneicapillus* (formerly a Candidate for federal listing; now treated as a California Bird Species of Special Concern[1]) on the Palos Verdes peninsula in 2018. Our study area extended across nine reserves covering a combined 1,225 acres managed by the Palos Verdes Peninsula Land Conservancy (Figures 1a and 1b). Our survey may be compared with previous surveys for these two birds conducted at most of the same sites in 2006, 2009, 2012 and 2015 (Dudek 2007, Hamilton 2009, CEM 2013, CEM 2015), as well as with more limited surveys conducted at various locations on the peninsula since 2010 (e.g., CEM 2011, 2013, and 2014).

For 2018, we estimate 19 territories of California gnatcatcher this year, and just five territories of cactus wren. Compared with previous surveys, the estimate of California gnatcatcher territories for 2018 is down by roughly half, and for cactus wrens is down roughly 75%. This unprecedented drop is extremely alarming, particularly for cactus wren, which may not survive many more years. Both California gnatcatcher and cactus wren were present together at three reserves early in the year, but only at two reserves, Three Sisters/Filiorum, by late spring (vs. five reserves in 2015). The California gnatcatcher was absent (or presumed absent) at two (vs. one in 2015), and the Cactus wren absent at seven of the nine reserves[2]; and unlike in prior years, neither focal species was detected at Agua Amarga Reserve. We attribute these declines to the combination of prolonged drought, cold/wet spring conditions in 2018, the continued degradation of native scrub habitat through growth in invasive shrubs, and an increase in local predators. However, it is not clear which of these factors is driving the decline, nor is it clear that any change in (human) management of the habitat would be able to reverse it.

Methods

We conducted targeted surveys for the California gnatcatcher and the cactus wren on 19 days to eight of nine reserves managed by Palos Verdes Peninsula Land Conservancy (collectively known as the Palos Verdes Nature Preserve) at the southwestern tip of the Palos Verdes peninsula (Table 1; Figures 1a, 1b) between 17 Feb. and 13 June 2018 (Tables 1 and 2). More than one site was visited on most days, for a total of c. 47 survey hours (Table 2). We used a two-visit protocol, with surveys spread at least one week apart, with one early-

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[1] In 2008, coastal populations of the cactus wren north of southern Orange County were deemed distinct from those in southern Orange County (termed *C. b. sandiegensis*) by the most recent publication of California Bird Species of Special Concern (Shuford and Gardali 2008). However, this view is not widely held within the ornithological community, and due to their extreme isolation and a life history that is essentially identical with coastal-slope populations to the south into San Diego County, we, as well as regulatory agencies like the Calif. Dept. of Fish and Game (CDFG; L. Comrack, pers. comm., April 2008), treat the Palos Verdes birds as a sensitive species under state law. In addition, CDFG requires that all playback surveys for the cactus wren in coastal-slope Los Angeles Co. (and Ventura Co.) be conducted under a Memorandum of Understanding reserved for special-status species.

[2] We elected not to survey Vista del Norte in 2018; we have not detected either target species in the 10+ years of focal surveys on the peninsula, and there are no verifiable records of either from this reserve (e.g., www.ebird.org), and virtually no coastal sage scrub.

season visit from late Feb. to early April ("Round 1") and one late-season visit during mid-May to mid-June ("Round 2")[3]. Data from a popular online bird sighting reporting platform (eBird; www.ebird.org) were incorporated into our analysis, as applicable, since many of the reserves were visited by competent birders during the same survey windows.

Following established protocol for California gnatcatcher surveys (USFWS 1997), visits were made between 6:00 a.m. and noon, typically beginning late morning when ambient morning temperatures were above (or were predicted to rise above) 55 degrees F. Surveys were not conducted under extreme weather (temperature, wind) conditions. Taped vocalizations of each species were employed on all surveys, as outlined in guidelines provided by PVPLC and approved by U.S. Fish and Wildlife Service/Department of Fish and Game ("7.3.2 Animal Species Monitoring"). A "zigzag" walking route was used to cover each reserve, following as closely to the most recent (2009) survey as possible (Appendix A). No more than 80 acres of coastal sage scrub was surveyed on any single day, following USFWS (1997) guidelines. The survey routes used in 2018 were intended to follow those used by previous surveyors (Dudek 2007, Hamilton 2009, etc.), though portions of several reserves contained only scattered patches of coastal sage scrub, or had inaccessible areas that could not be reached during the survey; these were generally skipped in 2018 to focus most efficiently on prime coastal sage scrub and cactus habitat within the preserve network, as was done in prior years (Appendix A).

Most surveys were carried out by Daniel S. Cooper (TE 100008-3; SC-10615), assisted by Robert A. Hamilton (TE 799557). Both Cooper and Hamilton have extensive experience with California gnatcatcher surveys throughout Los Angeles and other counties, and have conducted similar target bird surveys at the Portuguese Bend Reserve in prior years for the Palos Verdes Peninsula Land Conservancy.

In addition to recording aural detections of both species, visual scans (using Leica 8x42 Ultravid binoculars) were made of all cactus habitat for cactus wren nests, and sightings of the brown-headed cowbird (*Molothrus ater*), a known parasite of songbird nests, as well as other sensitive species were noted. Basic weather conditions were observed at the start and end of each visit (Table 2). All observations of the two target species were recorded directly onto aerial photographs, with special attention paid to documenting the number and breeding/territorial status of each in notes. For each sighting of a target species, we recorded:

- Date and start time of sighting (sightings were typically very brief, so stop times were typically not recorded unless more than a few seconds);
- Sex/age of individual(s) (if known);
- Banding information (color-banded, metal-banded, etc.);
- Habitat type where found (only if not coastal sage scrub for California gnatcatcher or cactus scrub for cactus wren);
- Number of birds associated with individual (e.g., family group, pair, etc.); and
- Breeding activity observed

[3] The 2006 preserve-wide surveys had used a 3-visit protocol; a reduction in effort for 2009 and 2012 was made per the NCCP/HCP guidelines for RPV.

Locations of all target/special-interest species were transferred from field maps onto Google Earth maps and converted to digital files (.kmz). These are presented in Appendix B.

From these sightings, we estimated the number of territories for each reserve, cognizant that two visits were insufficient to provide a confident estimate of either territory boundaries. Therefore, our territory numbers should be treated as rough approximations, rather than indications of actual population estimates. To allow for the most useful comparisons with prior surveys, we follow Hamilton's (2009) definition of a "territory" to include any discrete location where a territorial bird (male, in the case of the gnatcatcher) or pair was present on at least one visit. Locations where we detected an unmated adult bird of either species, or juvenile(s) of either species away from adults, were not considered "territories". In mapping locations of birds, we noted movements with arrows on our field maps, but mapped only the site of initial detection on the digital maps (otherwise, they would be nearly impossible to read, particularly given multiple visits).

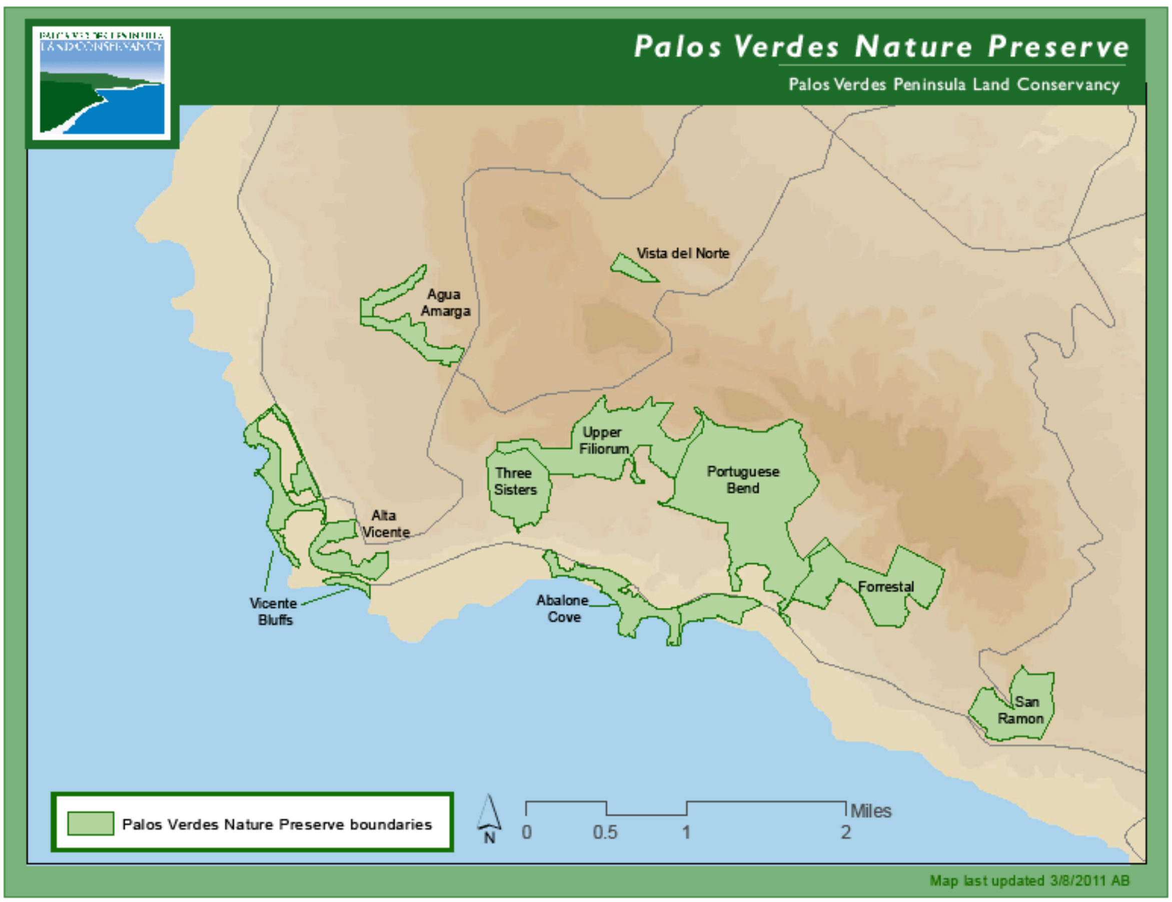

Figure 1a. Reserves in the Palos Verdes Nature Preserve in Rancho Palos Verdes (indicated in top of legend) surveyed during this study (and prior ones). Figure courtesy PVPLC.

Figure 1b. Aerial view of reserves. Clockwise, from upper left: L = Agua Amarga (formerly "Lunada Cyn."); N = Vista del Norte, U = Filiorum; C = Portuguese Bend (formerly "Canyons"); F = Forrestal; R = San Ramon; A = Abalone Cove (east and west); T = Three Sisters; B = Vicente Bluffs (upper and lower); V = Alta Vicente. Figure from Hamilton 2009, courtesy of PVPLC.

Table 1. Reserve acreage and total survey hours, 2012-18. Note that multiple sites were surveyed on some days (see Table 2 for additional detail).

Reserve	**Acres**	**Days surveyed 2012**	**Time afield 2012**	**Days surveyed 2015**	**Time afield 2015**	**Days surveyed 2018**	**Time afield 2018**
Abalone Cove	64	3	7:10	6	5:17	4	4:28
Agua Amarga	59	2	5:05	3	3:21	3	3:26
Alta Vicente	55	2	4:35	4	4:52	2	6:04
Forrestal	155	4	8:40	4	4:05	2	6:02
Portuguese Bend	399	4	12:00	5	6:51	2	11:42
San Ramon	95	3	4:10	2	2:05	2	3:07
Three Sisters/Filiorum (combined)	300	4	10:35	7	9:43	2	10:01
Vicente Bluffs	84	2	4:40	2	2:42	2	2:28
Vista del Norte	14	2	1:05	1	0:20	0	0
TOTAL	**1,225**	**26**	**58 hrs**	**34**	**c. 40 hrs**[4]	**19**	**c. 47 hrs**[5]

[4] Actual time surveying: 39:16

[5] Actual time surveying: 46:58

Table 2. Summary and description of survey effort in 2018. Number of birds listed is the maximum number of adults estimated (both visits). Letters after the reserve names refer to the abbreviations in Figure 1b.

Date	Survey round	Time	T. start (F)	T. end (F)	Sky/ Wind	Subarea	# CAGN	# CACW	
Abalone Cove (A)									
9 March	1	9:15-12:15	61	63	OC/3-5 mph		1	0	RAH
28 March	1	10:50-11:40	67	67	Clear/calm		4	0	DSC
18 May	2	10:34-10:54	N/A	N/A	N/A		3	0	DSC
31 May	2	10:26-11:44	62	67	PC/calm		2	0	DSC
Agua Amarga (L)									
17 Feb	1	11:03-11:15	69	60	Clear/calm	Eastern	0	0	DSC
28 Mar	1	7:42-9:01	57	57	Clear/calm		0	0	DSC
7 June	2	10:41-12:13	64	64	PC/calm		0	0	DSC
Alta Vicente (V)									
23 Feb	1	8:15-11:15	48	53	Clear/4-8 mph		4	2	RAH
24 May	2	8:20-11:24	58	59	Fog/calm		6	0	DSC
Forrestal (F)									
4 Apr	1	7:48-10:56	55	55	OC/calm		2	0	DSC
31 May	2	7:21-10:15	59	62	PC/0-3 mph		5	0	DSC
Portuguese Bend (C)									
21 Feb	1	8:20-11:20	50	57	Clear/3-5 mph	North	0	0	RAH
21 Feb	1	8:07-11:05	50	57	Clear/3-8 mph	South	2	0	DSC
18 May	2	8:20-11:40	61	66	OC/3-5 mph	North	2	0	RAH
18 May	2	7:56-10:20	60	65	OC/calm	South	3[6]	0	DSC
San Ramon (R)									
17 Feb	1	9:01-10:46	61	61	Clear/calm		2	0	DSC
7 June	2	9:04-10:26	62	64	OC/5-0 mph		2	0	DSC
Three Sisters (T)									
29 Mar	1	8:20-11:05	53	60	PC/3 mph		2	4	RAH
13 June	2	8:10-10:20	64	66	Fog/3-5 mph		6	3	RAH
Filiorum (U)									
29 Mar	1	8:13-10:51	58	58	Clear/calm		10	2	DSC
13 June	2	8:04-10:32	64	68	PC/calm		5	2	DSC
Vicente Bluffs (B)									
28 Mar	1	9:09-10:39	61	64	Clear/3-5 mph		4	0	DSC
24 May	2	11:33-12:31	59	61	OC/calm		6	0	DSC
Vista del Norte (N)									
N/A									

[6] An apparent family group (3-4 birds) was observed just south of the reserve boundary as the survey ended, which likely wandered down from the mapped territory in the southern portion of the reserve, and is not included here.

Results

We estimate 19 territories of California gnatcatcher, and five territories of cactus wren, during the 2018 breeding season (Table 3). This represents a drop of 54% and 74%, respectively, from the prior survey in 2015, and an even larger drop from the 2009-2015 average. Cactus Wren territories have never been estimated to be in the single-digits since monitoring began, and we only had birds survive the season at two (adjacent) reserves, Three Sisters and Filiorum. A former stronghold of the species on the peninsula, Alta Vicente reserve (13 territories estimated in 2012) had zero active territories by June 2018 (the single pair observed in February appeared to be absent as of March 2018). Agua Amarga Reserve, which had at least three territories each of California gnatcatcher and cactus wren in both 2009 and 2015, had zero territories in 2018 (we surveyed there on three separate days, and visited each "arm" of the reserve at least twice). The pattern noted in 2015 held in 2018, that cactus wren was not recorded at any reserve where absent on the prior survey. This year we can add three "new" extirpation locations for the species, Alta Vicente, Agua Amarga, and San Ramon. Maps showing all locations of California gnatcatcher and cactus wren observations, including nests, from the 2018 survey are provided in Appendix B, and are detailed in a table in Appendix C. No brown-headed cowbirds were noted during the 2015 (just one was detected in 2012).

Table 3. Estimates of territories of California gnatcatcher (CAGN) and cactus wren (CACW), by reserve.

		Abalone Cove	Agua Amarga	Alta Vicente	Forrestal	Port. Bend	San Ramon	Three Sisters	Filiorum[7]	Vicente Bluffs	Vista del Norte
2006 (65 CAGN/c. 30 CACW[8])											
	CAGN	8	4	8	12	14	7	8	N/A	4	0
	CACW	9 ad.	4 ad.	4 pr, 7 ad.	6 ad.	4 ad.	10 ad.	7 pr., 1 ad.	N/A	0	0
2009 (40 CAGN/18 CACW)											
	CAGN	3	3	5	5	7	4	4	N/A	10	0
	CACW	0	4	4	2	2	1	5	N/A	0	0
2012 (33 CAGN/38 CACW)											
	CAGN	5	1	5	9	6	1	2	0	4	0
	CACW	3	6	13	1	3	2	10	9	0	0
2015 (33 CAGN/19 CACW)											
	CAGN	1	3	4	7	6	2	2	4	4	0
	CACW	0	3	5	0	0	3	8	6	0	0
2018 (19 CAGN/5 CACW)											
	CAGN	2	0	2	2	3	1	2	4	3	0
	CACW	0	0	0[9]	0	0	0	3	2	0	0

[7] Filiorum was not censused prior to 2012; 10 territories of cactus wrens were detected on Filiorum in 2012 (preserve-wide total: 48).

[8] Assuming two adults per territory. Note that Dudek (2007) conducted three visits during the 2006 survey, while subsequent surveys made two.

Discussion

Overall, 2018 found the lowest numbers of both California gnatcatchers and cactus wrens since required every-three-year monitoring began in 2006. The reasons for this are not entirely clear, but it likely a combination of the following factors[10]:

- Crippling drought that started after 2012 and which has continued into 2018, which resulted in virtually no new foliage or flowering on shrubs/forbs by spring 2018 (and which likely reduced the available food tremendously);
- A relatively wet winter in 2016-17 that resulted in an explosion of weedy growth across the peninsula (esp. black mustard *Brassica nigra*) that altered the structure of the native low scrub habitat and rendered it less suitable for the two focal species;
- Unseasonably cool (and wet) conditions during early spring 2018 (in 2018, temperature data indicate that no survey date reached an air temperature in the 70s, only five days saw end temperatures >65F, and rain canceled several survey dates; by contrast, in 2015, 10 survey dates ended with temperatures at or above 70F);
- The continuing decline of cactus plants from drought and insect pests;
- The continued growth of invasive shrubs such as acacia (Acacia spp.) and others; and
- The continuing increase in predators such as Cooper's hawk (*Accipiter cooperii*) peninsula-wide.

It is also possible that the dramatic loss of cactus wrens is being accelerated by a genetic bottleneck, where viable young are not being produced at a rate that would sustain the population, and with essentially no immigration of new individuals, we're simply waiting for the remaining adults to die. Thus, these seemingly adverse environmental conditions may not be operating on a "normal" population, but one already struggling with low population size.

The following is a more detailed description of observations of California gnatcatcher and cactus wren by site, with reference to results from prior surveys.

<u>Abalone Cove</u>
Following the pattern of steep decline observed in 2015 when just a single California gnatcatcher territory (and no cactus wren) was noted, with one breeding territory again in the restored coastal sage scrub on the point near the center of the reserve (adult bringing in food to a likely nest site in May) (Figure 2). Encouragingly, this year (2018), we also noted a pair in a newer restoration area of the reserve west of here, where the PVPLC had been clearing weeds and planting native shrubs. The area around the main parking lot, and the trail down to the beach, continues to be unsuitable for either species, due to invasion by both non-

[9] A pair of cactus wrens were recorded here during the February survey (23 Feb. 2018); however, they were not observed during the subsequent survey (24 May 2018), and no reports beyond March 2018 have been entered into eBird.

[10] We base these insights on our own combined 70 year of birding/surveying experience in the Los Angeles region, and on conversations over the years with local biologists who have also worked with cactus wrens, including Dana Kamada, Barbara Kus, Milan Mitrovich, Kristine Preston, Tom Ryan, and Trish Smith.

natives such as acacia and large evergreen native shrubs such as lemonadeberry (*Rhus integrifolia*)[11].

For cactus wrens, we note that while wrens were absent in 2009, they recolonized in 2012, so it is probable that Abalone Cove is a somewhat peripheral site, supporting the species when the population on the peninsula is high, and winking out when fewer pairs are around. It is possible that (at least during "good years") it supports spillover pairs from the adjacent Filiorum Reserve, located just to the north across Palos Verdes Dr. However, we noted again that the cactus stands at Abalone Cove look even more sickly and sparse than in prior years, and clearly unsuitable for nesting wrens at this time[12]. The last pair of birds reported to ebird from Abalone Cove was in May 2013 (https://ebird.org/view/checklist/S14162696).

Figure 2. California gnatcatcher territories (white boxes), Abalone Cove. Note: far eastern portion of reserve was not visited in 2018.

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[11] The far eastern area of the reserve adjacent to Portuguese Bend is no longer part of the Nature Preserve, yet had at least one bird in 2006, was graded in 2009, and had recovered enough to support at least one territory in 2012. So, it is possible another pair was present here in 2018. Elsewhere on the reserve, again in 2018 essentially none of the archery range area appeared suitable for gnatcatcher, either because of vegetation clearing or due to drought causing the scrub to be extremely sparse.

[12] While vegetation was not quantitatively measured or assessed, the stands of cactus here were fairly short (i.e., 1-meter tall or lower), did not cover large, impenetrable blocks (as at Filiorum Reserve, for example), and appear to have shrunk in extent, based on "standing dead" individuals observed.

Agua Amarga

With no territories of either species, not much may be said about Agua Amarga. The habitat looks essentially unchanged here, though a relatively large area of weeds had been cleared within northern "arm" of Lunada Canyon (part of Agua Amarga Reserve), and the cactus stands throughout the reserve appear to have suffered due to weed invasion and drought (a phenomenon noted peninsula-wide). On a possibly positive note, a pair of cactus wrens was reported to ebird in April 2018 (https://ebird.org/view/checklist/S44439942), but the exact location was not noted.

Alta Vicente

Perhaps the most surprising change at all the reserves was at Alta Vicente, which had supported a relatively robust population of both California gnatcatchers and cactus wrens in prior years, but in 2018 was down to two – and possibly just one – territory of gnatcatchers and zero wrens (Figure 3); one of the two gnatcatcher pairs ("CAGN 2" at Alta Vicente) was not noted during the June visit, and while it may have fledged young and dispersed by the second survey round, it is possible that only a single (successful) gnatcatcher pair nested at Alta Vicente in 2018 (juveniles noted in June). The loss of cactus wren from this site seems part of a trend since 2012; as we wrote in the 2015 report, "several areas with fresh nests in 2012 were found to not support either nests or birds; thus, the drop in numbers is likely real, and was more similar to the estimate for 2009 (4 territories), and well below that estimated in 2006 (4 pairs plus 7 individuals)." The last pair reported to ebird at Alta Vicente was in March 2018 (https://ebird.org/view/checklist/S43840127).

It is likely that the continuing invasion of the cactus patch areas by weeds (including *Echium*) and acacia is not helping; as noted in 2015, "substantial stands of both cholla and prickly-pear cactus remain here, and while acacia shrubs continue to expand and overtake these native stands, wrens are continuing to build nests in cactus at the edge of these shrubs." It appears that these shrubs may have altered the cactus scrub community to such a degree that these birds could not persist. The increase in Cooper's hawk (*Accipiter cooperii*) may also be a factor, and multiple Cooper's hawks were noted each survey day throughout the study area, including directly over cactus wren habitat.

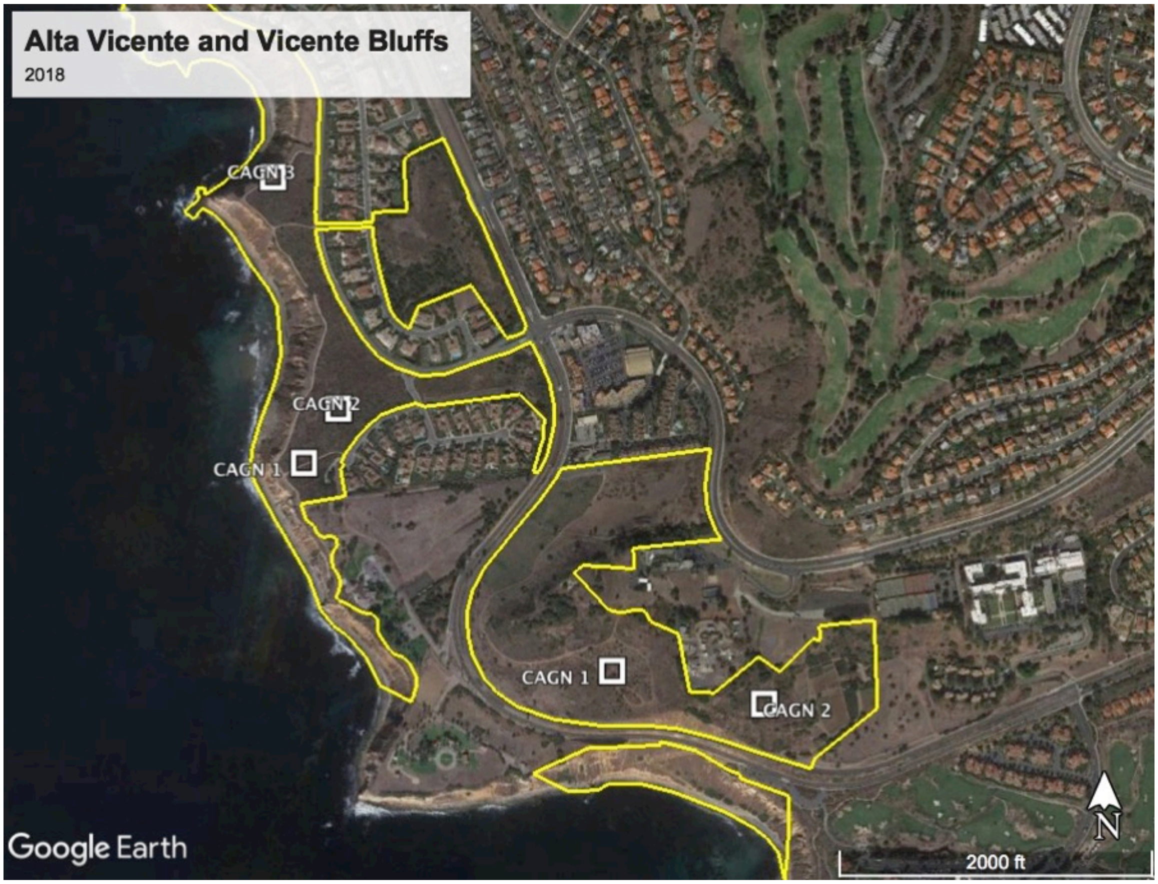

Figure 3. California gnatcatcher territories (white boxes), Alta Vicente (right) and Vicente Bluffs (left).

Forrestal

One of the steepest declines of either species came from Forrestal in 2018, when just two active California gnatcatcher territories were mapped (Figure 4), down from the 5-12 territories estimated since 2006. These territories appear to be in similar areas as in prior years, and at least one had young (female bringing in food 31 May) suggesting that several "peripheral" territories may have been lost, leaving only the highest-quality areas occupied, split between the western and eastern halves of the reserve.

As in 2015, cactus wren was entirely missed here, and the species therefore considered extirpated from the reserve, with no old or new wren nests observed. The last pair reported to ebird was in March 2011 (https://ebird.org/view/checklist/S7806016), with the last single here in March 2016.

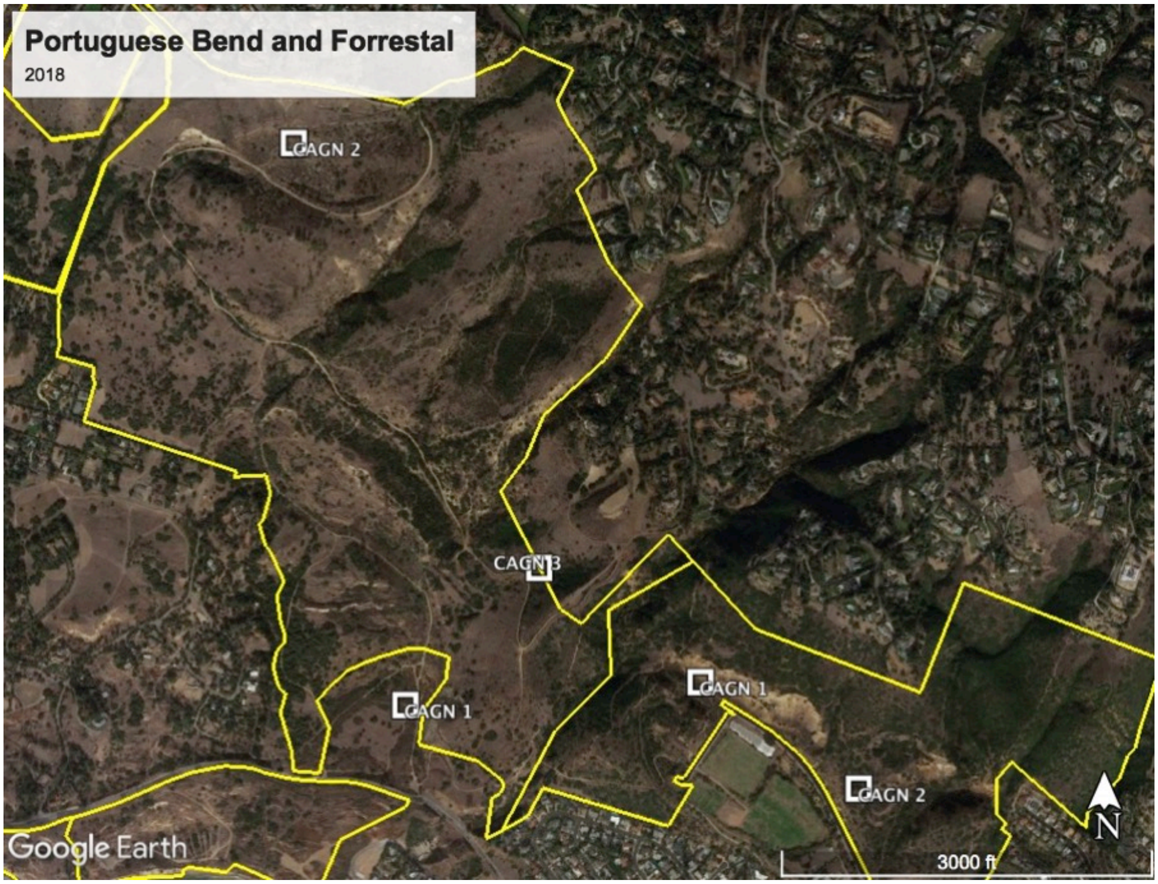

Figure 4. California gnatcatcher territories (white boxes), Forrestal (right) and Portuguese Bend (left).

<u>Portuguese Bend</u>
Unlike in prior surveys, the 2018 survey documented just 2-3 territories of California gnatcatchers (Figure 4) from what had been a local stronghold for the species (from 2015: the pattern of 5-7 territories, most in the southern half, with a smattering of sightings in the northern half, has held since (2009)". Interestingly, one of the two documented/potential nesting areas was within the large restoration area in the northern half of the reserve, which had not had regular sightings in prior surveys.

We note that active gnatcatcher territories were almost concentrated in restoration areas in other reserves, with both of the Abalone Cove territories in restored habitat, Alta Vicente one of the 1-2 territories in an active restoration area, and all three of the Vicente Bluffs territories in restoration habitat. This suggests that birds may be finding scarce resources in these "artificially productive" (via irrigation, weeding) zones.

The pair of cactus wrens noted along the "Barn Owl Trail" at the far eastern edge of Portuguese Bend on July 9, 2015 (CEM 2015) appear to have been the last known record of the species from the reserve (none have been reported to ebird since 2013).

San Ramon

One of the smallest reserves with relatively little coastal sage scrub, San Ramon was down to a single pair of California gnatcatcher 2018 (Figure 5), which was showing no indication of nesting. Therefore, this species – along with cactus wren, which went undetected here – may be vanishing from the reserve. While restoration planting evaluation was not part of our study, very little successfully restored habitat was noted. Whether traffic noise was a factor in this decline (as speculated on in 2015) is unknown, but given the steep declines at every other reserve, it would only be a contributing factor at most.

Figure 5. California gnatcatcher territories (white boxes); cactus wren territories (yellow boxes), San Ramon.

Three Sisters/Filiorum

Note: These reserves are directly adjacent to one another, and so will be discussed together here.

Together, these two adjacent reserves appear to support the last remaining pairs of cactus wrens on the peninsula, as well as an estimated six territories of California gnatcatchers. Additional gnatcatchers may be present in inaccessible areas that border each of these reserves (due to their loud calls, it is unlikely we missed any cactus wrens, however). Most troubling, however, is the loss of multiple pairs of cactus wrens at Three Sisters similar to the situation at Alta Vicente (from six pairs in 2015 to one pair in the upper portion of the reserve in 2018, and the outright loss of all four pairs in the canyon between the two reserves since 2012) despite the persistence of extensive cactus scrub.

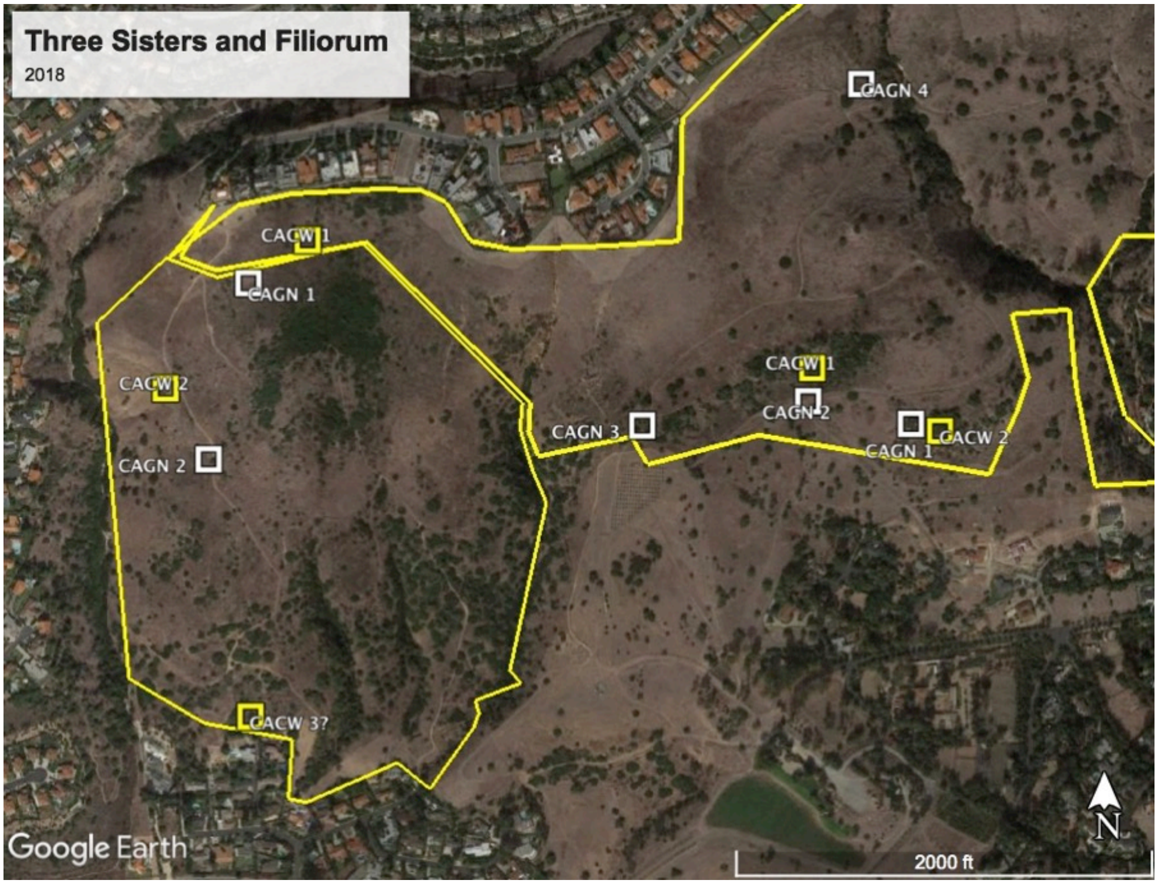

Figure 6. California gnatcatcher territories (white boxes); cactus wren territories (yellow boxes), Three Sisters (left) and Filiorum (right).

Vicente Bluffs
Unlike virtually any other reserve, Vicente Bluffs saw its population of California gnatcatcher remain stable, as in prior years, with three pairs in the main restoration area (Figure 2). The eastern portion of the reserve (located c. 100 meters east of the main reserve, and just west of Palos Verdes Dr., adjacent to a small debris basin; see Figure B-2) that supported a single territory in prior years ("territory 4" in 2015) was inaccessible in 2018 so was not surveyed (a "forest" of black mustard *Brassica nigra* blocked entry to the area that had supported coastal sage scrub in prior years). Cactus wren were again absent here, and with no large cactus patches, will remain so.

Additional notes

Reviewing what we wrote about the 2012 survey (Cooper 2013):

> "The apparent declines in gnatcatcher territories and increases in cactus wren territories should be interpreted with caution. These were based on as few as four visits, over four years, for many reserves, which is far too few to make claims of population trends. So, while these surveys are probably sufficient for presence/absence information – such as that neither species has colonized Vista del Norte reserve, or that California gnatcatcher may be nearing extirpation at Agua Amarga – numbers of both species vary naturally annually, and from decade to decade."

And,

> "Atwood et al. (1998b) noted [gnatcatcher] population swings of c. 50% during annual surveys on the peninsula from 1993-1997, ranging from a high of 56 in 1994 to a low of 26 pairs the following year (1995); our 2012 [and 2015] estimate of 33 pairs fits within this range, as does Hamilton's in 2009 (40 pairs) which used similar methodology. Therefore, only through repeated surveys over multiple years will we be able to assess trends with any confidence."

The 2018 estimate of 19 territories of gnatcatchers falls below Atwood's low of 26 pairs in 1995, though a handful of pairs are present on the peninsula in areas not visited by our survey (e.g., Trump National Golf Course/Ocean Trails, Terranea, and Shoreline Park, etc.). Still, it could be said that 2018 may be a very low ebb of a low period for the species. It is also clear that they are not "holding their own" at Agua Amarga or San Ramon, as suggested in 2015, but rather have retreated to a handful of the densest, most extensive vegetation at a handful of restoration areas (e.g., Vicente Bluffs) and in the most extensive blocks of natural habitat such as Three Sisters/Filiorum.

For cactus wrens, the situation can only be described as dire. A population down to five pairs – of any bird or animal species – is mathematically unlikely to sustain itself without immediate immigration of new individuals. In the case of the Palos Verdes peninsula, given its isolation, this seems essentially impossible in the long term (coastal cactus wren sightings away from nesting territories are virtually unknown in the Los Angeles area, even though stray gnatcatchers are fairly regular and widespread, albeit in low numbers). Even if there is still a pair or two in patches of cactus away from the reserves (e.g., at Ocean Trails, where a single bird was reported to eBird into June 2018), a population below c. 10 pairs is probably unsustainable.

Reversing this trend will be challenging, since these birds only breed in spring/early summer, and tend to occur in small, highly social groups that construct numbers of nests throughout large, adjacent patches of cactus. Having single pairs – much less individuals – at widely-spaced patches may not result in new young produced. Still, we would recommend the following measures be considered to attempt to save this population:

- Immediate and permanent removal (i.e., including the roots) of large acacia, *Caesalpinia*, *Echium*, and other invasive non-native trees and shrubs at Three Sisters, Filiorum, and Alta Vicente (the three last reserves that support/supported cactus wren);

- Installation of cactus wren nest boxes (e.g., similar to those deployed by Irvine Ranch Conservancy and other reserves in Orange County);
- Limiting human use of certain trails that run through prime cactus wren habitat, such as at Alta Vicente and Three Sisters, to reduce stress on the remaining pairs;
- Reducing supplemental irrigation of restoration zones near areas of recent cactus wren use (since this *may* be supporting/encouraging more weeds, more rodents, and possibly more raptors/predators);
- Removal of tall (non-native) trees on the periphery of the preserve known or likely to support nesting Cooper's hawks (e.g., pines, ficus); and
- (if necessary) Translocation of birds from Orange County or Ventura County populations to supplement the breeding population on the peninsula.

Translocation has proven successful in other parts of the birds' range, including Upper Newport Bay, where a population vanished and has subsequently been reestablished, and we will provide PVPLC with information on this as soon as we compile it.

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APPENDICES

Appendix A. Approximate walking routes taken by surveyor (Cooper) in 2015. Different colors represent routes taken on different survey days.

Figure A-1. Agua Amarga routes.

Figure A-2. Abalone Cove routes.

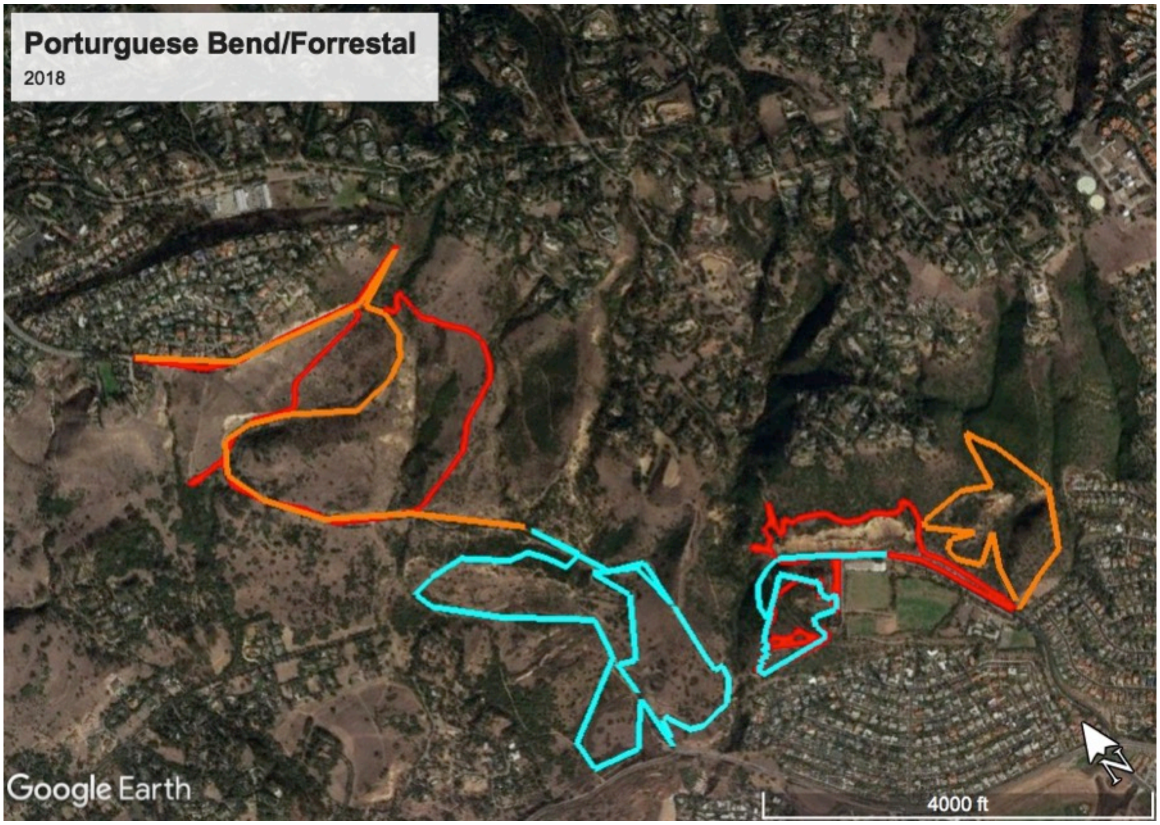

Figure A-3. Forrestal/Portuguese Bend routes.

Figure A-4. San Ramon route.

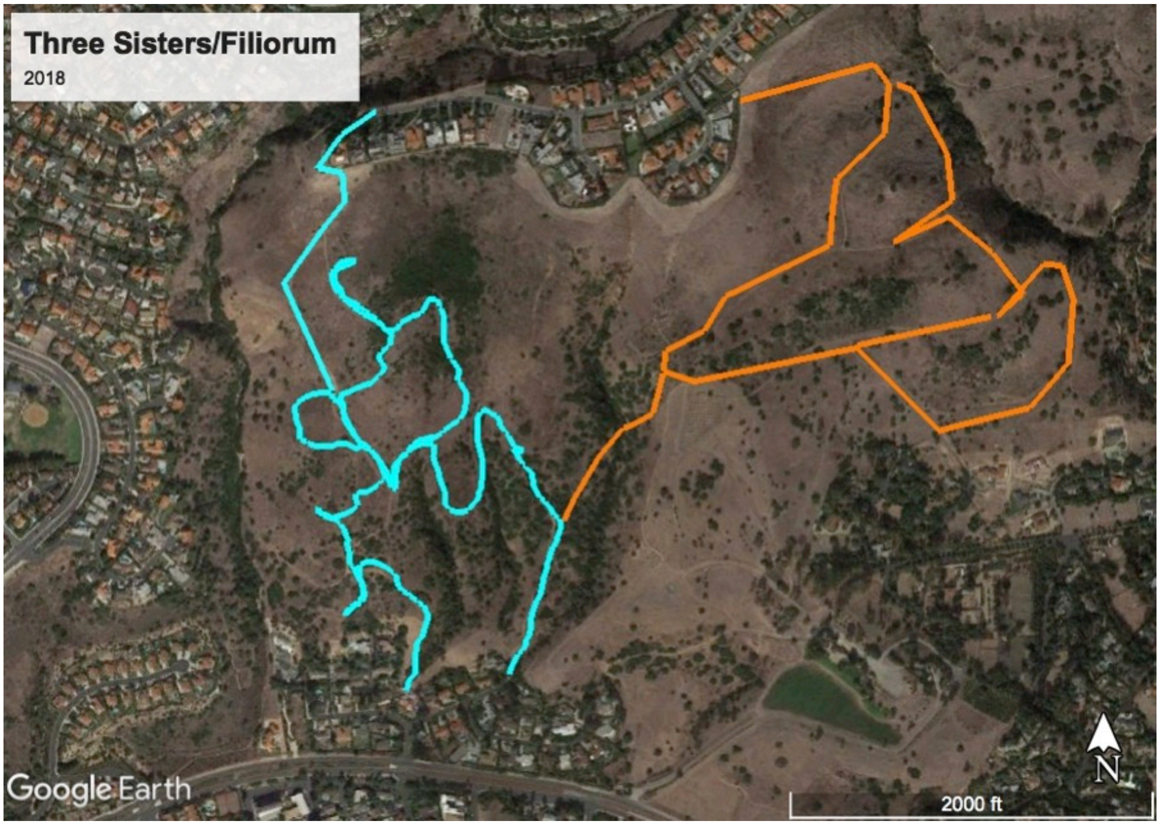

Figure A-5. Three Sisters/Filiorum routes.

Appendix B. Maps of all California gnatcatcher/cactus wren detections, including nests, 2018. Yellow pins represent gnatcatchers, green pins represent cactus wrens. Please refer to Appendix C for additional details on each.

Figure B-1. California gnatcatcher and cactus wren observations, Abalone Cove.

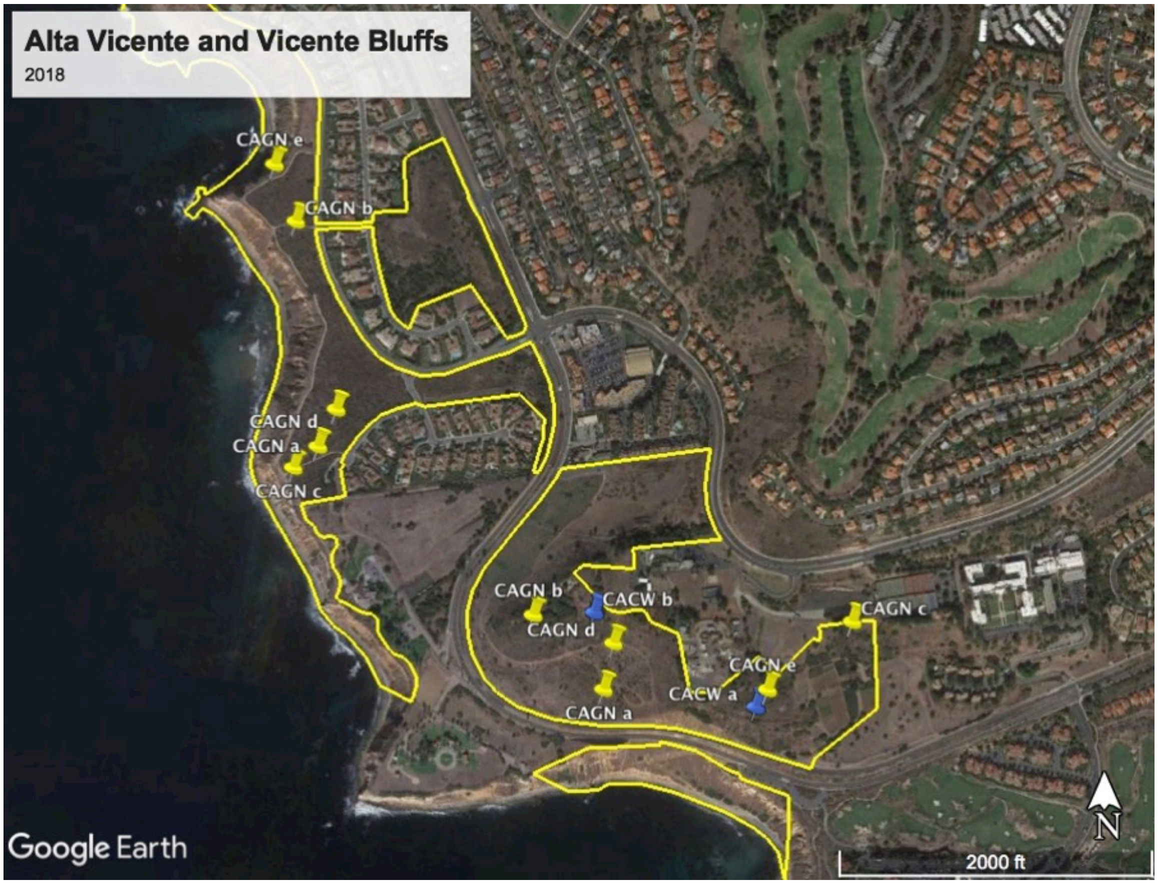

Figure B-2. California gnatcatcher and cactus wren observations, Alta Vicente (right) and Vicente Bluffs (left). Note that Vicente Bluffs is split into a main reserve and an "eastern extension".

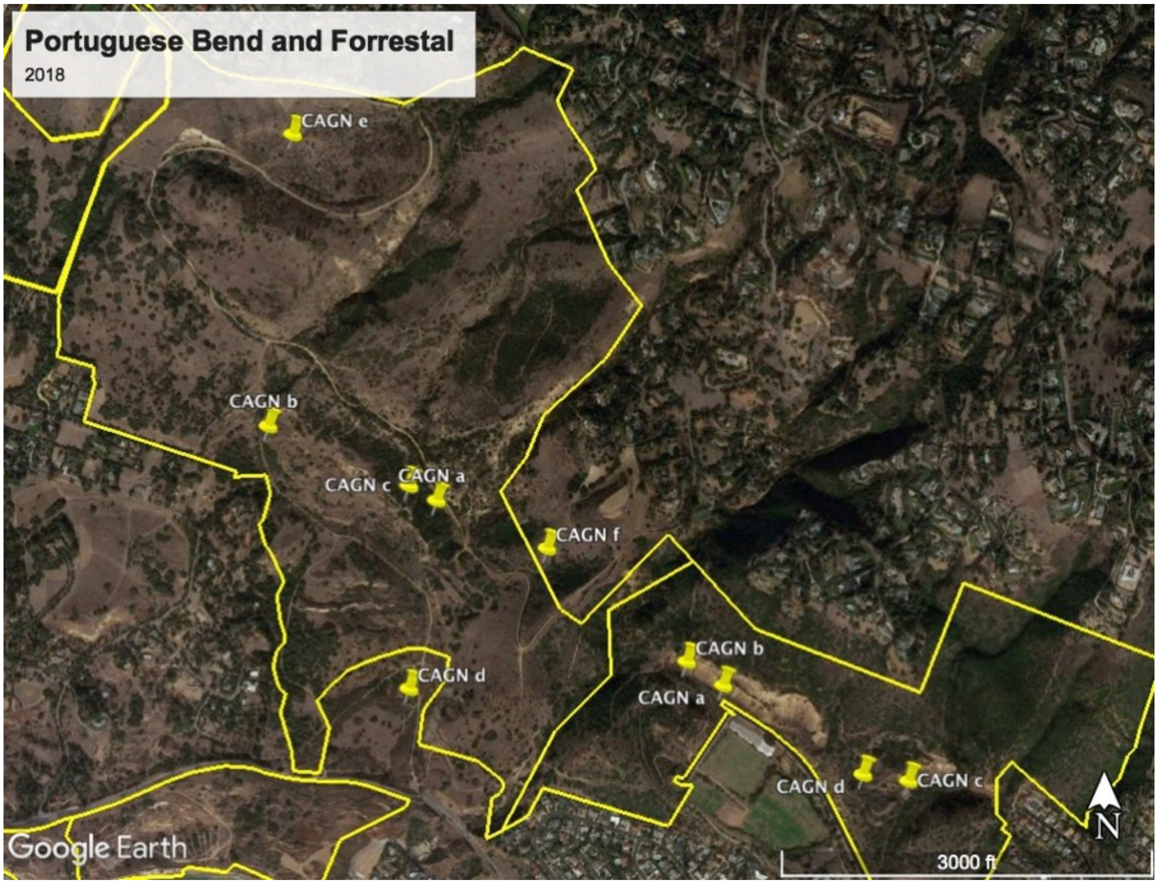

Figure B-3. California gnatcatcher and cactus wren observations, Forrestal and Portuguese Bend.

Figure B-4. California gnatcatcher and cactus wren observations, San Ramon.

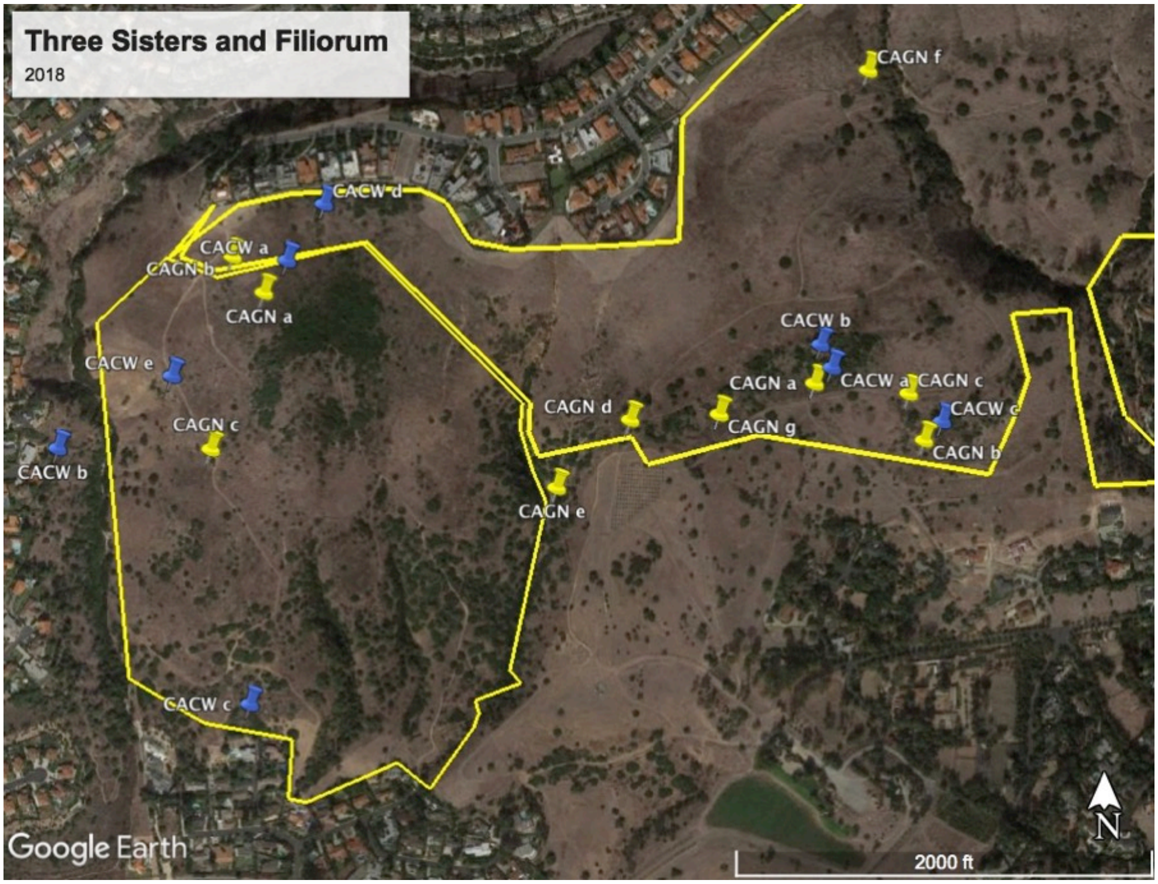

Figure B-5. California gnatcatcher and cactus wren observations, Three Sisters and Filiorum.

Appendix C. List of all California gnatcatcher ("CAGN" shaded) and coastal cactus wren (CACW) observations during 2015 survey, by reserve.
"Status": P = Pair; S = Single; F = Family group; J = Juvenile; N = Nest m/f = male/female; CF = Carrying food; NM = (Carrying) nesting material

Abalone Cove						
Subarea	**Date**	**Species**	**Status**	**Time**	**Notes**	
	19 Mar.	CAGN g	Sm	N/A		33.742252°, -118.376977°
	28 Mar.	CAGN a	P	10:58	Calling; male giving 'chuck' notes (nest?)	33.737537°, -118.374510°
	28 Mar.	CAGN b	Sm?	11:03	Poss. alarm calls (unseen)	33.738523°, -118.373875°
	28 Mar.	CAGN c	S	11:13	Loud mewing (heard from archery gate	33.740415°, -118.366707°
	18 May	CAGN d	S?	10:39	Silent, foraging; same or different bird called from slope just to north	33.738794°, -118.373269°
	18 May	CAGN e	P, N?	10:53	Female flew in w/ food	33.7380, -118.3740
	31 May	CAGN f	P	10:47	Flew in to rec., foraging; 3rd bird seen?	33.7401, -118.3753
Agua Amarga						
Subarea	**Date**	**Species**	**Status**	**Time**	**Notes**	
No CAGN or CACW were detected at Agua Amarga Reserve during 2018 survey						
Alta Vicente						
Subarea	**Date**	**Species**	**Status**	**Time**	**Notes**	
	23 Feb	CAGN d	P	N/A		33.743617°, -118.406280°
	23 Feb	CAGN e	P	N/A		33.742807°, -118.403049°
	24 May	CAGN a	P	8:42	"Frantically foraging"; made long flight north to main trail (heard again @ 11:07)	33.7428, -118.4065
	24 May	CAGN b	J (2), S	9:07	2 quiet J's, occ. calls; male seen same area 9:31.	33.7441, -118.4080
	24 May	CAGN c	Sm	10:28	Calling; long flight to east	33.7440, -118.4013
	23 Feb	CACW b	P			33.744148°, -118.406690°
	24 May	CACW a	N	N/A	Single fresh nest[13]	33.7425, -118.4033
Filiorum						
Subarea	**Date**	**Species**	**Status**	**Time**	**Notes**	
	29 Mar.	CAGN a	P, Sm	9:10	Mewing pair @ fence corner (male w/ line above eye); 2nd male (partial cap) just south of pair called 1x and flew c. 80 m south into	33.751876°, -118.378685°

[13] This appears to have been the last Cactus Wren nest in the reserve, presumably built in early spring (March?) 2018 and then unused as the last remaining pair was extirpated. At least 3 old/dilapidated nests observed 5/24 in the northeastern corner of the reserve (near the tennis courts), but not in use, and no birds were detected during the May survey.

					pepper.	
	29 Mar.	CAGN b	S(f?)	9:26	Mewing, flying around	33.751129°, -118.376957°
	29 Mar.	CAGN c	P	9:32	Single, then 2nd bird joined from north side of cactus patch	33.751744°, -118.377200°
	29 Mar.	CAGN d	P	10:09	Resp. to call	33.7514, -118.3816
	29 Mar.	CAGN e	P	10:27	Foraging slowly up cyn.; atypical habitat	33.7503, -118.3828
	13 June	CAGN f	P?	8:10	Two birds, one possibly CF, quiet mewing; no resp. to rec., moved east	33.7560, -118.3778
	13 June	CAGN g	F	9:30	1st heard from distance, then narrowed-down loc. Male (alarm call) + 1-2 others	33.7515,-118.3802
	29 Mar.	CACW a	P, N	9:10	Adult w/ NM, 2nd adult calling c. 20 m west.	33.7521, -118.3784
	13 June	CACW b	S, N	9:00	Ad. calling @ (old?) nest. 2nd bird possibly heard calling same patch @ 10:03.	33.7524, -118.3786
	13 June	CACW c	S, N	9:24	Strong response to recording; 2 nests in patch, one old, the other fair condition	33.751372°, -118.376679°
			Forrestal			
Subarea	**Date**	**Species**	**Status**	**Time**	**Notes**	
West	4 Apr	CAGN a	P	9:22	Male w/ full cap	33.742073°, -118.351733°
West	31 May	CAGN b	P	8:31	Flew in to rec.	33.7426, -118.3527
East	31 May	CAGN c	Sf	9:39	Foraging constantly, didn't resp. to rec.	33.739953°, -118.346801°
East	31 May	CAGN d	P, N?	10:02	Female CF	33.7401, -118.3480
			Portuguese Bend			
South	21 Feb	CAGN a	S?[14]	09:58	See note	33.746171°, -118.359365°
South	21 Feb	CAGN b	S	10:18	Distant mew heard from general area	33.747818°, -118.363846°
South	18 May	CAGN c	S	9:16	Mewing	33.7465, -118.3601
South	18 May	CAGN d	S,S (J?)	9:52	Both probable J, 1 w/ odd alarm-type call	33.7420, -118.3601
North	18 May	CAGN e	Sm, N	N/A	Male at nest	33.754285°, -118.363195°
North	18 May	CAGN f	Sm	N/A		33.745111°, -118.356422°
			Vicente Bluffs			
Subarea	**Date**	**Species**	**Status**	**Time**	**Notes**	
	28 Mar.	CAGN a	P,Sm	9:37	Pair (quiet, furtive) plus single active/vocal male	33.747049°, -118.412482°
	28 Mar.	CAGN b	Sm	9:49	Calling, unresponsive	33.750979°, -118.412948°
	24 May	CAGN c	P, FL?	11:40	Flew in from north (across trail), frantically foraging, FL possibly heard nearby (faint buzzing calls)	33.7467, -118.4130
	24 May	CAGN d	P	12:02	Resp. to call (2nd pair?);	33.7477, -118.4121

[14] "Gnatcatcher sp." flew across trail (twice), called once (equivocal as to species), and vanished.

					flew in from northeast	
	24 May	CAGN e	P	12:23	Flew in in resp. to call	33.7520, -118.4134
San Ramon						
Subarea	**Date**	**Species**	**Status**	**Time**	**Notes**	**Lat/Long**
	17 Feb	CAGN a	P	10:08	Foraging quietly	33.728661°, -118.332498°
	7 June	CAGN b	P	9:46	No CF observed; male flew in to rec. and did odd wing-tremble display; silent; neither actively foraging	33.7285, -118.3337
Three Sisters						
Subarea	**Date**	**Species**	**Status**	**Time**	**Notes**	
	29 Mar	CAGN a	P	N/A		33.753067°, -118.387376°
	13 June	CAGN b	F	N/A		33.753540°, -118.387870°
	13 June	CAGN c	P	N/A		33.751010°, -118.388215°
	29 Mar	CACW a	P	N/A		33.753487°, -118.387016°
	29 Mar	CACW b	S	N/A	Male, calling	33.751018°, -118.390635°
	29 Mar	CACW c	S	N/A	Male, calling	33.747658°, -118.387603°
	13 June	CACW d	S	N/A	Male	33.754227°, -118.386432°
	13 June	CACW e	P	N/A		33.751969°, -118.388832°

2.3 EL SEGUNDO BLUE BUTTERFLY SURVEYS

El Segundo Blue Butterfly (*Euphilotes battoides allyni*) Survey Results for the Palos Verdes Nature Preserve 2016

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October 26, 2016

Submitted to:

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SUMMARY

Surveys for the El Segundo blue butterfly (ESB, *Euphilotes battoides allyni*) were conducted within preserves managed by the Palos Verdes Peninsula Land Conservancy (Conservancy) under USF&WS Recovery Permit TE-217663-1. The butterfly is listed as Federally Endangered and is included in California's Wildlife Action Plan as a State-Endemic Special Status Invertebrate. Within the Palos Verdes Nature Preserve the butterfly inhabits the steep ocean bluffs around Point Vicente. Due to the ESB's endangered status, it is governed by the Palos Verdes Nature Preserve Natural Community Conservation Planning/Habitat Conservation Plan (NCCP/HCP) that mandates triennial surveys for long-term population trending. New ESB habitat has been added to the Palos Verdes Nature Preserve including Alta Vicente Reserve (2008 to present), Vicente Bluffs Reserve (2012 to present), Pelican Cove (2009), and Abalone Cove Reserve (2013).

Thirteen sites within the Palos Verdes Nature Preserve were surveyed for ESB presence and the number and phenological status of the ESB host plant sea-cliff buckwheat (*Eriogonum parvifolium*). Two sites lacked sea-cliff buckwheat plants and were not monitored following the initial visit. The total number of ESBs observed, 30, was twice the number seen in 2015, a very encouraging trend. All butterflies observed were seen within the Vicente Bluffs Reserves at Sites 3, 14, and 15. Host plants installed at Sites 14 and 15 in 2013 had gained their mature canopies, hosting numerous individual ESBs as a result.

The El Segundo blue butterfly readily utilizes sea-cliff buckwheat plants when added to areas near existing populations. While the canopies of the host plants had increased, the overall number of plants decreased substantially between 2014 and 2016. The loss was apparently due to drought, underscoring the importance of restoration projects for the butterfly. There was unexplained loss of several productive host plants between 2015 and 2016 at Site 14. Efforts to identify the cause and prevent future loss should be undertaken.

EL SEGUNDO BLUE BUTTERFLY

1 INTRODUCTION: EL SEGUNDO BLUE BUTTERFLY

The El Segundo blue butterfly (*Euphilotes battoides* allyni, ESB) is a member of the *Euphilotes battoides* complex that utilizes wild buckwheat species (*Eriogonum* spp.). The ESB is unique to this group in that it is dependent upon a single buckwheat species, sea-cliff buckwheat (*Eriogonum parvifolium*), for its entire life cycle (egg, larvae, pupae, and adult) (Shields 1975, Mattoni 1990). Although the ESB possesses unique, but microscopic morphological characters, it is otherwise virtually identical to the Bernardino blue (*Euphilotes bernardino*) (Pratt 2006a). In the field, the butterfly is identified by its association with sea-cliff buckwheat (formerly sea-cliff buckwheat, the new common name assigned in Baldwin et al. 2012).

Historically, the ESB inhabited dune habitat that ranged continuously along the coast from Santa Monica to Malaga Cove at the Palos Verdes Peninsula (Mattoni 1990). Intensive development that started in the 1890's has significantly reduced the habitat, leaving less than 10% of the dunes that is highly fragmented (Mattoni 1993). With the loss of habitat, ESB populations declined and it was listed as endangered in 1976 (U.S. Fish and Wildlife Service (USF&WS) 1976).

The recovery plan for ESB identified four recovery units: Ballona, Airport Dunes, El Segundo, and Torrance (USF&WS 1984). In the 2008 El Segundo Blue Butterfly 5-year Review, the butterfly was found to be absent at the Ballona Unit and present at all other units (USF&WS 2008). The Review considered that by 2007 ESB populations had increased at their respective recovery units; Airport Dunes and Torrance and colonized habitat at recent dune restoration projects at Dockweiler Beach, Redondo Beach, and Torrance Beach (in years 2006, 2004, and 2003, respectively). Since the 2008 review, ESBs were found at Ballona Wetlands (Karina Johnston, The Bay Foundation, personal communication). More encouraging news was the discovery of ESB on the bluffs around Point Vicente on the Palos Verdes Peninsula, a site not included in the recovery plan (Osborne 2001 and Pratt 2006b). Despite occupying a different habitat, steep shale bluffs instead of loose dune sands, the butterflies at this latter site were found solely on sea-cliff buckwheat and are considered El Segundo blue butterflies until taxonomic uncertainties of this genus are clarified (USF&WS 2008). Due to the fragmented populations and continued habitat degradation threats, ESB retains the endangered status (USF&WS 2008).

Within the Palos Verdes Nature Preserve, ESBs have been observed at Vicente Bluffs in front of the Oceanfront Estates and Pelican Cove (formerly Fishing Access) (Dalkey 2009, 2014, and 2015). Because Pelican Cove and Vicente Bluffs are reserves in the Palos Verdes Nature Preserve, they are covered under a Natural Community Conservation Plan (NCCP/HCP) that requires triennial ESB monitoring. In 2009, nine individuals were observed in a single day in early July during a preliminary survey, while no ESBs were observed at the base of the bluffs in 2014 and only two observed on top of the bluffs within restoration sites (Dalkey 2009 and 2014). In 2015, a total of 15 individuals were observed at Vicente Bluffs, Pelican Cove, and Alta Vicente Reserves in habitat areas containing planted sea-cliff buckwheat (Dalkey 2015).

2 METHODS: EL SEGUNDO BLUE BUTTERFLY

This work was conducted under USF&WS Recovery Permit TE-217663-1. Conservancy Stewardship Associate Josh Weinik accompanied me during each survey.

The ESB surveys described in this report were conducted to survey habitat areas in the Vicente Bluffs, Pelican Cove, Abalone Cove, and Alta Vicente Reserves as required by the NCCP/HCP. Areas containing sea-cliff buckwheat were patchy at the various sites, rendering traditional Pollard transects (Pollard 1977, Pollard and Yates 1983) inappropriate. Instead, point observations were made at individual patches of habitat within each site. During each visit, condition of the sea-cliff buckwheat bloom was assessed along with number of butterflies and, later in the season, evidence of any larval presence.

Point observations were conducted at a total of 11 sites at four different locations:

- Vicente Bluffs – Sites 2-3, 5-6, 14, and 15 (Appendix A, Figure A-1),
- Pelican Cove (formerly called Fishing Access) – Sites 11 and 12 (Appendix A, Figure A-1),
- Abalone Cove – Sites 7, 8, and 13 (Appendix A, Figure A-2), and
- Alta Vicente – Site 16 (Appendix A, Figure A-1).

3 RESULTS: EL SEGUNDO BLUE BUTTERFLY

A summary of all observations and comments are presented in Appendix A, Table A-1. Images from each site are provided in Appendix A, Figure A-3. Field datasheets are provided in Appendix B. Temperatures and wind conditions were optimal during all surveys. Additionally, light fogs, cluds, and overcast conditions provided higher humidities (not measured) to the benefit the buckwheat plants.

Access to Abalone Cove Site 9 was not surveyed due to restrictions in public access following a recent landslide that occurred on the slope resulting in hazards from falling rocks and unstable cliffs (City of Rancho Palos Verdes (RPV) 2016). Host plant at Site 9 occur within the vicinity of the landslide occurred and can only be observed from the base of the cliff directly below the landslide.

Sites 6 and 7 were visited only once during the survey. No live sea-cliff buckwheat plants were present at these sites, only a couple of remnant branches of dead plants that had had been alive in previous years. At the time of the first visit, Site 4 was combined with Site 5 for two reasons: first, slope failure had occurred since the last visit in 2014, impairing visibility at the site (Figure 1) and, secondly, the close proximity to Site 5 is problematic for discerning the boundaries of the two sites.

Figure 1. Slope failure, as indicated by large rocks visible on the cobbled beach below Site 4 (yellow arrows) complicated views of the site (green arrow).

The number of sea-cliff buckwheat plants were counted on June 7 along the bluff tops and on June 28 at the base of the bluffs. Total numbers of plants are summarized in Table 1, including those observed in 2014 and 2016.

Table 1. Summary of host plants present at survey transects for 2014 and 2016 and counts of PVB at each transect observed during the 2016 survey.

	Sea-cliff Buckwheat		El Segundo Blue Butterflies 2016				
Reserve – Site	**Total 2014**	**Total 2016**	**Female**	**Male**	**Unknown**	**Larvae**	**Total**
Vicente Bluffs – 2	23	6	0	0	0	0	0
Vicente Bluffs – 3	60	45	0	1	0	0	1
Vicente Bluffs – 4*	49	n/a	n/a	n/a	n/a	n/a	n/a
Vicente Bluffs – 5	19	11	0	0	0	0	0
Vicente Bluffs – 6**	1	0	0	0	0	0	0
Vicente Bluffs – 14	136	18	3	5	1	2	11
Vicente Bluffs – 15	19	28	6	9	0	3	18
Pelican Cove – 7**	0	0	n/a	n/a	n/a	n/a	n/a
Pelican Cove -11	18	7	0	0	0	0	0
Pelican Cove -12	22	6	0	0	0	0	0
Abalone Cove – 8	16	9	0	0	0	0	0
Abalone Cove – 9	56	n/a	0	0	0	0	0
Abalone Cove – 13	185	75	0	0	0	0	0
Alta Vicente – 16	34	33	0	0	0	0	0
Total	**638**	**238**	**9**	**15**	**1**	**5**	**30**

* Due to the close proximity to Site 5 and paucity of host plant, this Site 4 was combined with Site 5 in 2016.
** No sea-cliff buckwheat plants were present at Sites 6 & 7, so they were not revisited in 2016.
n/a Sites not surveyed.

A total of 30 butterflies, including 5 larvae, were observed, all at Vicente Bluffs (Figure 5, Table 1). Additional butterfly species observed included pygmy blues (*Brephidium exilis*) and gray hairstreaks (*Strymon melinus*). Additionally three ESBs were seen around the sea-cliff buckwheat plants along the Terranea Resort's adjacent parking lot twice during the survey and three ESB larvae were observed in the native garden at the Point Vicente Interpretive Center (see Comments, Appendix A, Table A-1). Both of these locations close to survey sites, but are not part of the Palos Verdes Nature Preserve.

The first butterfly was observed on May 25, when temperatures were near optimal (18-19°C) and the host plant bloom was just starting. The flight season began in earnest by June 13 when the host plant bloom had begun with 10% of the plants in flower. Adults were observed from June 13 through July 7 after which only larvae were observed. At this point, the host plants were generally at 100% flower and soon afterwards began going to seed.

Figure 5. A newly eclosed male being attacked by another male during the entire observation period at Site 15 on June 13.

Only one ESB, a male, was observed at the base of the Vicente Bluffs at Site 3, where sea-cliff buckwheat was the most abundant. Because this site is located directly below Site 14, where several ESBs were observed, it seemed logical that this male flew down to the base of the cliff to the host plants. Although we looked for females and also larvae, none was observed.

4 DISCUSSION

The encouraging news from this survey is the large increase in the number of ESB butterflies observed at Vicente Bluffs where sea-cliff buckwheat plants had been installed in 2013.

Generally, the ESBs appeared early in their host plants' flower development, with their bloom develop at 10% or greater, save for the early (May 25) appearance of a single butterfly. This is consistent with observations by Sheilds (1975) who noted that adults are most common during peak bloom and become less common as the peak bloom fades.

The 2016 survey provided an excellent example of the butterfly's abundance relationship with peak host plant bloom, in particular at Site 15. This site has two main clumps of sea-cliff buckwheat separated by other native plant species (Figure 2). Host plant developed their bloom first on the eastern side where ESBs were first observed on June 13. The western plants developed their blooms later, where the ESBs were first observed two weeks later (for detail, see comments for June 24 in Appendix A-2).

At the base of Vicente Bluffs, the bloom pattered differed from that observed in prior years (2009 and 2014). Previously it was observed that plants on the bluff tops bloom earlier than those on west facing cliffs that receive, likely a result of differences in sun exposure (Dalkey 2014). This year, the plants at the base of Vicente Bluffs were in full bloom on June 28, except for Site 3. There, the site is located in deep shade and bloomed later than the plants exposed to full sun.

Historically, the flight season of the ESB has been considered to occur from mid-June into August or September (Arnold 1990 and Mattoni 1990). In his description of the ESB, Shields (1975) stated that the flight season ranges from early July to late September. As discussed in Dalkey 2014 and 2015, and during this survey, the flight season has consistently occurring a month sooner, starting in late May to early June, then terminating in late June or early July as the sea-cliff buckwheat's peak bloom diminishes.

Ancillary observations at the nearby Point Vicente Interpretive Center's Native Plant Garden provided insight into bloom onset and length. There, new sea-cliff buckwheat had been planted and irrigated regularly, including through June and July. The blooms on these plants began later and lasted longer than at the monitoring sites, indicating water availability has an impact on host plant and likely the butterfly's flight season. While walking past the garden, we observed ESBs utilizing these plants, and, subsequently, their larvae on a couple of the garden's plants. Similarly, when the plants at the Terranea parking lot were irrigated, they hosted a longer, more abundant flight season. A number of sea-cliff buckwheat plants died at the Terranea site, indicating that supplemental irrigation was withdrawn in 2016.

Figure 2. Close-up view of Sites 14 and 15, showing Site 15's main clumps at the west and east, and the Pt Vicente Interpretive Center's Native Plant Garden (purple arrows).

As shown in Table 1, the number of host plants was greatly reduced between 2014 and 2016, their loss apparently resulting from the drought. Several sites contained skeletons of dead plants that had been observed in previous years (Figure 3), some of which were previously considered to be moribund (Dalkey 2014). While all sites had a decrease in the number of host plants (Table 1), the greatest impacts were observed at the base of Vicente Bluffs. The total number of plants observed in 2014 was 152, while only 62 were observed in 2016. There, both Site 6 and 7 lacked sea-cliff buckwheat. Sites 2, 3 and 5 contained substantially fewer plants. A similar trend was observed at Pelican Cove, Abalone Cove, and Alta Vicente. There was no recruitment observed at any site.

Figure 3. An example of a sea-cliff buckwheat skeleton. Young individuals observed in 2014 are seen to the left and right of the dead plant.

An unexplainable negative impact on the sea-cliff buckwheat plants occurred on the bluff top at Site 14 around the vicinity of the rockwork and fencing directly above the drainage outlet at the base of the cliff. These plants were in good condition and were used by the El Segundo blue butterfly in 2015 (Figure 4). In 2016, only a few plants remained along the fence line, with several plants missing that were present in 2015 (Figure 5). Skeletons from dead plants generally persist for a year or two, but no skeletons were found at this location in 2016. These plants could encroach on the adjacent trail's pathway. Perhaps they were removed by maintenance workers that were grooming the pathway?

It is very encouraging that El Segundo blue butterflies readily utilize the new host plants at Point Vicente. Plants that were installed in 2013 at Sites 14 and 15 have developed mature canopies, thereby increasing their capacity to host butterflies. The doubling of the numbers of ESBs observed in 2016 fully illustrates the importance of having host plants present along the bluff tops at the Vicente Bluffs Reserve.

Figure 4. Photo taken in 2015 showing the location of sea-cliff buckwheat (blue arrow) below the fence along the pathway at Site 14.

Figure 5. A close-up of Site 14 taken in 2016 shows all sea-cliff buckwheat plants are absent at this location. The blue arrow shows plants still present but lying adjacent to the pathway in the distance.

5 RECOMMENDATIONS

Future NCCP/HCP triennial surveys for the El Segundo blue butterfly should incorporate steps to accommodate differences in flight seasons on bluff top and cliff faces, including:

- Incorporate adaptive monitoring by monitoring weather conditions and host plant quality prior to setting out.
- Initiating the bluff top surveys in early June and continue them into July.
- Periodically check host plants at the base of the bluffs prior to conducting the ESB surveys.

Also, it is important to work with the City of Rancho Palos Verdes to insure that no host plants are accidentally removed and that trimming of the plants take place after August.

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APPENDIX A – EL SEGUNDO BLUE BUTTERFLY

TOPOGRAPHIC MAP, DATA, AND SURVEY IMAGES

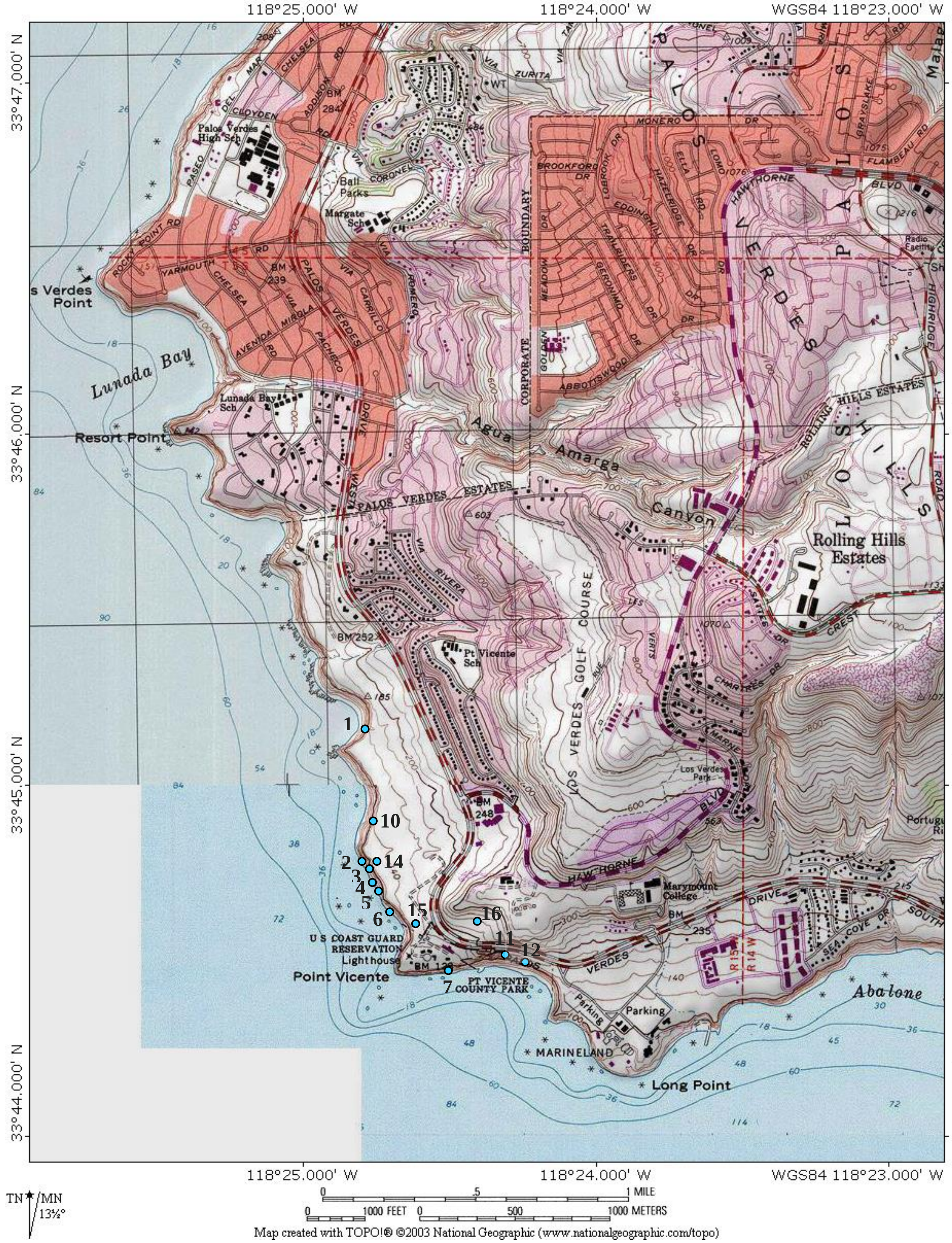

Figure A-1. Topographic map of Pt. Vicente and Pelican Cove (shown as Pt Vicente County Park) and observation sites.

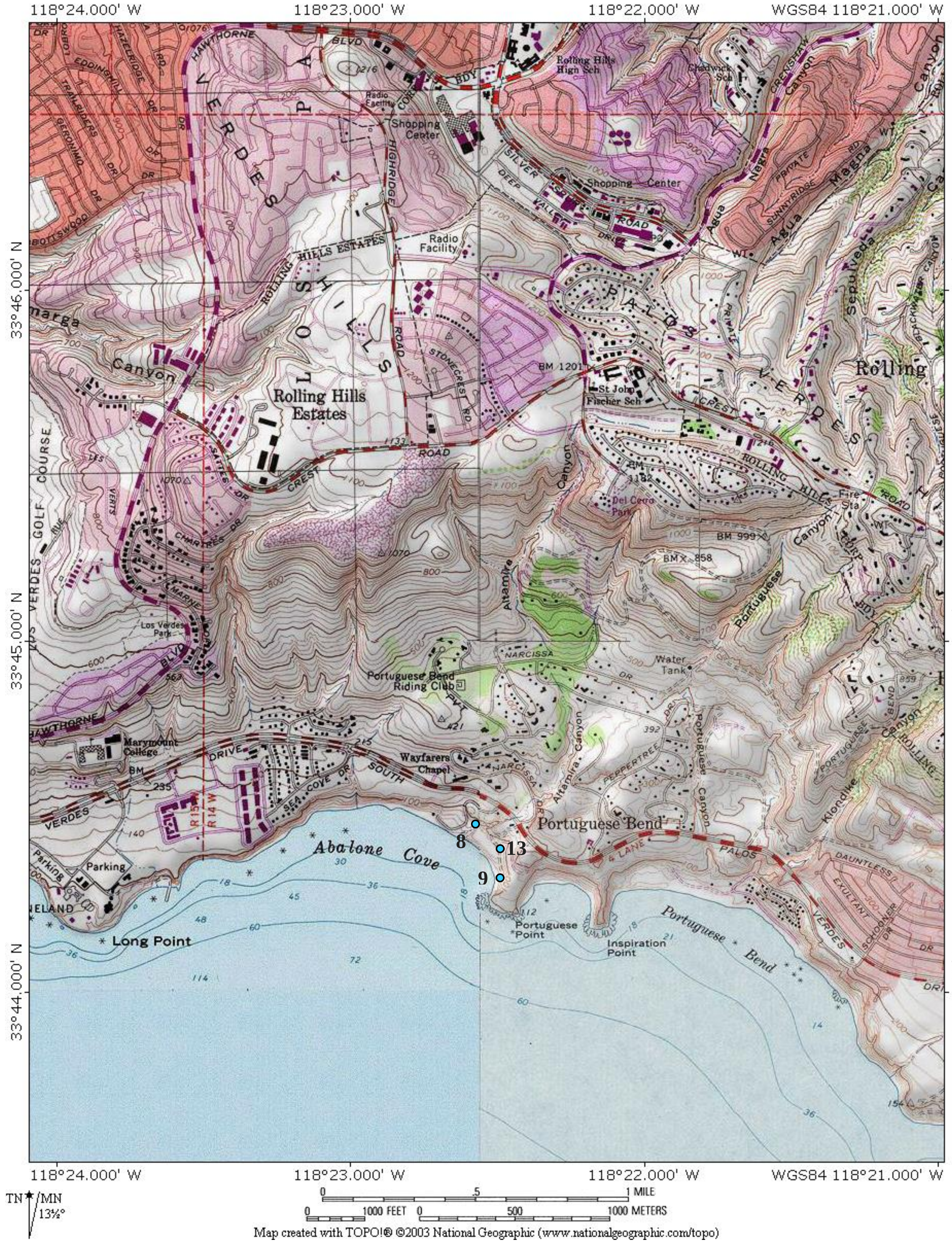

Figure A-2. Topographic map of locations of sites surveyed in the Palos Verdes Nature Preserve, Abalone Cove, Sites 8, 9, and 13.

Appendix A-2. List of butterfly observations along each transect from surveys conducted May 25 through August 2, 2016, where F = Female, M = Male, Ukn = Sex undetermined, Larv = Larvae, and Flr = Flowering.

Preserve	Date	Site	Time	Temp °C	Wind m/s	Sky	% Cloud Cover	El Segundo Blue Counts					Plant Phenology	Comments
								F	M	Ukn	Larv	Total		
Vicente Bluffs	25-May-15	14	13:04	19	11.6	Pcloudy	60	0	0	1	0	1	< 0% Flr	ESB probably a male. Number of host plants reduced.
	25-May-15	15	13:28	18	10.8	Pcloudy	60	0	0	0	0	0	< 0% Flr	Plants non-flowering, inflorescences developing
Pelican Cove	25-May-15	11	13:48	18	11.0	Pcloudy	60	0	0	0	0	0	< 0% Flr	Plants non-flowering, fewer host plants
	25-May-15	12	13:58	18	10.0	Pcloudy	50	0	0	0	0	0	< 0% Flr	Plants non-flowering, fewer host plants
Alta Vicente	25-May-15	16	14:41	18	8.0	Pcloudy	40	0	0	0	0	0	< 0% Flr	Plants non-flowering, inflorescences present
Vicente Bluffs	2-Jun-16	14	10:05	19	3.5	Fog	100	0	0	0	0	0	< 0% Flr	Inflorescences developing
	2-Jun-16	15	10:25	20	6.5	Fog	100	0	0	0	0	0	< 0% Flr	PVIC (not part of survey) has 30 newly installed plants
Pelican Cove	2-Jun-16	11	11:17	20	4.0	Light Fog	25	0	0	0	0	0	< 0% Flr	Plants non-flowering, 2 of total moribund
	2-Jun-16	12	11:25	20	10.0	Pcloudy	40	0	0	0	0	0	< 0% Flr	6 inflorescences developing
Abalone Cove	2-Jun-16	8	13:03	22	5.3	Clear	100	0	0	0	0	0	< 0% Flr	Inflorescences developing
	2-Jun-16	9	11:50											Access blocked by authorities because a recent landslide at Site 9 has destablilized slope.
	2-Jun-16	13	11:56	21	11.2	Clear	90	0	0	0	0	0	< 0% Flr	Inflorescences developing
Alta Vicente	2-Jun-16	16	12:32	21	8.5	Fog	5	0	0	0	0	0	<5% Flr	
Vicente Bluffs	9-Jun-16	14	10:08	18	1.9	Fog	100	0	0	0	0	0	<5% Flr	Last year's seedlings gone
	9-Jun-16	15	10:26	18	0.9	Ovcst	100	0	0	0	0	0	<5% Flr	
Pelican Cove	9-Jun-16	7	11:25	18	1.5	Ovcst	100	0	0	0	0	0	Absent	No host plant remaining, site will not be revisited in 2016
	9-Jun-16	11	11:47	19	3.0	Ovcst	100	0	0	0	0	0	<5% Flr	
	9-Jun-16	12	11:52	19	3.5	Ovcst	100	0	0	0	0	0	<5% Flr	
Abalone Cove	9-Jun-16	8	12:46	20	1.5	Ovcst	100	0	0	0	0	0	<0% Flr	
	9-Jun-16	13	12:42	20	2.5	Ovcst	100	0	0	0	0	0	<5% Flr	
Alta Vicente	9-Jun-16	16	13:23	2	4.1	Ovcst	100	0	0	0	0	0	<5% Flr	
Vicente Bluffs	13-Jun-16	14	10:48	18	5.7	Pcloudy	25	2	1	0	0	3	10% Flr	
	13-Jun-16	15	11:21	20	3.4	Pcloudy	15	1	5	0	0	6	10% Flr	1 pair mating
Pelican Cove	13-Jun-16	11	9:54	18	6.2	Ovcst	100	0	0	0	0	0		

	13-Jun-16	12	9:43	17	1.3	Ovcst	100	0	0	0	0	0		
Alta Vicente	13-Jun-16	16	10:27	18	5.5	Pcloudy	50	0	0	0	0	0	10% Flr	
Vicente Bluffs	24-Jun-16	14	11:26	23	3.0	Ovcst	100	1	3	0	0	4	50% Flr	
	24-Jun-16	15	11:55	20	0.9	Pcloudy	70	3	2	0	0	5	Varied	ESBs at east E parvi stand w/100% flr; west stand w/<5% flr
Pelican Cove	24-Jun-16	11	10:00	20	3.4	Ovcst	100	0	0	0	0	0	50% Flr	Only 6 plants 50% flr, other plants looking poorly
	24-Jun-16	12	10:06	20	1.2	Ovcst	100	0	0	0	0	0	25% Flr	1 ESBf and 1 ESBm observed at Terranea parking lot, outside survey area
Abalone Cove	24-Jun-16	8	11:04	21	3.7	Pcloudy	20	0	0	0	0	0	10% Flr	
	24-Jun-16	13	10:41	20	4.3	Pcloudy	45	0	0	0	0	0	100% Flr	1 *Brephidium exilis*, 1 *Strymon melinus*
Alta Vicente	24-Jun-16	16	12:30	23	5.1	Ovcst	100	0	0	0	0	0	75% Flr	
Vicente Bluffs	28-Jun-16	6	10:25	25	1.6	Ovcst	100	0	0	0	0	0	Absent	No host plant remaining except on dead skeleton, site will not be revisited in 2016
	28-Jun-16	5	10:53	25	n/a	Ovcst	90	0	0	0	0	0	100%	
	28-Jun-16	4	11:00											Degraded cliff, boulder fell where previously accessed, no host plant, site combined with Site 5 (noted in Appendix 2)
	28-Jun-16	3	11:10	26	1.5	Ovcst	80	0	1	0	0	1		
	28-Jun-16	2	11:28	26	0.0	Pcloudy	80	0	0	0	0	0		
Vicente Bluffs	30-Jun-16	14	9:46	21	3.3	Pcloudy	30	0	1	0	0	1		
	30-Jun-16	15	10:19	22	1.3	Pcloudy	70	2	0	0	0	2		ESBs on west side
Pelican Cove	30-Jun-16	11	10:41	21	6.7	Pcloudy	70	0	0	0	0	0	100%	
	30-Jun-16	12	10:49	22	2.1	Pcloudy	70	0	0	0	0	0	100%	
Abalone Cove	30-Jun-16	13	11:05	22	3.1	Pcloudy	30	0	0	0	0	0	100%	3 *Brephidium exilis*, 1 *Stymon melinus*
	30-Jun-16	8	11:14	22	4.1	Pcloudy	10	0	0	0	0	0		
Alta Vicente	30-Jun-16	16	11:45	23	5.4	Pcloudy	5	0	0	0	0	0	100%	1 Lycaenid unknown, not an ESB
Vicente Bluffs	6-Jul-16	5	10:18	21	1.0	Ovcst	100	0	0	0	0	0	100%	
	6-Jul-16	3	10:40	21	2.3	Pcloudy	50	0	0	0	0	0	50%	
	6-Jul-16	2	10:55	21	1.8	Pcloudy	50	0	0	0	0	0	50%	
Vicente Bluffs	7-Jul-16	14	10:40	21	4.8	Pcloudy	20	0	0	0	0	0	100%	
	7-Jul-16	15	10:00	21	4.8	Pcloudy	20	0	1	0	0	1	100%	ESBm observed on west side
Pelican Cove	7-Jul-16	11	11:00	22	4.7	Clear	0	0	0	0	0	0	100%	
	7-Jul-16	12	11:10	22	6.2	Clear	0	0	0	0	0	0	100%	1 ESBm, 1 ESB Unknown observed in Terranea

														parking lot
Abalone Cove	7-Jul-16	8	11:50	23	4.6	Clear	0	0	0	0	0	0	100%	
	7-Jul-16	13	11:40	23	7.5	Clear	0	0	0	0	0	0	100%	1 *Brephidium exilis*
Alta Vicente	7-Jul-16	16	12:20	23	8.4	Clear	0	0	0	0	0	0	100%	Noted 1 male California gnatcatcher, 2 cactus wrens (1 male, 1 juv)
Vicente Bluffs	12-Jul-16	5	10:20	21	2.1	Ovcst	100	0	0	0	0	0		Host plant starting to seed
	12-Jul-16	3	10:34	12	2.5	Ovcst	100	0	0	0	0	0	75%	
	12-Jul-16	2	10:49	21	1.4	Ovcst	100	0	0	0	0	0	40%	
	12-Jul-16	14	11:12	21	2.5	Ovcst	100	0	0	0	1	1	100%	1 ESB larvae observed
	12-Jul-16	15	11:38	22	2.8	Ovcst	100	0	0	0	3	3	100%	3 ESB larvae on east side; ESB larvae observed on host plant at PVIC garden
Vicente Bluffs	19-Jul-16	5	9:58	23	1.3	Pcloudy	10	0	0	0	0	0	Seeding	
	19-Jul-16	3	10:13	23	2.1	Pcloudy	10	0	0	0	0	0	100%	
	19-Jul-16	2	10:26	23	1.3	Pcloudy	20	0	0	0	0	0	Seeding	
	19-Jul-16	14	11:03	23	1.0	Pcloudy	20	0	0	0	1	1	100%	
	19-Jul-16	15	11:18	23	2.2	Pcloudy	10	0	1	0	0	1	100%	1 *Strymon melinus*
Vicente Bluffs	2-Aug-16	5	10:16	24	2.0	Clear	0	0	0	0	0	0		
	2-Aug-16	3	10:29	24	2.7	Clear	0	0	0	0	0	0	Seeding	Signs of larval damage, species unknown
	2-Aug-16	2	10:44	24	1.4	Clear	0	0	0	0	0	0	Seeding	Signs of larval damage, species unknown
	2-Aug-16	14	11:57	24	1.4	Clear	0	0	0	0	0	0	Seeding	2 *Strymon melinus*, Larval damage on flowers observed
	2-Aug-16	15	11:26	24	3.8	Clear	0	0	0	0	0	0	Seeding	1 *Strymon melinus*, Larval damage on flowers observed
Total ESB								**9**	**15**	**1**	**5**	**30**		

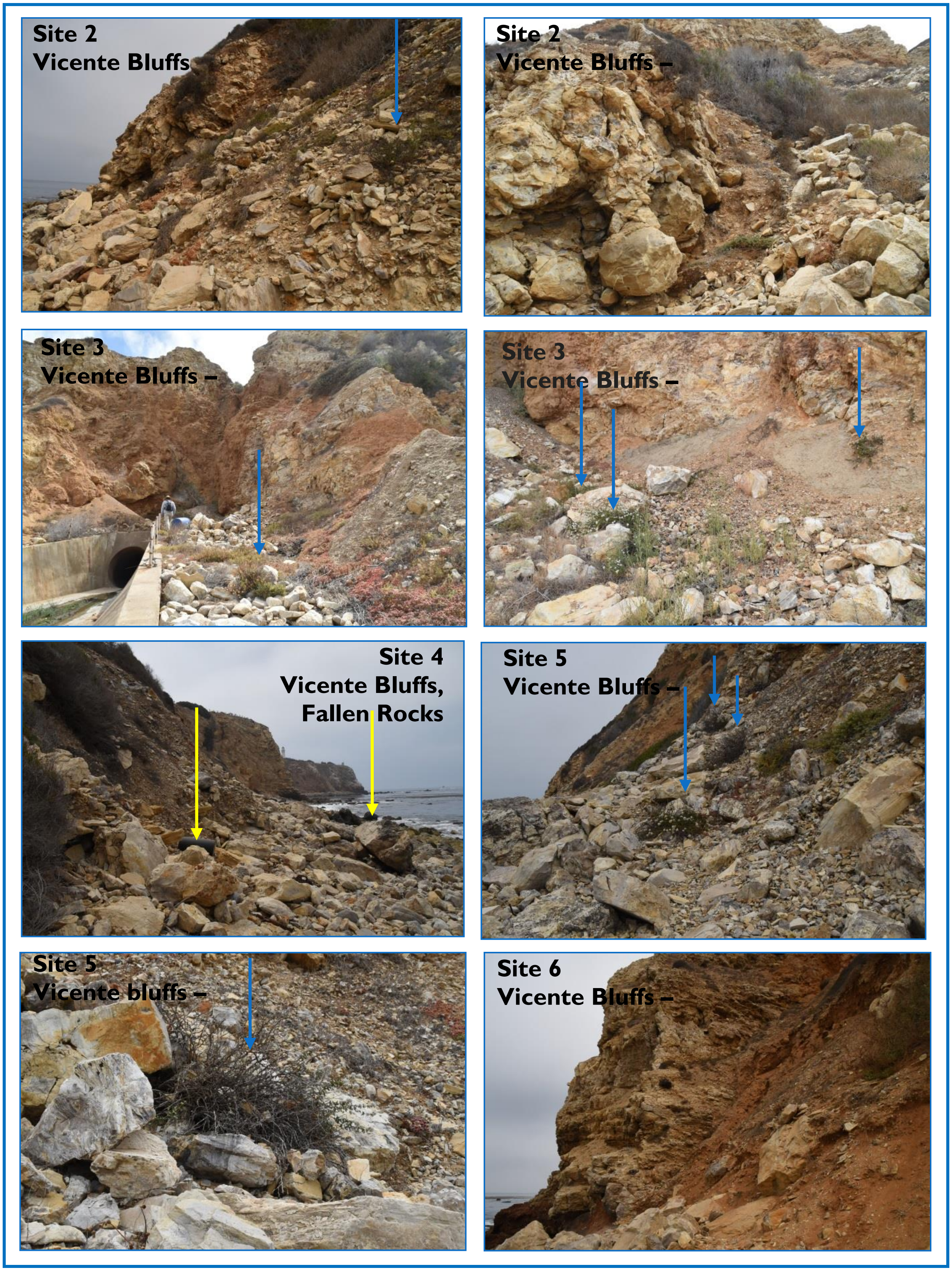

Figure A-3. Images of El Segundo blue butterfly survey sites at Vicente Bluffs visited during El Segundo blue butterfly surveys, May 25 – August 2, 2016. Blue arrows indicate host plant, yellow fallen rocks.

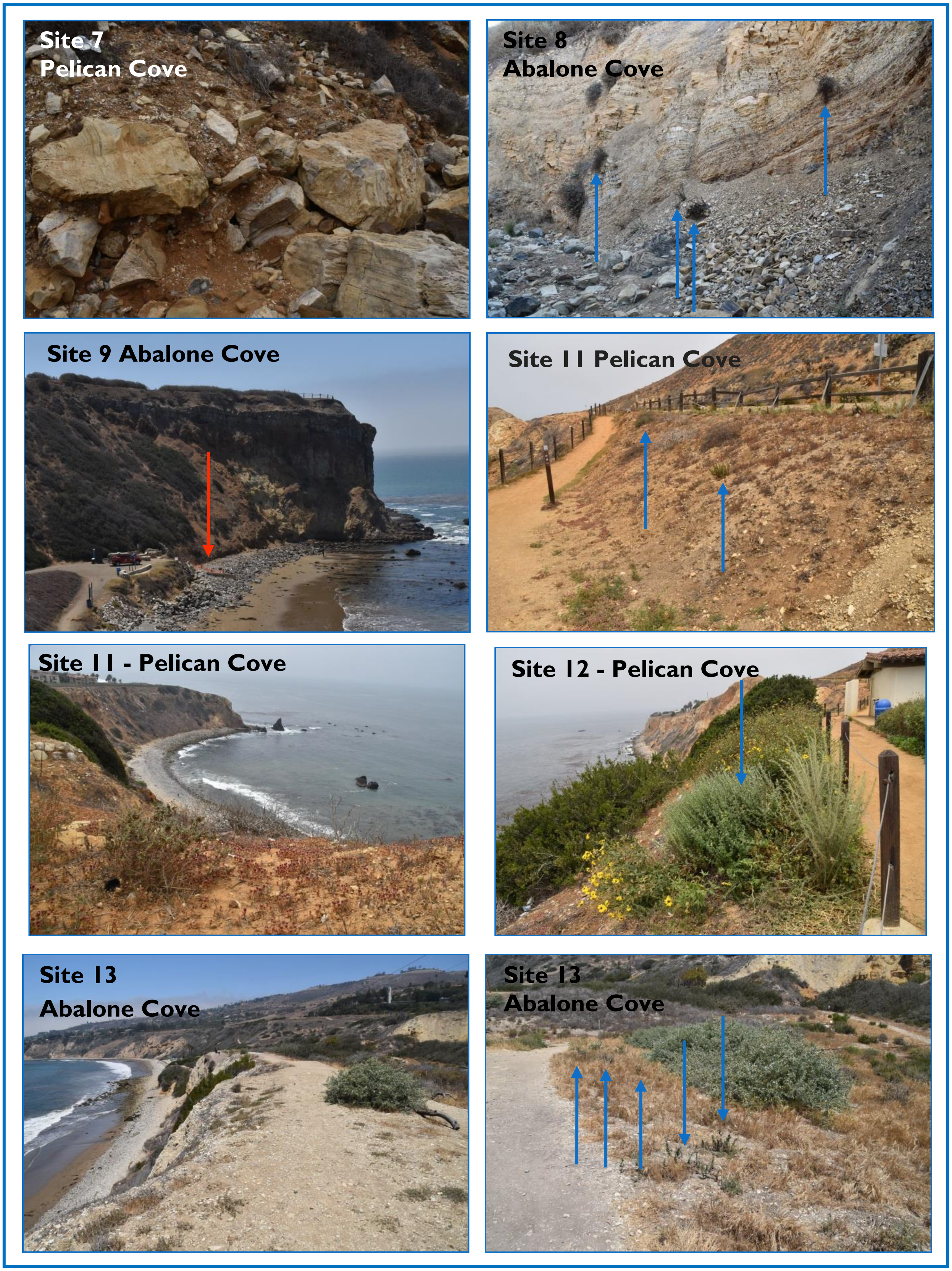

Figure A-3. Images of El Segundo blue butterfly survey sites at Vicente Bluffs visited during El Segundo blue butterfly surveys, May 25 – August 2, 2016. Blue arrows indicate host plant, orange arrow indicates barricade for slide area.

Figure A-3. Images of El Segundo blue butterfly survey sites at Vicente Bluffs visited during El Segundo blue butterfly surveys, May 25 – August 2, 2016. Blue arrows indicate host plant, orange arrow indicates barricade for slide area.

APPENDIX B – DATASHEETS FOR EL SEGUNDO BLUE BUTTERFLY

2.4 WILDLIFE MONITORING

Wildlife Monitoring:

Coyote, Gray Fox, and Red Fox in the Palos Verdes Nature Preserve 2016-2018

Prepared By Palos Verdes Peninsula Land Conservancy
2020

Wildlife Monitoring:
Coyote, Gray Fox, and Red Fox in the Palos Verdes Nature Preserve 2016-2018

Executive Summary

Surveys of canids inhabiting the Palos Verdes Nature Preserve--coyote (*Canis latrans*), gray fox (*Urocyon cinereoargeneus*), and red fox (*Vulpes vulpes*)--were conducted annually from November into March in 2015-16, 2016-17, 2017-18. All three species are found within the Preserve, though most of the observations were based upon scat. Few prints were observed during this monitoring period.

A Citizen Science Wildlife Tracking program was established in 2013-14 with successful results. The new volunteers provided additional wildlife trackers, augmenting the university students serving as Land Conservancy Interns. As a result of the additional help, the surveys were more comprehensive, covering more of the Preserve to provide better insight into trends.

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Introduction

Three wild species of canids inhabit the Palos Verdes Nature Preserve (PVNP, Preserve): coyote (*Canis latrans*), gray fox (*Urocyon cinereoargeneus*), and red fox (*Vulpes vulpes*). At one point, coyotes were extirpated from the Palos Verdes Peninsula, but then in the mid-1990s, the species returned (J. Lowery, pers. comm.). As top predators in the Preserve, all three species function as consumers of small mammals, lizards, and birds, along with vegetative matter (Gehrt et al. 2010). The ranges of these three species are not necessarily confined to the PVNP and are expected to include developed areas as well (Gehrt et al. 2010). Understanding the presence of wild canids within the Preserve will provide important information about their distribution and habits, enabling the City and Conservancy to make better informed management decisions and public outreach.

The Conservancy has regularly conducted wildlife tracking activities since 2006. The Natural Communities Conservation Plan and Habitat Conservation Plan (NCCP/HCP) for the PVNP includes provisions to describe biological data collected on wildlife movements, and frequency of road-killed wildlife, as such information is available. The NCCP/HCP also recommends the development of a program for disseminating information on responsible pet ownership. In response to these requirements, the Conservancy initiated a wild animal tracking program to develop an understanding of where the animals are found and what they eat.

This report provides a summary of tracking data collected during 2016-2018 on coyote, gray fox, and red fox. Scat investigations were also included and combined with data from the prior triennial survey to develop a more robust assessment on the prey consumed by these wild canids.

Methods

Tracking activities took place when canid activity was highest (November through April) and within reserves (Alta Vicente, Filiorum, and Forrestal, Ocean Trails, Portuguese Bend, Three Sisters) that receive the highest occurrences of wild canids. Filiorum was not surveyed prior in 2013, but was added and surveyed in 2014 -2015 as a result the conservancy's expanding Citizen Science Wildlife Tracking program.

Survey participants walked established routes within the study area documenting presence of wild canid tracks (paw imprint) or scat (fecal remains). Observations of wild canid presence were recorded on field data sheets (Appendix C) and photographed. Species identifications of tracks or scat were made through reference of Lowery (2013). Recorded information included trail name and location to allow the potential of trail-specific analysis of wild canid presence. The majority of surveys were conducted in Portuguese Bend reserve, the area of highest wild canid activity observed in previous studies (Palos Verdes Peninsula Land Conservancy 2011 and 2013).

Priority investigative effort was given to scat rather than tracks, as the seasonality of quality imprints are not commonly found during the survey period but rather during the dry season (summer months) when fine grain/dust accumulates on trail surfaces. The high presence of domestic dogs and human foot traffic within the study area also created difficulties in locating or discerning wild canid tracks.

Wildlife trackers recorded their observations on map worksheets (Appendix C) and took photos of the scat, its contents, and prints, when present. The wildlife trackers data were logged into an Excel spreadsheet and emailed to the Conservancy with their photos for verification.

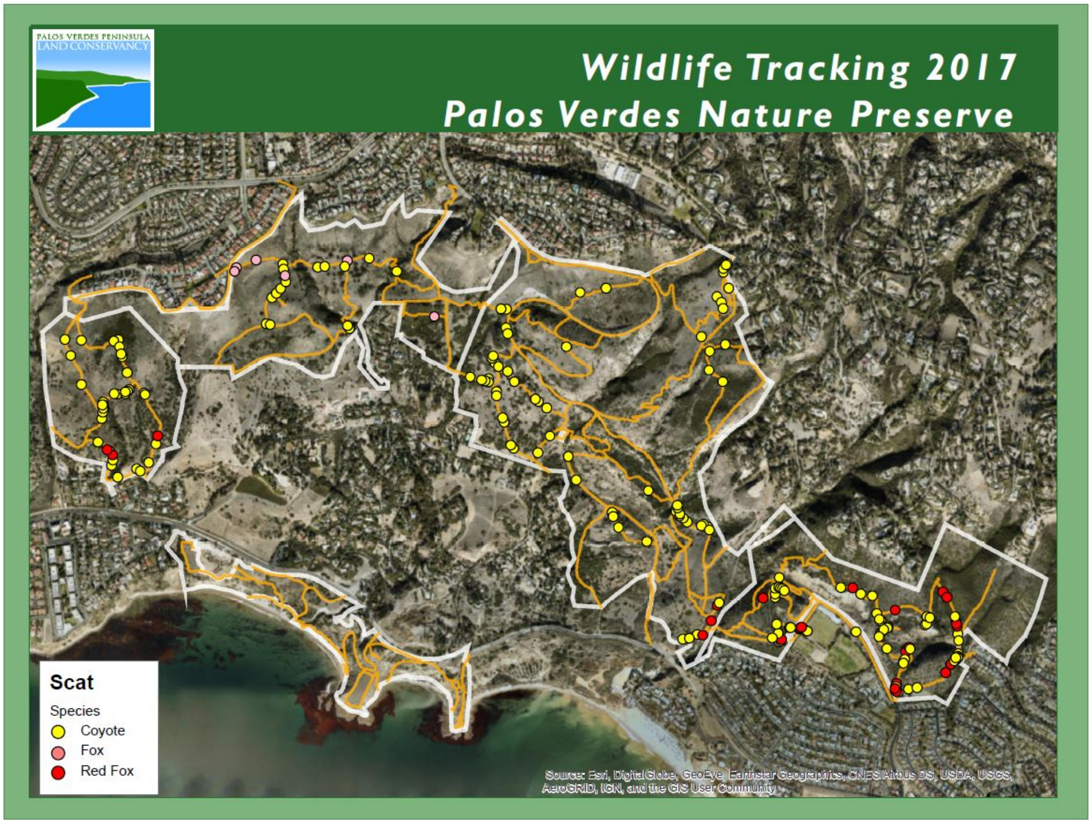

Figure 1. Map of preserves where tracking activities took place with examples from 2017

Results

The total number of visits for the 2016 – 2018 survey period was 97. Forrestal received the most visits (30) while Portuguese Bend (27), Filiorum (9), Three sisters (16), Ocean Trails (4), and Alta Vicente (11) received less.

The 2017-18 wildlife tracking survey identified a total of 202 wild canid scat in the survey area. Coyote scat was the most common found with 175 scat being identified as coyote and 27 as fox scat. This disparity may imply that the coyote is the most abundant wild canid within the Palos Verdes Nature Preserve. Despite the coyote's potential dominance, smaller canids, the red and gray fox were also observed. Although no scat was identified specifically to gray fox, several video captures were made of the gray fox within the Forrestal Nature Reserve. Coyote scat was found across all reserves studied, included those reserves or reserve sections identified in previous years as potential exclusion areas or those with little to no coyote scat observed. Red Fox scat was found within all reserves studied except the largest reserve, Portuguese Bend, where all four survey sections were void of fox scat.

The 2018 wildlife tracking survey identified a total of 192 wild canid observations in the survey area. Coyote observations were the most common found with 167 scat and tracks being identified as coyote and 25 as fox. This disparity may imply that the coyote is the most abundant wild canid within the Palos Verdes Nature Preserve. Despite the coyote's potential dominance, smaller canids, the red and gray fox were also observed. Although no scat or tracks were identified specifically to gray fox, several video captures have been made of the gray fox within the Forrestal Nature Reserve. Coyote observations were found across all reserves studied.

Discussion

The presence of top predators within wildlife habitats has been documented as crucial to ensuring healthy ecosystem function. In the Palos Verdes Nature Preserve the success of nesting songbirds, namely the federally protected California gnatcatcher and state protected coastal cactus wren, can be positively influenced by the presence of top predators through their control of meso-predator (i.e.: striped skunk and raccoon) populations. The presence of coyotes is specifically indicated by the Rancho Palos Verdes Natural Community Conservation Plan as an important ecological element necessary for successful nesting conditions. Considering the presence of coyotes in these terms, the broad range of the coyote observed within the Palos Verdes Nature Preserve indicates the existence of an important meso-predator control dynamic. If compared to the previous year's (2016-2017) wildlife tracking program results, the observed coyote abundance areas of former exclusion, such as, lower Portuguese Bend and Filiorum, would suggest that nesting conditions in relation to predation pressure for protected songbirds has improved. Also indicated in the previous year's report was evidence of high-use areas, or those locations where scat and tracks were regularly sighted. It was expected that high levels of coyote scat observations indicated higher investment by coyotes within these areas and could signal the possibility of den sites. Areas noted as high-use and potential den sites in last year's report were again observed to be locations of consistent coyote occupation. Describing specific areas of the Preserve as viable den site habitat could prove valuable in managing for healthy coyote populations. Further research looking into the presence of Grey Fox in the PVNP is suggested to monitor the declining population.

Additional Benefits

Two posters focused on wildlife tracking research were created during this timeframe. PVPLC staff, Josh Weinik, presented a poster at the SERCAL conference and a local high school student, Austin Nash, presented his poster at Peninsula High School.

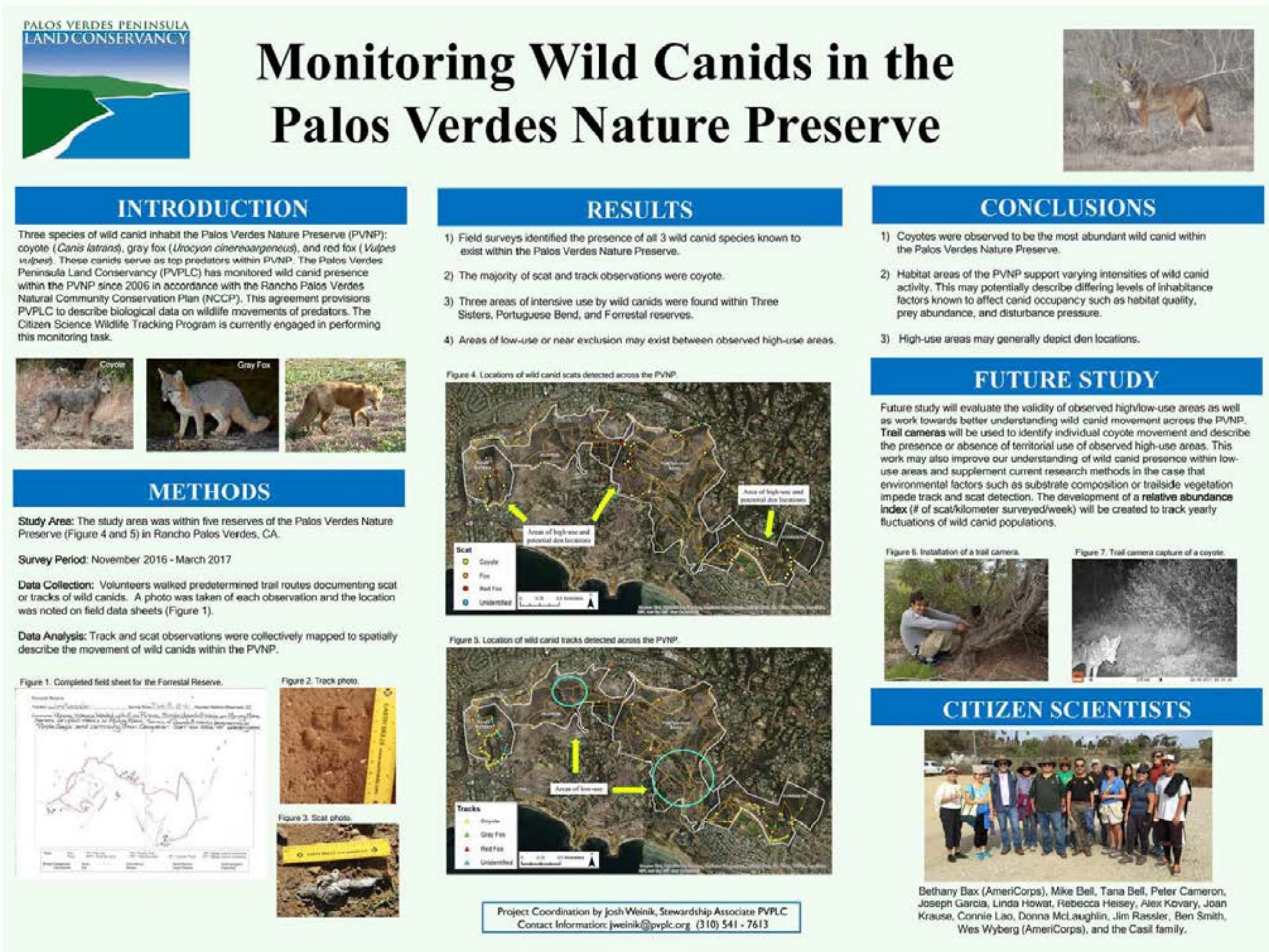

Figure 2. Monitoring wild canids in the Palos Verdes Nature Preserve

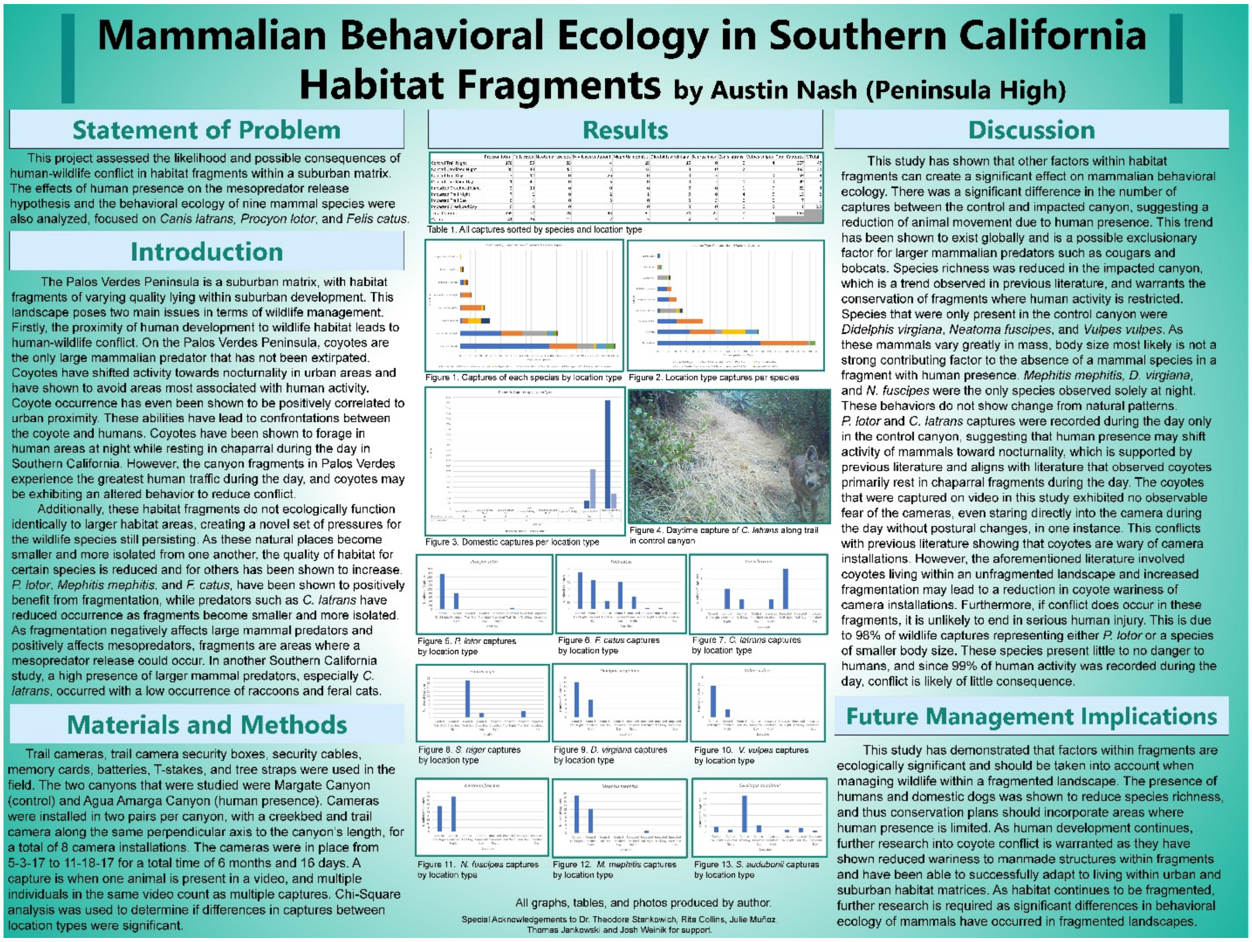

Figure 3. Mammalian behavioral ecology in southern California habitat fragments by Austin Nash

Citizen Science Wildlife Tracking Program

The Citizen Science Wildlife Tracking Program has been very successful in bringing enthusiastic volunteers to the monitoring program. The Conservancy has a goal of developing a base of permanent Wildlife Tracking volunteers that will help guide novice trackers to generate better quality data. After multiple years, the Conservancy has developed a training program, established portions of trails for surveying, and effective mechanisms for transferring the collected data from the volunteer to the Conservancy for archiving in the Conservancy's database.

By involving Citizen Science volunteers, more of the Preserve was covered during the tracking season. The additional and more comprehensive data gained through the program will enable the Conservancy to better elucidate trends, both in this report and in future years.

Recommendations

The Wildlife Tracking program has been in place for a decade resulting in a rich set of data for assessing the coyote, gray fox, and red fox activities in the Preserve. By continuing this program, a long-term dataset will be developed that can potentially answer increasingly complex questions and improve trend analysis. Continuing and growing the Citizen Science Wildlife Tracking Program is essential for success of the program. Care should be made to conduct the tracking in the same manner as established in the wildlife tracking protocol to allow for year-to-year comparisons.

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APPENDIX A

Wildlife Tracking Survey Data

Date	Reserve	Trail	Observation Type	Species	Observer	Rabbits* per reserve	Comments
11/7/2016	Alta Vicente	Prickly Pear Trail	Scat	Coyote	Tana and Mike	0	
11/15/2016	Alta Vicente	Nike Trail	Scat	Coyote	Tana and Mike	0	
11/15/2016	Alta Vicente	Prickly Pear Trail	Scat	Coyote	Tana and Mike	0	
11/15/2016	Alta Vicente	Prickly Pear Trail	Scat	Coyote	Tana and Mike	0	
11/15/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
11/15/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
11/22/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
11/22/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
11/22/2016	Alta Vicente	Nike Trail	Scat	Coyote	Tana and Mike	0	
11/30/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
11/30/2016	Alta Vicente	South Spur Trail	Scat	Coyote	Tana and Mike	0	
11/30/2016	Alta Vicente	South Spur Trail	Scat	Coyote	Tana and Mike	0	
11/30/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
11/30/2016	Alta Vicente	Alta Vicente Trail	Track	Coyote	Tana and Mike	0	
11/30/2016	Alta Vicente	Prickly Pear Trail	Scat	Coyote	Tana and Mike	0	
12/6/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
12/6/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
12/6/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
12/6/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
12/6/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
12/6/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
12/6/2016	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Tana and Mike	0	
12/6/2016	Alta Vicente	Prickly Pear Trail	Scat	Coyote	Tana and Mike	0	
12/6/2016	Alta Vicente	Prickly Pear Trail	Scat	Coyote	Tana and Mike	0	
12/19/2016	Alta Vicente	North Spur Trail	scat	coyote	Mike and Tana	0	
12/27/2016	Alta Vicente	Alta Vicente Trail	Track	coyote	Mike and Tana	0	
12/19/2016	Alta Vicente	Alta Vicente Trail	scat	Coyote	Mike and Tana	0	
1/17/2017	Chandler Reserve	1	scat	coyote	Wes and Bethany	3	
1/17/2017	Chandler Reserve	2	Track	Coyote	Wes and Bethany	3	
1/17/2017	Chandler Reserve	5	Tracks	Coyote	Wes and Bethany	3	
1/17/2017	Chandler Reserve	6	Scat	Coyote	Wes and Bethany	3	
1/17/2017	Chandler Reserve	8	Track	Coyote	Wes and Bethany	3	
1/17/2017	Chandler Reserve	9	Scat	Coyote	Wes and Bethany	3	
1/17/2017	Chandler Reserve	11	Track	Coyote	Wes and Bethany	3	
11/11/2016	Filiorum C	Zote's Cutacross	scat	coyote	Linda Howat	0	
12/10/2016	Filiorum C	rattlesnake trail	scat	coyote	Linda Howat	1	
11/11/2016	Filiorum C	Kelvin Canyon Trail	track	coyote	Linda Howat		
11/30/2016	Forrestal	Flying Mane	Track	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Flying Mane Trail	Track	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Flying Mane Trail	Track	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Flying Mane Trail	Track	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Flying Mane Trail	Track	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Flying Mane Trail	Track	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Flying Mane Trail	Track	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Quarry Trail	Track	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Quarry Trail	Track	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Quarry Trail	Scat	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Quarry Trail	Track	Coyote	Jim and Connie	0	
11/30/2016	Forrestal	Quarry Trail	Track	Coyote	Jim and Connie	0	
12/4/2016	Forrestal	Flying Mane Trail	Scat	Coyote	Jim and Connie	0	
12/4/2016	Forrestal	Pirate Trail	Scat	Coyote	Jim and Connie	0	
12/4/2016	Forrestal	Pirate Trail	Track	Coyote	Jim and Connie	0	
12/4/2016	Forrestal	Pirate Trail	Track	Coyote	Jim and Connie	0	
12/4/2016	Forrestal	Purple Sage Trail	Scat	Coyote	Jim and Connie	0	
12/4/2016	Forrestal	Purple Sage Trail	Scat	Coyote	Jim and Connie	0	
12/9/2016	Forrestal	Cristo que Viento Trail	Track	Coyote	Jim Rassler	0	tracks uphill on pirate and downhill on cristo
12/9/2016	Forrestal	Pirate Trail	Track	Coyote	Jim Rassler	0	tracks uphill on pirate and downhill on cristo
12/26/2016	Forrestal	Pirate Trail	track	coyote	Jim Rassler	0	coyote tracks headed uphill on pirate. Single downhill track on flying mane. Series of uphill tracks on flying mane. Series of downhill tracks beginning on purple sahe and conitniehd down conqueror
12/26/2016	Forrestal	Pirate Trail	scat	coyote	Jim Rassler	0	
12/26/2016	Forrestal	Flying Mane Trail	track	coyote	Jim Rassler	0	
12/26/2016	Forrestal	Flying Mane Trail	track	coyote	Jim Rassler	0	
12/26/2016	Forrestal	Flying Mane Trail	track	coyote	Jim Rassler	0	
12/26/2016	Forrestal	Flying Mane Trail	track	coyote	Jim Rassler	0	
12/26/2016	Forrestal	Flying Mane Trail	track	coyote	Jim Rassler	0	
12/26/2016	Forrestal	Conqueror	track	coyote	Jim Rassler	0	
12/26/2016	Forrestal	Conqueror	track	coyote	Jim Rassler	0	
12/26/2016	Forrestal	Conqueror	track	coyote	Jim Rassler	0	
12/26/2016	Forrestal	Purple Sage Trail	track	coyote	Jim Rassler	0	
1/8/2017	Forrestal	Flying Mane Trail	scat	coyote	Jim Rassler	1	
1/8/2017	Forrestal	Mariposa Trail	track	coyote	Jim Rassler	1	going uphill
1/8/2017	Forrestal	Mariposa Trail	scat	coyote	Jim Rassler	1	
1/8/2017	Forrestal	Mariposa Trail	scat	coyote	Jim Rassler	1	
1/26/2017	Forrestal	Dauntless Trail	track	coyote	Jim Rassler	0	
1/26/2017	Forrestal	Flying Mane Trail	track	coyote	Jim Rassler	0	
1/26/2017	Forrestal	Flying Mane Trail	scat	coyote	Jim Rassler	0	
1/26/2017	Forrestal	Basalt Trail	track	coyote	Jim Rassler	0	
1/26/2017	Forrestal	Quarry Trail	scat	coyote	Jim Rassler	0	
1/26/2017	Forrestal	Quarry Trail	scat	coyote	Jim Rassler	0	
1/29/2017	Forrestal	Canyon View Trail	scat	coyote	Jim and Connie	0	
1/29/2017	Forrestal	Mariposa Trail	scat	coyote	Jim and Connie	0	
1/29/2017	Forrestal	Mariposa Trail	scat	coyote	Jim and Connie	0	
2/1/2017	Forrestal	Mariposa Trail	scat	coyote	Jim Rassler	0	
2/1/2017	Forrestal	Mariposa Trail	scat	coyote	Jim Rassler	0	
12/9/2016	Forrestal	Dauntless Trail	Track	Coyote	Jim Rassler	0	tracks uphill on pirate and downhill on cristo
12/11/2016	Forrestal	Pirate Trail	Scat	Coyote	Jim Rassler	0	
12/11/2016	Forrestal	Pirate Trail	Track	Coyote	Jim Rassler	0	
12/11/2016	Forrestal	Flying Mane Trail	Scat	Coyote	Jim Rassler	0	
11/17/2016	Portuguese Bend	Eagle's Nest Trail	Scat	Coyote	Joan and Donna	0	
11/26/2016	Portuguese Bend	Grapevine Trail	Scat	Coyote	Joan and Donna	0	Saw lots of scattered fur on grapevine trail, then found scat on same trail
2/2/2017	Portuguese Bend	Rim Trail	track	coyote	Alex and Rebecca	0	
11/6/2016	Portuguese Bend A	Kelvin Canyon Trail	Track	Coyote	Joe Garcia	0	
11/6/2016	Portuguese Bend A	Gary's Gulch Trail	Track	Coyote	Joe Garcia	0	
11/6/2016	Portuguese Bend A	Kelvin Canyon Trail	Track	Coyote	Joe Garcia	0	
11/6/2016	Portuguese Bend A	Gary's Gulch Trail	Track	Coyote	Joe Garcia	0	
11/11/2016	Portuguese Bend A	Burma Road Trail	Scat	Coyote	Joe Garcia	0	Fresh - Found on trail spur next to Photo 008 - Possibly pair of Coyotes
11/11/2016	Portuguese Bend A	Burma Road Trail	Scat	Coyote	Joe Garcia	0	Fresh - Found on trail spur next to Photo 007 - Possibly pair of Coyotes
11/11/2016	Portuguese Bend A	Burma Road Trail	Scat	Coyote	Joe Garcia	0	Anthropogenic Material - Cloth Band Aid
11/11/2016	Portuguese Bend A	Water Tank Trail	Scat	Coyote	Joe Garcia	0	
11/11/2016	Portuguese Bend A	Kubota Trail	Track	Coyote	Joe Garcia	0	Possibly pair of Coyotes traveling along trail.
11/11/2016	Portuguese Bend A	Kubota Trail	Track	Coyote	Joe Garcia	0	From same series of tracks, further along the trail. - See Photo 011 -
11/11/2016	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joe Garcia	0	
11/19/2016	Portuguese Bend A	Burma Road Trail	Track	Coyote	Joe Garcia	0	
11/19/2016	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joe Garcia	0	Possibly pair of Coyotes
11/19/2016	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joe Garcia	0	
11/19/2016	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joe Garcia	0	
11/25/2016	Portuguese Bend A	Peacock Flats Trail	Track	Coyote	Joe Garcia	0	
12/10/2016	Portuguese Bend A	Burma Road Trail	Scat	Coyote	Joe Garcia	0	No disceernable tracks due to hardened ground after rain/dry
12/3/2016	Portuguese Bend A	Kelvin Canyon Trail	Scat	Coyote	Joe Garcia	0	
12/3/2016	Portuguese Bend A	Kelvin Canyon Trail	Scat	Coyote	Joe Garcia	0	
12/3/2016	Portuguese Bend A	Kubota Trail	Scat	Coyote	Joe Garcia	0	
12/18/2016	Portuguese Bend A	Vanderlip Trail	scat	coyote	Joe Garcia	1	
12/18/2016	Portuguese Bend A	Vanderlip Trail	scat	coyote	Joe Garcia	1	not sure on trail location, Kubita, Vanderlip, or Ailor (3X??)
12/18/2016	Portuguese Bend A	Kubota Trail	scat	coyote	Joe Garcia	1	
12/10/2016	Portuguese Bend A	Burma Road Trail	scat	coyote	Joe Garica	0	hard ground tracks not registering
12/1/2016	Portuguese Bend B	Burma Road Trail	Scat	Coyote	Joan and Donna	0	
12/15/2016	Portuguese Bend B	Fire Station Trail	scat	coyote	Donna and Joan		
11/12/2016	Three Sisters	Three Sisters	Scat	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Three Sisters	Scat	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Sunshine Trail	Scat	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Three Sisters Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Three Sisters Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	0	
11/12/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	0	
11/19/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Barkentine Trail	Scat	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Three Sisters Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	McCarrell Canyon Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	McCarrell Canyon Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Three Sisters Trail	Track	Coyote	Alex and Rebecca	6	
11/19/2016	Three Sisters	Three Sisters Trail	Track	Coyote	Alex and Rebecca	6	
12/11/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca		
12/11/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca		
12/11/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca		
12/11/2016	Three Sisters	Three Sisters Trail	Scat	Coyote	Alex and Rebecca		
12/11/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca		3 times
12/11/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca		
12/11/2016	Three Sisters	Barkentine Trail	Track	Coyote	Alex and Rebecca		

12/11/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		
12/11/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		
12/11/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		
12/11/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		
12/19/2016	Three Sisters	McCarrell Canyon Trail	Track	Coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Three Sisters Trail	Track	Coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Three Sisters Trail	Track	Coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		2 times
12/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Sunshine Trail	Track	Coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Barkentine Trail	Track	coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Barkentine Trail	Track	coyote	Alex and Rebecca		
12/19/2016	Three Sisters	Barkentine Trail	Track	coyote	Alex and Rebecca		runnign pattern
12/19/2016	Three Sisters	Barkentine Trail	Track	coyote	Alex and Rebecca		
1/18/2017	Three Sisters	McCarrell Canyon Trail	track	Coyote	Alex and Rebecca	0	
1/18/2017	Three Sisters	Sunshine Trail	track	coyote	Alex and Rebecca	0	
1/18/2017	Three Sisters	Barkentine Trail	track	coyote	Alex and Rebecca	0	
1/17/2017	Chandler Reserve	3	Track	Dog	Wes and Bethany	3	
1/17/2017	Chandler Reserve	4	Scat	Dog	Wes and Bethany	3	
1/17/2017	Chandler Reserve	7	track	dog	Wes and Bethany	3	
1/17/2017	Chandler Reserve	10	Scat	Dog	Wes and Bethany	3	
1/17/2017	Chandler Reserve	12	Track	Dog	Wes and Bethany	3	
11/30/2016	Forrestal	Quarry Trail	Scat	Fox	Jim and Connie	0	
11/19/2016	Portuguese Bend A	Kelvin Canyon Trail	Track	Fox	Joe Garcia	0	
11/19/2016	Portuguese Bend A	Kelvin Canyon Trail	Scat	Fox	Joe Garcia	0	Possibly pair of Coyotes
11/19/2016	Portuguese Bend A	Kubota Trail	Scat	Fox	Joe Garcia	0	
11/19/2016	Portuguese Bend A	Kubota Trail	Scat	Fox	Joe Garcia	0	
12/10/2016	Portuguese Bend A	Burma Road Trail	Scat	Fox	Joe Garcia	0	No disceernable tracks due to hardened ground after rain/dry
12/3/2016	Portuguese Bend A	Peacock Flats Trail	Scat	Fox	Joe Garcia	0	
12/18/2016	Portuguese Bend A	Burma Road Trail	Scat	fox	Joe Garcia	1	
12/18/2016	Portuguese Bend A	Burma Road Trail	scat	fox	Joe Garcia	1	
12/18/2016	Portuguese Bend A	Burma Road Trail	track	fox	Joe Garcia	1	
12/18/2016	Portuguese Bend A	Burma Road Trail	scat	fox	Joe Garcia	1	
12/10/2016	Portuguese Bend A	Burma Road Trail	scat	fox	Joe Garica	0	hard ground tracks not registering
12/11/2016	Three Sisters	Barkentine Trail	Track	Fox	Alex and Rebecca		
12/11/2016	Three Sisters	Barkentine Trail	Track	Fox	Alex and Rebecca		
12/11/2016	Three Sisters	Sunshine Trail	Track	Fox	Alex and Rebecca		
12/11/2016	Three Sisters	Sunshine Trail	Track	Fox	Alex and Rebecca		
12/19/2016	Three Sisters	Barkentine Trail	Track	Fox	Alex and Rebecca		
11/30/2016	Forrestal	Quarry Trail	Track	Grey Fox	Jim and Connie	0	
11/30/2016	Forrestal	Quarry Trail	Track	Grey Fox	Jim and Connie	0	
1/17/2017	Alta Vicente	none	none	none	Mike and Tana	0	
11/26/2016	Filiorum C	none	none	none	Linda Howat	0	rabbit fur observed on the trail
12/28/2016	Filiorum C	none	none	none	Linda Howat	0	
12/9/2016	Portuguese Bend	none	none	none	Joan and Donna	0	
12/29/2016	Portuguese Bend B	None	none	none	Donna and Joan	0	no sightings
11/5/2016	Portuguese Bend B	none	none	none	Donna and Joan		
11/5/2016	Portuguese Bend B	none	none	none	Donna and Joan		
11/5/2016	Portuguese Bend C	none	none	none	Ben Smith		
11/13/2016	Portuguese Bend C	none	none	none	Ben Smith		
11/19/2016	Portuguese Bend C	none	none	none	Ben Smith		
11/25/2016	Portuguese Bend C	none	none	none	Ben Smith		
12/4/2017	Portuguese Bend C	none	none	none	Ben Smith		
12/11/2017	Portuguese Bend C	none	none	none	Ben Smith		
12/17/2017	Portuguese Bend C	none	none	none	Ben Smith		
12/22/2017	Portuguese Bend C	none	none	none	Ben Smith		
11/5/2016	Portuguese Bend D	none	none	none	Ben Smith		
11/13/2016	Portuguese Bend D	none	none	none	Ben Smith		
11/19/2016	Portuguese Bend D	none	none	none	Ben Smith		
11/25/2016	Portuguese Bend D	none	none	none	Ben Smith		
12/4/2016	Portuguese Bend D	none	none	none	Ben Smith		
12/11/2016	Portuguese Bend D	none	none	none	Ben Smith		
12/17/2017	Portuguese Bend D	none	none	none	Ben Smith		
12/22/2017	Portuguese Bend D	none	none	none	Ben Smith		
11/11/2016	Portuguese Bend A	Peacock Flats Trail	Track	Other	Joe Garcia	0	Unknown - Possible Lint Ball from clothes dryer
11/6/2016	Portuguese Bend A	Burma Road Trail	Scat	Red Fox	Joe Garcia	0	Possible Raccoon, contents similar to Raccoon observed in training. Size of scat and color resembles Fox.
11/6/2016	Portuguese Bend A	Burma Road Trail	Scat	Red Fox	Joe Garcia	0	Possible Raccoon, contents similar to Raccoon observed in training. Size of scat and color resembles Fox.
11/11/2016	Portuguese Bend A	Peacock Flats Trail	Track	Red Fox	Joe Garcia	0	
11/19/2016	Three Sisters	Barkentine Trail	Scat	Red Fox	Alex and Rebecca	6	
11/19/2016	Three Sisters	McCarrell Canyon Trail	Track	Red Fox	Alex and Rebecca	6	
12/6/2016	Alta Vicente	Alta Vicente Trail	Scat	Unidentifed	Tana and Mike	0	
11/12/2016	Alta Vicente	Prickly Pear Trail	Scat	Unidentified	Tana and Mike		
11/15/2016	Alta Vicente	Alta Vicente Trail	Scractches	Unidentified	Tana and Mike	0	
11/15/2016	Alta Vicente	Alta Vicente Trail	Scat	Unidentified	Tana and Mike	0	
12/3/2016	Portuguese Bend A	Gary's Gulch Trail	Track	Unidentified	Joe Garcia	0	
12/3/2016	Portuguese Bend A	Gary's Gulch Trail	track	Unidentified	Joe Garcia	0	
12/1/2016	Portuguese Bend B	Fire Station Trail	Scat	Unidentified	Joan and Donna	0	
12/1/2016	Portuguese Bend B	Ishibashi Trail	Track	Unidentified	Joan and Donna	0	
11/12/2016	Three Sisters	Barkentine Trail	Scat	Unidentified	Alex and Rebecca	0	
11/12/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca	0	
11/12/2016	Three Sisters	McCarrell Canyon Trail	Track	Unidentified	Alex and Rebecca	0	
11/12/2016	Three Sisters	Three Sisters Trail	Track	Unidentified	Alex and Rebecca	0	
11/12/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca	0	
11/19/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca	6	
11/19/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca	6	
11/19/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca	6	
11/19/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca	6	
11/19/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca	6	
11/19/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Unidentified	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Unidentified	Alex and Rebecca	6	
11/19/2016	Three Sisters	Sunshine Trail	Track	Unidentified	Alex and Rebecca	6	
11/19/2016	Three Sisters	Three Sisters Trail	Track	Unidentified	Alex and Rebecca	6	
11/19/2016	Three Sisters	Three Sisters Trail	Track	Unidentified	Alex and Rebecca	6	
12/11/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca		
12/11/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca		
12/11/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca		
12/11/2016	Three Sisters	Barkentine Trail	Track	Unidentified	Alex and Rebecca		
12/11/2016	Three Sisters	Sunshine Trail	Track	Unidentified	Alex and Rebecca		
12/19/2016	Three Sisters	Barkentine Trail	Track	unidentified	Alex and Rebecca		
12/19/2016	Three Sisters	Barkentine Trail	Track	unidentified	Alex and Rebecca		
1/18/2017	Three Sisters	Barkentine Trail	track	Unidentified	Alex and Rebecca	0	
1/18/2017	Three Sisters	Barkentine Trail	track	Unidentified	Alex and Rebecca	0	
1/18/2017	Three Sisters	Barkentine Trail	track	unidentified	Alex and Rebecca	0	
1/18/2017	Three Sisters	Barkentine Trail	track	unidentified	Alex and Rebecca	0	
1/18/2017	Three Sisters	Barkentine Trail	track	unidentified	Alex and Rebecca	0	
12/6/2016	Alta Vicente	Alta Vicente Trail	Scat	Unidnentified	Tana and Mike	0	
1/17/2017	Chandler Reserve				Wes and Bethany	3	

Date	Reserve	Trail	Observation Type	Species	Observer	Rabbits*per reserve	Comments
11/14/2017	Agua Amarga	Lunada Canyon	N/a	None	Lynn Y. and Josh W.	0	No Scat or tracks observed
12/3/2017	Agua Amarga	Lunada Canyon	Scat	Coyote	Lynn Y.	2	Scat found just before entering trail/area
12/3/2017	Agua Amarga	Lunada Canyon	Scat	Coyote	Lynn Y.	2	Scat found just before entering trail/area
12/3/2017	Agua Amarga	Lunada Canyon	Scat	Coyote	Lynn Y.	2	Scat found at top of steep hill
12/3/2017	Agua Amarga	Lunada Canyon	Scat	Coyote	Lynn Y.	2	Scat found further up
12/3/2017	Agua Amarga	Lunada Canyon	Scat	Coyote	Lynn Y.	2	Scat found after stream crossing
12/3/2017	Agua Amarga	Lunada Canyon	Scat	Coyote	Lynn Y.	2	none
12/3/2017	Agua Amarga	Lunada Canyon	Scat	Coyote	Lynn Y.	2	none
12/3/2017	Agua Amarga	Lunada Canyon	Scat	Coyote	Lynn Y.	2	none
12/3/2017	Agua Amarga	Lunada Canyon	Scat	Coyote	Lynn Y.	2	none
12/3/2017	Agua Amarga	Lunada Canyon	Scat	Racoon	Lynn Y.	2	Lots of racoon scat near dead racoon
12/17/2017	Agua Amarga	Lunada Canyon	Tracks	Fox	Lynn Y.	2	At the bottom of steep hill
12/17/2017	Agua Amarga	Lunada Canyon	Tracks	Fox	Lynn Y.	2	At top of steep hill
12/17/2017	Agua Amarga	Lunada Canyon	Tracks	Fox	Lynn Y.	2	At top of steep hill
12/17/2017	Agua Amarga	Lunada Canyon	Tracks	Fox	Lynn Y.	2	At top of steep hill
12/17/2017	Agua Amarga	Lunada Canyon	Tracks	Fox	Lynn Y.	2	At top of steep hill
12/17/2017	Agua Amarga	Lunada Canyon	Tracks	Ca. Ground Squirrel	Lynn Y.	2	None
12/17/2017	Agua Amarga	Lunada Canyon	Tracks	Ca. Ground Squirrel	Lynn Y.	2	None
12/17/2017	Agua Amarga	Lunada Canyon	Tracks	Fox	Lynn Y.	2	Between manholes; Foxy scat area from 12/3
12/17/2017	Agua Amarga	Lunada Canyon	Scat	Fox	Lynn Y.	2	By manholes
12/17/2017	Agua Amarga	Lunada Canyon	Tracks	Dor or Coyote	Lynn Y.	2	None
12/17/2017	Agua Amarga	Lunada Canyon	Tracks	Rabbit	Lynn Y.	2	None
12/17/2017	Agua Amarga	Lunada Canyon	Scat	Racoon	Lynn Y.	2	None
1/1/2018	Agua Amarga	Lunada Canyon	Tracks	Racoon	Lynn Y.	1	Tracks heading up the steep hill
1/1/2018	Agua Amarga	Lunada Canyon	Scat	Coyote	Lynn Y.	1	Between 1st and 2nd Manholes
1/1/2018	Agua Amarga	Lunada Canyon	Tracks	Unknown	Lynn Y.	1	Tracks on top of steep hill
1/13/2018	Agua Amarga	Lunada Canyon	Tracks	Bike	Lynn Y.	0	Rain washed powdery top layer, leaving onlyhard surface that only mountain bikers couldgenerate enough force to disturb top.
1/13/2018	Agua Amarga	Lunada Canyon	Tracks	Bike	Lynn Y.	0	Same as entry above
2/11/2018	Agua Amarga	none	none	none	Lynn Y. and Jim R.	1	no scat, a couple of unclear tracks (too wased out to make a determination; possible coyote)
11/21/2017	Alta Vicente	Alta Vicente Trail	Scat	Hawk or Owl	Mike B.	0	Possible hawk or owl pellet. Just fur and bones
11/30/2017	Alta Vicente	Alta Vicente Trail	Scat	Unknown	Mike B.	0	Very similar to fox scat on rock reported around 10/30
12/7/2017	Alta Vicente	Prickly Pear Trail	Scat	Coyote	Mike B. & Tana B.	0	Warm Snata Ana wind from south At 15 mph
12/7/2017	Alta Vicente	Prickly Pear Trail	Scat	Coyote	Mike B. & Tana B.	0	Same as entry above
12/7/2017	Alta Vicente	Alta Vicente Trail	Scat	Coyote	Mike B. & Tana B.	0	Same as entry above
12/7/2017	Alta Vicente	Alta Vicente Trail	Scat	Unknown	Mike B. & Tana B.	0	Same as entry above
12/23/2017	Alta Vicente	Prickley Pear Trail	Scat	coyote	Mike B.	0	same entry as above
12/28/2017	Alta Vicente	Coyote Scat	Scat	Coyote	Mike B.	0	Acacia branches blcking game trails to prickly pear
1/4/2018	Alta Vicente	All Trails	N/a	None	Mike B. & Tana B.	0	None
1/13/2018	Alta Vicente	Prickly Pear Trail	Scat	Coyote	Mike B.	0	Some Erosion from recent rains along steeper trail sections
1/13/2018	Alta Vicente	Prickly Pear Trail	Scat	Coyote	Mike B.	0	Same as entry above
1/18/2018	Alta Vicente	Prickly Pear Trail	Scat	Raptor	Mike B.	0	SE end shows most evidence of useage by coyotes
1/18/2018	Alta Vicente	Prickly Pear Trail	Scat	Raptor	Mike B.	0	Same as entry above
1/18/2018	Alta Vicente	Alta Vicente Trail	Scat	Raptor	Mike B.	0	Same as entry above
1/24/2018	Alta Vicente	none					
1/31/2018	Alta Vicente	Alta Vicente Trail	scat	coyote	Mike	1	
12/23/2018	Alta Vicente	Prickley Pear Trail	Scat	coyote	Mike B.	0	rabbit foot and leg bone, 2 coyote scats on Prickely pair, calico cat at nursery
11/15/2017	Chandler Preserve		Scat	Coyote	Mike B.	0	
12/5/2017	Chandler Preserve		scat	Coyote	Mike B.	1	coyote scat various locations, saw 1 rabbitt downhill right from Bucksin entrance
12/5/2017	Chandler Preserve		scat	Coyote	Mike B.	1	coyote scat various locations, saw 1 rabbitt downhill right from Bucksin entrance
12/5/2017	Chandler Preserve		scat	Coyote	Mike B.	1	coyote scat various locations, saw 1 rabbitt downhill right from Bucksin entrance
12/5/2017	Chandler Preserve		scat	Coyote	Mike B.	1	coyote scat various locations, saw 1 rabbitt downhill right from Bucksin entrance
12/5/2017	Chandler Preserve		scat	Coyote	Mike B.	1	coyote scat various locations, saw 1 rabbitt downhill right from Bucksin entrance
12/5/2017	Chandler Preserve		scat	Coyote	Mike B.	1	coyote scat various locations, saw 1 rabbitt downhill right from Bucksin entrance
12/5/2017	Chandler Preserve		scat	Coyote	Mike B.	1	coyote scat various locations, saw 1 rabbitt downhill right from Bucksin entrance
12/13/2017	Chandler Preserve		scat	Coyote	Mike B.	4	lots of coyote scat-large animal I think, 1 area scattered fur, 1 area feathers
12/13/2017	Chandler Preserve		scat	Coyote	Mike B.	4	lots of coyote scat-large animal I think, 1 area scattered fur, 1 area feathers
12/13/2017	Chandler Preserve		scat	Coyote	Mike B.	4	lots of coyote scat-large animal I think, 1 area scattered fur, 1 area feathers
12/13/2017	Chandler Preserve		scat	Coyote	Mike B.	4	lots of coyote scat-large animal I think, 1 area scattered fur, 1 area feathers
12/13/2017	Chandler Preserve		scat	Coyote	Mike B.	4	lots of coyote scat-large animal I think, 1 area scattered fur, 1 area feathers
12/21/2017	Chandler Preserve		scat	coyote	Mike B.	6	6 rabbits, 4 new scats as shown
12/21/2017	Chandler Preserve		scat	coyote	Mike B.	6	7 rabbits, 4 new scats as shown
12/21/2017	Chandler Preserve		scat	coyote	Mike B.	6	8 rabbits, 4 new scats as shown
12/21/2017	Chandler Preserve		scat	coyote	Mike B.	6	9 rabbits, 4 new scats as shown
12/26/2017	Chandler Preserve		scat	coyote	Mike B.	0	lots of dog scat, a few off-leash dogs, some with equestrians
12/26/2017	Chandler Preserve		scat	coyote	Mike B.	0	lots of dog scat, a few off-leash dogs, some with equestrians
12/26/2017	Chandler Preserve		scat	coyote	Mike B.	0	lots of dog scat, a few off-leash dogs, some with equestrians
12/26/2017	Chandler Preserve		scat	coyote	Mike B.	0	lots of dog scat, a few off-leash dogs, some with equestrians
12/26/2017	Chandler Preserve		scat	unidentified	Mike B.	0	lots of dog scat, a few off-leash dogs, some with equestrians
1/3/2018	Chandler Preserve		scat	Coyote	Mike B.	1	10 raptors, lizards, butterflies
1/3/2018	Chandler Preserve		scat	Coyote	Mike B.	1	10 raptors, lizards, butterflies
1/3/2018	Chandler Preserve		scat	Coyote	Mike B.	1	10 raptors, lizards, butterflies
1/3/2018	Chandler Preserve		scat	Coyote	Mike B.	1	10 raptors, lizards, butterflies
1/17/2018	Chandler Preserve		scat	Coyote	Mike B.	1	lots of evidence of coyote precense, including one very fresh deposit
1/17/2018	Chandler Preserve		scat	Coyote	Mike B.	1	lots of evidence of coyote precense, including one very fresh deposit
1/17/2018	Chandler Preserve		scat	Coyote	Mike B.	1	lots of evidence of coyote precense, including one very fresh deposit
1/17/2018	Chandler Preserve		scat	Coyote	Mike B.	1	lots of evidence of coyote precense, including one very fresh deposit
1/17/2018	Chandler Preserve		scat	Coyote	Mike B.	1	lots of evidence of coyote precense, including one very fresh deposit
1/17/2018	Chandler Preserve		track	Coyote	Mike B.	1	lots of evidence of coyote precense, including one very fresh deposit
1/17/2018	Chandler Preserve		track	Coyote	Mike B.	1	lots of evidence of coyote precense, including one very fresh deposit
1/19/2018	Chandler Preserve		scat	Coyote	Mike B.	0	very warm, much scat by golfcourse eucalyptus, only one photo
1/19/2018	Chandler Preserve		scat	Coyote	Mike B.	0	very warm, much scat by golfcourse eucalyptus, only one photo
1/19/2018	Chandler Preserve		scat	Coyote	Mike B.	0	very warm, much scat by golfcourse eucalyptus, only one photo
1/19/2018	Chandler Preserve		scat	Coyote	Mike B.	0	very warm, much scat by golfcourse eucalyptus, only one photo
2/5/2018	Chandler Preserve		scat	Coyote	Mike B.	1	lots of scat. Equestrians reporting common daylight sightings
2/5/2018	Chandler Preserve		scat	Coyote	Mike B.	1	lots of scat. Equestrians reporting common daylight sightings
2/5/2018	Chandler Preserve		scat	Coyote	Mike B.	1	lots of scat. Equestrians reporting common daylight sightings
2/5/2018	Chandler Preserve		scat	Coyote	Mike B.	1	lots of scat. Equestrians reporting common daylight sightings
2/4/2018	Filiorum	Eucalyptus trail	scat	fox	Brenda E.	1	1 3/4w X 2 1/4L. This looks like a hind track. Small, pointed heel pad, low disturbance, large middle toes , shale of outside toes.
11/12/2017	Filliorum	Zote's Cutacross	Scat	Unknown	Brenda E.	1	Blunt scat with fur
11/12/2017	Filliorum	Zote's Cutacross	Scat	Unknown	Brenda E.	1	Possible Coyote, but looked to small
11/12/2017	Filliorum	Zote's Cutacross	Tracks	Coyote	Brenda E.	1	Heel not visible; Width 2.225 low disturbance, no visible claws
11/12/2017	Filliorum	Zote's Cutacross	Scat	Coyote	Brenda E.	1	Blunt scat with fur
11/12/2017	Filliorum	Jack's Hat Trail	Scat	Coyote	Brenda E.	1	None
11/12/2017	Filliorum	Jack's Hat Trail	Scat	Unknown	Brenda E.	1	Blunt scat with fur
11/12/2017	Filliorum	Jack's Hat Trail	Scat	Coyote	Brenda E.	1	Looked like 2 deposits, but dispersed
11/12/2017	Filliorum	Jack's Hat Trail	Scat	Coyote	Brenda E.	1	Looked like 2 deposits, but dispersed
11/12/2017	Filliorum	Jack's Hat Trail	Scat	Coyote	Brenda E.	1	None
11/12/2017	Filliorum	Jack's Hat Trail	Scat	Coyote	Brenda E.	1	None
11/12/2017	Filliorum	Jack's Hat Trail	Scat	Coyote	Brenda E.	1	None
11/12/2017	Filliorum	Pony Trail	Scat	Coyote	Brenda E.	1	None
11/12/2017	Filliorum	Pony Trail	Scat	Coyote	Brenda E.	1	None
11/12/2017	Filliorum	Ford Trail	Scat	Coyote	Brenda E.	1	None
11/12/2017	Filliorum	Ford Trail	Scat	Coyote	Brenda E.	1	None
12/3/2017	Filliorum	Zote's Cutacross	Scat	Unknown	Brenda E.	1	Possible Fox Scat
12/3/2017	Filliorum	Zote's Cutacross	Tracks	Fox	Brenda E.	1	Triangular heel pad, no blunt claws, compact toes, loose dirt, uphill (disturbance)
12/3/2017	Filliorum	Zote's Cutacross	Tracks	Unknown	Brenda E.	1	Possible coyote track; lowdisturbance, compact toes, no visible claws, about 3" in length
12/3/2017	Filliorum	Zote's Cutacross	Tracks	Unknown	Brenda E.	1	More disturbance and blunt claws created doubt about previous track ID (entry above); small old dark
12/3/2017	Filliorum	Unknown	Scat	Coyote	Brenda E.	1	Larger, dark, but it could be because it's fresh
2/4/2018	Filliorum	Zote's Cutacross	scat	coyote	Brenda E.	1	older scat, grey. Fur present
2/4/2018	Filliorum	Zote's Cutacross	scat	Coyote	Brenda E.	1	small scat, grey, fur present
2/4/2018	Filliorum	Zote's Cutacross	scat	coyote	Brenda E.	1	fresher scat, greying
2/4/2018	Filliorum	Zote's Cutacross	scat	coyote	Brenda E.	1	larger deposit, greying, possibley two deposits right next to each other, labeled as one
2/4/2018	Filliorum	Zote's Cutacross	scat	unidentified	Brenda E.	1	older scar, white, the only smaller piece is taprred.
2/4/2018	Filliorum	Zote's Cutacross	scat	coyote	Brenda E.	1	very old, visible fur, not excctly grey but light in color
11/3/2017	Forrestal	Mariposa Trail	Scat	Fox	Jim R.	0	None
11/3/2017	Forrestal	Mariposa Trail	Scat	Fox	Jim R.	0	None
11/3/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	None
11/3/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
11/3/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
11/3/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
11/3/2017	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
11/3/2017	Forrestal	Quarry Trail	Scat	Fox	Jim R.	0	None
11/3/2017	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
11/3/2017	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
11/3/2017	Forrestal	Basalt Trail	Scat	Unknown	Jim R.	0	May be domestic dog, but to fresh to investigate
11/8/2017	Forrestal	Mariposa Trail	Scat	Coyote	Jim R.	0	None
11/8/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
11/8/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
11/8/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
11/8/2017	Forrestal	Pirate Trail	Scat	Coyote and Fox	Jim R.	0	Mixed Scat. Possible territory dispute between coyotes and young red fox
11/8/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
11/8/2017	Forrestal	Pirate Trail	Tracks	Coyote	Jim R.	0	None
11/8/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	Intermittent tracks headed uphill on Pirate Trail
11/8/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	Intermittent tracks headed uphill on Pirate Trail
11/8/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	Intermittent tracks headed uphill on Pirate Trail
11/8/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	Intermittent tracks headed uphill on Pirate Trail
11/8/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	Intermittent tracks headed uphill on Pirate Trail
11/8/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	Intermittent tracks headed uphill on Pirate Trail
11/8/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	Intermittent tracks headed uphill on Pirate Trail
11/8/2017	Forrestal	Intrepid Drive	Scat	Coyote	Jim R.	0	None
11/8/2017	Forrestal	Intrepid Drive	Scat	Coyote	Jim R.	0	None

11/8/2017	Forrestal	Intrepid Drive	Scat	Coyote and Fox	Jim R.	0	Mixed Scat. Possible territory dispute between coyotes and young red fox
11/8/2017	Forrestal	Purple Sage	Scat	Unknown	Jim R.	0	Coyote Scat. Determined in next survey
11/22/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	None
11/22/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	None
11/22/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	None
11/22/2017	Forrestal	Flying Maine	Scat	Coyote	Jim R.	0	None
11/22/2017	Forrestal	Purple Sage	Scat	Coyote	Jim R.	0	Unknown scat now identified
11/22/2017	Forrestal	Dauntless Trail	Tracks	Red Fox	Jim R.	0	None
11/22/2017	Forrestal	Vista Trail	Scat	Red Fox	Jim R.	0	None
11/22/2017	Forrestal	Vista Trail	Scat	Coyote	Jim R.	0	None
11/22/2017	Forrestal	Vista Trail	Scat	Coyote	Jim R.	0	None
12/4/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
12/4/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
12/4/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
12/4/2017	Forrestal	Pirate Trail	Tracks	Coyote	Jim R.	0	None
12/4/2017	Forrestal	Pirate Trail	Tracks	Coyote	Jim R.	0	None
12/4/2017	Forrestal	Pirate Trail	Tracks	Coyote	Jim R.	0	None
12/4/2017	Forrestal	Pirate Trail	Scat	Coyote	Jim R.	0	None
12/4/2017	Forrestal	Quarry Trail	Tracks	Coyote	Jim R.	0	None
12/4/2017	Forrestal	Quarry Trail	Scat	Fox	Jim R.	0	None
12/4/2017	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
12/20/2017	Forrestal	Pirate Trail	Scat	Fox	Jim R.	0	None
12/20/2017	Forrestal	Pirate Trail	Scat	Fox	Jim R.	0	None
12/20/2017	Forrestal	Pirate Trail	Tracks	Red Fox	Jim R.	0	None
12/20/2017	Forrestal	Pirate Trail	Tracks	Coyote	Jim R.	0	None
12/20/2017	Forrestal	Pirate Trail	Tracks	Coyote	Jim R.	0	None
12/20/2017	Forrestal	Pirate Trail	Tracks	Coyote	Jim R.	0	None
12/20/2017	Forrestal	Forrestral Drive	Scat	Coyote	Jim R.	0	None
12/20/2017	Forrestal	Intrepid Drive	Scat	Fox	Jim R.	0	None
12/20/2017	Forrestal	Intrepid Drive	Scat	Fox	Jim R.	0	None
12/20/2017	Forrestal	Purple Sage	Scat	Fox	Jim R.	0	None
12/20/2017	Forrestal	Purple Sage	Scat	Fox	Jim R.	0	None
12/20/2017	Forrestal	Flying Maine	Scat	Fox	Jim R.	0	None
12/20/2017	Forrestal	Flying Maine	Scat	Coyote	Jim R.	0	None
12/29/2017	Forrestal	Mariposa Trail	Scat	Fox	Jim R.	0	None
12/29/2017	Forrestal	Mariposa Trail	Tracks	Coyote	Jim R.	0	None
12/29/2017	Forrestal	Mariposa Trail	Tracks	Coyote	Jim R.	0	None
12/29/2017	Forrestal	Mariposa Trail	Scat	Coyote	Jim R.	0	None
12/29/2017	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
12/29/2017	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
12/29/2017	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
1/11/2018	Forrestal	Mariposa Trail	Tracks	Coyote	Jim R.	1	None
1/11/2018	Forrestal	Mariposa Trail	Tracks	Coyote	Jim R.	1	None
1/11/2018	Forrestal	Mariposa Trail	Scat	Coyote	Jim R.	1	None
1/11/2018	Forrestal	Mariposa Trail	Tracks	Coyote	Jim R.	1	None
1/17/2018	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
1/17/2018	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
1/17/2018	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
1/17/2018	Forrestal	Quarry Trail	Scat	Coyote	Jim R.	0	None
1/17/2018	Forrestal	Basalt Trail	Scat	Coyote	Jim R.	0	None
1/24/2018	Forrestal	flying mane	scat	coyote	Jim R.	0	
1/24/2018	Forrestal	Mariposa Trail	scat	fox	Jim R.	0	
1/24/2018	Forrestal	Mariposa Trail	scat	fox	Jim R.	0	
1/24/2018	Forrestal	Mariposa Trail	scat	fox	Jim R.	0	
1/24/2018	Forrestal	Pirate trail	track	red fox	Jim R.	0	
1/24/2018	Forrestal	Pirate trail	scat	coyote	Jim R.	0	
1/24/2018	Forrestal	Pirate trail	scat	coyote	Jim R.	0	
1/24/2018	Forrestal	Pirate trail	scat	coyote	Jim R.	0	
1/24/2018	Forrestal	Pirate Trail	track	fox	Jim R.	0	a run of three tracks
1/31/2018	Forrestal	Canyon View Trail	scat	coyote	Jim R.	0	
1/31/2018	Forrestal	Basalt Trail	scat	coyote	Jim R.	0	
1/31/2018	Forrestal	Basalt Trail	scat	coyote	Jim R.	0	
1/31/2018	Forrestal	Quarry Trail	scat	fox	Jim R.	0	
1/31/2018	Forrestal	Quarry Trail	scat	coyote	Jim R.	0	
1/31/2018	Forrestal	Quarry Trail	scat	coyote	Jim R.	0	
1/31/2018	Forrestal	Quarry Trail	scat	coyote	Jim R.	0	
1/31/2018	Forrestal	Quarry Trail	scat	fox	Jim R.	0	
1/31/2018	Forrestal	Quarry Trail	scat	fox	Jim R.	0	
1/31/2018	Forrestal	Pirate Trail	track	fox	Jim R.	0	several tracks
3/1/2018	Forrestal	Purple Sage Trail	scat	coyote	Jim R.	0	
3/1/2018	Forrestal	Purple Sage Trail	scat	unidentified	Jim R.	0	
3/1/2018	Forrestal	Basalt Trail	track	fox	Jim R.	0	two tracks
3/1/2018	Forrestal	Quarry Trail	scat	coyote	Jim R.	0	
3/1/2018	Forrestal	Quarry Trail	scat	coyote	Jim R.	0	
3/1/2018	Forrestal	Quarry Trail	scat	coyote	Jim R.	0	
3/1/2018	Forrestal	Quarry Trail	track	fox	Jim R.	0	
3/1/2018	Forrestal	Pirate Trail	track	unidentified	Jim R.	0	
3/1/2018	Forrestal	Pirate Trail	track	coyote	Jim R.	0	
3/1/2018	Forrestal	Pirate Trail	track	fox	Jim R.	0	rear track
3/1/2018	Forrestal	Pirate Trail	scat	coyote	Jim R.	0	
3/1/2018	Forrestal	Mariposa Trail	scat	coyote	Jim R.	0	
3/1/2018	Forrestal	Mariposa Trail	scat	coyote	Jim R.	0	
3/14/2018	Forrestal	Fossil Trail	scat	coyote	Jim R.	1	several very old and weathered CS on Fossil. Scat on Quarry proved to be coyote deposited over domestic dog
3/14/2018	Forrestal	Fossil Trail	scat	coyote	Jim R.	1	several very old and weathered CS on Fossil. Scat on Quarry proved to be coyote deposited over domestic dog
3/14/2018	Forrestal	Fossil Trail	scat	coyote	Jim R.	1	several very old and weathered CS on Fossil. Scat on Quarry proved to be coyote deposited over domestic dog
3/14/2018	Forrestal	Fossil Trail	scat	coyote	Jim R.	1	several very old and weathered CS on Fossil. Scat on Quarry proved to be coyote deposited over domestic dog
3/14/2018	Forrestal	Quarry Trail	scat	coyote	Jim R.	1	several very old and weathered CS on Fossil. Scat on Quarry proved to be coyote deposited over domestic dog
12/25/2017	Ocean Trails	Catalina Trail	Scat	Coyote	Tina L.	1	None
12/25/2017	Ocean Trails	Gnatcatcher Trail	Scat	Coyote	Tina L.	1	None
1/1/2018	Ocean Trails	Catalina Trail	Scat	Coyote	Tina L.	0	None
1/1/2018	Ocean Trails	Catalina Trail	Scat	Coyote	Tina L.	0	None
1/1/2018	Ocean Trails	Catalina Trail	Scat	Coyote	Tina L.	0	None
1/25/2018	Ocean Trails		none		Tina L.	0	
1/31/2018	Ocean Trails	Catalina Trail	Scat	Coyote	Tina L.	4	throughout the trail, 4 rabbits were spotted, some where seen on the golf course
11/6/2017	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
11/6/2017	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
11/6/2017	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
12/11/2017	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
12/11/2017	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
12/11/2017	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
12/11/2017	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
12/11/2017	Portuguese Bend A	Kubota Trail	Scat	Coyote	Joan K. & Donna M.	0	None
12/11/2017	Portuguese Bend A	Burma Road Trail	Scat	Coyote	Joan K. & Donna M.	0	None
12/11/2017	Portuguese Bend A	Burma Road Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/3/2018	Portuguese Bend A	Water Tank Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/3/2018	Portuguese Bend A	Water Tank Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/3/2018	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/3/2018	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/3/2018	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/3/2018	Portuguese Bend A	Kubota Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/3/2018	Portuguese Bend A	Burma Road Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/3/2018	Portuguese Bend A	Burma Road Trail	Scat	Coyote	Joan K. & Donna M.	0	*Coyotes heard near Vanderlip/Burma Road @ 9:45 AM
1/22/2018	Portuguese Bend A	Kubota Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/22/2018	Portuguese Bend A	Kubota Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/22/2018	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/22/2018	Portuguese Bend A	Vanderlip Trail	Scat	Coyote	Joan K. & Donna M.	0	None
1/22/2018	Portuguese Bend A	Peacock Flats Trail	Scat	Coyote	Joan K. & Donna M.	0	None
2/5/2018	Portuguese Bend A	Peacock Flats Trail	Scat	Coyote	Joan K. & Donna M.	0	
2/5/2018	Portuguese Bend A	gary's gulch	Scat	Coyote	Joan K. & Donna M.	0	
2/5/2018	Portuguese Bend A	Kubota Trail	Scat	Coyote	Joan K. & Donna M.	0	
2/5/2018	Portuguese Bend A	Kubota Trail	Scat	Coyote	Joan K. & Donna M.	0	
2/26/2018	Portuguese Bend A	gary's gulch	Scat	Coyote	Joan K. & Donna M.	1	
2/26/2018	Portuguese Bend A	Kubota Trail	Scat	Coyote	Joan K. & Donna M.	1	
2/26/2018	Portuguese Bend A	Water Tank Trail	Scat	Coyote	Joan K. & Donna M.	1	
1/12/2018	Portuguese Bend C	Grapevine Trail	Tracks	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Grapevine Trail	Tracks	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Grapevine Trail	Tracks	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Grapevine Trail	Tracks	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Grapevine Trail	Tracks	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Grapevine Trail	Scat	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Grapevine Trail	Scat	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Grapevine Trail	Scat	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Rim Trail	Tracks	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Rim Trail	Tracks	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Paintbrush Trail	Scat	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Paintbrush Trail	Scat	Coyote	Tania	0	None
1/12/2018	Portuguese Bend C	Paintbrush Trail	Scat	Coyote	Tania	0	None
2/27/2018	Portuguese Bend C	Grapevine Trail	track	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
2/27/2018	Portuguese Bend C	Grapevine Trail	track	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
2/27/2018	Portuguese Bend C	Grapevine Trail	scat	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
2/27/2018	Portuguese Bend C	Grapevine Trail	scat	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
2/27/2018	Portuguese Bend C	Grapevine Trail	scat	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed

2/27/2018	Portuguese Bend C	Grapevine Trail	scat	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
2/27/2018	Portuguese Bend C	Grapevine Trail	scat	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
2/27/2018	Portuguese Bend C	Grapevine Trail	scat	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
2/27/2018	Portuguese Bend C	Rim Trail	scat	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
2/27/2018	Portuguese Bend C	Rim Trail	track	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
2/27/2018	Portuguese Bend C	Rim Trail	track	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
2/27/2018	Portuguese Bend C	Rim Trail	scat	Coyote	Tania	0	dry sunny for most of the survey. ended early when I got a text about the preserve being closed
11/5/2017	Portuguese Bend D	Klondile Canyon Trail	Scat	Fox	C. Sprouse	0	None
11/5/2017	Portuguese Bend D	Klondile Canyon Trail	Scat	Fox	C. Sprouse	0	None
11/5/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
11/5/2017	Portuguese Bend D	Landslide Scrap Trail	Tracks	Unknown	C. Sprouse	0	None
11/5/2017	Portuguese Bend D	Peppertree Trail	Tracks	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Scat	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Forrestal Reserve Area	Tracks	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Barn Owl Trail	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Barn Owl Trail	Scat	Unknown	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Sandbox Area	Tracks	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Sandbox Area	Tracks	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Sandbox Area	Tracks	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Sandbox Area	Tracks	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Sandbox Area	Tracks	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Sandbox Area	Tracks	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Burma Road Trail	Tracks	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	Burma Road Trail	Tracks	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	North Sanbox Trail	Scat	Coyote	C. Sprouse	0	None
11/17/2017	Portuguese Bend D	North Sanbox Trail	Tracks	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Forrestral Reserve Area	Scat	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Forrestral Reserve Area	Scat	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Klondile Canyon Trail	Scat	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/7/2017	Portuguese Bend D	Burma Road Trail	Tracks	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Forrestral Reserve Area	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Forrestral Reserve Area	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Forrestral Reserve Area	Scat	Unknown	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Peppertree Trail	Scat	Unknown	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Peppertree Trail	Scat	Unknown	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Peppertree Trail	Scat	Unknown	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Peppertree Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Peppertree Trail	Scat	Unknown	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Peppertree Trail	Scat	Unknown	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Peppertree Trail	Scat	Coyote	C. Sprouse	0	None
12/26/2017	Portuguese Bend D	Sandbox Area	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Forrestral Reserve Area	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Forrestral Reserve Area	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Burma Road Trail	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Landslide Scrap Trail	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Peppertree Trail	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Peppertree Trail	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Peppertree Trail	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Sandbox Area	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Sandbox Area	Scat	Coyote	C. Sprouse	0	None
1/15/2018	Portuguese Bend D	Klondile Canyon Trail	Scat	Fox	C. Sprouse	0	None

Date	Reserve	Trail	Obs_Type	Species	Observer	Rab_Count	Comments
1/4/2019	Alta Vicente	Alta Vicente	track	unidentified	Trevor Heise	0	a lot of raccoons
11/10/2018	Alta Vicente				Trevor Heise		**hard to read**
11/25/2018	Alta Vicente	Prickly Pear Trail	scat	unidentified	Trevor Heise	0	
11/25/2018	Alta Vicente	Prickly Pear Trail	track	unidentified	Trevor Heise	0	
11/24/2018	Chandler	NA	visual	coyote	Mike Bell	9	6:15 AM sighting
11/24/2018	Chandler	NA	visual	coyote	Mike Bell	9	6:25 AM sighting
11/24/2018	Chandler	NA	visual	coyote	Mike Bell	9	7:05 AM sighting, coyote at bottom f n Dales Loop below cattel enclosure. Eating a Mouse?
11/27/2018	Chandler	NA	visual	coyote	Mike Bell	14	coyote white tip
11/27/2018	Chandler	NA	scat	coyote	Mike Bell	14	CS-1
12/3/2018	Chandler	NA	scat	coyote	Mike Bell	8	
12/3/2018	Chandler	NA	scat	coyote	Mike Bell	8	
12/19/2018	Chandler	NA	scat	coyote	Mike Bell	1	CS1
12/19/2018	Chandler	NA	scat	coyote	Mike Bell	1	CS2
12/29/2018	Chandler	NA	scat	coyote	Mike Bell	0	
12/29/2018	Chandler	NA	scat	coyote	Mike Bell	0	
12/29/2018	Chandler	NA	scat	coyote	Mike Bell	0	
1/2/2019	Chandler	NA	visual	coyote	Mike Bell	9	
1/5/2019	Chandler	NA	visual	coyote	Mike Bell	9	
11/31/2018	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CS1
11/31/2018	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CS2
11/31/2018	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CS3
11/31/2018	Filiorum	Pony	scat	coyote	Tania Morris	0	CS5
11/31/2018	Filiorum	Pony	scat	coyote	Tania Morris	0	CS4
11/28/2018	Filiorum	Zotes Cutacross	scat	coyote	Tania Morris	0	
11/28/2018	Filiorum	Jacks Hat	scat	red fox	Tania Morris	0	
11/28/2018	Filiorum	Jacks Hat	scat	coyote	Tania Morris	0	
11/28/2018	Filiorum	Pony	scat	coyote	Tania Morris	0	
11/28/2018	Filiorum	Pony	scat	coyote	Tania Morris	0	
11/28/2018	Filiorum	Pony	scat	coyote	Tania Morris	0	
11/28/2018	Filiorum	Pony	track	coyote	Tania Morris	0	multiple tracks
11/28/2018	Filiorum	Pony	track	coyote	Tania Morris	0	multiple tracks
11/28/2018	Filiorum	Pony	scat	coyote	Tania Morris	0	
12/31/2018	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CS1
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CS2
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CS3
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CS4
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CT5
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CT6
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CT7
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CT8
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CT9
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CT10
1/11/2019	Filiorum	Jack's Hat	scat	coyote	Tania Morris	0	CS11
11/2/2018	Forrestal	Pirate	scat	coyote	Jim Rassler	0	
11/2/2018	Forrestal	Pirate	track	red fox	Jim Rassler	0	
11/2/2018	Forrestal	Pirate	scat	coyote	Jim Rassler	0	
11/2/2018	Forrestal	Pirate	track	red fox	Jim Rassler	0	
11/2/2018	Forrestal	Pirate	scat	coyote	Jim Rassler	0	
11/2/2018	Forrestal	Pirate	scat	coyote	Jim Rassler	0	
11/2/2018	Forrestal	Mariposa	scat	coyote	Jim Rassler	0	
11/2/2018	Forrestal	Flying Mane	track	coyote	Jim Rassler	0	
11/2/2018	Forrestal	Fossil	track	red fox	Jim Rassler	0	
11/2/2018	Forrestal	Conqeror	scapes	NA	Jim Rassler	0	
11/2/2018	Forrestal	Purple Sage	scat	fox	Jim Rassler	0	
11/4/2018	Forrestal	Pirate	scat	coyote	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Pirate	scat	coyote	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Mariposa	scat	fox	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Mariposa	track	coyote	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Mariposa	track	coyote	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Flying Mane	track	coyote	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Flying Mane	track	coyote	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Flying Mane	track	red fox	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Flying Mane	track	coyote	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Flying Mane	track	coyote	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Flying Mane	track	coyote	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Flying Mane	track	coyote	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Canyon	track	red fox	Jim Rassler and Kathy	0	
11/4/2018	Forrestal	Conqeror	track	red fox	Jim Rassler and Kathy	0	
11/21/2018	Forrestal	Pirate	scat	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Pirate	scat	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Pirate	scat	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Pirate	scat	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Pirate	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Pirate	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Pirate	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Pirate	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Mariposa	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Mariposa	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Mariposa	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Mariposa	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Cristo Que Viento	track	red fox	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Cristo Que Viento	track	red fox	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Cristo Que Viento	scat	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Mariposa	scat	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Mariposa	scat	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Mariposa	scat	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Mariposa	scat	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Basalt	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	many notes see data sheet
11/21/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	many notes see data sheet
12/1/2018	Forrestal	Pirate	scat	coyote	Jim Rassler	0	
12/1/2018	Forrestal	Mariposa	track	coyote	Jim Rassler	0	
12/1/2018	Forrestal	Mariposa	track	coyote	Jim Rassler	0	
12/1/2018	Forrestal	Canyon	track	red fox	Jim Rassler	0	
12/1/2018	Forrestal	Dauntless	scat	fox	Jim Rassler	0	
12/1/2018	Forrestal	NA	track	unidentified	Jim Rassler	0	
12/1/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	
12/1/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0	
12/1/2018	Forrestal	Quarry	scat	coyote	Jim Rassler	0	
12/19/2018	Forrestal	Flying Mane	scat	fox	Jim Rassler	0	
12/19/2018	Forrestal	Pirate	track	coyote	Jim Rassler	0	

12/19/2018	Forrestal	Pirate	track	coyote	Jim Rassler	0
12/19/2018	Forrestal	Pirate	track	coyote	Jim Rassler	0
12/19/2018	Forrestal	Pirate	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	scat	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Cristo Que Viento	track	coyote	Jim Rassler	0
12/28/2018	Forrestal	Quarry	track	coyote	Jim Rassler	0
1/9/2019	Forrestal	Quarry	track	coyote	Jim Rassler	0
1/9/2019	Forrestal	Quarry	scat	coyote	Jim Rassler	0
1/9/2019	Forrestal	Quarry	track	coyote	Jim Rassler	0
11/9/2018	George F Canyon	Post 2	scat	raccoon	Silke Von Bueren	1
11/9/2018	George F Canyon	Post 3	scat	coyote	Silke Von Bueren	1
11/9/2018	George F Canyon	Post 8	scat	coyote	Silke Von Bueren	1
11/9/2018	George F Canyon	Post 8	scat	coyote	Silke Von Bueren	1
11/9/2018	George F Canyon	Post 8	scat	coyote	Silke Von Bueren	1
11/9/2018	George F Canyon	Post 8	scat	coyote	Silke Von Bueren	1
11/9/2018	George F Canyon	Post 9	scat	coyote	Silke Von Bueren	1
11/9/2018	George F Canyon	Post 12	scat	coyote	Silke Von Bueren	1
12/11/2018	George F Canyon		scat	coyote	Silke Von Bueren	0
12/11/2018	George F Canyon		scat	coyote	Silke Von Bueren	0
12/11/2018	George F Canyon		scat	coyote	Silke Von Bueren	0
12/11/2018	George F Canyon		scat	coyote	Silke Von Bueren	0
12/11/2018	George F Canyon		scat	coyote	Silke Von Bueren	0
12/11/2018	George F Canyon		track	coyote	Silke Von Bueren	0
12/11/2018	George F Canyon		track	coyote	Silke Von Bueren	0
11/22/2018	George F Canyon		scat	coyote	Silke Von Bueren	0
12/29/2018	George F Canyon		scat	unidentified	Silke Von Bueren	0
12/29/2018	George F Canyon		scat	coyote	Silke Von Bueren	0
12/29/2018	George F Canyon		scat	coyote	Silke Von Bueren	0
11/6/2018	Ocean Trails	Catalina	scat	coyote	Alejandra	0
11/6/2018	Ocean Trails	Catalina	scat	fox	Alejandra	0
11/6/2018	Ocean Trails	Sunset	scat	coyote	Alejandra	0
11/18/2018	Ocean Trails	Gnatcatcher	track	red fox	Alejandra	0
11/18/2018	Ocean Trails	Shoreline Park	scat	coyote	Alejandra	0
11/18/2018	Ocean Trails	Shoreline Park	scat	coyote	Alejandra	0
11/18/2018	Ocean Trails	Shoreline Park	scat	coyote	Alejandra	0
11/18/2018	Ocean Trails	Catalina	scat	coyote	Alejandra	0
11/18/2018	Ocean Trails	Catalina	scat	red fox	Alejandra	0
11/18/2018	Ocean Trails	Catalina	scat	red fox	Alejandra	0
11/18/2018	Ocean Trails	sunset	scat	coyote	Alejandra	0
12/14/2018	Ocean Trails				Alejandra	0
12/14/2018	Ocean Trails				Alejandra	0
12/14/2018	Ocean Trails				Alejandra	0
12/14/2018	Ocean Trails				Alejandra	0
12/14/2018	Ocean Trails				Alejandra	0
12/14/2018	Ocean Trails				Alejandra	0
12/14/2018	Ocean Trails				Alejandra	0
12/16/2018	Ocean Trails	Gnatcatcher	scat	coyote	Alejandra	0
12/17/2018	Ocean Trails	Gnatcatcher	scat	coyote	Alejandra	0
12/18/2018	Ocean Trails	Shoreline Park	scat	coyote	Alejandra	0
1/11/2019	Portuguese Bend D	Vanderlip	scat	coyote	Joan Krause/Donna McLaughlin	0
1/11/2019	Portuguese Bend D	Vanderlip	scat	coyote	Joan Krause/Donna McLaughlin	0
1/11/2019	Portuguese Bend D	Vanderlip	scat	coyote	Joan Krause/Donna McLaughlin	0
1/11/2019	Portuguese Bend D	Vanderlip	scat	coyote	Joan Krause/Donna McLaughlin	0
1/11/2019	Portuguese Bend D	Vanderlip	scat	coyote	Joan Krause/Donna McLaughlin	0
1/9/2019	Portuguese Bend B	Ishibashi	scat	coyote	Mike Ben	0
1/9/2019	Portuguese Bend B	Ishibashi	scat	coyote	Mike Ben	0
1/9/2019	Portuguese Bend B	Ishibashi	scat	coyote	Mike Ben	0
1/9/2019	Portuguese Bend B	Ishibashi	scat	coyote	Mike Ben	0
1/9/2019	Portuguese Bend B	Ishibashi	scat	coyote	Mike Ben	0
1/9/2019	Portuguese Bend B	Ishibashi	scat	coyote	Mike Ben	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/8/2018	Portuguese Bend D	Ishibashi Farm Trail	scat	coyote	Matt Covill	0
11/23/2018	Three Sisters	Peppertree	track	coyote	Lynn Yamaoka/ Jim Rassler	0
11/23/2018	Three Sisters	Peppertree	scat	coyote	Lynn Yamaoka/ Jim Rassler	0
11/23/2018	Three Sisters	Peppertree	scat	coyote	Lynn Yamaoka/ Jim Rassler	0
11/23/2018	Three Sisters	Peppertree	scat	coyote	Lynn Yamaoka/ Jim Rassler	0
11/23/2018	Three Sisters	Peppertree	scat	coyote	Lynn Yamaoka/ Jim Rassler	0
11/23/2018	Three Sisters	Peppertree	track	coyote	Lynn Yamaoka/ Jim Rassler	0
11/23/2018	Three Sisters	Peppertree	track	coyote	Lynn Yamaoka/ Jim Rassler	0
11/23/2018	Three Sisters	Peppertree	track	coyote	Lynn Yamaoka/ Jim Rassler	0
11/23/2108	Three Sisters	Barkentine	track	fox	Lynn Yamaoka/ Jim Rassler	0
11/23/2018	Three Sisters	Barkentine	track	fox	Lynn Yamaoka/ Jim Rassler	0
11/23/2018	Three Sisters	Barkentine	track	fox	Lynn Yamaoka/ Jim Rassler	0
12/25/2018	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka/ Jim Rassler	0
12/25/2018	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
12/25/2018	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
12/25/2018	Three Sisters	Barkentine	scat	coyote	Lynn Yamaoka	0
12/25/2018	Three Sisters	Barkentine	scat	coyote	Lynn Yamaoka	0
12/25/2018	Three Sisters	Barkentine	scat	coyote	Lynn Yamaoka	0
12/25/2018	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
12/25/2018	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0

12/25/2018	Three Sisters	Barkentine	scat	coyote	Lynn Yamaoka	0
12/25/2018	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	scat	fox	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	scat	fox	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	scat	fox	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
1/5/2019	Three Sisters	Barkentine	track	coyote	Lynn Yamaoka	0
12/16/2018	White Point	Grassland Loop Trail	scat	coyote	Patricia Lyon	0
12/16/2018	White Point	Grassland Loop Trail	scat	coyote	Patricia Lyon	0
12/16/2018	White Point	Grassland Loop Trail	scat	coyote	Patricia Lyon	0
12/16/2018	White Point	Grassland Loop Trail	scat	coyote	Patricia Lyon	0
1/9/2109	White Point	Grassland Loop Trail	track	coyote	Patricia Lyon	0
1/9/2019	White Point	Grassland Loop Trail	track	red fox	Patricia Lyon	0
1/9/2019	White Point	Grassland Loop Trail	track	other	Patricia Lyon	0

APPENDIX B
Wildlife Tracking Methods

Wildlife Tracking Methodology

October 8, 2015

Citizen Science Wildlife Tracking:
Procedures for field methods and data submission.

Preserving land and restoring habitat for the education and enjoyment of all

The Conservancy is a nonprofit 501(c)(3) organization dedicated to open space preservation and habitat restoration throughout the Peninsula

PALOS VERDES PENINSULA LAND CONSERVANCY PO BOX 3427. PALOS VERDES PENINSULA. CA 90274 TEL; (310)541-761

Method Overview

The Palos Verdes Peninsula Land Conservancy and the City of Rancho Palos Verdes (RPV) manage the Palos Verdes Nature Preserve under the guidance of the Natural Communities Conservation Plan (NCCP/HCP), a document developed by the US Fish and Wildlife Service (F&WS) along with the California Department of Fish and Wildlife (DF&W). This document specifies that activity of wildlife mesopredators such as coyotes, gray fox, and red fox be monitored. The results of this monitoring is reported to RPV, F&WS, and DF&W. The Conservancy began monitoring these animals in 2006 and has developed established protocols for such monitoring, which are described in this document.

The monitoring is conducted when the animals are most active, November through March by walking along specific routes in the preserves. While walking along marked trails, surveyors search for evidence of coyotes, gray fox, and red fox which is usually in the form of scat or track imprints. Scat is the most frequent observation made, with tracks a distant second. Once found, a clear photograph must be taken and location along with appropriate comments noted on a datasheet. When scat is found, a closer look is required to determine, if possible, what the predator has eaten. When tracks are found, the length and width of the track is measured along with a measurement of the animal's stride, when possible.

Training is required for participants to develop the necessary skills for optimal accuracy in identifying scat, its contents, and tracks. At minimum, initial training requires four 2-3 hour sessions, which are conducted on Saturdays in October. Additionally Citizen Science participants are encouraged to accompany advanced trackers to enhance their skills. Photographs of observations are an important tool for confirming the accuracy of observations. The Conservancy provides additional support as needed and occasionally host 1-day workshops featuring experts in the field to further extend people's tracking skills.

Recorded data are submitted electronically to the Conservancy using Excel worksheets and pdf (or photos) of the field datasheets. These data are uploaded into the Conservancy's Monitoring Database for data assessment and reporting. It is not unusual to have no observations during a survey. In this case, surveyors must submit an Excel report stating None for observations. This information is necessary in order to determine visitation frequency that is calculated from the total number of surveys for each specific preserve section.

Recommended literature includes:
The Trackers Field Guide by James C. Lowery, 2nd Ed. 2013
Scats and Tracks of the Pacific Coast by James Halfpenny 1999

Summary of tasks

1. Tracking takes place November through March on a weekly basis, weather permitting.
2. Prepare for field work
3. Walk specified section of trail, make observations, and take photographs
    a. Observe scat, photograph, investigate for prey content, and photograph, recording on approximate location on field datasheet
    b. Observe track, photograph, measure print width, length, and stride length (when possible), recording on back of field datasheet
4. Enter data into WildlifeTracking FieldData.xlsx spreadsheets following convention provided as examples (see Wildlife Illustrated Field Manual)
5. Rename scat and track photos following convention provided as examples
6. At the end of each month, send spreadsheet and photos to Ann Dalkey at adalkey@verizon.net.

Prepare for Wildlife Tracking

1. Print-out specific maps of the reserve where you will be doing the tracking (see WildlifeTracking Maps.pdf)
2. Bring with you:
    a. Tracking ruler supplied by PVPLC,
    b. Datasheet for your area
    c. Clipboard and pen
    d. Camera
3. Safety: Always take a cell phone. Reception is very good in most parts of the preserves
4. Comfort recommendation: Sturdy shoes and long pants, plus a hat

Field Methods

1. Observation
    a. While hiking, continuously scan the trail and sides of trail
    b. If working in a group, determine individual tasks
        i. Recorder – this person is responsible for filling-out the forms and watching the work in progress to insure all data are collected
        ii. Measurer – this person measures tracks, when found, in investigates the scat
        iii. Photographer
2. Scat investigations – Mark data directly on datasheet
    a. Determine species, photograph (Figure 1)
        i. Coyote scat is gray, generally full of fur and bones, and located near trail intersections.
        ii. Fox scat is brown, often tapered, and located. It is very difficult to distinguish gray fox from red fox, so they are recorded as fox.
    b. Tease scat apart to determine the identity of the prey using the following categories (see Wildlife Prey Illustrations and (Figure 1):
        i. Avian
        ii. Cat (for domestic cat)
        iii. Invertebrate
        iv. Rabbit
        v. Rodent
        vi. Small mammal (many skeletal parts are present)
        vii. Large mammal (only fragments of bones are present)
        viii. Trash (anthropogenic material)
        ix. Vegetation (includes grass, seeds, etc.)
        x. Unidentified
    c. Add comments as needed
3. Track investigations – Use back of datasheet to record observations.
    a. Determine species, photograph for report with ruler in field of view (Figure 1).
    b. Measure track's width and length in millimeters (mm), noting whether it is a fore or hind paw and left or right, if possible.
    c. Obtain as many measurements as possible when multiple prints are present, including stride length in centimeters (cm).
4. Photographic documentation – follow this convention for naming photos that will be submitted with your data:
    a. SpeciesScat (FS or CS) Date (as yymmdd) Contents PhotoNumber. For example: FS 131021 Rodent 468.jpg
    b. SpeciesTrack (GFT or RFT or CT) Date (as yymmdd) Paw PhotoNumber. For example: GFT Hind R131021 468.jpg

Data Review and Input

1. Create electronic version of the field datasheet.
    a. Make a pdf iteration using a scanner, or take a photo with your camera making sure all features are clearly visible.
    b. Rename the file as **PreserveSec Map yyyymmdd YourName.** For example: PortBendD Map 20130927 Dalkey.pdf.
2. Input data into Excel workbook WildlifeTracking Field Data.xlsx
    a. Rename (Save As) file as **Preserve Sec yyyymmdd YourName**. The software will automatically add the correct extension (.xlsx) For example: PortBendD 20130927 Dalkey.xlsx.
    b. Transcribe your data from the field datasheet into the appropriate pages. Note each page has a format example to follow
        i. Scat
        ii. Tracks
        iii. Misc Comments – this is where you add comments provided to you by hikers you interface with along the trail.

Figure 1. Common scat, prints, and prey examples.

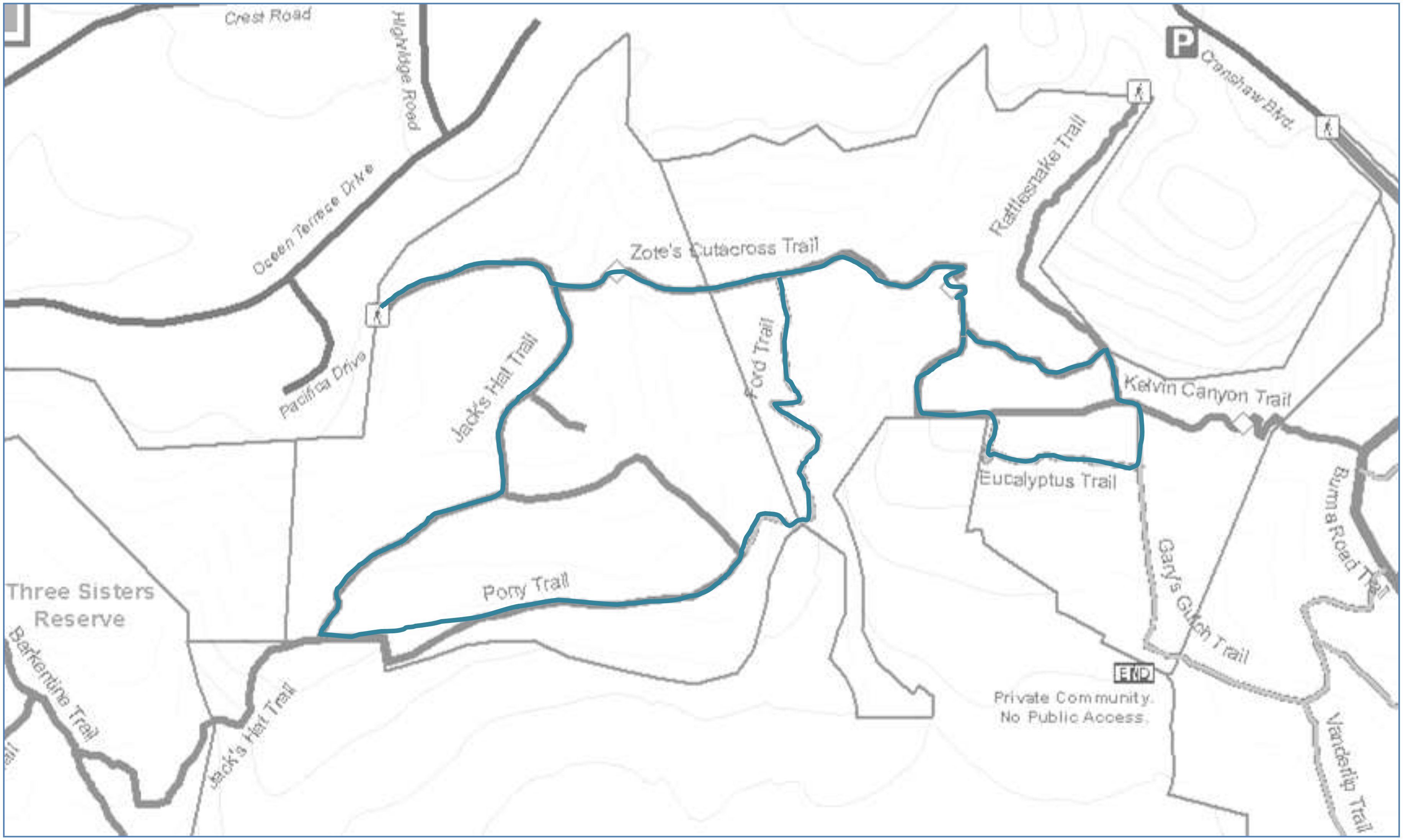
APPENDIX C

Wildlife Tracking
Field Datasheets and Maps

Filiorum Reserve

Tracker: ______________________________ **Survey Date:**________________ **Number Rabbits Observed:**____

Comments: ____



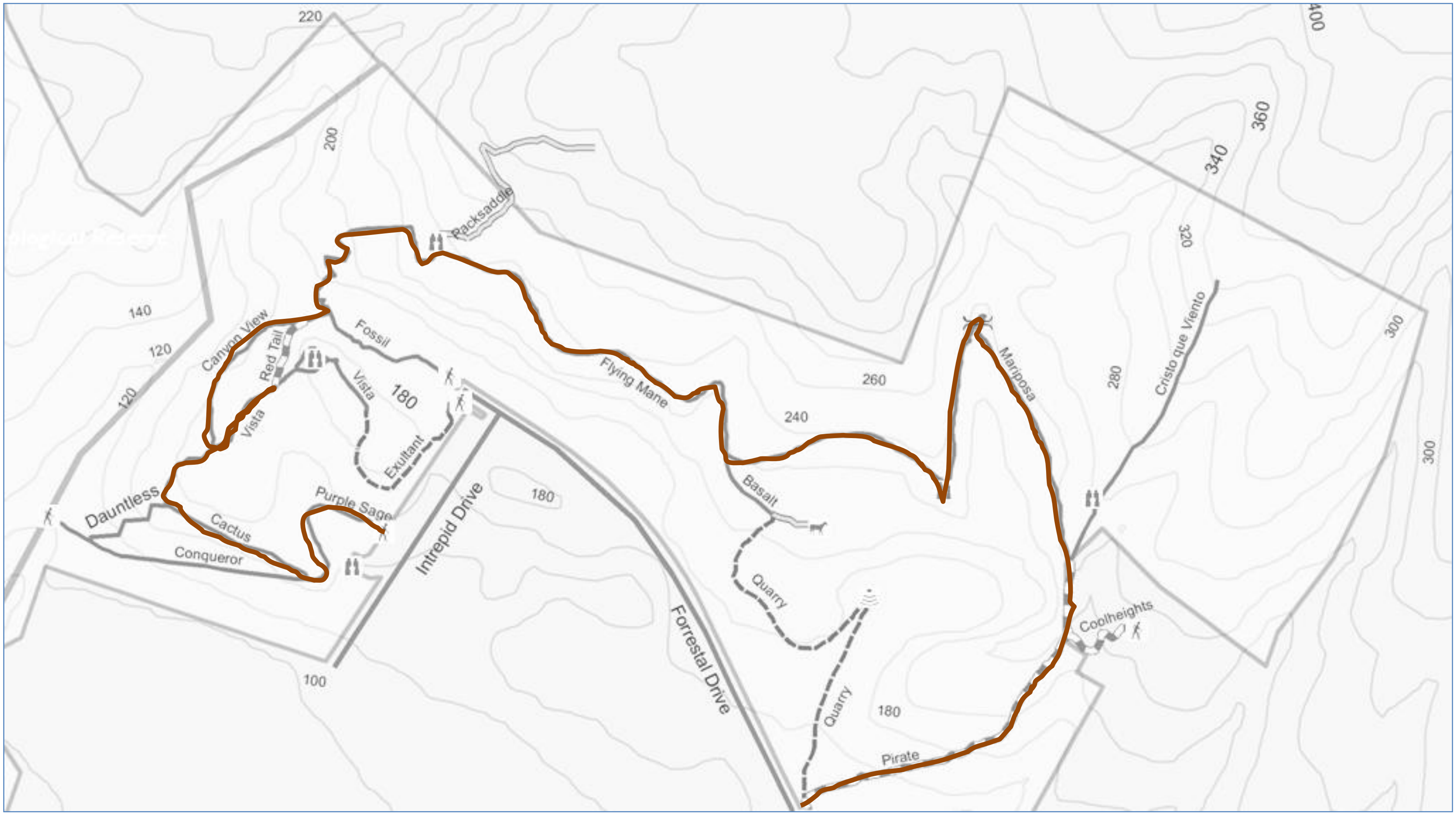
Key:	Scat:	FS = Fox scat	CS = Coyote Scat		OS = Other, note in comments
	Track:	GFT = Gray fox track	RFT = Red fox track	CT = Coyote Track	OT = Other, note in comments

Prey Categories:	Avian	Invertebrate	Small Mammal	Anthropogenic
Unidentified	Cat	Rodent	Large Mammal	Vegetation

Forrestal Reserve

Tracker: ______________________________ **Survey Date:** ________________ **Number Rabbits Observed:** _____

Comments: ____



Key:	Scat:	FS = Fox scat	CS = Coyote Scat		OS = Other, note in comments
	Track:	GFT = Gray fox track	RFT = Red fox track	CT = Coyote Track	OT = Other, note in comments

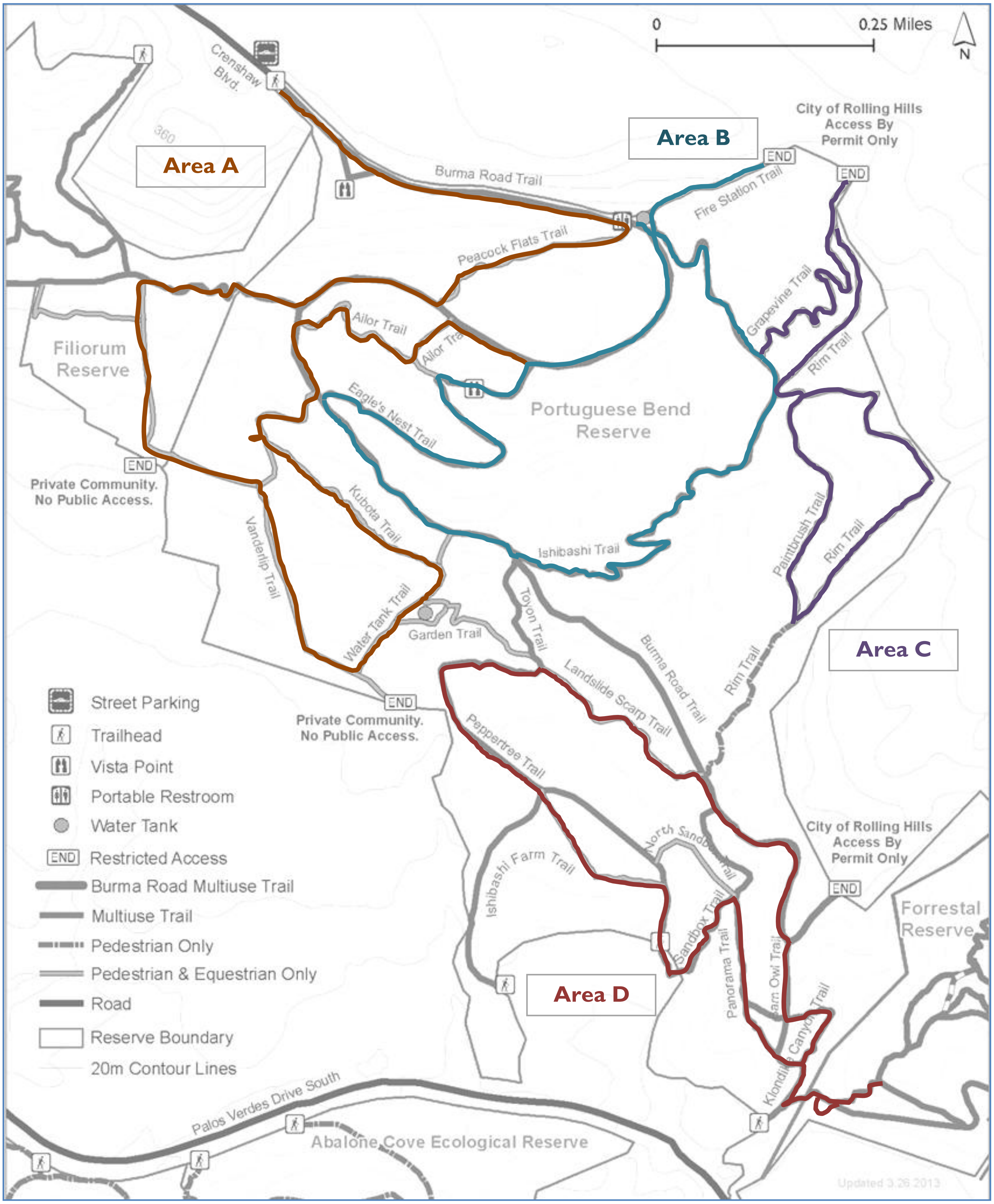
Prey Categories:	Avian	Invertebrate	Small Mammal	Anthropogenic
Unidentified	Cat	Rodent	Large Mammal	Vegetation

Portuguese Bend Reserve

Tracker: ______________________________ **Survey Date:**________________ **# Rabbits Obsvd:**_____

Comments:

____



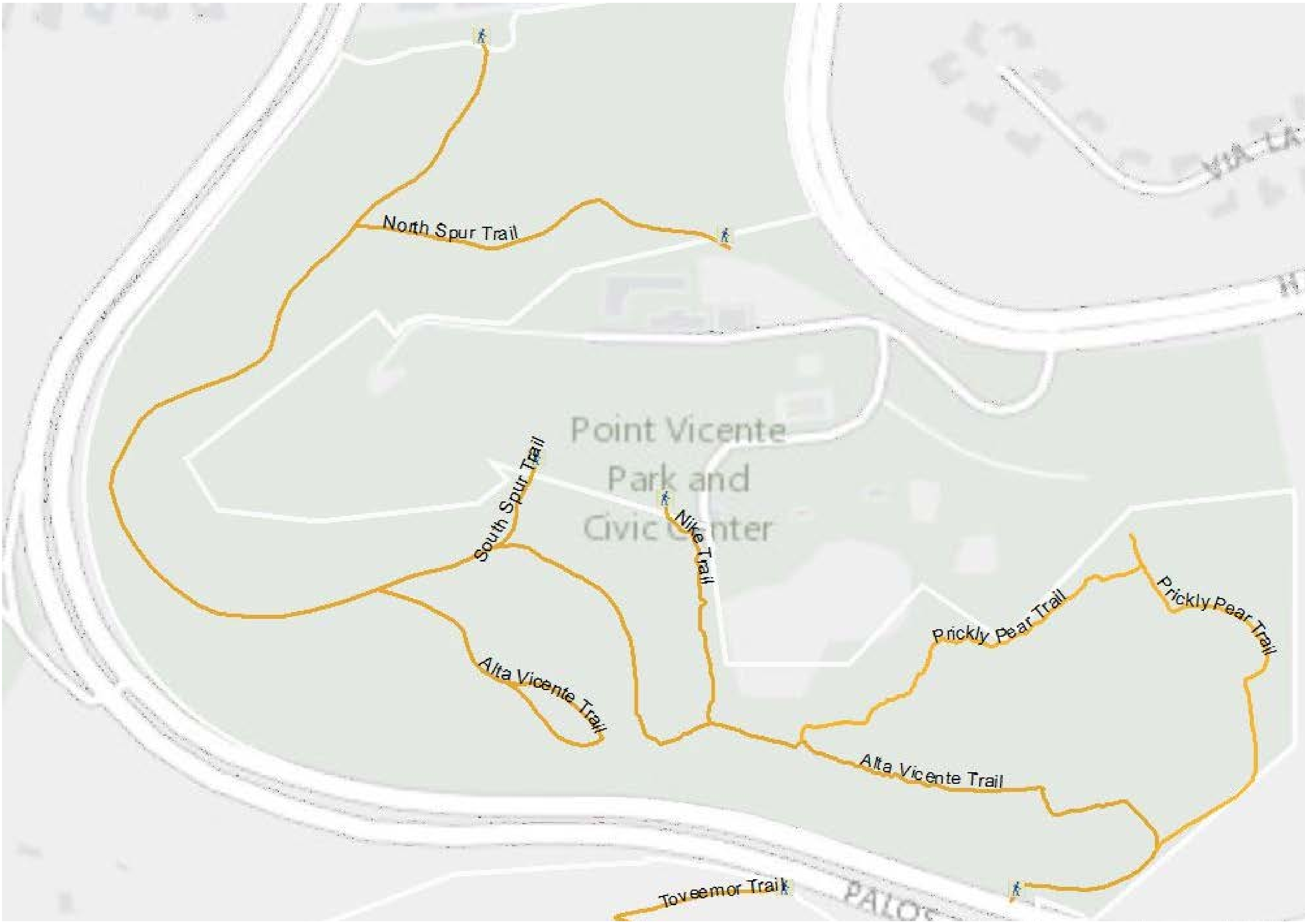
Key:	Scat:	FS = Fox scat	CS = Coyote Scat		OS = Other, note in comments
	Track:	GFT = Gray fox track	RFT = Red fox track	CT = Coyote Track	OT = Other, note in comments

Prey Categories:	Avian	Invertebrate	Small Mammal	Anthropogenic
Unidentified	Cat	Rodent	Large Mammal	Vegetation

Alta Vicente

Tracker: ________________________________ **Survey Date:**__________________ **Number Rabbits Observed:**____

Comments: ____

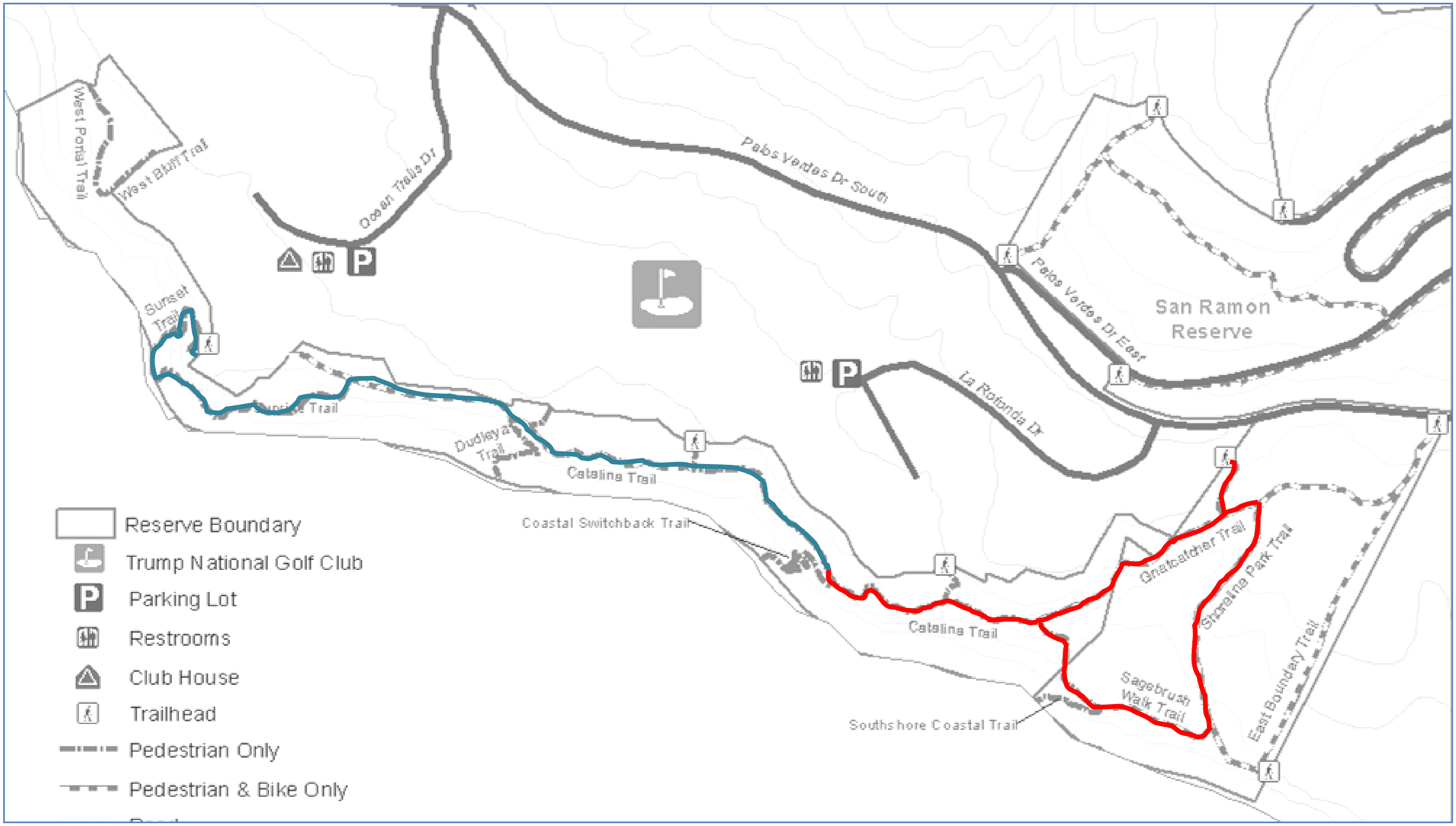


Key:	Scat:	FS = Fox scat	CS = Coyote Scat		OS = Other, note in comments
	Track:	GFT = Gray fox track	RFT = Red fox track	CT = Coyote Track	OT = Other, note in comments

Ocean Trails Reserve

Tracker: ________________________________ **Survey Date:**_________________ **Number Rabbits Observed:**_____

Comments: ____



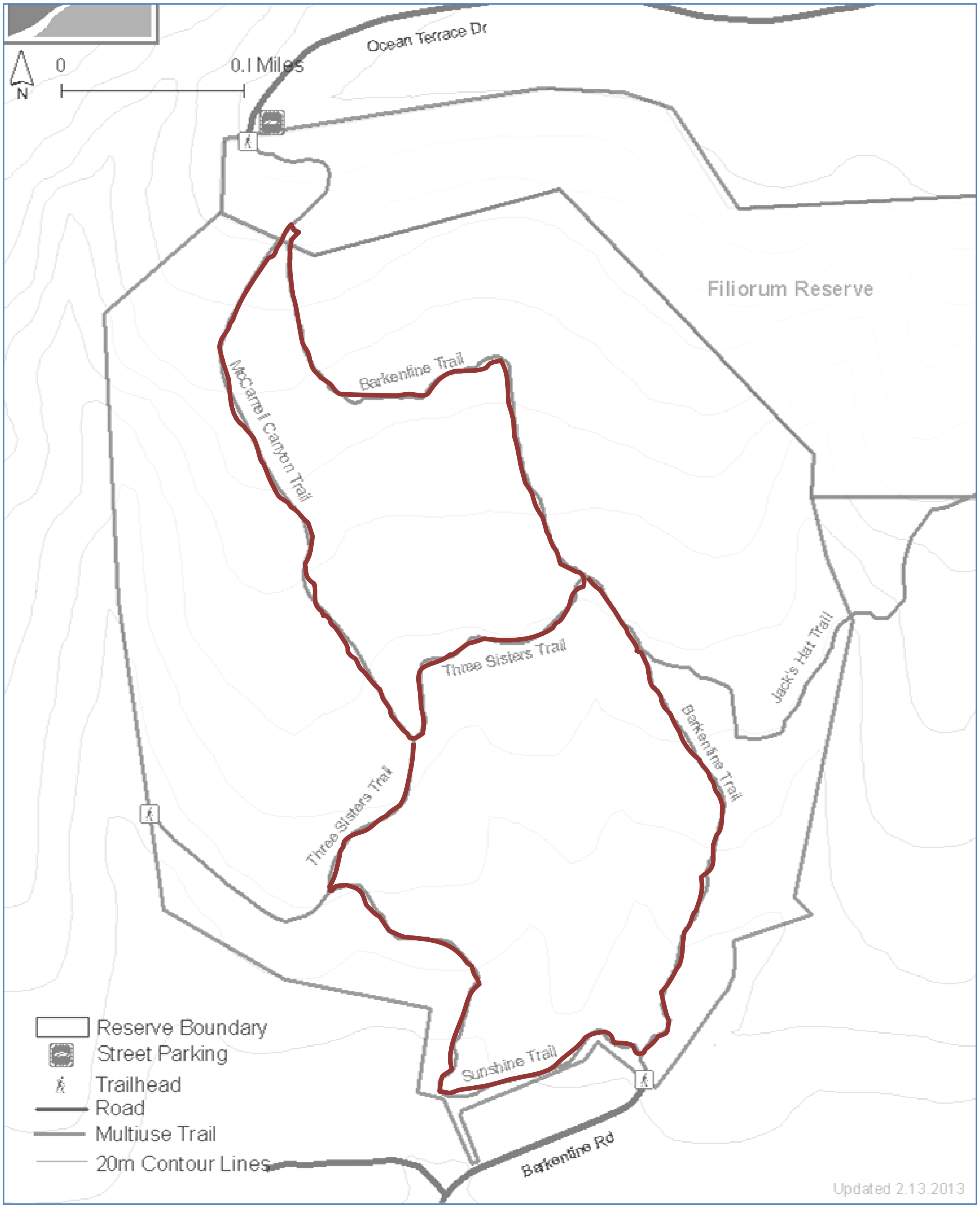
Key:					
	Scat:	FS = Fox scat	CS = Coyote Scat		OS = Other, note in comments
	Track:	GFT = Gray fox track	RFT = Red fox track	CT = Coyote Track	OT = Other, note in comments

THREE SISTERS RESERVE

Tracker: ______________________________ **Survey Date:**________________ **# Rabbits Obsvd:**_____

Comments:

____



Key: Scat:	FS = Fox scat	CS = Coyote Scat		OS = Other, note in comments
Track:	GFT = Gray fox track	RFT = Red fox track	CT = Coyote Track	OT = Other, note in comments

Prey Categories:	Avian	Invertebrate	Small Mammal	Anthropogenic
Unidentified	Cat	Rodent	Large Mammal	Vegetation

SECTION 3

HABITAT RESTORATION PLAN

Habitat Restoration Plan for the

Abalone Cove Ecological Reserve in the Palos Verdes Nature Preserve




FEBRUARY 2016

PREPARED BY:

Palos Verdes Peninsula Land Conservancy
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605 Third Street
Encinitas, CA 92024

HABITAT RESTORATION PLAN
for the
Abalone Cove Reserve
in the
Palos Verdes Nature Preserve

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FEBRUARY 2016

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Habitat Restoration Plan for the Abalone Cove Reserve in the Palos Verdes Nature Preserve

1 INTRODUCTION

This Habitat Restoration Plan (HRP) was prepared for the Abalone Cove Reserve within the Palos Verdes Nature Preserve (PVNP) located in the City of Rancho Palos Verdes, California (Figures 1 and 2). The Abalone Cove Reserve is one of ten ecological reserves within the approximately 1,400-acre PVNP. The PVNP is owned by the City of Rancho Palos Verdes and managed by the Palos Verdes Peninsula Land Conservancy (PVPLC).

This HRP discusses implementing restoration of approximately 3.5 acres of coastal sage scrub, 1.1 acre of cactus scrub, 0.2 acre of mulefat scrub, and the enhancement of approximately 8.3 acres of mixed coastal scrub in a disturbed area of the Abalone Cove Reserve. Portions (approximately 2.2 acres) of the habitat enhancement area were identified for planting additional cactus. The HRP addresses restoration design, planting recommendations, installation procedures, maintenance requirements, monitoring methodology, and performance standards.

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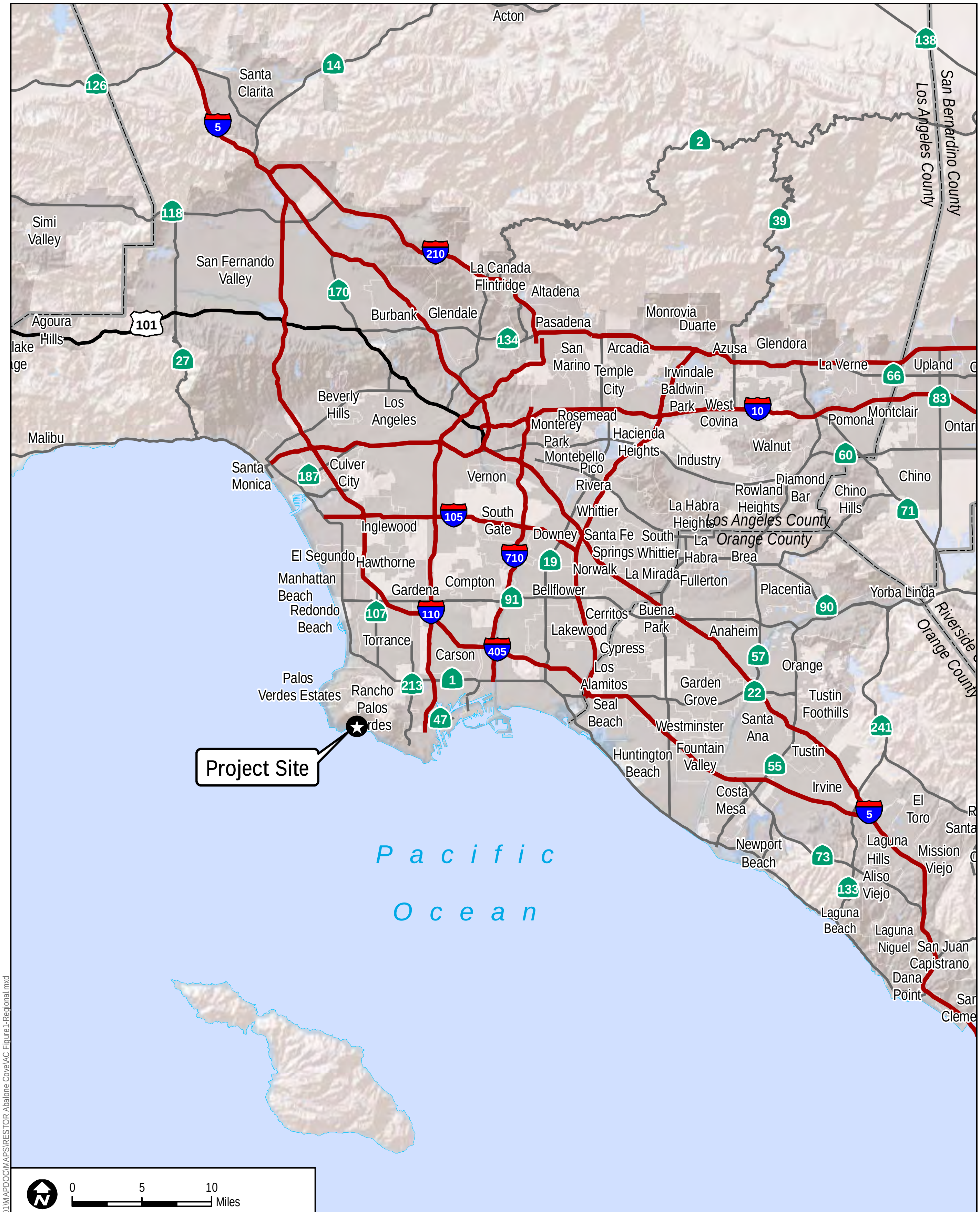

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FIGURE 1

Regional Map

Habitat Restoration Plan for the Abalone Cove Ecological Reserve in the Portuguese Bend Nature Preserve

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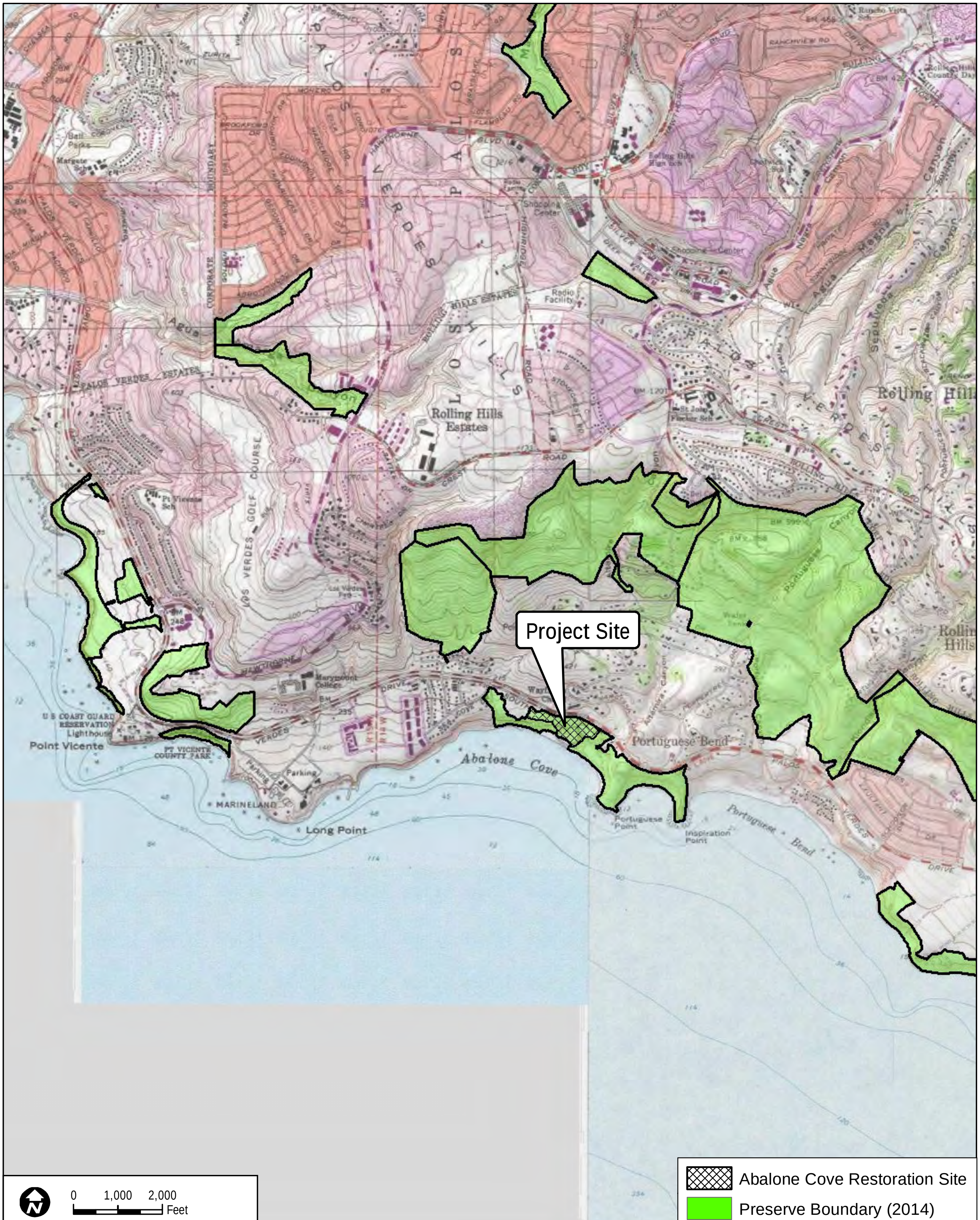

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SOURCE: USGS 7.5-Minute Redondo Beach, San Pedro Series Quadrangles.

FIGURE 2
Vicinity Map

Habitat Restoration Plan for the Abalone Cove Ecological Reserve in the Portuguese Bend Nature Preserve

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2 EXISTING CONDITIONS

2.1 Site Description

The Abalone Cove Reserve is located on the southern portion of the Palos Verdes Peninsula. The entire Abalone Cove Reserve is approximately 64 acres and is located south of Palos Verdes Drive South along the shoreline of the peninsula. There are two promontories, Portuguese and Inspiration Points, which bound the cove within the Abalone Cove Reserve. The proposed restoration area is located upslope from the Portuguese Bend Nursery School (Beach School) in the central part of the reserve.

2.2 Vegetation Communities

Plant communities and land covers within the Abalone Cove Reserve are typical of plant communities found in this region, exhibiting various levels of disturbance, but containing elements of the native plant communities. Vegetation mapping of the reserve was prepared by the PVPLC and the California Native Plant Society (CNPS) (PVPLC and CNPS 2010). According to the vegetation mapping conducted by PVPLC and CNPS, the proposed restoration area consists of California coastal sage scrub, mixed coastal scrub, and non-native grassland, comprised of several subtypes (e.g., alliances and associations). The existing vegetation communities present in the restoration/enhancement area are described below.

2.2.1 Coastal Sage Scrub

The coastal sage scrub on site was mapped by CNPS as *Encelia californica* association, *Encelia californica* alliance, *Encelia californica-Artemisia californica* association, and *Rhus integrifolia* (strongly dominant) association (PVPLC and CNPS 2010). Coastal sage scrub is composed of low, subshrubs approximately 1 meter (3 feet) high, many of which are facultatively drought-deciduous (Holland, 1986). Dominant shrub type varies across this vegetation type, depending on localized factors and levels of disturbance, but often includes California Sagebrush (*Artemisia californica*) and California Brittlebush (*Encelia californica*). In this community the shrub layer primarily forms a continuous canopy, but there are areas with a more open canopy, widely spaced shrubs, and fairly well-developed understory. Within the site non-native species, including black mustard (*Brassica nigra*), Russian thistle (*Salsola tragus*), wild oat (*Avena barbata, A. fatua*) and other non-native grasses have invaded the coastal sage scrub community.

2.2.2 Mixed Coastal Scrub

The mixed coastal scrub on site was mapped by CNPS as disturbed *Rhus integrifolia* association, and urban trees (PVPLC and CNPS 2010). Though these areas are dominated by lemonadeberry (*Rhus integrifolia*) they are disturbed and contain many non-native shrubs and trees, including coastal wattle (*Acacia cyclops)* spiny holdback (*Caesalpinia spinosa*), and Phoenix palm (*Phoenix canariensis*).

2.2.3 Non-native Grassland

Non-native grassland within the project site was mapped by CNPS as cleared land, and California annual and perennial grassland macrogroup (PVPLC and CNPS 2010). Non-native grassland is typically characterized by dense to sparse cover of weedy, introduced annuals including wild oat, brome grasses (*Bromus diandrus, B. madritensis, B. hordeaceus*) and black mustard. Annual grassland often occurs in areas where there has been some historic disturbance to the natural community. At the proposed restoration site, non-native grassland is heavily dominated by wild oat, brome grasses, black mustard, fennel, tocalote (*Centaurea melitensis*), and false brome (*Brachypodium distachyon*).

2.3 Geology and Soils

The Palos Verdes Peninsula is primarily an old marine terrace with relatively steep eroded canyons which drain southwesterly into the Pacific Ocean. The underlying geologic material consists of marine sedimentary and basaltic rocks. The area is seismically active, with active Palos Verdes and San Pedro fault zones that have caused the peninsula to uplift relative to the adjacent Los Angeles Basin and the offshore bedrock.

According to the Report and General Soil Map for Los Angeles County (USDA 1969), the soils within the Abalone Cove Reserve are composed of the Altamont-Diablo association (30–50% slopes). Soils of the Altamont-Diablo association occur on gently sloping to rolling foothills throughout the Los Angeles basin as far north as Point Dume. The Altamont-Diablo association is comprised of approximately 60% Altamont soils and 30% Diablo soils. Diablo soils are described to be 22–52 inches deep, are well drained, and have slow subsoil permeability. Altamont soils are described to be 24–36 inches deep, are well drained, and have slow subsoil permeability. They have dark brown, neutral, clay surface layers about 12 inches thick underlain by a brown, calcareous clay subsoil.

The proposed restoration area is primarily a terrace above the coastal bluffs. The terrace appears to have been used for agriculture in the 1950's and 1960's, but has lain fallow for several decades. Three soil samples were collected from the proposed restoration area. The soil samples were collected from three areas proposed for restoration (Figure 3). Each of the soil samples was composed of 3-4 subsamples consisting of the 12-16-inch deep soil profile from each location to create a composite soil sample for analysis. The composite soil samples are representative of the general soil conditions on site within the rooting zone of the target plant species. The soil samples were submitted to Wallace Laboratories for analysis of standard soil constituents, agricultural suitability, texture, and cation exchange capacity. The results of the analysis show that, the soils are clay, with a slow/fair infiltration rate and fair organic matter (Appendix A). The soils on site are slightly alkaline (pH = 7.69-7.76) and the salinity is low (ECe = 0.44-0.72). Major nutrients (nitrogen and phosphorus) are low.

Plant establishment is not expected to be significantly inhibited due to the soil chemistry described above. The soils appear to be suitable for the establishment of the target habitats without soil remediation or extensive soil amendments. However, container plants may struggle to become established and grow healthfully without supplemental watering, and amendments may be necessary if plants are struggling to become established. While the soils on site pose no significant problems to establishment of native habitat, as native soils they have low levels of major nutrients. Native species are adapted to lower nutrient soils, but will benefit from some supplemental nutrient augmentation during planting to initiate establishment (e.g., slow-release fertilizer packet).

2.4 Special-Status Species

Two special-status wildlife species have been documented within or nearby the restoration and enhancement areas. Coastal California gnatcatcher (*Polioptila californica californica*) (CAGN) and the cactus wren (*Campylorhynchus brunneicapillus*) (CAWR) have been observed in the coastal sage scrub enhancement area, as well as on the southern border of the coastal sage scrub restoration area (PVPLC 2012) (Figure 3).

No special-status plant species have been documented within the specific area identified for restoration in the HRP. However, four special-status plant species have been documented nearby, including aphanisma (*Aphanisma blitoides*), south coast saltscale (*Atriplex pacifica*), woolly sea-blite (*Suaeda taxifolia*), and sea dahlia (*Coreopsis maritima*) (Dudek and PVPLC 2007; CNPS 2015). In addition to special-status plant species, the host plant seacliff buckwheat (*Eriogonum parvifolium*) for the federally listed, endangered, El Segundo blue butterfly (*Euphilotes battoides allyni*) is known to occur in the vicinity of the proposed restoration areas. Observation of the El Segundo blue butterfly has not been reported at the Abalone Cove Reserve.

2.5 Non-Native Invasive Species

Non-native species are abundant within the area identified for restoration, making up the majority of the existing vegetative cover. Non-native species are also common in the area proposed for enhancement. Controlling non-native species during the plant establishment phase will present a significant challenge, and should be prioritized as the most critical aspect of the maintenance program. The most predominant non-native species observed on-site include black mustard, coastal wattle, spiny holdback, Peruvian pepper, Brazilian pepper, and non-native grasses. These species, as well as additional non-native species observed or expected on site, are provided in Table 1 with their associated rating in the California Invasive Plant Council's (Cal-IPC) Inventory of Invasive Plant Species (2015).

Table 1
Non-Native Plant Species and Associated Cal-IPC Ratings

High
Bromus madritensis ssp. *madritensis*—compact brome
Carpobrotus edulis—hottentot fig
Foeniculum vulgare—fennel
Moderate
Atriplex semibaccata—Australian saltbush
Avena barbata—slender oat
Brassica nigra – black mustard
Moderate
Bromus diandrus—ripgut brome
Centaurea melitensis—Maltese star-thistle
Glebionis coronaria—crowndaisy
Hordeum murinum—mouse barley
Mesembryanthemum crystallinum—common iceplant
Myoporum laetum—myoporum
Pennisetum setaceum—crimson fountaingrass
Euphorbia terracina—Geraldton carnation weed
Limited
Bromus hordeaceus—soft brome
Erodium cicutarium—redstem stork's bill
Marrubium vulgare—horehound
Olea europaea—olive
Phoenix canariensis—phoenix palm
Ricinus communis—castorbean
Salsola tragus—prickly Russian thistle
Schinus molle – Peruvian peppertree
Schinus terebinthifolius—Brazilian peppertree

Table 1
Non-Native Plant Species and Associated Cal-IPC Ratings

None
**Acacia cyclops*—coastal wattle
Caesalpinia spinosa—spiny holdback
Erigeron bonariensis - asthmaweed
Lactuca serriola – prickly-lettuce
Malva parviflora—cheeseweed mallow
**Melilotus indicus*—annual yellow sweetclover
***Pinus* sp.—pine
Solanum elaeagnifolium – silverleaf nightshade
Sonchus oleraceus—common sowthistle
**Tropaeolum majus*—nasturtium
Yucca gloriosa – Spanish dagger

* Note that while there are several species on the list that do not have a Cal-IPC rating for the state of California, that some of these species can be locally invasive. Species with an asterisk are considered to be moderately invasive within the region and should be aggressively controlled. The Targeted Exotic Removal Program for Plants (TERPP) provides additional target invasive species (PVPLC 2013) that may occur on-site

** Note that some trees taller than 5 feet will be left in place and not removed. Seedlings and young saplings less than 5 feet tall will be removed.

2.6 Additional Considerations

The City of Rancho Palos Verdes has plans for a stabilization project on the walls of the steep, highly eroded canyon on the eastern border of the enhancement area. To allow a buffer for stabilization activities, the enhancement area will leave a buffer of at least 30 feet along the canyon rim, where no enhancement activities will be undertaken.

Additionally, two or more electric utility poles intersect the enhancement area in transit to the Beach School. Restoration and enhancement activities will allow a 15 foot buffer around utility poles, allowing only the management and control of particularly invasive species within these zones (i.e., no planting or seeding).

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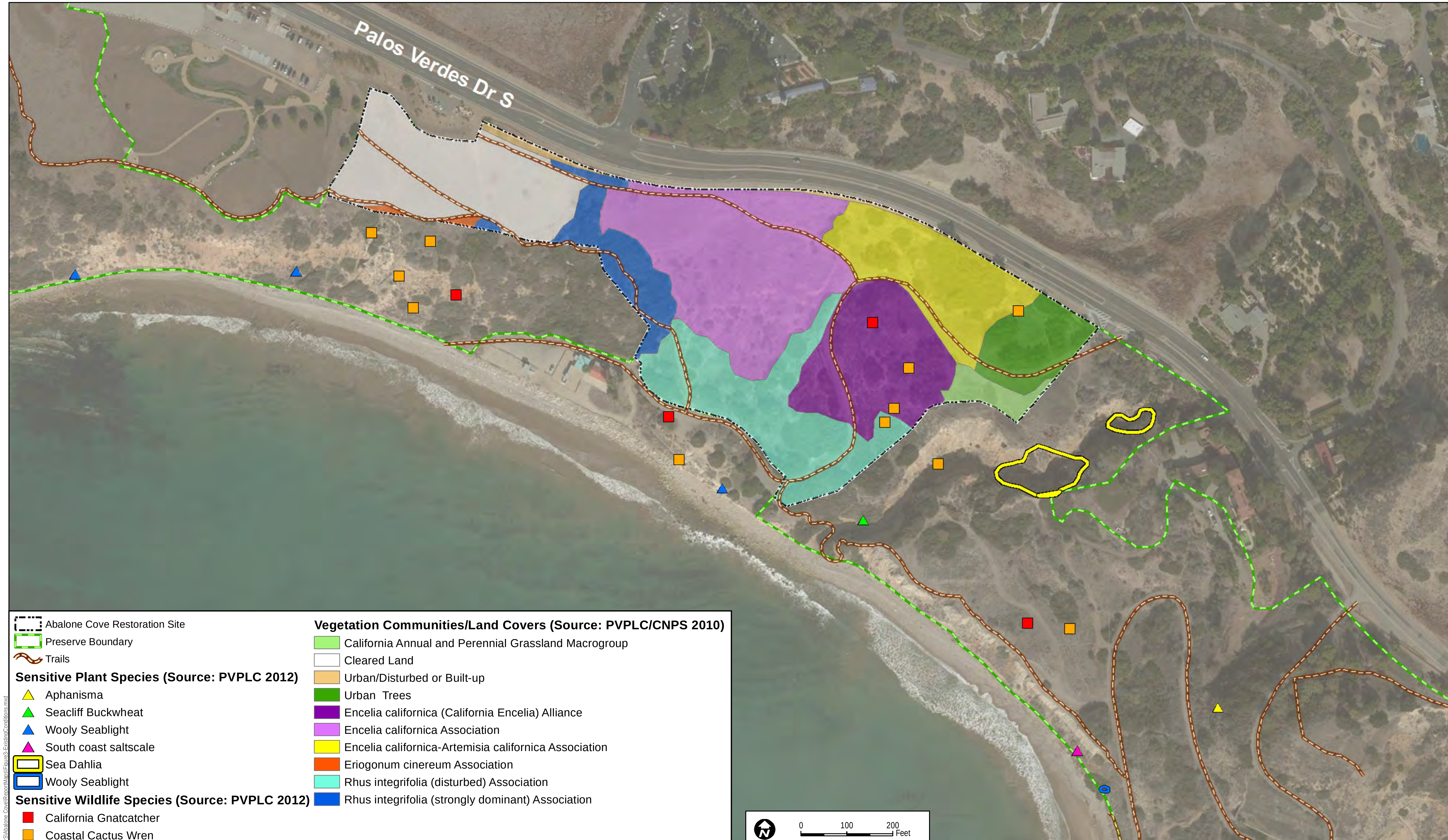

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SOURCES: Palos Verdes Peninsula Land Conservancy 2012; Bing Maps, 2015

FIGURE 3

Existing Conditions

Habitat Restoration Plan for the Abalone Cove Ecological Reserve in the Portuguese Bend Nature Preserve

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3 RESTORATION PROGRAM

This HRP outlines the restoration and enhancement implementation strategy for upland habitat at the Abalone Cove Reserve and proposes to provide for the restoration of approximately 4.8 acres of habitat restoration, and the enhancement of approximately 8.3 acres of mixed coastal scrub. This HRP uses a restoration approach that emphasizes the recovery of the degraded ecosystem through planting and seeding to re-establish or enhance biological functions and services within portions of the Abalone Cove Reserve.

3.1 Restoration Site Goals and Objectives

The disturbed and fragmented habitat existing in the proposed restoration and enhancement locations limit the magnitude of potential wildlife use and provide opportunities for the further spread and establishment of invasive weed species in the area. The planting of native coastal sage scrub, cactus scrub, mulefat scrub, and enhancement of mixed coastal scrub will provide contiguous native habitat that includes a mosaic of shrub cover which will resist the invasion of invasive weed species and provide increased nesting, cover, and foraging opportunities for wildlife. In particular, the overarching goal of the restoration program is to provide habitat for coastal California gnatcatcher and the cactus wren.

The habitat restoration program will focus on the creation of habitat for covered species with the objective of increasing the overall habitat carrying capacity for the target species populations. Coastal scrub restoration is intended to provide improved foraging habitat for resident and migrating wildlife species, and potential nesting and foraging habitat for the coastal California gnatcatcher, and other sensitive wildlife species. Achievement of the performance standards described herein would create suitable habitat for these species. However, occupation of the site by these species is not a requirement for successful project completion.

In addition to these broad goals, the following site-specific objectives for the Abalone Cove Reserve restoration site have been incorporated into this HRP in the interest of minimizing adverse impacts to biological resources:

- Avoid additional or unplanned disturbance to existing native habitats during implementation of the project construction and long-term maintenance activities;
- Prevent any impacts to sensitive plant or wildlife species during implementation of the project construction and long-term maintenance activities;
- Control non-native invasive weed species considered to be highly or moderately invasive on the Cal-IPC Invasive Plant Inventory (2015), and others identified by PVPLC as locally invasive (PVPLC 2013);

- Utilize erosion control measures in the form of "Best Management Practices" (BMPs) on the site as conditions necessitate;
- Reintroduce special-status plant species and/or host plants of special-status wildlife species as components of the planting plans where feasible and as appropriate.

3.2 Habitats to be Established or Enhanced

The habitat restoration program consists of site preparation (primarily non-native plant species removal), native planting, seeding, supplemental watering, maintenance, and monitoring. Proposed planting for the target habitat types will focus primarily on the installation of container plants to achieve the project goals. A native seed mix will also be applied as a supplemental measure to increase cover and diversity.

The habitat restoration areas are currently dominated by non-native species. The existing habitat in the restoration areas contains many non-native annual herbs, including black mustard, Russian thistle, and bromes (Figure 4, Photos 1 and 2). Non-native perennials, such as fennel, spiny holdback, Peruvian pepper, and Brazilian pepper also exist within the restoration areas.

Coastal sage scrub habitat will make up the majority of the restored habitat, followed by cactus scrub. Mulefat scrub is planned for approximately 0.2 acre within the restoration area. Each specific habitat type to be restored is described below. It is expected that all planting shall be installed to mimic the natural distribution and vegetation mosaic of adjacent healthy habitats.

Photo 1: Representative view of western restoration area (facing west)

Photo 2: Non-native plants in the western restoration area (black mustard, brome grasses, Russian thistle)

Photo 3: Trail lined by invasive spiny holdback (*Ceasalpinia spinosa*)

Photo 4: Invasive perennial weeds in the habitat enhancement zone (Coastal wattle, Brazilian pepper)

Photo 5: Representative view of the eastern restoration area (facing west)

Photo 6: Invasive annual weeds in the restoration site (black mustard, wild oat)

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FIGURE 4
Site Photographs

Habitat Restoration Plan for the Abalone Cove Ecological Reserve in the Portuguese Bend Nature Preserve

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3.2.1 Coastal Sage Scrub

The restoration strategy for coastal sage scrub habitat on the Abalone Cove Reserve restoration site includes reintroducing regionally appropriate native coastal sage scrub species that are currently present in adjacent native habitats. The plant palette includes a container plant and seed mix composition (Table 2) that has been designed to replicate the native composition of a healthy coastal sage scrub plant community similar to existing coastal sage scrub habitat present on the Abalone Cove Reserve site, and with the specific intent to provide habitat suitable for occupation by coastal California gnatcatcher. The planting palette has thus been designed to contain a composition of shrub species that are dominant in coastal sage scrub habitat occupied by coastal California gnatcatcher (Atwood et al. 1994). On the Palos Verdes Peninsula, the primary coastal sage scrub dominants include California sagebrush, California brittlebush, and coastal buckwheat, with coast goldenbush, lemonadeberry, California buckwheat, sages, bladderpod, coast prickly-pear, and wishbone bush as common constituents.

The plant palette provides a quantity of container plants (perennial species) that is estimated to establish approximately 75% cover for coastal sage scrub, 60% cover for cactus scrub, and 100% for mulefat scrub once the plants reach maturity. The seed mix is provided to address erosion control and enhance species diversity, and will be applied as needed, and as determined necessary by the PVPLC.

Table 2
Proposed Coastal Sage Scrub Planting Palette (Approximately 3.5 Acres)

Botanical Name	Common Name	Container Size	Spacing (on center)	Group Size	Quantity (per acre)	Total # Plants
Container Plants						
Artemisia californica	California sagebrush	D40	5	5	348	1,220
Astragalus trichopodus var. *lonchus*	Ocean locoweed	D40	3	7	184	645
Baccharis pilularis	Coyote brush	D40	5	3	87	305
Brickellia californica	California bricklebush	D40	5	3	87	305
Corethrogyne filaginifolia	Common sandaster	D40	3	3	24	85
Cylindropuntia prolifera	Coastal cholla	1-gallon	4	5	27	95
Dudleya virens	Bright green dudleya	D40	3	3	24	85
Elymus condensatus	Giant wildrye	D40	6	3	24	85
Encelia californica	California brittlebush	D40	5	5	261	915
Eriogonum cinereum	Coastal buckwheat	D40	5	5	87	305
Eriogonum fasciculatum	California buckwheat	D40	5	5	157	549

Table 2
Proposed Coastal Sage Scrub Planting Palette (Approximately 3.5 Acres)

Botanical Name	Common Name	Container Size	Spacing (on center)	Group Size	Quantity (per acre)	Total # Plants
Eriogonum parvifolium	Seacliff buckwheat	D40	5	5	87	305
Eriophyllum confertiflorum	Golden yarrow	D40	3	3	145	508
Isocoma menziesii	Coast goldenbush	D40	5	3	87	305
Mirabilis laevis var. *crassifolia*	Wishbone bush	D40	4	5	54	191
Opuntia littoralis/oricola	Chaparral prickly-pear	1-gallon	6	3	24	85
Peritoma arborea	Bladderpod	D40	5	5	35	122
Rhus integrifolia	Lemonadeberry	D40	15	1	4	14
Salvia leucophylla	Purple sage	D40	5	5	87	305
Salvia mellifera	Black sage	D40	5	3	87	305
				Total Container Plants	1,920	6,734
			Seed Mix			
Botanical Name	*Common Name*	*Pure Live Seed*	*Lbs. Per Acre*		*Total Lbs.*	
Eschscholzia californica var. *maritima*	California poppy	85	2		7	
Lupinus bicolor	Miniature lupine	90	2		7	
Lupinus succulentus	Arroyo lupine	90	4		14	
Stipa lepida	Foothill needlegrass	65	1		3.5	
Stipa pulchra	Purple needlegrass	75	6		21	
		Total Lbs.	**15**		**52.5**	

3.2.2 Cactus Scrub

The restoration strategy for cactus scrub is comparable to that described for coastal sage scrub, except that the composition of species was modified to be dominated by prickly-pear cactus (*Opuntia littoralis, O. oricola*). The plant palette includes a container plant and seed mix composition (Table 3) that has been designed to replicate the native composition of a healthy cactus scrub plant community similar to existing cactus scrub habitat present on the Abalone Cove Reserve site, and with the specific intent to provide habitat suitable for occupation by cactus wren. In addition to areas identified for cactus scrub restoration, approximately 2.2 acres of the habitat enhancement area were designated for planting additional cactus. These areas were previously documented to support cactus wren and have since been overgrown with non-native trees and shrubs and lemonadeberry

Table 3
Proposed Cactus Scrub Planting Palette (1.1 Acres)

Botanical Name	Common Name	Container Size	Spacing (on center)	Group Size	Quantity (per acre)	Total # Plants
Container Plants						
Artemisia californica	California sagebrush	D40	5	5	227	249
Astragalus trichopodus var. *lonchus*	Ocean locoweed	D40	3	7	111	123
Brickellia californica	California bricklebush	D40	5	3	52	57
Corethrogyne filaginifolia	Common sandaster	D40	3	3	24	27
Cylindropuntia prolifera	Coastal cholla	1-gallon	4	10	272	299
Encelia californica	California brittlebush	D40	5	5	87	96
Eriogonum fasciculatum	California buckwheat	D40	5	3	174	192
Isocoma menziesii	Coast goldenbush	D40	5	3	35	38
Mirabilis laevis var. *crassifolia*	Wishbone bush	D40	4	5	54	60
Opuntia littoralis/ oricola	Coast prickly-pear	1-gallon	6	30	363	399
Peritoma (=Isomeris) arborea	Bladderpod	D40	6	5	36	40
Rhus integrifolia	Lemonadeberry	D40	15	1	2	2
Salvia mellifera	Black sage	D40	5	3	87	96
				Total Container Plants (per acre)	**1,524**	**1,678**
Seed Mix						
Botanical Name	*Common Name*	*Pure Live Seed*	*Lbs. Per Acre*			*Total Lbs.*
Eschscholzia californica var. *maritima*	California poppy	74	2			2.2
Lupinus bicolor	pygmy lupine	78	2			2.2
Lupinus succulentus	arroyo lupine	81	4			4.4
Phacelia ramosissima	branching phacelia	80	0.25			0.275
Stipa lepida	foothill needlegrass	54	1			1.1
Stipa pulchra	purple needlegrass	42	6			6.6
		Total Lbs. Per Acre	**15.25**			**16.8**

3.2.3 Mulefat Scrub

The restoration strategy for mulefat scrub habitat on the Abalone Cove Reserve restoration site includes reintroducing regionally appropriate native mulefat scrub species. A small drainage within the restoration area has been selected as being compatible with mulefat scrub based on the vegetation that currently inhabits the channel and its apparent hydrology. The mulefat scrub restoration area within the Abalone Cove Reserve will contain the native species mulefat (*Baccharis salicifolia*), giant wildrye (*Elymus condensatus*), and blue elderberry (*Sambucus nigra*) as dominant species (Table 4).

Table 4
Proposed Mulefat Scrub Planting Palette (Approximately 0.2 Acre)

Botanical Name	Common Name	Container Size	Spacing (on center)	Group Size	Quantity (per acre)	Total # Plants
Container Plants						
Artemisia dracunculus	Tarragon	D40	4	3	136	27
Baccharis pilularis	Coyote bush	D40	5	3	87	17
Baccharis salicifolia	Mulefat	1-gallon	6	3	605	121
Elymus condensatus	Giant wildrye	D40	5	3	174	35
Isocoma menziesii	Coast goldenbush	D40	5	3	87	17
Muhlenbergia rigens	Deergrass	D40	3	3	242	48
Sambucus nigra	Blue elderberry	1-gallon	8	1	102	20
Verbena lasiostachys	Western vervain	D40	3	3	242	48
Total Container Plants (per acre)					**1,675**	**333**
Seed Mix						
Botanical Name	*Common Name*	*Pure Live Seed*		*Lbs. Per Acre*		*Total Lbs.*
Ambrosia psilostachya	Western ragweed	8		2		0.4
Artemisia douglasiana	Mugwort	5		1		0.2
Eschscholzia californica var. *maritima*	California poppy	78		2		0.4
Isocoma menziesii	Coast goldenbush	80		1		0.2
Lupinus succulentus	Arroyo lupine	54		2		0.4
Stipa pulchra	Purple needlegrass	42		4		0.8
Total Lbs. Per Acre				**12.0**		**2.4**

3.3 Habitat to be Enhanced

The habitat enhancement program consists of site preparation (primarily non-native plant species removal), maintenance, monitoring, and potential native planting or seeding. The habitat enhancement area is currently dominated by a mix of native and non-native species. Although the enhancement area currently supports native species, including lemonadeberry (*Rhus integrifolia*) and coast brittlebush (*Encelia californica*), a number of non-native perennials, such as coastal wattle, phoenix palm, spiny holdback, Peruvian pepper, and Brazilian pepper are also common.

Habitat enhancement generally includes control of non-native weed species and reliance on natural succession to fill the gaps left by removal. In the case of the enhancement area in Abalone Cove Reserve it is likely that most locations in the enhancement zone will improve naturally after initial removal of invasive species. However, in locations that a significant area is cleared, in-planting of native species may be necessary. The area north of the access road, nearest to Palos Verdes Drive South in particular may necessitate additional planting after removal activities occur.

The planting palette in Table 2 for coastal sage scrub habitat and Table 3 for cactus scrub provide options for installing supplemental plants in areas that require selective planting to fill in gaps created from invasive species removal. Note that Tables 2 and 3 do not account for the quantity of container plants that will be needed for the enhancement areas, as the acreage of invasive species removal is not known. However, the number of container plants is expected to be relatively low compared to the restoration areas. Selective in-planting shall mimic the natural distribution and vegetation mosaic of adjacent native habitats.

3.4 Revegetation Materials

Plant materials for the restoration planting areas will include container stock and seed of coastal scrub species, as indicated in the plant palettes provided in Tables 2–4. As much as feasible, the container plant materials will be grown from native seed collected on the Palos Verdes Peninsula. The plant nursery will grow the plants primarily in D40 Deepots, with some smaller and larger sizes depending on the species (as indicated in Tables 2–4). Additionally, for the seed mixes, PVPLC will coordinate collection of available seed from the peninsula for application at the restoration site. If some species cannot be grown as container stock at the nursery, or local seed is not available for collection, the planting palettes may be adjusted, or another source may be used for acquiring locally sourced plant materials.

DriWater may also be used to aid plant establishment. DriWater is a time released natural cellulose gum gel that retains moisture which is slowly released into the soil when the gel is broken down by naturally occurring enzymes. The moisture released from the DriWater gel becomes available for uptake by developing plant roots. DriWater can be applied in cardboard cartons or in plastic tubes with gel packs. DriWater can be costly to utilize on large scale restoration projects, and therefore would only be used in special cases where supplemental watering was insufficient to promote plant establishment. DriWater may be most useful within the enhancement area if supplemental watering is infeasible.

3.5 Target Functions and Values

The primary functional goal of the restored coastal sage scrub, cactus scrub, and mulefat scrub and the enhanced mixed coastal scrub is to restore vegetation that contains a diversity of native coastal scrub plant species and that provides habitat value for sensitive wildlife species, particularly for coastal California gnatcatcher and cactus wren. Additionally, a secondary consideration is to create contiguous and intact habitat which resists the re-establishment of invasive plant species.

3.6 Time Lapse

The length of time necessary to develop high quality habitat depends on a variety of factors including weather, soil conditions, herbivory protection, weed competition, and maintenance quality. Under optimal conditions, coastal sage scrub, cactus scrub, and mulefat scrub may take approximately three from the installation of container plants and application of seed to develop the appropriate structure to provide the functions and values needed for habitation of wildlife, including suitable nesting habitat for California gnatcatcher and other scrub species. In an unirrigated setting, and with drought conditions, scrub development may take longer than three years to mature enough to be suitable for nesting. As a hedge against drought, the addition of supplemental watering would increase plant survival, improve establishment, and hasten habitat development. This plan allows for five years of maintenance and monitoring to establish the target habitats.

4 IMPLEMENTATION PLAN

4.1 Rationale for Expecting Success

The identified locations for restoration on the Abalone Cove Reserve are directly adjacent to viable and self-sustaining target habitats, indicating appropriate environmental conditions to support the intended habitats. This HRP includes a provision for supplemental watering to promote establishment and survival of native species included in the plant palette. The HRP also includes a 5-year maintenance plan, wherein invasive non-native weeds within the restoration site will be controlled to aid native plant establishment. Additionally, native plant materials will be grown or collected from sources on the Palos Verdes Peninsula, thus preserving genetic integrity and increasing the potential for long-term success.

4.2 Preliminary Schedule

Appropriate timing of planting and seeding will minimize the need for supplemental watering and will increase the survival rate of the installed plants. The best survival rates are achieved when container plants and seed are installed at the onset of the rainy season or soon thereafter (November through February). Planting and seeding at the site should be timed to take advantage of seasonal rainfall patterns and most appropriate growing season temperatures (see Charts 1–2 and Table 5).

Table 5
Preliminary Restoration Project Schedule

Task	Date
Site clearing	Fall prior to first year
Invasive weed species control and grow-kill cycles	Winter and Spring of first year
Installation of supplemental watering system	Summer of first year
Planting container stock	Fall and Early Winter of second year
Seed application	Fall and Early Winter of third year
Monitoring and maintenance	To begin upon successful installation of container plants

Chart 1
Average Monthly Precipitation for the Portuguese Bend Nature Preserve

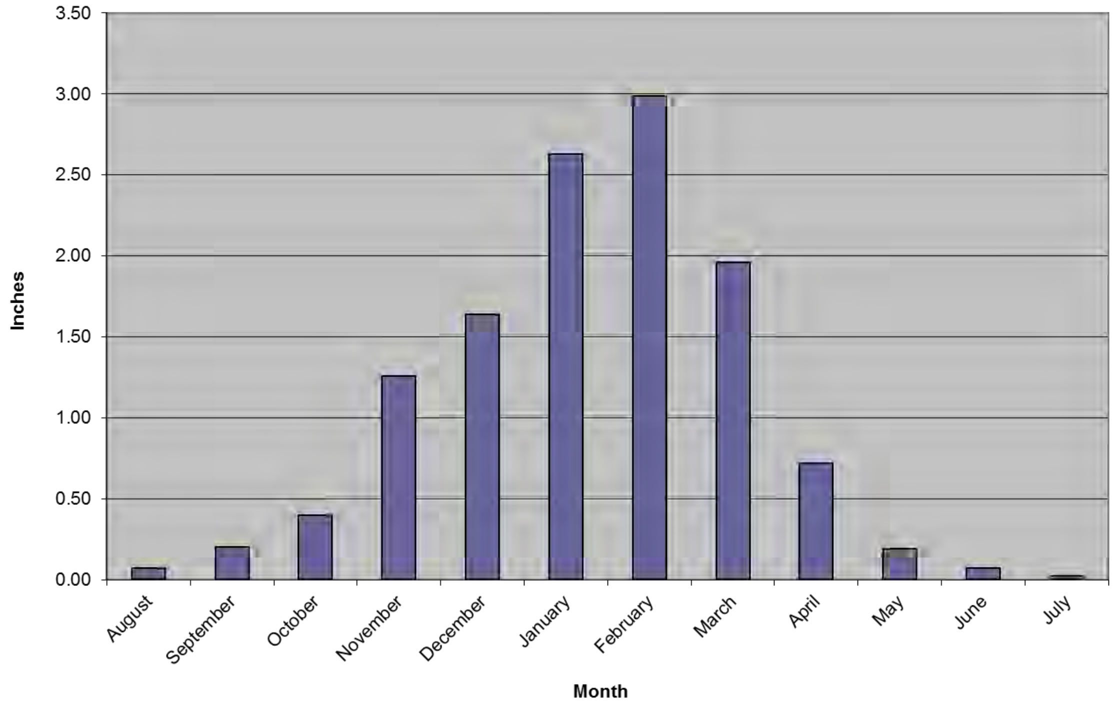
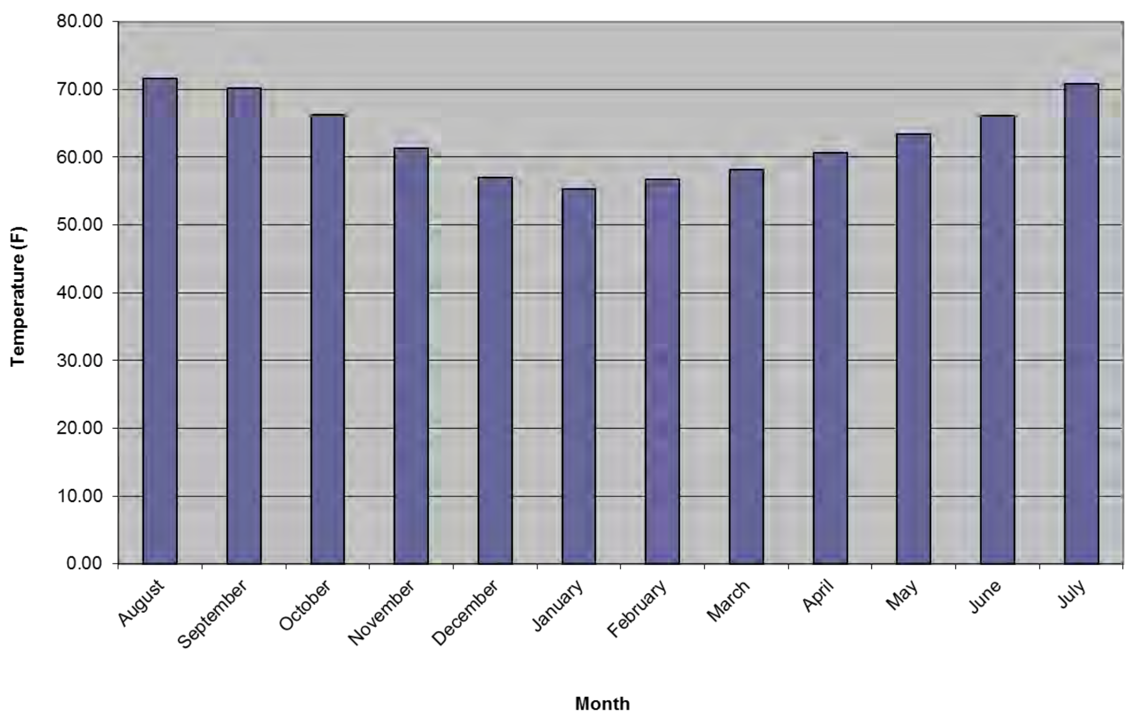


Chart 2
Average Monthly Temperatures for the Portuguese Bend Nature Preserve



4.2.1 Site Preparation

Site preparation includes control of invasive weed species and soil preparation in the restoration areas. If clearing of weeds is planned to be performed during the migratory bird nesting season (February 15–September 15), a nesting bird survey should be conducted by a qualified wildlife biologist within 72 hours prior to vegetation removal in accordance with the Migratory Bird Treaty Act (16 U.S.G. 703-712).

During site preparation, all invasive weed species, particularly non-native annual grasses, black mustard, and fennel, should be killed and removed from the restoration areas. Invasive species control should also include exotic trees and shrubs such as spiny holdback, Peruvian pepper, Brazilian pepper, coastal wattle, pine trees, and palms, as directed by PVPLC staff.

The initial weed control effort will involve a combination of chemical and mechanical treatment. Prior to the installation of native plant materials, "grow and kill" weed removal treatments should be conducted by allowing non-native seedling emergence in the winter and spring. When weeds have begun to grow, and before they begin to develop flowers or flowering structures, a foliar application of an appropriate systemic herbicide should be applied to kill target weeds. If adequate rainfall occurs during this period, multiple grow-kill cycles should be repeated. The restoration ecologist will provide weed control recommendations to the restoration maintenance staff that are specific to the target weed species identified for control. Any use of herbicides shall be in accordance with label instructions, following the recommendations of a licensed Pest Control Advisor, and any application shall be applied under the direction of a state-certified Qualified Applicator.

4.2.2 Supplemental Watering System

The planned method of providing supplemental watering at the proposed restoration area is with a temporary above-ground drip irrigation system. This will help ensure that native container plants and seed installed on site will become adequately established. The supplemental watering system would only be used until the plants are established such that they can survive on their own between periods of rainfall. It is expected that, depending upon the level of plant establishment, the watering system would be removed after two to three years of use. Watering on site will gradually be decreased prior to the removal of the system so the plants can become acclimated to the site's natural conditions.

The habitat enhancement area may prove infeasible for installation of a temporary watering system. Areas that require planting within the enhancement area will be considered for supplemental watering from a water truck or the use of alternative methods such as DriWater.

There is a fire hydrant located immediately north of the proposed restoration site along Palos Verdes Drive South that may function as a point of connection for a temporary irrigation system (Figure 5). The irrigation system should be designed by a landscape architect to ensure that the system has adequate water pressure to supply water to all areas of the proposed restoration site. The supplemental watering system would be installed as an above-ground system, so that irrigation equipment may be removed once the system has been decommissioned.

4.2.3 Erosion Control

Where needed, erosion control measures, such as the installation of sandbags, fiber rolls, silt fencing, and/or erosion-control matting may be necessary to control erosion until target vegetation is established. At a minimum, silt fencing should be installed at the toe of slopes that are unvegetated after removing non-native species. Additionally, erosion control materials may be needed at the edge of the coastal bluff, particularly in the locations where surface runoff coalesces and runs off the bluff. No erosion control materials should be used that contain seed from non-native plants. The need and location of erosion control will be determined in the field by the project's restoration ecologist.

4.2.4 Plant Installation

Standard planting procedures will be employed for installing container stock. Planting holes shall be approximately twice the width of the rootball, and as deep. If dry soil conditions exist at the time of plant installation, planting holes will be filled with water and allowed to drain immediately prior to planting. A fertilizer packet with controlled-release fertilizer (e.g., Best Paks 20-10-5) will be placed in the bottom of each hole prior to planting.

4.2.5 Seed Application

Seed will be hand broadcast throughout the restoration site. The seed mix is primarily a supplemental feature to increase diversity and will not occur until the second year of the Restoration Program. The seeding sites should be prepared by removing weedy vegetation to expose the soil surface. The seed should be raked into the soil so there is good seed-soil contact. Seeding should be timed to occur prior to or early in the rainy season.

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SOURCE: Palos Verdes Peninsula Land Conservancy, 2014; Bing Maps, 2015

FIGURE 5

Abalone Cove Restoration Area

Habitat Restoration Plan for the Abalone Cove Ecological Reserve in the Portuguese Bend Nature Preserve

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5 MAINTENANCE PLAN

The purpose of the maintenance plan is to provide guidelines for long-term maintenance of the restoration site during the establishment period. Maintenance activities will be initiated during the weed reduction period (i.e., grow-kill cycles), and will occur at the direction of the project's restoration ecologist on an as-needed basis. The maintenance period will intensify after the installation of the container plants. Maintenance will be necessary until the habitats are fully established, which is estimated to take approximately five years.

Because the goal of this project is to establish a natural system that can support itself with little or no maintenance, the primary focus of the maintenance plan is concentrated in the first few seasons of plant growth following the revegetation effort, when weeds can easily out-compete native plants. The intensity of the maintenance activity is expected to subside each year as the native plants become established, and local competition from non-native plants for resources is minimized through direct removal and treatment of non-native plants.

5.1 Maintenance Activities

Maintenance activities will be primarily related to non-native invasive plant species control. Supplemental watering, supplemental planting, trash removal, and erosion control will also be conducted, as necessary.

- Non-native plant species should be controlled as soon as they begin to establish. Recommended control methods should be tailored to each specific weed species and should include the most effective control measures for the species and time of year. Control methods may include a combination of manual, mechanical, and chemical control.
- Container plants should be watered when natural rainfall is not adequate to sustain the establishing plants. The project's restoration ecologist will be responsible for scheduling the supplemental watering to promote plant establishment. Supplemental watering should be conducted as deep, soaking watering to promote deep rooting.
- Generally, the site will not be fertilized during the maintenance period unless determined necessary by the project's restoration ecologist as a remedial measure to correct soil nutrient deficiencies.
- Deadwood and leaf litter of native vegetation should not be removed. Deadwood and leaf litter provide valuable microhabitats for invertebrates, reptiles, small mammals, and birds. Non-organic trash and debris should be removed from the revegetation areas on a regular basis.

- Erosion control materials should be maintained in working order until they are deemed no longer necessary by the project's restoration ecologist. Maintenance of erosion control materials may include repairing or replacing dilapidated, damaged, or ineffective materials.

5.2 General Habitat Maintenance Guidelines

5.2.1 Weed Control

Weeds are expected to be the primary pest problem in the restoration area during the first several years of the maintenance period. Weeds should be controlled so they do not prevent the establishment of the native species or invade adjacent areas. A combination of physical removal, mechanical treatments (weed whipping) and appropriate herbicide treatments should be used to control the non-native/invasive plant species. Weeds should be controlled prior to setting seed, and should be removed from the site if they become large enough to block sunlight to developing native plants.

Re-establishment of non-native plants onto the site can be adequately minimized by regular and timely maintenance visits with implementation of effective weed control measures. Weed control will require constant diligence by the maintenance personnel. Invasive plant species, such as those listed in Table 1 should be controlled wherever possible within the restoration area. Mature invasive tree species will be retained at the discretion of the PVPLC though the majority of individuals should be removed to reduce the spread of weed propagules.

Removal of weeds by hand where practicable and effective is the most desirable method of control and should be done around individual plantings and native seedlings to avoid inadvertent damage to the native species. However, several of the invasive species may be more effectively controlled with herbicide due to their tenacious and spreading root systems, their size, or their ability to re-sprout from root fragments. All herbicides shall be used in accordance with label instructions, following the recommendations of a licensed Pest Control Advisor, and any application shall be applied under the direction of a state-certified Qualified Applicator. The project's restoration ecologist should monitor control efforts to ensure that the target weed species are being adequately addressed without impacting the native plants.

The non-native Bagrada bug (*Bagrada hilaris*) has been documented on the Palos Verdes Peninsula, and is known to cause substantial damage to plant species from the mustard family (*Brassicaceae*) (County of Los Angeles 2013; University of California, Riverside 2013). As black mustard is one of the predominant species within the proposed coastal sage scrub restoration area, the Bagrada bug may occur; however, it is expected that the damage caused by this insect would be to non-native mustard species, and not native plants. Despite this, if the species becomes problematic as a pest species on the native plants, then the restoration ecologist will evaluate whether or not control measures are necessary. Similarly, if other deleterious pests (e.g., beetles on bladderpod) become problematic enough to cause container plant mortality, the restoration ecologist may recommend measures to minimize pests and promote healthy plant establishment.

5.2.2 Supplemental Watering System

Supplemental watering will be provided for two to three years after planting to help the container plants become established. Supplemental watering will be provided through a drip irrigation system. Supplemental watering would likely be necessary every 3–4 weeks during the dry season, and more frequently immediately after installation if natural rainfall does not provide adequate moisture. If a temporary, on-grade supplemental watering system is installed in the restoration area as described in Section 4.4, it would need to be maintained and repaired as necessary.

The watering system shall be checked regularly to ensure proper operation and adequate coverage of the restoration areas. Problems with the watering system shall be repaired immediately to reduce potential plant mortality or erosion. The frequency and duration of irrigation applications shall be adjusted seasonally in coordination with the project's restoration ecologist to meet habitat needs.

Supplemental watering will be terminated when deemed appropriate by the project's restoration ecologist. All above-ground components of the watering system should be removed from the site at the successful completion of the project. The timing for cessation and removal of the irrigation system shall be determined by the project's restoration ecologist.

5.2.3 Clearing and Trash Removal

Trash consists of all man-made materials, equipment, or debris dumped, thrown, washed into, or left within the restoration area. Pruning or clearing of native vegetation is not anticipated to be necessary within the restoration area, unless extensive growth is causing a maintenance problem for a utility or for an area outside of the restoration area. Any pruning or clearing of native vegetation should be approved by the project's restoration ecologist. Deadwood and leaf litter of native vegetation will be left in place to replenish soil nutrients and organic matter.

5.3 Schedule of Maintenance Inspections

The project's restoration ecologist will perform quarterly maintenance/monitoring inspections during the scheduled maintenance and monitoring period. Recommendations for maintenance efforts will be based upon these site observation visits. Weed control shall be conducted as needed to ensure adequate control to promote healthy establishment of the target habitat types. It is anticipated that weed control will be necessary on a monthly basis during the winter and early spring when weeds are vigorously growing. Weed control during other times of the year will likely be diminished, but conducted as necessary, and as directed by the project's restoration ecologist.

6 MONITORING PLAN

Monitoring of the restoration site has a two-fold purpose: **(1)** To monitor the progress of the Abalone Cove Reserve restoration areas by assessing native habitat establishment relative to the established performance standards; and **(2)** To direct and monitor the maintenance activities and determine remedial actions in a manner that ensures that appropriate maintenance occurs in a timely manner. The monitoring will be performed by the project's restoration ecologist.

The project's restoration ecologist will be responsible for monitoring activities of all the work crews during preparation of the restoration area including site clearing and soil preparation, weed control, container plant and seed application, and quarterly monitoring for the duration of the 5-year maintenance and monitoring period.

Reports will be prepared annually for the restoration areas after installation is complete. Each report will include qualitative data, photo documentation, and future recommendations for site maintenance as described below.

6.1 Performance Standards

Performance standards have been established for the habitat restoration area based on the guidelines in the draft NCCP/HCP and on expected vegetative development relative to undisturbed habitat of the same type (Table 6). The following performance standards apply to the Abalone Cove restoration site:

1. Soil at the site is stable and shows no significant erosion.
2. After five years, non-native plant cover is less than 25% with less than 15% cover of invasive perennial species. After five years, there will be no presence of species on Cal-IPC List A with the possible exception of Cal-IPC List A non-native annual grasses.
3. Native plant cover after three years in the CSS community should be greater than 40% with at least 30% cover from perennial species. At five years, total native cover should be greater than 50% with appropriate species diversity.
4. Native plant cover after three years in the cactus scrub community should be greater than 30% with at least 20% cover from perennial species and 5% cover from cactus species. Native plant cover after five years in the cactus scrub community should be greater than 40% with at least 10% cover from cactus.

Table 6
Performance Standards

Year	Percent Cover of Native Species (%)*			Non-native Cover (for all habitat types)	
	Coastal Sage Scrub	*Cactus Scrub*	*Mulefat Scrub*	*Invasive Perennial Species Cover*	*Total Non-native Species Cover*
Year 3	>40% (>30% perennial)	>30% (>20% perennial and >5% cacti)	>40%	<15% (0% of Cal-IPC List A)*	<25%
Year 5	>50%	>40% (>10% cacti)	>50%	<15% (0% of Cal-IPC List A)*	<25%

* The NCCP/HCP success criteria allow an exception to the requirement for 0% Cal-IPC List A for non-native annual grasses. In other words, Cal-IPC List A grass species would not count toward the 0% criteria, but would count toward the 25% criteria for total non-native species cover.

The Year 3 performance standards will be utilized to assess the annual progress of the restoration area, and are regarded as interim project objectives designed to reach the final Year 5 goals. Fulfillment of these standards will indicate that the restoration area on the project site is progressing toward the habitat type and functions that constitute the long-term goals of the plan. If the restoration efforts fail to meet the performance standards in any year, the project's restoration ecologist may recommend remedial action to be implemented the following year with the intent to enhance the vegetation to a level of conformance with the original standard. These remedial actions may include re-seeding, re-planting, applying soil amendments, additional weed control measures, erosion control, or adjustments to the watering and maintenance practices.

6.2 Monitoring Methods and Schedule

Annual qualitative assessments will be conducted through visual analysis of the restoration area to assess vegetation development, weed presence, and plant establishment. Qualitative monitoring will include reviewing the health and vigor of container plants and seed germination/establishment, assessing survival/mortality, checking for the presence of pests and disease, soil moisture content, and the effectiveness of the supplemental watering, erosion problems, invasion of weeds, and the occurrence of trash and/or vandalism. Representative photographs of the restoration site from stationary photo points will be taken annually.

Permanent vegetation sampling sites will be established within the coastal sage scrub and cactus scrub restoration areas at randomized representative locations. A minimum of one transect will be established for each two acres of restoration area, and at least one transect for each habitat type. The mulefat scrub area is too small to establish quantitative sampling sites and will be evaluated with visual estimates of cover. Transect data will be collected in Years 3 and 5 from the restoration sites in the spring and will be used to determine compliance and achievement of the restoration performance standards. Transect data will be collected using the point-intercept method to determine percent target vegetation cover and weed cover. If the restoration project is in compliance with the Year 5 performance standards in an earlier monitoring period, then qualitative assessments may be substituted for the quantitative monitoring until the end of the 5-year restoration program. If the restoration site is performing below the interim performance standards, the project's restoration ecologist will determine if remedial measures are necessary.

Each monitoring visit will be followed by a summary of observations, recommendations, and conclusions. Results from the annual monitoring will be used to evaluate the progress of each habitat toward the ultimate goals of the project, and to recommend appropriate management actions.

6.3 Monitoring Reports

The designated restoration ecologist will monitor and report on the restoration work underway in the Abalone Cove Reserve. The restoration area will be monitored for five years, with reports prepared in Years 1-3 and Year 5. Monitoring reports should provide concise, meaningful summaries of the restoration progress and provide direction and maintenance recommendations for future work.

Annual reports will include the following:

1. A description of the restoration and maintenance activities (e.g., seeding, irrigation, weed control, trash removal) conducted on the site during the previous year including the dates the activities were conducted.
2. A description of existing conditions within the restoration site, including descriptions of vegetation composition, weed species, and erosion problems, if any.
3. Qualitative and quantitative monitoring data related to proposed target goals including a comparative analysis of data over the years the project has been monitored.
4. Recommendations for remedial measures to correct problems or deficiencies, if any.
5. Representative photographs of notable observations on site and from fixed photo viewpoints.

6.4 Project Conclusion

At the end of the 5-year monitoring period, a final report will be prepared by the restoration ecologist for submittal to PVPLC. The final report will summarize the project relative to project goals. Upon completion, the site will be managed along with other reserve lands in the Palos Verdes Nature Preserve by the PVPLC.

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APPENDIX A

Soil Test Results

WALLACE LABS
365 Coral Circle
El Segundo, CA 90245
(310) 615-0116

SOILS REPORT Print Date July 17, 2015 Receive Date 7/16/15

Location Palos Verdes Peninsula, Job No. 9085

Requester Andy Thomson and Jake Marcon, Dudek

graphic interpretation: * very low, ** low, *** moderate
* * * * high, * * * * * very high

ammonium bicarbonate/DTPA

extractable - mg/kg soil	**Sample ID Number**	15-198-07		15-198-08		15-198-09	
Interpretation of data	**Sample Description**	AC #1		AC #2		AC #3	
low medium high	**elements**		graphic		graphic		graphic
0 - 7 8-15 over 15	**phosphorus**	10.35	***	10.25	***	9.20	***
0-60 60 -120 121-180	**potassium**	522.13	*****	318.32	*****	247.26	*****
0 - 4 4 - 10 over 10	**iron**	1.38	*	1.45	*	1.38	*
0- 0.5 0.6- 1 over 1	**manganese**	2.01	****	2.01	****	1.61	****
0 - 1 1 - 1.5 over 1.5	**zinc**	2.45	****	2.40	****	11.62	*****
0- 0.2 0.3- 0.5 over 0.5	**copper**	6.19	*****	5.50	*****	6.36	*****
0- 0.2 0.2- 0.5 over 1	**boron**	0.18	**	0.23	***	0.17	**
	calcium	322.10	***	316.50	***	326.12	***
	magnesium	259.18	*****	304.98	*****	347.17	*****
	sodium	197.35	***	212.89	****	155.06	***
	sulfur	20.84	*	20.50	*	27.78	**
	molybdenum	0.08	***	0.01	**	0.10	****
	nickel	2.51	**	1.85	**	1.74	**
The following trace	**aluminum**	n d	*	n d	*	n d	*
elements may be toxic	**arsenic**	0.07	*	0.01	*	0.03	*
The degree of toxicity	**barium**	2.41	*	1.81	*	2.97	*
depends upon the pH of	**cadmium**	1.46	**	0.99	*	1.00	*
the soil, soil texture,	**chromium**	n d	*	n d	*	n d	*
organic matter, and the	**cobalt**	0.06	*	0.04	*	n d	*
concentrations of the	**lead**	2.51	**	2.10	**	4.20	**
individual elements as	**lithium**	0.40	*	0.40	*	0.43	*
well as to their interactions.	**mercury**	n d	*	n d	*	n d	*
	selenium	n d	*	n d	*	n d	*
The pH optimum depends	**silver**	n d	*	n d	*	n d	*
upon soil organic	**strontium**	0.61	*	0.68	*	0.75	*
matter and clay content-	**tin**	n d	*	n d	*	n d	*
for clay and loam soils:	**vanadium**	1.28	**	1.20	**	1.38	**
under 5.2 is too acidic							
6.5 to 7 is ideal	**Saturation Extract**						
over 8.0 is too alkaline	**pH value**	7.69	****	7.76	****	7.68	****
The ECe is a measure of	**ECe (milli-**	0.72	**	0.45	**	0.44	**
the soil salinity:	**mho/cm)**		millieq/l		millieq/l		millieq/l
1-2 affects a few plants	**calcium**	61.1	3.1	38.8	1.9	41.3	2.1
2-4 affects some plants,	**magnesium**	14.3	1.2	8.7	0.7	9.7	0.8
> 4 affects many plants.	**sodium**	43.6	1.9	32.9	1.4	26.5	1.2
	potassium	11.4	0.3	2.3	0.1	2.5	0.1
	cation sum		6.4		4.2		4.1
problems over 150 ppm	**chloride**	128	3.6	48	1.3	49	1.4
good 20 - 30 ppm	**nitrate as N**	12	0.9	7	0.5	5	0.3
	phosphorus as P	0.2	0.0	0.3	0.0	0.1	0.0
toxic over 800	**sulfate as S**	7.6	0.5	8.5	0.5	11.3	0.7
	anion sum		5.0		2.4		2.4
toxic over 1 for many plants	**boron as B**	0.28	**	0.16	*	0.22	**
increasing problems start at 3	**SAR**	1.3	*	1.2	*	1.0	*
est. gypsum requirement-lbs./1000 sq. ft.		37		54		58	
	relative infiltration rate	slow/fair	sand - 19.6%	slow	sand - 18.0%	slow	sand - 18.1%
	soil texture	clay	silt - 34.3%	clay	silt - 33.1%	clay	silt - 35.9%
	lime (calcium carbonate)	slight	clay - 46.1%	low	clay - 48.9%	slight	clay - 46.0%
	organic matter	fair		fair		fair	
	moisture content of soil	14.5%	gravel over 2 mm	15.2%	gravel over 2 mm	15.4%	gravel over 2 mm
	half saturation percentage	41.3%	8.8%	40.8%	8.4%	46.3%	8.9%

Elements are expressed as mg/kg dry soil or mg/l for saturation extract.
pH and ECe are measured in a saturation paste extract. nd means not detected.
Sand, silt, clay and mineral content based on fraction passing a 2 mm screen.

SECTION 4

PREDATOR CONTROL PLAN

PREDATOR CONTROL PLAN

Prepared By

Austin Parker

PALOS VERDES PENINSULA

LAND CONSERVANCY

January 2018

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4.1 INTRODUCTION

This 2018 Predator Control Plan (PCP) for the Palos Verdes Peninsula Land Conservancy outlines appropriate provisions and measures to adequately comply with the Preserve Management requirements of the NCCP/HCP. The Draft NCCP/HCP requires a Predator Control Plan to be drafted and revised every three years after the results from the comprehensive surveys. This PCP has been written based on the results of regular monitoring taking place from 2016 through 2018, and recommends specific actions to be taken to reduce predation of covered species within the Palos Verdes Nature Preserve for the following three years.

This PCP provides the framework for the pet/feral animal education program and the native predator education program, and establishes the need for monitoring for feral or domestic animals, native large predators, and mesopredators.

4.2 NON-NATIVE ANIMAL SPECIES MANAGEMENT PLANS

Native species are often at a disadvantage after invasive predators are introduced, so special management measures may be needed to control these invading species. Non-native animal species have few natural predators or other ecological controls on their population sizes, and they thrive under conditions created by humans. These species may aggressively out-compete native species or otherwise harm sensitive species. When top predators are absent, intermediate predators can multiply and increase predation on native wildlife species and their nests. Feral and domestic animals, particularly cats, also prey on small native wildlife species. Stables may provide resources for increased populations of parasitic cowbirds, which adversely affect native songbird breeding populations.

4.3 FERAL AND DOMESTIC ANIMALS

Monitoring

Through its Stewardship Program, the Conservancy and associated volunteers conducts regular walks of all properties under management to monitor all resources, including feral and domestic animals, native large predators and mesopredators. These regular visits are conducted through various programs including the Volunteer Trail Watch (VTW) and the Wildlife Tracking community science program, as well as regular staff field visits to the preserve.

Feral cats are defined as cats that have reverted to a wild state and avoid human beings. The conditions of domestication, including contact with human beings, must be duplicated in each generation for domestic behavior to occur.

Observations of a feral or domestic animal are recorded by VTW members year-round or by Wildlife Tracking Program volunteers from November to March. Regular monitoring allows the

Conservancy to document evidence of predators and become more informed about which areas have the highest occurrences of feral and/or domestic animal use. Areas determined to be the highest in use may be targeted for specific control measures and education opportunities.

The Conservancy monitors areas in the PVNP that are in proximity to houses, parks and other developed areas. It is recommended that edge effects be monitored over the long term to determine if they become problematic and if so, to document where the problems are occurring.

Pet/Feral Animal Education Program

The Conservancy may establish an education program for homeowners regarding responsible pet ownership if deemed necessary. The program could consist of information distributed via the Conservancy's webpage, signage on the Preserve, informational handouts, and information disseminated during monthly public nature walks and through local cities. This program will encourage:

1. Keeping pets indoors, especially at night;
2. Having pets neutered or spayed to reduce unwanted reproduction and long-range wanderings;
3. Belling of cats to reduce their effectiveness as predators;
4. Keeping dogs on leashes when walking them on trails in Preserves;
5. Discouraging release of unwanted pets into the wild;
6. Prohibiting the feeding of feral animals.

Feral Animal Control Program

Few feral animals have been observed in the Preserve over the last three years. Some cats have been seen near the Rancho Palos Verdes City Hall in the easternmost auxillary parking area due to a resident leaving out cat food. This activity has since stopped.

The Conservancy will continue to monitor throughout the Preserve, and if a significant impact is determined, staff will consult with the agencies about actions to be taken. A feral animal removal program could be established. This program could consist of trapping and removal at regular intervals throughout the year. It would be based on the latest scientific data to ensure its success. At this time, it is not recommended that a feral animal removal program be conducted.

4.4 COWBIRD MONITORING AND TRAPPING PROGRAM

Observations of cowbird presence and numbers within the Preserve will be provided every three years during the gnatcatcher and cactus wren surveys. Additionally, all incidental sightings will be reported in the annual reports. No cowbirds were observed during gnatcatcher and cactus wren surveys conducted in 2018, and no incidental cowbird sightings occurred.

If there are incidental observations of cowbird parasitism on a gnatcatcher nest, consultation with Wildlife Agencies and experts will occur to determine if cowbirds are a likely cause of gnatcatcher population decline. If cowbirds are determined a threat to gnatcatcher populations, a cowbird trapping program may be initiated. At this time, there is no recommendation from the Conservancy to initiate a cowbird trapping program.

4.5 NATIVE LARGE PREDATORS

Monitoring

The Conservancy's VTW program and Wildlife Tracking community science program offer a mechanism to monitor of the presence and location of large native predators in the Preserve. A monitoring program using wildlife cameras as well as track and scat analysis has been in place since 2007. Results of the 2016-2018 surveys indicate that wild canid (coyote and fox) observations have modestly declined across previously surveyed reserves. Detailed results can be found in the Wildlife tracking section, (Appendix E) of the 2018 annual report.

Native Predator Education Program

The Conservancy will continue to educate the general public regarding the role of native predators by providing information on the Conservancy's webpage, signage on the Preserves, informational handouts, and information disseminated during monthly public nature walks. This program will explain the role and necessity of large native predators, such as coyotes, within the ecosystem, and the need to protect them from disturbance.

Furthermore, the City of Rancho Palos Verdes has implemented a Coyote Management Plan that provides information to the public promoting the coexistence with coyotes in the city. City staff has actively educated city residents about reducing harmful interactions between coyotes and people/pets in the urban areas of the City.

4.6 MESOPREDATOR MONITORING AND CONTROL

Mesopredators are smaller carnivores such as that are principle predators of birds and other small vertebrates. Declines in larger mammalian carnivores due to habitat fragmentation and human interaction can often lead to an increase in mesopredators. This increase in mesopredators has been implicated in the decline and extinction of prey species, including song birds and potentially the federally threatened California gnatcatcher.

Monitoring

. The Wildlife Tracking Program has utilized wildlife cameras and scat analysis since 2007. Detailed results of mesopredator observations can be found in Appendix E of the 2018 annual report.

Control

If key native predator species are extirpated from the Preserve and studies indicate that these specific mesopredators are adversely affecting sensitive native wildlife, the Conservancy will consult with the Wildlife Agencies about further actions, which may include initiating a program to control mesopredators, including feral cats and the non-native red fox.

4.7 CONCLUSION

The Conservancy recommends to implement the Predator Control Plan as follows: :

- Note observations and impacts of potential predators within the Preserve as a part of its regular monitoring schedule
- Continue to manage Wildlife Tracking Community Science program
- Provide education programs regarding the impacts of predators on natural open spaces and habitat;
- Consult with the Wildlife Agencies or establish a trapping program for brown-headed cowbirds if deemed necessary in the future;
- Consult with the Wildlife Agencies or control predators such as feral cats and mesopredators if deemed necessary in the future.

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SECTION 5

TARGETED EXOTIC REMOVAL PROGRAM FOR PLANTS (TERPP)

CUMULATIVE REPORT FOR THE TARGETED EXOTIC REMOVAL PROGRAM FOR PLANTS (TERPP)

Prepared by:

Palos Verdes Peninsula Land Conservancy

June 2020

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APPENDIX

1.0 INTRODUCTION

The Palos Verdes Peninsula Land Conservancy (PVPLC), as habitat manager of the Palos Verdes Nature Preserve (PVNP), conducts strategic weed control activities throughout the year as part of the Targeted Exotic Plant Removal Plan for Plants (TERPP). As directed in the draft Rancho Palos Verdes Natural Communities Conservation Plan (NCCP/HCP), PVPLC selects five acres or 20 small sites of invasive plants for removal each year. The overall goal of this program is to systematically target invasive species throughout the PVNP to increase the success of native plant growth and create greater habitat opportunities for wildlife.

The TERPP is an element of the NCCP/HCP that includes a specific protocol for ranking exotic species populations and strategically removing those species over time. This TERPP Report documents PVPLC's efforts from 2016 - 2018 to remove exotic plant species that threaten native vegetation in the PVNP. It details the methods of assessing the threat of individual exotic species to native vegetation, field methods for removal and provides site-specific documentation related to every completed removal site.

Each TERPP site is tracked via GIS, a tool that aids in the planning and monitoring efforts. Since 2006, PVPLC has treated 133 TERPP sites, and the program is ongoing. Every year, tracking, documenting and planning for the following year becomes more complex as more sites are added if targeted populations are not entirely eradicated through weed control efforts. Use of GIS allows staff not only to look at the land within the NCCP/HCP boundaries, but to view the Palos Verdes Peninsula at a landscape level. In 2012, staff began developing a TERPP mapping system to track weed populations (baseline) and TERPP treatments over time, and this system continues to be implemented during this reporting period. The invasive weed baseline has assisted in determining priority populations to target for treatment.

2.0 SITE ASSESSMENT

Invasive species control is included in PVPLC's annual conservation planning strategy where Stewardship staff prioritize potential TERPP sites and assess best practice methods for removal. Guided by the NCCP/HCP, which ranks known exotic species with potential to be found around the PVNP based on State and Federal guidelines, PVPLC staff locate TERPP sites to target for the calendar year, assess the best method for eradication, photo document and map the population/s, and conduct weed removal accordingly.

The PVPLC weighs potential areas for exotic species control based on several criteria:

1. Threat to native vegetation of pariticular populations of NCCP/HCP covered species;

2. Feasibility of eradication, which includes limiting disturbance to native habitat and ease of access, and;

3. Invasiveness of exotic species, using a synthesized rating system drawn from plant invasiveness rankings from both the California Invasive Plant Council (Cal-IPC) and the California Department of Food and Agriculture (CDFA).

Through regular property reviews and viewing fine scale imagery through the Geographic Information System (GIS), ArcGIS, PVPLC plans for invasive species control across the entire Preserve area.

A sample of the TERPP field data collection form is in Appendix D1. The forms provide basic information about the species targeted, including site identification number and property, approximate location, removal methods used, and general comments related to the removal activities. This form has since been converted over to the ArcGIS program "Survey 123", which aids in field collection and GIS data collection. PVPLC also includes photo documentation: staff photographs the sites before work takes place and after the removal of the individual or population of exotic species. Photo documentation not only confirms completion of the work, but also provides a snapshot of the surrounding environment at the time of the TERPP-related activities. This record helps to create a historical record of the presence of non-native plant species on the sites, which may inform future restoration efforts.

3.0 FIELD METHODS

PVPLC staff uses best practice, the most effective and least intrusive, methods at all times when conducting TERPP-related activities. High priority areas may occur near rare or endangered biological populations. Care is taken to minimize soil erosion, fire risk, disturbance to surrounding native vegetation and further dispersal of the exotic species. PVPLC utilizes a combination of methods to conduct exotic species removal, generally limited to the following:

- Mechanical removal - staff may use tools with motorized blades to fell larger species;
- Hand removal - staff conduct most removals by hand pulling and/or with small hand tools for pruning and cutting;
- Chemical control - trained staff applies herbicides at the appropriate phase of vegetative growth;
- Growth and seed maturation, and;
- Disposal - City of Rancho Palos Verdes staff coordinate with waste companies to supply green waste and trash containers.

Qualified Licensed Applicator(s) develop all recommendations for chemical pest control and senior staff supervises field staff and contractors in sensitive areas. Additionally, field staff has an integral role in the TERPP and often have crucial, site-specific knowledge related to the sites.

4.0 SUMMARY OF ACTIVITIES FROM 2016 TO 2018

4.1 2016 TERPP

In 2016, PVPLC treated 23 populations of invasive plants across seven reserves (Appendix H). Of these, 17 were populations of *Euphorbia terracina* (Geraldton spurge, Euphorbia).

PVPLC treated two populations of *Coronilla valentina* ssp. *glauca* in Abalone Cove. This treatment site has been part of follow-up treatments to the seed bank to prevent range expansion for this species which has the potential to cause major infestations in the area.

PVPLC treated one population of *Arundo donax* at Abalone Cove. There is limited occurrence of this species on the preserve and any individuals that are found are eradicated to prevent spread.

PVPLC treated one population of *Mesembryanthemum crystallinum* at Abalone Cove.

PVPLC treated one population of *Cephalophyllum alstonii* at Abalone Cove.

PVPLC treated one population of Acacia cyclops at Vicente Bluffs as part of an ongoing removal of what looks to be an expanding population of these species. Follow up site visits will be needed to keep the seed bank from germinating.

4.2 2017 TERPP

In 2017, PVPLC treated 21 populations of invasive plants across eight reserves (Appendix I). Of these, 19 were populations of *Euphorbia terracina* (Geraldton spurge, Euphorbia).

PVPLC treated one population of *Coronilla valentina* at Abalone Cove a

At Alta Vicente, a population of *Cortaderia selloana* was removed and is being monitored for seedbank germination.

4.3 2018 TERPP

In 2018, PVPLC treated 21 populations of invasive plants across seven reserves (Appendix J). Of these, 18 were populations of *Euphorbia terracina* (Geraldton spurge, Euphorbia).

In addition to Euphorbia treatments, the 2018 TERPP treated three populations of *Acacia cyclops* (Coastal Wattle) at Filiorum, Three Sisters and Alta Vicente. This targeting of *Acacia cyclops* was in response to cactus plants being covered by the Coastal Wattle and leading to the decline in Cactus Wren populations in those locations. The three Acacia removal sites totaled approximately 6.2 acres.

5.0 REFERENCES

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APPENDIX D1: SAMPLE TERPP FORM

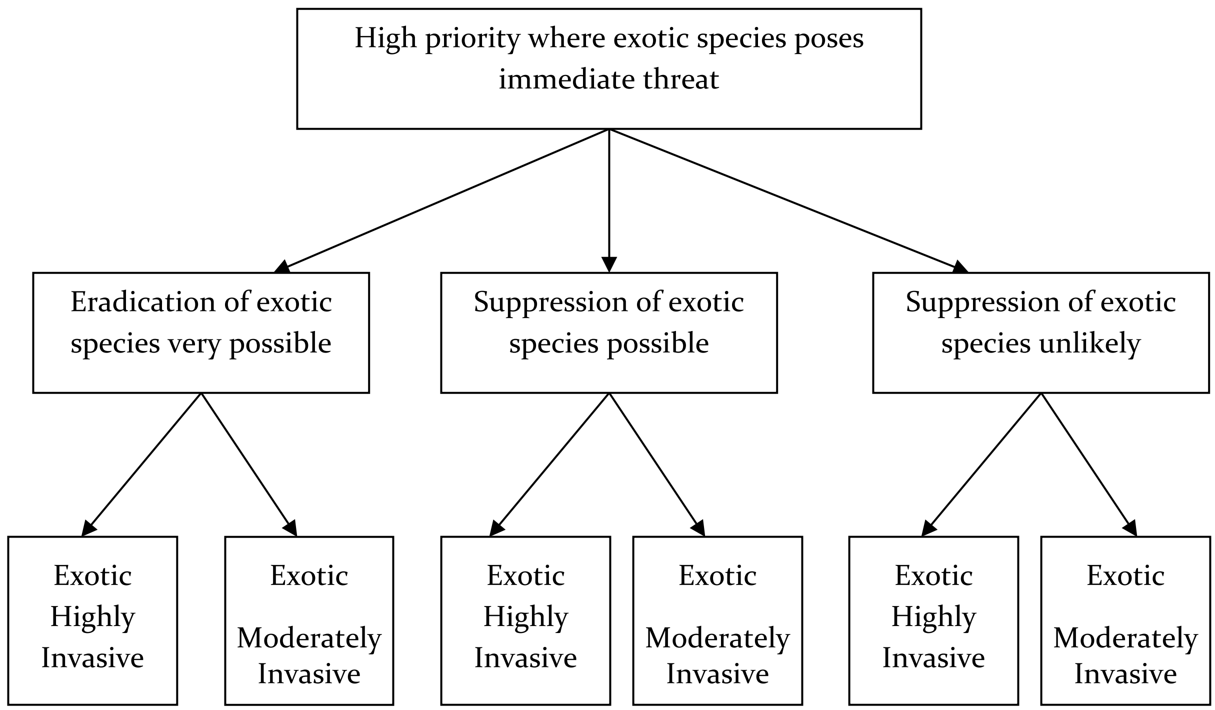
Invasive Weed Mapping Field Datasheet

Survey Type New Infestation Assesment Treatment	**Surveyor's Name**
Date	**Location Description:**
Species	
Preserve	
Stand ID	**Surrounding Vegetation Type:** cactus scrub coastal sage scrub riparian bluff grassland non-native plants trail non-native annual grass (NNAG) Other
Stand Size 1 ft^2 - 10 ft^2 10 ft^2 - 100 ft^2 100 ft^2 -300ft^2 300 ft^2 - 600 ft^2 600 ft^2 - 1000 ft^2 > 1000 ft^2	
No. Individuals 1-10 10-50 50-100 100-200 200-500 500-1000 >1000	**Stand Comments:**
Percent Canopy Cover 1-5% 5-10% 10-25% 25-50% 50-75% +75%	
Plant Phenology Flowering Non-Flowering Fruiting	
Plant Age Seedling Juvenile Mature Dead	
Treatment Type Hand pull Herbicide Hand-pull/Herbicide Weed-whip Mulch Tree removal Other	**Treatment Comments:**
Area Treated 1 ft^2 - 10 ft^2 10 ft^2 - 100 ft^2 100 ft^2 - 300 ft^2 300 ft^2 - 600 ft^2 600 ft^2 - 1000 ft^2 > 1000 ft^2	
Percent of Infestation Treated 0-25% 25-50% 50-75% 75-100%	
Photo Image Numbers:	**Additional Comments:**

Stand ID Example: AC_EuTe_01_yyyy.mm.dd.jpg
Preserve abbreviations:
AA - Agua Amarga AC - Abalone Cove AV - Alta Vicente CP - Chandler Preserve DF - DFSP GF - George F
FI - Filiorum FO - Forrestal OT - Ocean Trails PB - Portugeuese Bend SR - San Ramon
TS - Three Sisters VB - Vicente Bluffs VN - Vista del Norte WP - White Point OR - Other

Rev 3/13

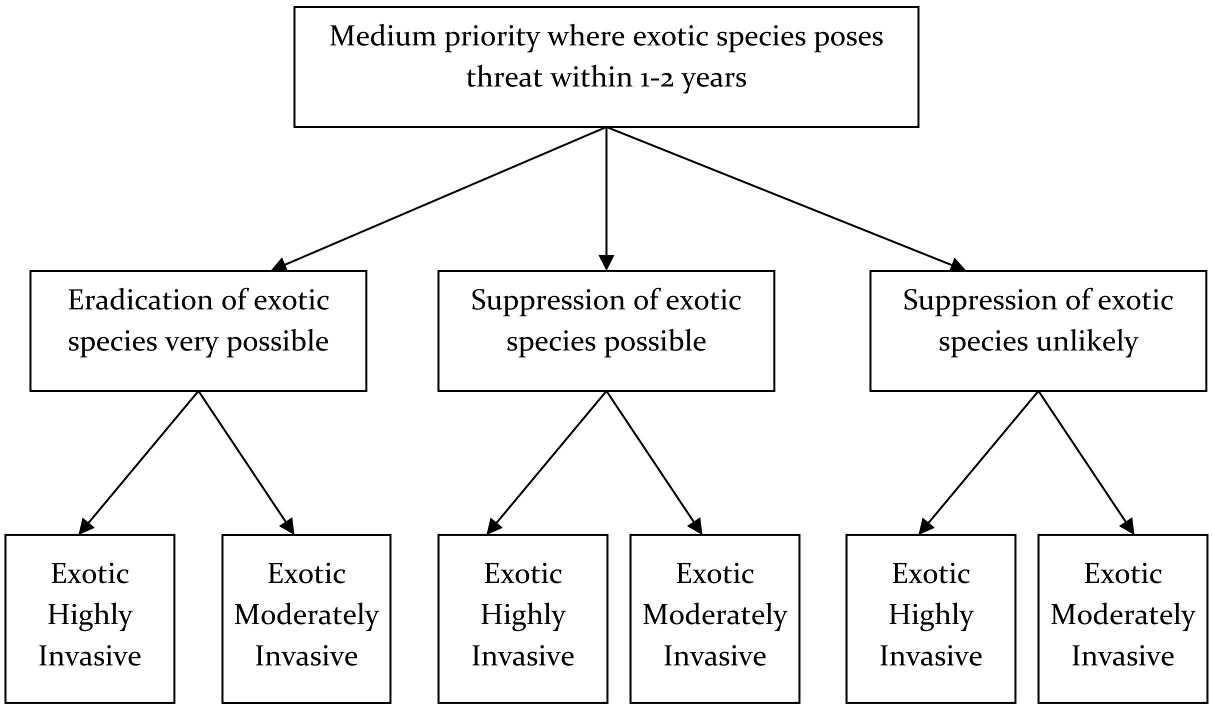
APPENDIX D2: FLOWCHART FOR HIGH PRIORITY THREAT TO NATIVE VEGETATION



Priority Ranking For Control of Exotic Species

1-3= Low priority   4-7= Medium priority   8-10= High priority

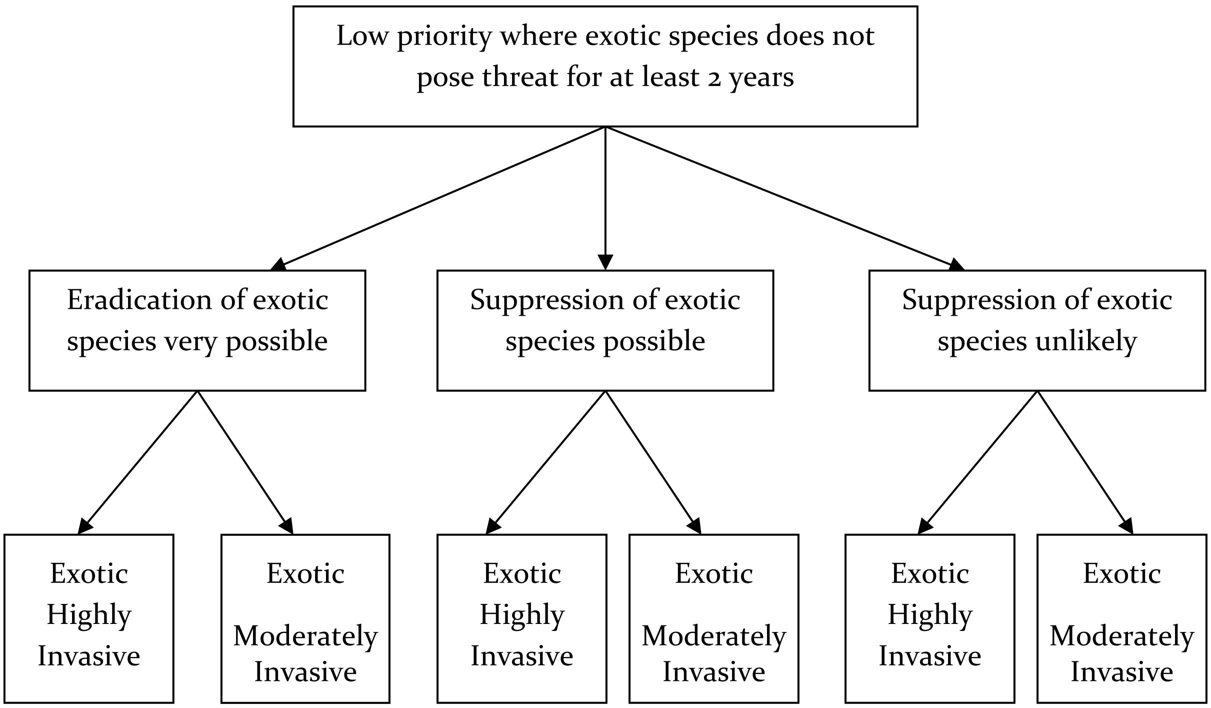
APPENDIX D3: FLOWCHART FOR MEDIUM PRIORITY DEGREE OF THREAT TO NATIVE VEGETATION



Priority Ranking For Control of Exotic Species

1-3= Low priority 4-7= Medium priority 8-10= High priority

APPENDIX D4: FLOWCHART FOR LOW PRIORITY DEGREE OF THREAT TO NATIVE VEGETATION



Priority Ranking For Control of Exotic Species

1-3= Low priority 4-7= Medium priority 8-10= High priority

APPENDIX D5: HIGHLY INVASIVE SPECIES

Genus species	**Common name**
Arundo donax	Giant reed
Asparagus asparaagoides	Bridal creeper
Avena barbata	Slender oat
Avena fatua	Wild oat
Brachypodium distachyon	False brome
Brassica nigra	Black mustard
Bromus diandrus	Ripgut grass
Bromus madritensis ssp. rubens	Red brome
Carpobrotus edulis	Hottentot fig
Caesalpinia spinosa	Spiny holdback
Centaurea melitensis	Tocalote
Chrysanthemum coronarium	Garland chrysanthemum
Cortaderia selloana	Pampas grass
Cynodon dactylon	Bermuda grass
Euphorbia terracina	Spurge
Foeniculum vulgare	Fennel
Malva nicaeensis	Bull mallow
Malva parviflora	Cheeseweed
Malva sylvestris	Mallow
Mesembryanthemum crystallinum	Annual iceplant
Nicotiana glauca	Tree tobacco
Pennisetum clandestinum	Kikuyu grass
Pennisetum setaceum	Fountain grass
Picris echioides	Bristly ox-tongue
Pistacia atlantica	Pistachio

Pittosporum undulatum	Pittosporum
Raphanus sativus	Wild radish
Ricinus communis	Castor bean
Salsola tragus	Russian thistle
Silybum marianum	Milk thistle
Sonchus asper	Prickly sow thistle
Sonchus oleraceus	Sow thistle
Spartium junceum	Spanish broom
Tamarix species	Tamarisk
Tropaeolum majus	Garden nasturtium

APPENDIX D6: MODERATELY INVASIVE SPECIES

Genus species	Common Name	Genus species	Common Name
Acacia cyclops	Acacia	*Limonium perezii*	Sea lavender
Acacia species	Acacia	*Limonium sinuatum*	Sea lavender
Aegilops cylindrica	Jointed goat grass	*Lobularia maritima*	Sweet alyssum
Ageratina adenophorum	Eupatory	*Lolium multiflorum*	Italian rye
Atriplex semibaccata	Australian saltbush	*Lolium perenne*	Perennial ryegrass
Bassia hyssopifolia	Five-Hook bassia	*Marrubium vulgare*	Horehound
Bromus hordeaceus (mollis)	Soft brome	*Medicago polymorpha*	Bur clover
Bromus catharticus	Rescue grass	*Medicago sativa*	Alfalfa
Cakiel maritime	Sea rocket	*Melilotus albus*	White sweet clover
Carduus pycnocephalus	Italian thistle	*Melilotus indicus*	Yellow sweet clover
Carpobrotus aequilaterus	Sea Fig	*Myoporum laetum*	Myoporum
Carpobrotus chilensis iceplant	Fig-Marigold	*Olea europea*	Olive
		Oxalis pes-caprae	Bermuda buttercup
Conium maculatum	Poison hemlock	*Pelargonium zonale*	Zonal geranium
Convolvulus arvensis	Bindweed	*Phalaris minor*	Phalaris
Erodium cicutarium	Red stem filaree	*Phoenix canariensis*	Phoenix palm
Eucalyptus camaldulensis	Red gum tree	*Piptatherum miliacea*	Smilo grass
Eucalyptus globulus	Blue gum tree	*Pittosporum undulatum*	Pittosporum
Eucalyptus species	Gum tree	*Plantago lanceolata*	English plantain
Hirschfeldia incana	Annual mustard	*Polygonum aviculare*	Knotweed
Hordeum murinum leporinum	Foxtail barley	*Polypogon monspessulensis*	Rabbitsfoot
Hordeum vulgare	Common barley	*Pyracantha sp.*	Firethorn
Lactuca serriola	Compass plant	*Rumex crispus*	Curly dock
Lathyrus tangianus	Tangier pea		

Schinus molle	Mexican pepper	*Washington robusta*	Mexican fan palm
Schinus terebinthifolius	Brazilian pepper	*Vicia sativa*	Spring vetch
Sisymbrium irio	London rocket	*Vulpia myuros varhirsuta*	Annual fescue
Trifolium hirtum	Rose clover	*Vulpia myuros var myuros*	Rattail fescue

APPENDIX D7: EXOTIC, NON-INVASIVE SPECIES

Scientific Name	Common Name	Genus species	Common Name
Amaranthus albus	Tumbleweed	*Gnaphalium luteo-album*	White cudweed
Anagallis arvensis	Pimpernel	*Koehlreuteria species*	Koehlreuteria
Apium graveolens	Celery	*Lamarckia aurea*	Goldentop
Aptenia cordifolia	Baby sun-rose	*Lantana montevidensis*	Lantana
Atriplex glauca	Saltbush	*Lathyrus odoratus*	Sweet pea
Bidnes pilosa	Common beggar-ticks	*Lycium species*	Lycium
Capsella bursa-pastoris	Shepherd's purse	*Lycopersicon esculentum*	Garden tomato
Centranthus rubber	Red valerian	*Malephora crocea*	Mesemb
Ceratonia siliqua	Locust bean tree	*Melaleuca species*	Melaleuca
Chamaesyce maculata	Spotted spurge	*Mesembryanthemum nodiflorum*	Iceplant
Chenopodium album	Lamb’s quarters	*Osteoapermu fruticosum*	African daisy
Chenopodium ambrosioides	Mexican tea	*Oxalis corniculata*	Woodsorrel
Chenopodium murale	Nettleleaf goosefoot	*Paspalum dilatatum*	Dallis grass
Conyza canariensis	Horseweed	*Pinus halepensis*	Alepppo pine
Coronilla valentina	Coronilla	*Plantago major*	Plantain
Cyperus involucratus	Umbrella plant	*Poa annua*	Bluegrass
Digitaria sanguinalis	Hairy crabgrass	*Polygonum arenastrum*	Knotweed
Echium fastuosum	Pride of madeira	*Senecio vulgaris*	Groundsel
Erodium botrys	Long-beaked filaree	*Silene gallica*	Common catchfly
Euphorbia lathyris	Gopher plant	*Triticum aestivum*	Cultivated wheat
Euphorbia peplus	Petty spurge	*Urtica urens*	Dwarf nettle
Filago gallica	Narrow-leaf filago	*Veronica anagallis-aquatica*	Water speedwell
Fraxinus uhdei	Shamel ash	*Yucca species*	Spanish bayonet
Gazania species	Gazania		
Geranium carolinianum	Geranium		

Table 1. 2016 TERRP Treatments

Stand ID	Reserve	Name	Stand Size	Number Individuals	Treatment	Percent Treated
AA_EuTe_02	Agua Amarga	*Euphorbia terracina*	10-100ft	10-50	Hand pull	75-100%
AC_CeAl_01	Abalone Cove	*Cephalophyllum alstonii*	10-100ft	100-200	Hand pull	0-25%
AC_EuTe_01	Abalone Cove	*Euphorbia terracina*	100-300ft	200-500	Herbicide	75-100%
AC_EuTe_04	Abalone Cove	*Euphorbia terracina*	100-300ft	1-10	Hand pull	75-100%
AC_Eu-Te_05	Abalone Cove	*Euphorbia terracina*	10-100	50-100	Herbicide	75-100%
AC_CoVa_01	Abalone Cove	*Coronilla valentina*	10-100	200-500	Herbicide	75-100%
AC_CoVa_02	Abalone Cove	*Coronilla valentina*	100-300ft	500-1000	Hand pull	75-100%
AC_ArDo_01	Abalone Cove	*Arundo donax*	1-10ft	1-10	Herbicide	75-100%
AC_MeCr_01	Abalone Cove	*Mesembryanthemum crystallinum*	100ft	50-100	Hand pull	25-50%
AV_EuTe_01	Alta Vicente	*Euphorbia terracina*	600-1000ft	50-100	Herbicide	75-100%
AV_EuTe_02	Alta Vicente	*Euphorbia terracina*	10-100ft	50-100	Herbicide	75-100%
AV_EuTe_03	Alta Vicente	*Euphorbia terracina*	10-100ft	50-100	Hand pull	75-100%
PB_EuTe_10	Portuguese Bend	*Euphorbia terracina*	>1000ft	100-200	Herbicide	75-100%
PB_EuTe_03	Portuguese Bend	*Euphorbia terracina*	10-100ft	1-10	Hand pull	75-100%
PB_EuTe_05	Portuguese Bend	*Euphorbia terracina*	10-100ft	10-50	Hand pull	75-100%

PB_EuTe_07	Portuguese Bend	*Euphorbia terracina*	10-100ft	1-10	Hand pull	75-100%
PB_Eute_08	Portuguese Bend	*Euphorbia terracina*	600-1000ft	200-500	Hand pull	75-100%
TS_EuTe_01	Three Sisters	*Euphorbia terracina*	600-1000ft	500-1000	Herbicide	50-75%
TS_EuTe_02	Three Sisters	*Euphorbia terracina*	>1000ft	500-1000	Herbicide and weed whip	75-100%
TS_EuTe_03	Three Sisters	*Euphorbia terracina*	300-600ft	200-500	Herbicide	50-75%
TS_EuTe_04	Three Sisters	*Euphorbia terracina*	100-300ft	200-500	Herbicide	50-75%
VB_AcCy_01	Vicente Bluffs	*Acacia cyclops*	10-100ft	1-10	Tree Removal	0-25%
VB_EuTe_01	Vicente Bluffs	*Euphorbia terracina*	10-100ft	1-10	Hand pull	75-100%

Table 1. 2017 TERRP Sites and Treatment Description

Stand ID	Reserve	Name	Stand Size	Number Individuals	Treatment	Percent Treated
AA_EuTe_01	Agua Amarga	*Euphorbia terracina*	10-100ft	50-100	Hand pull	75-100%
AC_CoVa_02	Abalone Cove	*Coronilla valentina*	10-100ft	100-200	Hand pull	0-25%
AC_EuTe_01	Abalone Cove	*Euphorbia terracina*	>1000ft	100-200	Herbicide	75-100%
AC_EuTe_03	Abalone Cove	*Euphorbia terracina*	10-100ft	10-50	Hand pull	75-100%
AC_Eu-Te_04	Abalone Cove	*Euphorbia terracina*	100-300ft	200-500	Herbicide	75-100%
AV_EuTe_01	Alta Vicente	*Euphorbia terracina*	300-600ft	10-50	Herbicide	75-100%
AV_EuTe_02	Alta Vicente	*Euphorbia terracina*	300-600ft	100-200	Hand pull	75-100%
AV_EuTe_03	Alta Vicente	*Euphorbia terracina*	300-600ft	100-200	Hand pull	75-100%
AV_EuTe_04	Alta Vicente	*Euphorbia terracina*	100-300ft	200-500	Herbicide	75-100%
AV_CoSe_01	Alta Vicente	*Cortaderia selloana*	10-100ft	1-10	Hand pull	75-100%
FI_EuTe_01	Filiorum	*Euphorbia terracina*	300-600ft	200-500	Herbicide	25-50%
FO_EuTe_01	Forrestal	*Euphorbia terracina*	300-600ft	10-50	Hand pull	75-100%
PB_EuTe_06	Portuguese Bend	*Euphorbia terracina*	600-1000ft	200-500	Herbicide	75-100%
PB_EuTe_09	Portuguese Bend	*Euphorbia terracina*	100-200ft	100-200	Hand pull	75-100%
PB_EuTe_10	Portuguese Bend	*Euphorbia terracina*	1-10ft	1-10	Hand pull	75-100%

TS_EuTe_01	Three Sisters	*Euphorbia terracina*	>1000ft	>1000	Herbicide	50-75%
TS_EuTe_02	Three Sisters	*Euphorbia terracina*	>1000ft	200-500	Herbicide	75-100%
TS_EuTe_03	Three Sisters	*Euphorbia terracina*	100-300ft	50-100	Herbicide	75-100%
TS_EuTe_04	Three Sisters	*Euphorbia terracina*	100-300ft	500-1000	Herbicide	75-100%
VB_EuTe_02	Vicente Bluffs	*Euphorbia terracina*	1-10ft	1-10	Hand pull	75-100%
VB_EuTe_03	Vicente Bluffs	*Euphorbia terracina*	10-100ft	1-10	Hand pull	75-100%

Table 1. 2018 TERRP Sites and Treatment Description

Stand ID	Reserve	Name	Stand Size	Number Individuals	Treatment	Percent Treated
AA_EuTe_01	Agua Amarga	*Euphorbia terracina*	10 – 100ft	50 - 100	Hand pull	75 - 100%
AA_EuTe_02	Agua Amarga	*Euphorbia terracina*	10 – 100ft	100 - 200	Herbicide	75 – 100%
AC_EuTe_05	Abalone Cove	*Euphorbia terracina*	300 - 600ft	100-200	Herbicide	75 - 100%
AV_EuTe_02	Alta Vicente	*Euphorbia terracina*	10 - 100ft	50-100	Herbicide	75 - 100%
AV_EuTe_03	Alta Vicente	*Euphorbia terracina*	300 - 600ft	200-500	Hand pull	75 - 100%
AV_EuTe_04	Alta Vicente	*Euphorbia terracina*	300 - 600ft	200-500	Herbicide	75 - 100%
PB_EuTe_02	Portuguese Bend	*Euphorbia terracina*	1 – 10ft	1 - 10	Hand pull	75 – 100%
PB_EuTe_03	Portuguese Bend	*Euphorbia terracina*	1 – 10ft	1 - 10	Hand pull	75 -100%
PB_EuTe_04	Portuguese Bend	*Euphorbia terracina*	10 – 100ft	10 - 50	Hand pull	75 – 100%
PB_EuTe_05	Portuguese Bend	*Euphorbia terracina*	1 – 10ft	1 - 10	Hand pull	75 – 100%
PB_EuTe_07	Portuguese Bend	*Euphorbia terracina*	100 – 300ft	50 - 100	Herbicide	75 – 100%
PB_EuTe_08	Portuguese Bend	*Euphorbia terracina*	>1,000ft	100 - 200	Hand pull	75 – 100%
PB_EuTe_09	Portuguese Bend	*Euphorbia terracina*	300 – 600ft	100 - 200	Herbicide	75 – 100%
PB_EuTe_10	Portuguese Bend	*Euphorbia terracina*	1 – 10ft	10 - 50	Hand pull	75 – 100%
TS_EuTe_01	Three Sisters	*Euphorbia terracina*	600 - 1000ft	500 - 1000	Herbicide	75 - 100%

TS_EuTe_02	Three Sisters	*Euphorbia terracina*	300 - 600ft	500 - 1000	Hand pull	50 - 75%
TS_EuTe_03	Three Sisters	*Euphorbia terracina*	100 – 300ft	200 - 500	Herbicide	75 – 100%
VB_EuTe_02	Vicente Bluffs	*Euphorbia terracina*	1 - 10ft	20	Hand pull	75 - 100%
AV_AcCy_01	Alta Vicente	*Acacia cyclops*	.82 acres		Cut Stump	75 - 100%
TS_AcCy_03	Three Sisters	*Acacia cyclops*	2.3 acres		Cut Stump	75 - 100%
FI_AcCy_01	Filiorum	*Acacia cyclops*	3.08		Cut Stump	75 - 100%

SECTION 6

DISCUSSION AND MANAGEMENT RECOMMENDATIONS

SECTION 6 DISCUSSION AND MANAGEMENT RECOMMENDATIONS

6.1 INTRODUCTION

This section discusses management recommendations based on the results of the 2016-2018 covered species surveys, 15-acre Abalone Cove habitat restoration plan, TERPP report, and predator management report. Because the covered species surveys, habitat restoration plan, predator report, and TERPP reports were authored as stand-alone documents and each clearly states management recommendations independently, this section will attempt to summarize all aspects of management of the PVNP, including topics not covered in the above sections, such as trails and public use. Recommendations are based on analysis of successful techniques as well as areas that can be improved.

6.2 HABITAT RESTORATION

Habitat monitoring of restoration areas show that seed germination and native plant growth has been low during the years of low rainfall, only the 2017 rain year had above average rainfall. To better meet success criteria, fill-in planting was necessary in parts of the Alta Vicente and Portuguese Bend Restoration areas. Future restoration plans will incorporate higher numbers of container plants, and rely less on seed germination for meeting success criteria, while seeding will still be utilized as an important component for developing a native seed bank. Additionally, PVPLC has implemented the use of drip line irrigation systems to replace overhead sprinklers, which has shown an increase in plant vitality and reduction in plant mortality, and will be the preferred method of irrigation in all future planting projects.

6.3 MANAGEMENT RECOMMENDATIONS

Trails

The Preserve trails fall under the City's Public Use Master Plan (PUMP), which is an NCCP-covered activity, and must therefore follow certain avoidance and minimization measures and guidelines to protect covered species, including closing trails that were previously in use and no longer authorized.

Visitors have been creating new unauthorized trails on the Preserve, and tampering with PVPLC's trail closures. With the addition of full-time Field Operations Specialist in 2014, whose main task is to close unauthorized trails and replace closures after vandalism, PVPLC staff and volunteers have closed off spur trails using cactus and physical barriers at Vicente Bluffs (Pelican Cove), Alta Vicente, Abalone Cove, Forrestal, Filiorum, Portuguese Bend, San Ramon, Three Sisters and Vista Del Norte. PVPLC recommends the continued coordination with volunteers of the Rapid Response team to monitor closures and assist with the replacement of removed closures. Over the years, Cactus has matured and created permanent barriers, so using plant species where feasible is the best recommended approach.

PVPLC, with City of RPV coordination, created a Volunteer Trail Watch program to educate the public and improve trail etiquette, protect the natural resources of the Palos Verdes Nature Preserve, enhance the safety of, and promote an enjoyable experience for all Preserve visitors. Trail Watch volunteers observe activities on the Preserve, communicate the importance of following Preserve Rules to the public, and inform enforcement about times and locations of problematic activities. The VTW program has collected lots of data about visitor impacts, trail issues, and trends in violations of the rules to support enforcement.

PVPLC recommends that future enforcement efforts target individuals who are causing vandalism to trail closures and signage as well as other rules violations, and utilize VTW reports of observations and trends to help focus enforcement efforts. Additionally, PVPLC recommends enhanced distribution of the "Sharing Trails Safely" brochure and website link to enhance efforts to protect natural resources and promote safety. PVPLC also recommends the City continue its coordination with PVPLC and include its recommendations when making recreation and trails decisions. Lastly PVPLC recommends establishing an annual review with the WAs, City and Land Conservancy to discuss the public use and recreation within the Preserve, and investigate possible impacts and remediation strategies that may be necessary to protect covered species and their habitats.

Covered Species

Covered Plant Species

During this triennial monitoring period, the Palos Verdes Peninsula Land Conservancy (Conservancy) conducted covered plant species monitoring during 2017. Previously poorly defined boundaries at the monitoring sites resulted in highly variable year to year counts of the species (PVPLC 2013). To reduce this variability, all sites were mapped using GPS to create GIS maps to develop clearly defined boundaries for this and future surveys. Additional stands resulting from the Conservancy's restoration projects and those found in the Preserve were mapped as a management tool to promote better knowledge of the special status plant species within the Preserve. Large numbers of the annual species Atriplex and Aphanisma were observed and several new stands were mapped, expanding the extent of these species. Overall the Atriplex and Aphanisma returned to 2011 numbers after a population boom in 2015. The population of Crossosoma remains unchanged from the previous survey, with roughly 900 individuals. Dudleya and Lycium counts match those from previous surveys recorded. Suaeda counts were limited and down from 528 to 295. One factor in this number drop was the access to the reference stand. Threats to all species include invasive non-native species, cliff erosion, long-term drought, and trampling.

PVPLC is collecting seed of these covered plants for propagation and out-planting at restoration sites. In 2013, as part of a restoration funded by two grants (National Fish and Wildlife Foundation and Santa Monica Bay Restoration Commission/Coastal Conservancy grant), invasive plants were removed and covered species (Atriplex, Aphanisma, Dudleya, Lycium) were installed along the coastal bluffs at Abalone Cove. These plants continue to be maintained and monitored.

PVPLC recommendations are to:

- Continue to remap stands to determine how and where boundaries change, especially for the annuals Aphanisma and Atriplex and for the perennial Suaeda.
- Install covered plant species in restoration efforts as feasible and where appropriate.
- Remove threatening invasive species in priority areas.
- Continue to seek restoration funding directed toward enhancing populations of these six species.
- Continue to use GIS and other advanced monitoring techniques to create more accurate survey results.

Covered Wildlife Species

El Segundo Blue Butterfly

Surveys for the El Segundo blue butterfly (ESB) were conducted in 2016. Within the Palos Verdes Nature Preserve, ESB inhabit the steep ocean bluffs around Point Vicente. The NCCP/ HCP mandates triennial surveys for long-term population trending.

The 2016 survey was conducted at 13 sites with host plants. Weekly surveys were conducted from May 25 through August 2 – in order to observe host plants in peak bloom. The total number of ESBs observed, 30, was twice the number seen in 2015, a very encouraging trend. Two previously surveyed sites no longer had sea-cliff buckwheat plants while other areas such as Abalone Cove and Vicente Bluffs experienced a large increase in host plant populations due to restoration efforts since the last survey.

PVPLC will continue to remove invasive plants that compete with the ESB host plant, seek funding to enhance butterfly habitat, and plant ESB host plant in all appropriate restoration sites.

California Gnatcatcher and Cactus Wren

Surveys for California gnatcatcher and cactus wren were conducted in 2018. In 2012 the protocol was modified from earlier protocols to complete two passes versus three.

Overall, 2018 found the lowest numbers of both California gnatcatchers and cactus wrens since required every-three-year monitoring began in 2006. We estimate 19 territories of California gnatcatcher, and five territories of cactus wren, during the 2018 breeding season. This represents a drop of 54% and 74%, respectively, from the prior survey in 2015, and an even larger drop from the 2009-2015 average.

The reasons for this are not entirely clear, but it likely a combination of the following factors: Crippling drought that started after 2012 and which has continued into 2018, which resulted in virtually no new foliage or flowering on shrubs/forbs by spring 2018 (and which likely reduced the available food tremendously); A relatively wet winter in 2016-17 that resulted in an explosion of weedy growth across the peninsula (esp. black mustard *Brassica nigra*) that altered the structure of the native low scrub habitat and rendered it less suitable for the two focal species; Unseasonably cool (and wet) conditions during early spring 2018 (in 2018, temperature data indicate that no survey date reached an air temperature in the 70s, only five days saw end temperatures >65F, and rain canceled several survey dates; by contrast, in 2015, 10 survey dates ended with temperatures at or above 70F); The continuing decline of cactus plants from drought and insect pests; The continued growth of invasive shrubs such as acacia (Acacia spp.) and others; and The continuing increase in predators such as Cooper's hawk (*Accipiter cooperii*) peninsula-wide.

It is also possible that the dramatic loss of cactus wrens is being accelerated by a genetic bottleneck, where viable young are not being produced at a rate that would sustain the population, and with essentially no immigration of new individuals, we're simply waiting for the remaining adults to die. Thus, these seemingly adverse environmental conditions may not be operating on a "normal" population, but one already struggling with low population size. PVPLC will continue to work with the agencies and researchers to understand the decline but will continue to enhance and create appropriate habitat and wildlife corridors for these two species.

Threats

Invasive Plants

Invasive species are a ubiquitous problem in wild lands, and pose a substantial threat to the integrity of native vegetation communities in the PVNP. Aggressive non-native plant control is a highly recommended priority for the long-term preservation of established and future recruitment of native vegetation stands in the PVNP. Management priorities are based on the highly invasive species as listed by the California Invasive Plant Council (Cal-IPC). Of particular concern are highly invasive species such as *Euphorbia terracina* (Geraldton carnation spurge), located in Portuguese Bend Reserve and San Ramon, *Ricinus communis* (castor bean) located in Agua Amarga and Abalone Cove, and *Acacia cyclops* (acacia) found throughout the PVNP. PVPLC conducted invasive weed surveys to produce a baseline map for invasive plants. These maps can be compared to results of future invasive plant surveys to determine whether a population is spreading. Along with the vegetation map produced in 2000, this map will allow PVNP staff to prioritize and target areas for TERPP and restoration. TERPP activities can be focused to:

1. Reduce invasive plant expansion into otherwise high quality habitat.
2. Control invasive plants in areas where clearing invasive plants will create higher quality habitat.

Wildfires

Because fire is a natural feature of the region, under normal circumstances natural re-growth of habitat is expected. However, extensive fires or repeated fires in the same location of the Preserve may adversely affect the Covered Species conserved by the Permit Area plan because habitat type conversion from existing habitat(s) to invasive or non-native weeds can occur.

PVPLC will monitor burned areas within the PVNP to determine if the habitat is recovering, and for negative impacts on Covered Species. Measures developed by consensus between the City and the Wildlife Agencies will be implemented if deemed necessary. These measures could include erosion control, noxious species control, reseeding, or other measures identified during the analysis.

As resources and funding are made available, PVPLC shall prioritize and remove plants identified on LA County's High Fire Risk, including but not limited to Acacia. The presence of Acacia is prevalent throughout the Preserve and the City, impacting habitat and posing risks by potentially spreading fire within the Preserve and/or to nearby residential areas. PVPLC shall seek funding opportunities to remove Acacia from key areas outside of the fuel modification zones managed by the City.

Erosion, Compaction, Habitat Loss

Coastal bluff erosion was observed in all survey areas within the PVNP that occur on the coastline. In addition to coastal bluff erosion, canyon erosion was documented in Lower Altamira canyon where the population of Coreopsis occurs. Canyon erosion also occurs in several other canyons on the peninsula within the PVNP. Plant species that occur on the coastal bluffs (such as Dudleya, Aphanisma, Suaeda and Lycium), or on the side slopes of eroding canyons, are threatened by potential erosion. Additionally, wildlife species which rely on the habitat on the coastal bluffs and in eroding canyons, are threatened by the loss or degradation of their habitat. The majority of coastal bluff erosion threatening coastal bluff plant and wildlife species is naturally occurring and little can be done to prevent it from happening. The soils on the peninsula are highly erosive and the area is highly geologically active. However, some erosion problems that were noted within the PVNP (e.g., Pelican Point) were a consequence of unauthorized, unstable coastal bluff trails, which PVPLC has since closed and restored.

Some additional erosion problems on the coastal bluffs are related to disturbed vegetation and presence of invasive annual species. Restoration of degraded coastal bluffs would help to minimize soil erosion and improve native coastal bluff scrub habitat.

PVPLC will continue to maintain established trails, and close and revegetate unauthorized trails. The trail improvements and restoration project completed at Pelican Cove and Vicente Bluffs will continue to reduce cliff erosion at this site. PVPLC obtained funding for habitat restoration at Abalone Cove Reserve, including closing and replanting unauthorized trails, which have since began to revegetate and limit access. PVPLC will continue to monitor for erosion and develop erosion control plans when necessary.

PVPLC recommends that the City develop a protocol for utility company access and fuel modification that can be closely followed by staff to ensure that habitat impacts and erosion do not occur.

Predator Control

Feral Cats and Red Fox

Few feral animals have been observed in the PVNP over the last three years, except at Vicente Bluffs, in the area adjacent to the Palos Verdes Interpretive Center, as well as Alta Vicente Reserve. Evidence of cats in the Reserve, was in the form of what appeared to be "cat trails" through the vegetation. Feral cat activity was due to a long-established feral cat feeding station near the Reserve. In collaboration with City of RPV staff, most of the feral cats were removed, and the cat feeding station was moved a greater distance from the Reserve. PVPLC will monitor to ensure that there is no longer evidence of cats in the Preserve.

PVPLC will continue to monitor throughout the Preserve, and if a significant impact is determined, will consult with agencies on follow-up actions. Options may include a feral animal removal program will be established. This program could consist of trapping and removal at regular intervals throughout the year. It would be based on the latest scientific data to ensure its success.

Brown-headed Cowbirds

The Predator Control Plan addresses monitoring and control of brown-headed cowbirds. The brown-headed cowbird is a nest parasite that lays its eggs in other bird species' nests, including the nests of California gnatcatcher. This behavior negatively affects native bird species, and can reduce reproductive success. Brown-headed cowbirds have not been observed during California gnatcatcher and cactus wren surveys, and there were no incidental observations on the Preserve. If brown-headed cowbirds become a threat, a cowbird trapping program may be implemented.

Climate Change

Climate change poses a significant threat through reduced precipitation and more episodic rain storms, sea-level rise, and increased wildfires in the southwestern US (Global Change Project 2009). Higher temperatures, changes in rainfall, and fire regime, would lead to changes in the distribution and composition of vegetation communities (CCCC 2006). In particular, an increased frequency of wildfires would result in a change in vegetation types from shrubs to grassland (CCCC 2006).

Climate change scenarios for California predict a decrease in shrub communities, including CSS, due to the increase in the frequency of wildfires (CCCC 2006). The predicted loss of shrub land is associated with increased frequency of wildfires, and not with changes in temperature or precipitation (CCCC 2006). CSS restoration in the PVNP is an important long-term goal based on this scenario. A diverse plant community, created with a diverse seed mix and plant palette, will facilitate regeneration after fire disturbance, and prevent habitat type conversion to a grassland community. In addition, an adaptive management model will allow for adjustments as techniques and outcomes are evaluated.

Long-term drought from reduced precipitation has the potential to impact the survivorship of the more drought-sensitive species, such as Crossosoma and the annuals Aphanisma and Atriplex. Sea-level rise will accelerate cliff erosion (Global Change Project 2009), leading to an additional threat to those species. Species such as Dudleya, Eriogonum, Lycium, and Suaeda, with remnant populations along the steep ocean bluffs, may be subject to habitat loss and may need assistance in recolonizing new bluff areas.

PVPLC will continue to monitor rare plant species populations and drought sensitive species for survivorship impacts. Where appropriate, propagation of these species will occur in PVPLC's native plant nursery and bulking up of seed will occur. Suitable locations for out planting will be identified, such as restoration sites or other protected and managed areas, and documented for success.

Adaptive Management

An adaptive management framework will be used to modify restoration and management activities as success is assessed, new information becomes available, or changes occur in weather conditions. Adaptive management is a key element of implementing effective conservation programs which takes into account data from monitoring species and natural systems as well as new information from management and targeted studies to continually assess and adjust the effectiveness of conservation actions.

Adaptive management may include re-prioritizing monitoring efforts, as indicated by monitoring results and the resultant degree of management required for a given resource. For example, if a specific population proves stable over a period (e.g., 10–20 years), the frequency of monitoring may be reduced, particularly if a species' habitat and physical site characteristics remain unchanged. Conversely, another species may require more intensive monitoring because of declining trends. The remediation and adaptive management program will achieve the objectives of providing corrective actions where (1) resources are threatened by land uses in and adjacent to the Preserve, (2) current management activities are not adequate or effective, or (3) enforcement difficulties are identified.

The highest priority monitoring tasks will be those (1) that provide direct evidence of changes in key biological resources and (2) for which corrective or remedial management actions are possible.

6.4 LITERATURE CITED

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SECTION 7

2018 ANNUAL REPORT

Palos Verdes Peninsula
Land Conservancy

January -- December 2018

PALOS VERDES NATURE PRESERVE
ANNUAL REPORT

FOR THE

RANCHO PALOS VERDES
NATURAL COMMUNITY CONSERVATION PLAN

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LAND CONSERVANCY

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June 2020

2018 ANNUAL REPORT

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1.0 INTRODUCTION

The 2018 Palos Verdes Nature Preserve Annual Report for the Rancho Palos Verdes Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) provides annual submittal requirements by the Palos Verdes Peninsula Land Conservancy (PVPLC) for the Palos Verdes Nature Preserve (Preserve). Additionally this report details stewardship activities, research, funding, and community involvement in the Preserve during the period January 1 through December 31, 2018. This report also includes annual submittal requirements of the City of Rancho Palos Verdes including habitat tracking and updates on Covered Projects and Activities permitted under the NCCP/HCP. This 2018 annual report is a submittal within the three-year NCCP/HCP Comprehensive Report covering years 2016-2018.

PVPLC is the designated Habitat Manager for the Palos Verdes Nature Preserve for the City of Rancho Palos Verdes. The Preserve encompasses approximately 1,400 acres and is located on the southern side of the Palos Verdes Peninsula in the City of Rancho Palos Verdes, California. The Preserve was formed under the RPV NCCP/HCP (adopted by City Council in October 2018) to "maximize benefits to wildlife and vegetation communities while accommodating appropriate economic development within the City and region pursuant to the requirements of the NCCP Act and Section 10(a) of the ESA (URS 2004a)." As a primary component of the NCCP/HCP, a Preserve design was proposed to conserve regionally important habitat areas and provide habitat linkages in order to benefit sensitive plants and wildlife. PVPLC manages the habitat in the Preserve per the requirements of the NCCP/HCP and further detailed in a management agreement with the City.

The primary focus of management for the Preserve is to maintain or restore habitat for the covered plant and animal species listed in the NCCP/HCP. A Habitat Management Plan was adopted in 2007 that outlines the restoration of five acres per year for a total of 15 acres over a three-year period. This plan also outlined the methodology for removal of exotic plant species, a predator control plan, and the monitoring of covered plant and animal species. PVPLC seeks additional funding when possible, to perform restoration on more than the minimum five acres per year required in the NCCP/HCP. Several opportunities of this nature occurred during the reporting period that enabled PVPLC to implement additional restoration as detailed below. Additionally, PVPLC executes several trail projects and habitat protection measures with the aid of staff, volunteers and additional funding sources.

PVPLC also facilitates scientific research through citizen science programs and academic research in the Preserve. Volunteers greatly support the implementation of management strategies for the Preserve by assisting in monitoring the properties, wildlife, and habitat as well as help restore habitat and maintain trails. Collaborating with regional high schools and colleges allows for scientific research that expands our understanding of the Preserve.

Annual Submittals (Included in This Report)

1. Restoration plans for the NCCP/HCP and other projects
2. NCCP/HCP Restoration Monitoring Report
3. Targeted Exotic Removal Program for Plants (TERPP) Report
4. Trail maintenance activities and Project List
5. Volunteer involvement and support
6. Citizen Science and Education Programs
7. City Projects and Tracking of Habitat Impacts

Site Description

The Preserve is located on the southern side of the Palos Verdes Peninsula in the City of Rancho Palos Verdes, California (Figure 1). The approximately 1,400-acre Preserve has been divided into twelve subareas referred to as Reserves.

The topography of the Preserve is diverse, ranging from relatively flat lowland areas above steep coastal bluffs in the south, to very steep slopes, ridgelines and gullies on the slopes to the north. Elevations range from approximately sea level along the coastal edges of Vicente Bluffs, Abalone Cove, and Ocean Trails to approximately 1,300 feet above mean sea level at the northern most parcel, vista del Norte. Adjacent land uses include single-family residences on most sides, open space associated with neutral lands on the Peninsula, the Pacific Ocean to the south and west, and the Los Verdes and Trump National golf courses near the western and eastern ends of the Preserve area.

Figure 1. Map of the Palos Verdes Nature Preserve with associated Reserves locations.

Table 1
Reserve Names of the Palos Verdes Nature Preserve. See Figure 1 for locations.

Abalone Cove Reserve	Ocean Trails Reserve*
Agua Amarga Reserve	Portuguese Bend Reserve
Alta Vicente Reserve	San Ramon Reserve
Filiorum Reserve	Three Sisters Reserve
Forrestal Reserve	Vicente Bluffs Reserve
Malaga Reserve**	Vista del Norte Reserve
* Not managed by PVPLC, but managed under Habitat Conservation Plan ** Will be added to the Preserve when NCCP/HCP is adopted	

2.0 HABITAT RESTORATION PLAN

The initial Preserve Habitat Management Plan (PHMP) for the Draft NCCP/HCP was created in 2007. A component of the PHMP was the Habitat Restoration Plan for five acres per year for a total of 15 acres over the first three-year period. This plan was completed in April 2007 and concluded that Alta Vicente Reserve in the Preserve ranked the highest in terms of site suitability for an immediate restoration project. The Habitat Restoration Plan for Alta Vicente Reserve outlines appropriate habitat revegetation locations and methodology to adequately comply with the Preserve Management requirements of the Rancho Palos Verdes NCCP/ HCP. The Habitat Restoration Plan for Alta Vicente Reserve provides guidelines for the establishment of coastal sage scrub (CSS), coastal cactus scrub (CCS), and PVB butterfly habitat on a total of 15 acres during 3 consecutive years at the Alta Vicente Reserve. However, since a fire occurred at Portuguese Bend Reserve in August 2009, plans were adapted to focus immediate habitat restoration at Portuguese Bend, and only Phase 1 and 2 (10 acres) were implemented at Alta Vicente. The Restoration Plan for Portuguese Bend covers habitat restoration and monitoring of 25 acres over five years (2010 to 2015). The following provides a brief description of work done to fulfill the NCCP/HCP during the reporting period. Table 2 provides the implementation schedule for Phase 1 through 5 at Portuguese Bend.

In 2015, PVPLC developed new habitat restoration plans to execute the final phases of the restoration at Alta Vicente, and these plans were included in the 2015 Comprehensive Report. Phase 3 was initiated in 2016 and Phase 4 initiated in 2017, with the installation of drip irrigation and coastal sage scrub vegetation species. Table 3 provides the implementation schedule for Phase 3 and 4 at Alta Vicente.

2.1 PORTUGUESE BEND RESERVE RESTORATION

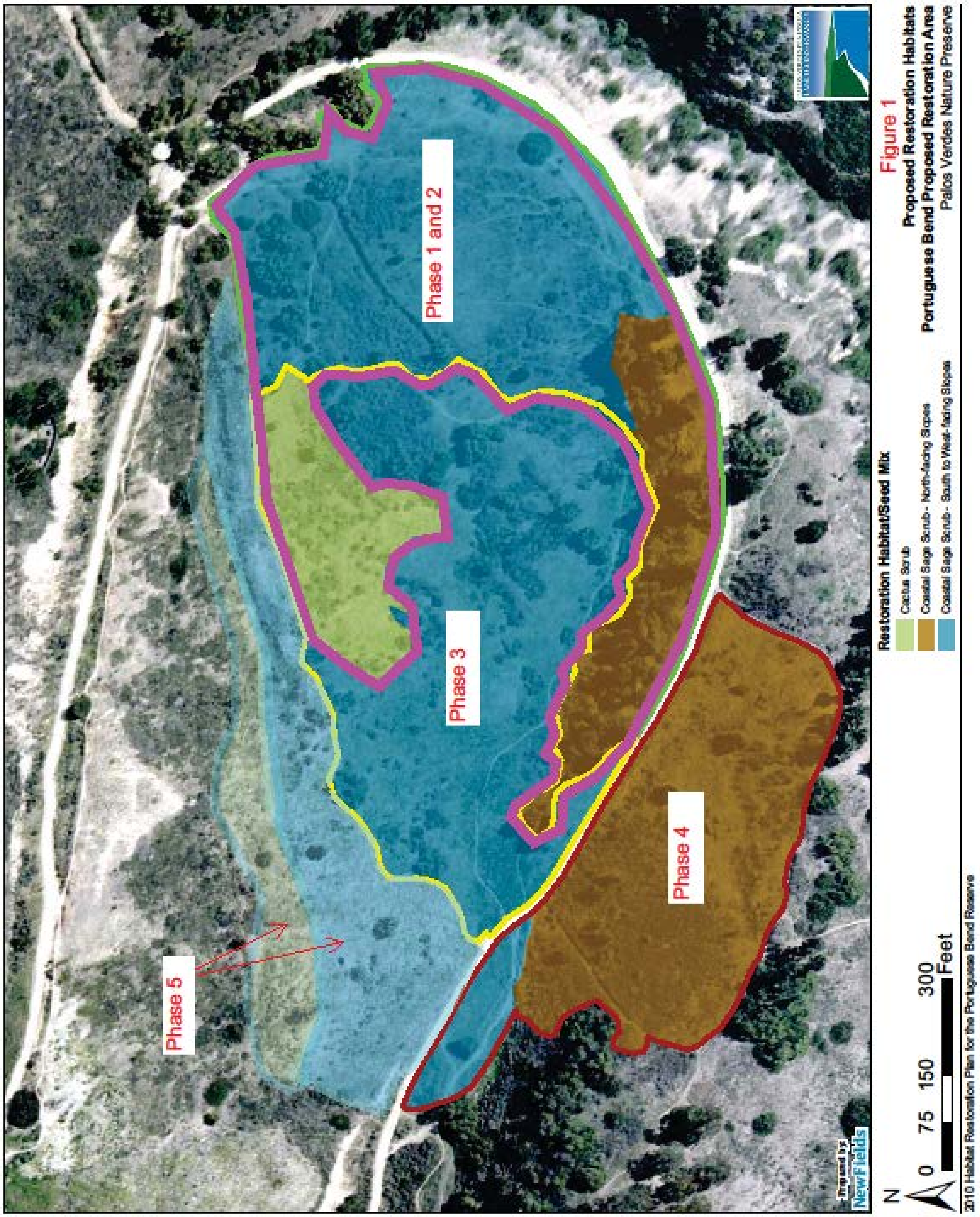
The habitat restoration plan for Portuguese Bend is to complete 25 acres in five phases (Table 2, Figure 2). Site preparation at Portuguese Bend began in February 2010. Field staff weeded (hand/herbicide) the burn area in 2010. In February 2011, goats were deployed to clear vegetation. Due to the high density of weeds, an additional year of weeding was implemented, and plants were installed on ten acres in fall 2012 (Phase 1 and Phase 2).

PVPLC implemented "grow and kill" prior to plant installation, and improve seed and plant survival after planting. Phases 1, 2 and 3 were irrigated with overhead sprinklers. Drip irrigation was installed for Phases 4 in fall 2014 and for Phase 5 in fall 2015, coinciding with the plant installation for those phases. Weed control is implemented in all phases for five years minimum after they are initiated.

Table 2
Restoration Project Schedule for Portuguese Bend Reserve Phases 1, 2, 3, 4 and 5, based on the Portuguese Bend Reserve Habitat Restoration Plan.

	Task	Date
PHASE1 and PHASE 2	Begin site preparation, weed removal	Fall 2010
	Install irrigation	Winter 2012
	Final site preparation: weed and thatch removal	Fall 2012
	Installation: Seeding and planting	Fall 2012-Early Winter 2013
	Maintenance weeding	Winter 2013-Spring 2014
	Fill-in planting, as needed	Fall 2013-Fall 2014
	5-year biological monitoring and maintenance	Spring 2013-Spring 2017
	Phase one and two completion	2017, end of Year 5
PHASE 3	Site preparation, weed removal	Fall 2012-Fall 2013
	Final site preparation: weed and thatch removal	Fall 2013
	Installation: Seeding and planting	Fall 2013-Early Winter 2014
	Maintenance weeding	Winter 2014-Spring 2015
	Remedial seeding, as needed	Fall 2014-Fall 2015
	5-year biological monitoring and maintenance	Spring 2014-Spring 2018
	Phase three completion	2018, end of Year 5
PHASE 4	Site preparation, weed removal	Fall 2013-Fall 2014
	Final site preparation: weed and thatch removal	Fall 2014
	Installation: Seeding and planting	Fall 2014-Early Winter 2015
	Maintenance weeding	Winter 2015-Spring 2016
	Remedial seeding, as needed	Fall 2015-Fall 2016
	5-year biological monitoring and maintenance	Spring 2015-Spring 2019
	Phase 4 completion	2019, end of Year 5
PHASE 5	Site preparation, weed removal	Fall 2014-Fall 2015
	Final site preparation: weed and thatch removal	Fall 2015
	Installation: Seeding and planting	Fall 2015-Early Winter 2016
	Maintenance weeding	Winter 2016-Spring 2017
	Remedial seeding, as needed	Fall 2016-Fall 2017
	5-year biological monitoring and maintenance	Spring 2016-Spring 2020
	Phase 5 completion	2020, end of Year 5

Figure 2. Map of restoration areas at Portuguese Bend Reserve.



2.2 ALTA VICENTE RESERVE RESTORATION

The habitat restoration conducted at the Alta Vicente Reserve consists of four phases, with one phase initiated each year. The first five-acre phase of restoration (Phase 1) began with site preparation during the fall of 2007 and 2008 to minimize weeds after planting (as per the timeline in the Alta Vicente Restoration Plan, Table 2). Phase 1 plants were installed and hydroseeded during the winter of 2009/2010. Site preparation for Phase 2 began in fall 2008. In December 2010, staff removed *Acacia cyclops* and completed planting and seeding in the Phase 2 area. Staff weeded and maintained Phase 1 and 2. Additional container plants were installed from 2012 to 2017 to fill in areas with low native plant cover.

Phase 3 (Figure 3) was initiated in fall 2016 with the installation of drip irrigation system and container plants throughout the 5 acre area. Year 1 monitoring began in spring 2018. Preparation for Phase 4 planting began in summer 2017 with site clearing using goats and drip irrigation system installation. Phase 4 planting began in winter 2017 and extended through early 2018, Year 1 monitoring will begin in spring 2019.

Table 3
Restoration Project Schedule for Alta Vicente Reserve, based on the Alta Vicente Reserve Habitat Restoration Plan.

	Task	Date
PHASE 3	Begin site preparation, weed removal	Fall 2016
	Install irrigation	Fall 2016
	Planting Container Stock	Fall and Early Winter 2016
	Seed application	Fall and Early Winter 2017
	Monitoring and Maintenance	To begin after planting, Winter 2016
	5-year biological monitoring and maintenance	Spring 2018-Spring 2022
PHASE 4	Begin site preparation, weed removal	Summer 2017
	Install irrigation	Fall 2017
	Planting Container Stock	Fall and Early Winter 2017
	Seed application	Fall and Early Winter 2017
	Monitoring and Maintenance	To begin after planting, Winter 2017
	5-year biological monitoring and maintenance	Spring 2019-Spring 2023

Figure 3. Map of Phase 3 and 4 Restoration Area at Alta Vicente Reserve

2.3 CACTUS WREN ENHANCEMENTS

PVPLC refocused restoration efforts in 2018 to enhance habitat for the cactus wren in response to drastic decline of the peninsula's populations as observed by Cooper (see Appendix E for report) and concern from the California Department of Fish and Wildlife. Four cactus species population locations over a total of 7.06 acres were targeted and strategically thinned of encroaching vegetation. Additionally, 371 cactus were planted throughout 1.14 acres within the areas cleared of encroaching weeds. Figure 4 and Table 4 provide a location map and a summary of the work performed. It is recommended that these thinned areas be maintained to protect cactus plants from late successional species encroachment and weed species abundance. Other high priority cactus wren habitat areas have been identified for similar restoration approach and can be treated and planted given available resources.

Figure 4: Cactus Wren Enhancement Project Locations

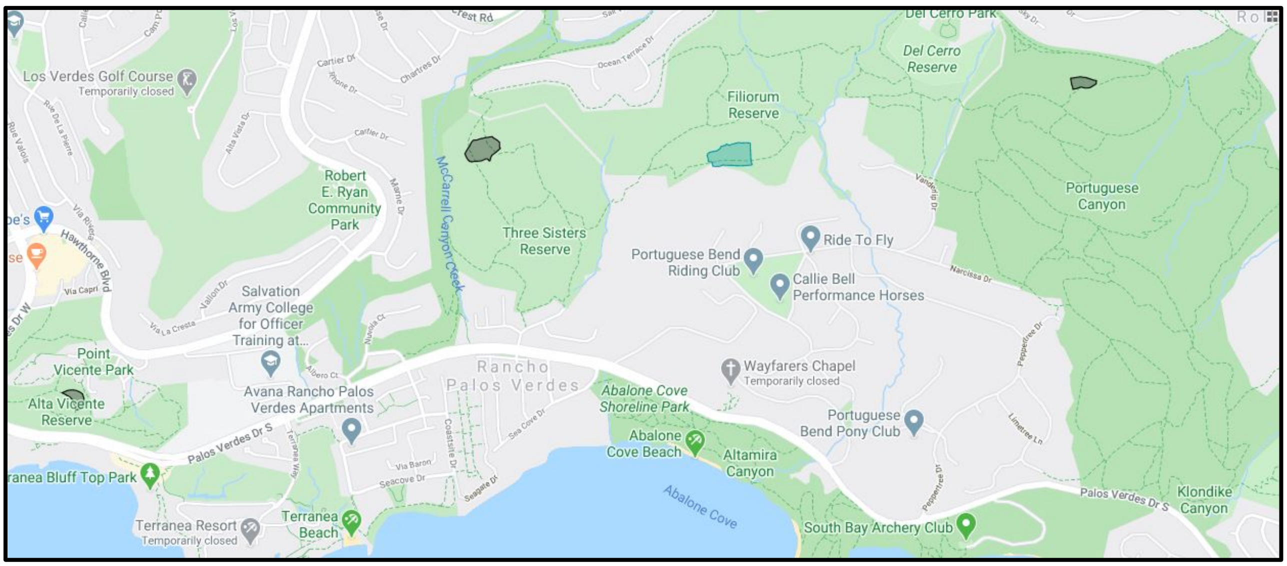


Table 4: Cactus Wren Enhancement Project

Location	Acres Cleared	Acres of Cactus Planted	Quantity of Plants
Alta Vicente	0.82	0.25	65 containers, 70 pads
Three Sisters	2.30	0.75	193 containers
Filiorum	3.08	0	0
Portuguese Bend	0.86	0.14	43 containers
TOTAL	**7.06 acres**	**1.14 acres**	**301 containers, 70 pads**

3.0 ADDITIONAL RESTORATION ACTIVITIES IN 2018

PVPLC seeks additional funding, to perform restoration on more than the minimum five acres per year required in the NCCP/HCP. Several opportunities occurred during the reporting period. Figure 5 provides a site map for all restoration projects active in 2018, including the restoration at Alta Vicente and Portuguese Bend Reserves that fulfills the requirements of the NCCP/HCP Habitat Restoration Plan. A complete summary of all restoration work completed in the Preserve, along with maps of restoration sites, can be found in Appendix C.

3.1 ABALONE COVE

Funding from the National Fish and Wildlife Foundation (NFWF), the Santa Monica Bay Restoration Commission, the Coastal Conservancy, the U.S. Fish and Wildlife Service Coastal Program, and the California Trails and Greenways Foundation provided funding to restore and enhance five acres of coastal sage scrub and coastal bluff scrub at Abalone Cove Reserve. Three acres were planted in 2013, and an additional two acres were restored and enhanced in 2014, 2015, and 2016. Maintenance and fill-in planting continued in 2017 and final project monitoring was submitted to the grantors in 2018.

3.2 AGUA AMARGA

In 2012, an additional mitigation project (D&M Eight LTD) funded the planting of 147 riparian plants at Lunada Canyon. The plants were installed in January 2014 and irrigated with a drip irrigation system. Severe rains in 2014 caused torrential stream flows that removed some of the installed plants. PVPLC installed replacement plants and monitored the site’s recovery in 2015, 2016 and 2017. The final report was submitted in 2018.

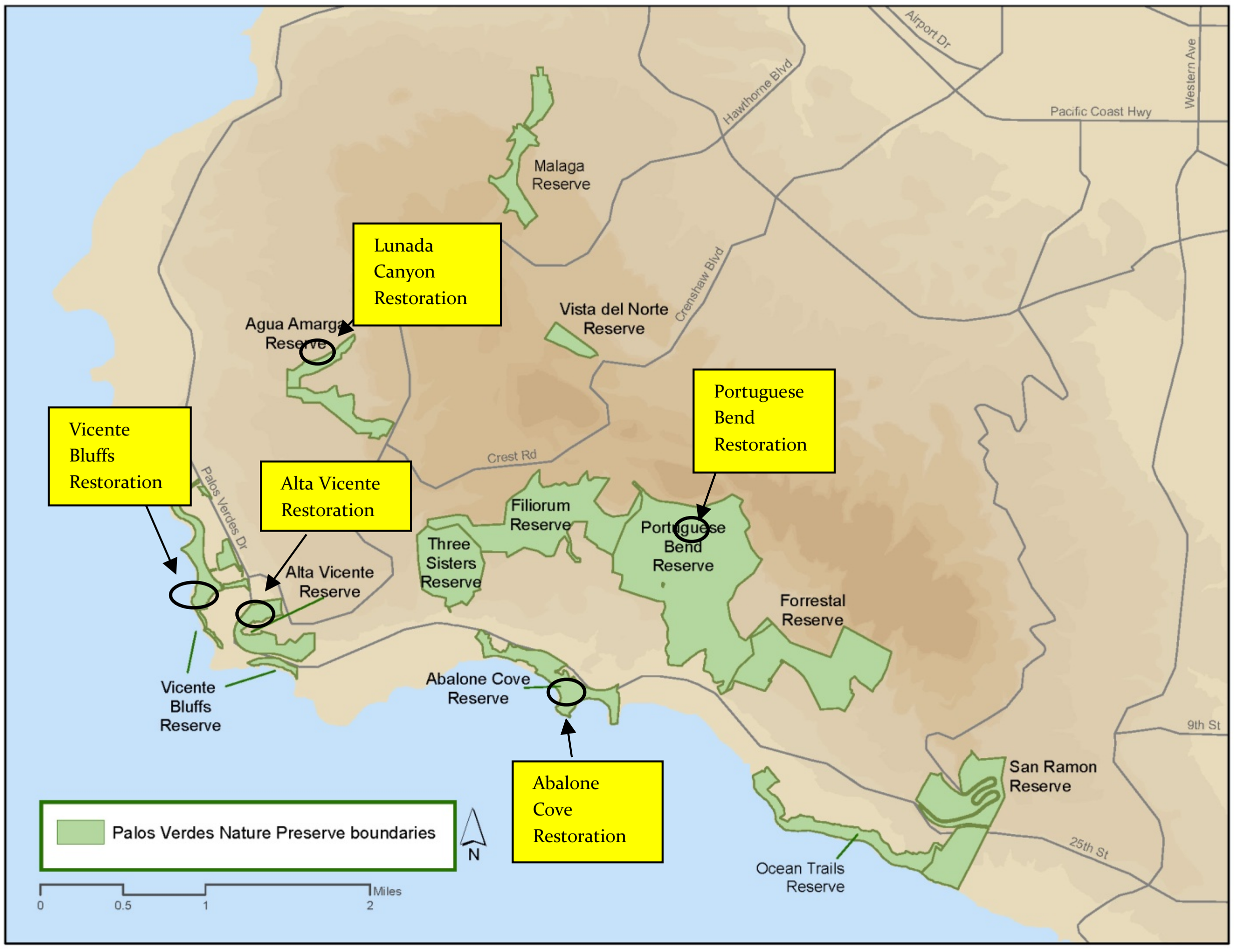
3.3 VICENTE BLUFFS

In June 2008, a grant agreement was signed with the State Coastal Conservancy to provide habitat restoration at Vicente Bluffs Reserve. PVPLC restored three acres of coastal bluff scrub and El Segundo blue butterfly habitat by removing acacia, pampas grass and ice plant, and installing container plants with coastal bluff scrub and El Segundo blue butterfly host plants. PVPLC added plants to this site in 2013, 2014 and 2015 to fulfill the grant goals. Since then, volunteers have continued the effort to plant host plants and remove weeds through 2018 in order to expand habitat area for the El Segundo blue butterfly.

3.4 PORTUGUESE BEND

In 2012, PVPLC received funding from the Habitat Conservation Fund to create trail-side habitat consisting of coastal sage scrub and cactus scrub to close unauthorized trails. The closeout of this grant occurred in 2018.

Figure 5. Site map for active 2018 restoration projects in the Palos Verdes Nature Preserve.



4.0 MONITORING

4.1 HABITAT RESTORATION MONITORING

PVPLC's stewardship staff conducted surveys at the restoration sites throughout the Preserve including quantitative vegetation transects, qualitative vegetation assessments and photo point monitoring. Vegetation transect surveys were conducted using standardized methods (line intercept and CNPS Rapid Vegetation Assessment) that provide data on the cover of native and non-native plants in the habitat in order to evaluate success against criteria as determined in the habitat restoration plans. Quantitative point-intercept transect surveys are conducted in Year 3 and Year 5 after planting, whereas qualitative rapid vegetation assessments are conducted in Years 1, 2 and 4. In 2018, restoration monitoring was conducted at Alta Vicente and Portuguese Bend Reserves. Detailed monitoring reports are in Appendix A.

At Alta Vicente, the plants in all phases of the restoration area are healthy and growing. The cactus scrub has met success criteria. The coastal sage scrub has nearly achieved success criteria of 50% native plant cover (43% qualitatively observed). PVPLC has adapted by increasing plant density and utilizing drip irrigation instead of overhead sprinklers in subsequent restoration projects. The Palos Verdes blue butterfly habitat has not met the success criteria, due to low numbers of host plants along the transect (3% quantitatively). In 2019 staff will focus on controlling weeds on a regular basis to decrease competition and increase bare ground for seed germination. PVPLC will continue to observe and control weeds in Phase 1 and Phase 2 to observe the rate of restoration, but will stop monitoring these areas since they are beyond Year 8 of restoration and are meeting qualitative measurements. Phase 3 was monitored for its Year 1 analysis in 2018. Using qualitative methods (CNPS Rapid Vegetation Assessment Method) coastal sage scrub and wildflower habitats were found to already be approaching Year 3 goals with native cover above 50% in coastal sage scrub and 28% in wildflower restored areas.

At Portuguese Bend, Phase 1 and 2 were installed the same year (2012), to allow for an additional year of weed control at the site prior to planting. Therefore, they both represent Year 6 after plant installation for the 2018 monitoring. Plants were healthy, and recruitment from seed was observed at the site, however several transects within coastal sage scrub habitat (north and south facing) of Phase 1 and 2 continued to struggle to meet success criteria. This is due to now-discontinued restoration methods of overhead irrigation and sparse planting arrays. Transects PB1, PB2 and PB3 will be monitored using qualitative methods in 2019 to determine site success. The Conservancy will plant and remove non-native species in less dense areas to aid in native plant percent cover in these areas in 2018. Transect PB6 has met success criteria for Cactus Scrub restoration and will be removed from monitoring after 2018. At Portuguese Bend in Phase 3 (Year 5) native plant cover has achieved quantitative success criteria achieving Year 5 standards in 2018. PB4 and PB5 will be removed from future monitoring activities. Phase 4 (Year 4) has surpassed the qualitative success criteria and is on track for year 5 quantitative monitoring in

2019. Phase 5 (Year 3) was evaluated against success criteria in 2018 and surveyed using both quantitative (point intercept) and qualitative (CNPS Rapid Vegetation Assessment) methods. Quantitative and qualitative measurements describe the PB8 transect as meeting criteria for both native and non-native plant cover in Year 3 monitoring. The cactus scrub habitat transect, PB9, of Phase 5 restoration was evaluated against success criteria in 2018 and surveyed using both quantitative (point intercept) and qualitative (CNPS Rapid Vegetation Assessment) methods. Cactus species presence at the site was low, with only 1% cover by *Opuntia littoralis* being observed in qualitative monitoring with no other cactus species present. This transect did meet criteria measures for native plant cover, yet fell short of achieving the Year 3 cactus cover goal of 5%. The Land Conservancy will conduct infill planting in cactus scrub areas in 2019 in order to meet year 5 success criteria in 2020.

4.2 COVERED SPECIES MONITORING

The NCCP/HCP requires surveys for covered species on the Preserve every three years. The Comprehensive Management and Monitoring Report for 2016-2018 contains the latest report on the status of covered plant species, El Segundo blue butterfly, California gnatcatcher and cactus wren.

The draft NCCP/HCP includes a total of six covered plant species. They are aphanisma (*Aphanisma blitoides*), south coast saltscale (*Atriplex pacifica*), Catalina crossosoma (*Crossosoma californicum*), island green dudleya (*Dudleya virens* ssp. *insularis*), Santa Catalina Island desert thorn (*Lycium brevipes* var. *hassei*) and woolly seablite (*Suaeda taxifolia*). Surveys for covered plant species will be triggered by precipitation that totals at least 9.75 inches (75% of the annual average), or the last year of the comprehensive reporting period. The survey for covered plants and El Segundo blue butterfly was conducted in 2016 for the 2016-2018 comprehensive report period, and will be monitored again sometime in the 2019-2021 reporting period. California gnatcatcher and cactus wren surveys took place in 2018, which can be found in Appendix E of the Comprehensive Report.

4.3 MONITORING CITY PROJECTS

PVPLC provided monitoring and consultation for one project in 2018. A table of habitat impacts is shown in Appendix J.

In the month of October, new vegetation clearing for access to landslide monitoring locations. Approximately 0.22 acres total was cleared in the preserve. A report is included in Appendix J.

In most years, seasonal rains cause significant erosion damage to many trails, largely concentrated in Portuguese Bend Reserve (Vanderlip Trail, Burma Road Trail, Peppertree Trail, and Sandbox Trail), resulting in temporary trails closures until repaired. Prior to work, the Conservancy aided Public Works staff in monitoring for nesting bird activity and implementing minimization measures. As a result, no impacts to habitat, covered species or nesting birds were observed.

4.4 MISCELLANEOUS PROJECT COORDINATION

Illegal grading occurred in Abalone Cove near the residential property (5500 Palos Verdes Drive South) in 2017 and mitigation was set to be implemented in 2018. That project has been delayed due to rain and subsequent soil stabilization work, and is scheduled to be implemented in the Fall of 2020. PVPLC continues to work closely with city staff and the homeowners.

5.0 UTILITY AND CONTRACTOR ACCESS

Although some protocols are currently in place to ensure that utilities and contractors accessing the Preserve follow guidelines to remain on permitted trails and avoid damaging the habitat, PVPLC is collaborating with the City to create more effective protocols and outreach techniques. For example, a Project Form helps communicate all aspects of desired contractor, City, and Conservancy projects desired to take place in the preserve. Additionally, a Preserve Access Protocol will be developed after adoption of the NCCP/HCP to address where authorized vehicles may travel in the Preserve. The City also hosts an annual Utility Meeting to receive updates on upcoming projects throughout the City and provide reminders for protocols to follow while conducting work in the Preserve.

6.0 TARGETED EXOTIC REMOVAL PROGRAM FOR PLANTS

The Targeted Exotic Removal Program for Plants (TERPP) is an element of the Preserve Habitat Management Plan for the NCCP/HCP that requires the annual removal of exotic plant species of twenty individual populations or five acres in the Preserve. The TERPP provides a protocol for ranking the degree of threat to native vegetation, the feasibility of eradication, and the invasiveness of each exotic species found in the Preserve. Populations of exotic plant species are then targeted for removal based on the results of the ranking outcome.

In 2018, PVPLC met the objectives for the TERPP program by treating 21 populations of invasive plants. PVPLC treated 18 populations of the highly invasive *Euphorbia terracina.* Euphorbia seeds can persist in the soil for 3 to 5 years, and treatment needs to be repeated for several years to successfully control this species on the Preserve. Euphorbia is a very serious invasive, and PVPLC believes its expansion in the Preserve must be controlled. Therefore, many of the TERPP sites are the same as in the previous years.

Three populations of *Acacia cyclops* were removed at Filiorum, Alta Vicente and Three Sisters. While targeting Acacia populations that were beginning to spread for TERPP, this removal was also used to enhance Cactus Wren habitat locations where Acacia had begun to take over native cactus patches.

7.0 FUEL MODIFICATION

Fuel modification is the clearing or thinning of vegetation in areas that occur immediately adjacent to residential structures and roads. The City of RPV is responsible for brush clearance within the Preserve (with the exception of Lunada Canyon owned by PVPLC), to provide an appropriate level of fire protection, emphasizing the protection of public safety in the urban-wildlife interface areas while minimizing environmental impacts of fire suppression and control. PVPLC has collaborated with RPV for the protection of habitat and tracking of habitat loss associated with fuel modification. In 2018, RPV staff successfully collaborated with PVPLC to ensure that bird surveys were completed prior to fuel modification activities and sensitive habitat areas were avoided.

A portion of the Agua Amarga Reserve (Lunada Canyon) is owned by PVPLC and it is PVPLC's responsibility to maintain brush clearance requirements. All of these requirements were met in May and June 2018. No other fuel modification areas within the Preserve fall under the responsibility of PVPLC.

8.0 CITIZEN SCIENCE AND EDUCATION

The Preserve is an ideal setting for an outdoor laboratory, because it provides scientists and students with access to a variety of habitat types and wildlife. Student research topics are often chosen to answer questions informing improved restoration practices and to better understand the local ecology. Citizen Science volunteer programs assist the Land Conservancy with annual monitoring of the presence and abundance of cactus wren and mesopreditors (coyote, grey fox and red fox) as part of the NCCP/HCP Predator Control program. A report of 2018 research projects and citizen science monitoring programs is located in Appendix E.

9.0 TRAIL MANAGEMENT AND MONITORING

9.1 PRESERVE TRAILS PLAN

The Preserve Trails Plan is a part of the City's Public Use Master Plan (PUMP), which is a NCCP/HCP-covered activity, and must follow certain avoidance measures and guidelines to protect covered species. The RPV City Council approved the latest version updates of PUMP in April 2013 after the designation of trails in Filiorum Reserve.

9.2 TRAIL MANAGEMENT

PVPLC continues to update trail maps, print and place map brochures at major trailheads, and post them on PVPLC's website. PVPLC regularly refreshes carsonite signs and decals in the Preserve to better delineate trails. A full-time PVPLC field operations technician focuses on unauthorized trail closure, trail delineation and graffiti removal. Due to the abundance of rain, staff and volunteers spent lots of time repairing trail erosion issues in Portuguese Bend Reserve, and cleared most trails that experienced overgrown vegetation. The following represent the accomplishments in 2018 for trail management:

Area Closed Signs Installed	4 signs
Decals Replaced	17 decals
Graffiti Removed	25 removed
New/Repaired Carsonite markers	12 markers
Trail Maintenance Projects	170 projects
New Spur Trail Closures	108 closures
Brush Trimming/Weed clearance	18 projects
Trail Crew Events (Maintenance Projects)	9 events
Rapid Response Volunteer Days	59 events

With support of grants from Habitat Conservation Fund, PVPLC worked with the City of Rancho Palos Verdes to design a master plan for Preserve signage to include designs for primary trailhead markers, interpretive panels and regulatory signage. The signage plan was approved by City Council in July 2016. In 2017, the Los Angeles County Regional Parks and Open Space District provided funds to implement the new Preserve signs at Alta Vicente Reserve and HCF funded signs at Portuguese Bend Reserve and Agua Amarga Reserve. In 2018, signage was installed at Vicente Bluffs, Vista del Norte and San Ramon Reserves. The remaining Reserve signs will be installed in 2019 and 2020 with city funding.

9.3 UNAUTHORIZED TRAIL CLOSURES

Implementing the Preserve Trails Plan involves closing many trails that were previously in use and are no longer authorized. PVPLC's priorities are to close newly created unauthorized trails before they become established and damage habitat. PVPLC has also developed techniques to reduce trail widening, particularly at trail intersections. Maintaining closures of unauthorized trails is intensive work, which requires continuously reinforcing and replacing trail closures when signage, branches, and plants are removed. Rapid Response Team volunteers assist in maintaining closures by reclosing sections on a regular basis. Additionally, the Volunteer Trail Watch watered cactus pads during the summer to help maintain trail closures. Unauthorized trail closures were assisted by funds from the Habitat Conservation Fund, the Los Angeles County Grants, the National Fish and Wildlife Foundation, Coastal Conservancy and Santa Monica Bay Restoration Commission.

In 2018, focal areas were Filiorum (Gary's Gulch Trail, Kelvin Canyon Trail); Portuguese Bend (Ishibashi Trail, Barn Owl Trail and Ishibashi Farm Trail, Panorama trail); Forrestal (Prickly Pear trail, Flying Mane Trail, Quarry Trail, Vista Trail, Dauntless Trail, Trail and Exultant Trail); and Abalone Cove Reserves (Sea Dahlia Trail, Smuggler's Trail, Inspiration point trail and Olmsted Trail) (Appendix G).

9.4 TRAIL REPAIR

The PVPLC volunteer Trail Crew assists in much of the trail work on the Preserve. A complete summary of the PVPLC Volunteer Trail Crew Program can be found in the Volunteer Involvement section of the report (Appendix F). PVPLC staff or RPV staff including Open Space Management, Recreation and Parks, and Public Works personnel were also involved in trail enhancements. The following lists the trail projects that the PVPLC Volunteer Trail Crew conducted in 2018:

Portuguese Bend

- Ishibashi Farm Trail- Reestablished and repaired tread. Pruned brush growing onto trail. **(January)**
- Sandbox Trail- Installed grade dips and repaired tread **(February)**
- Sand Box Trail- Installed check dams to stabilize trail **(March)**
- Vanderlip Trail- Installed multiple grade dips to control surface water. Filled in eroded areas along trail**. (April)**

Abalone Cove

- Olmsted Trail- Built rock wall to improve tread and keep users from shortcutting. **(August)**
- Cliffside Trail- Built retaining wall to prevent further erosion. **(July)**
- Cliffside Trail-Extended retaining wall up the trail. **(December)**

Vista Del Norte

- Vista Del Norte Trail-Reestablished and repaired tread. **(November)**

Forrestal

- Pirate Trail-Grade dips were cleaned out. Check dams were reset. Tread was improved in some sections **(June)**
- Vista Loop Trail- Filled in ruts and installed a grade dip. **(September)**

Future Trail Projects

Trail projects that may be completed in the future, based on funding, are listed in Appendix H.

9.5 TRAIL MONITORING

PVPLC stewardship staff and volunteers from the Volunteer Trail Watch (VTW) Program conducted trail patrols to educate trail users and to report maintenance and safety issues to City and Conservancy staff during the reporting period. The mission of the Palos Verdes Nature Preserve Volunteer Trail Watch Program is to serve as eyes and ears of the City and the Palos Verdes Peninsula Land Conservancy with a view to 1) protect the natural resources of the Palos Verdes Nature Preserve, including the flora and fauna as well as the geology, topography and scenic landscape, and 2) enhance the safety of, and promote an enjoyable experience for all Preserve visitors. Volunteers educate the public about Preserve rules and etiquette; and enter observations of infractions into a web portal (i.e. dogs off leash, off-trail activity, user on non-designated trail, etc.) to allow enforcement personnel and Preserve managers to track time and location of these activities. 19 new volunteers completed the fifth training workshop for the Volunteer Trail Watch, which took place in January. The VTW also meets every quarter to provide additional training and information to share with Preserve visitors. Additional details of the VTW program are described in detail in the Volunteer Annual Report section of the report (Appendix F).

The City of RPV grants permission for night hikes in the Preserve. A listing of night hikes is found in Appendix K.

In 2018, PVPLC was awarded a California Department of Fish and Wildlife LAG Grant. The grants intended goal was to monitor and manage trail widening threats to habitat. The initial tasks of the grant are expected to begin in 2019.

10.0 VOLUNTEER INVOLVEMENT

PVPLC is a non-profit organization that relies heavily on the support of community involvement to perform many of the tasks necessary to manage the Preserve. In 2018, volunteers contributed over 19,384 hours of service (an increase of 407 hours from 2017) totaling $563,900 of in-kind service in support of conservation, restoration, education and management of the Palos Verdes Nature Preserve. The 2018 Volunteer Annual Report detailing the volunteer programs is located in Appendix F.

11.0 ABILITY TO ACCOMPLISH RESOURCE MANAGEMENT GOALS

PVPLC, City staff and Wildlife Agency representatives successfully achieved the approval of the Draft NCCP/HCP in 2019. The subsequent permits will be issued from the State and Federal wildlife agencies in order to give take authorization to the City to conduct projects in the NCCP/HCP area and Preserve.

PVPLC has been successful at completing restoration under the NCCP/HCP, monitoring NCCP/HCP covered species, and meeting the goals for targeted invasive plant removal.

Concerns about habitat management in the future include the ability to successfully close unauthorized trails and to prevent new trails from being created. Closing unauthorized trails is time consuming and expensive because of continuous vandalism, drought, and increasing use of the Preserve. PVPLC is taking information collected by staff and the VTW to coordinate with City of RPV staff and the Lomita Sheriffs assigned to patrol the Preserve to help determine which areas need more enforcement and maintenance attention.

It is the Conservancy's recommendation, in concurrence with the City of Rancho Palos Verdes and the Wildlife Agencies, that a new 5-acre NCCP/HCP restoration project is not initiated until the fall of 2019. In response to the report of dwindling cactus wren territories, in 2018 the Conservancy focused on restoring habitat for the cactus wren by removing Acacia and planting mature prickly pear cactus in addition to management of current NCCP/HCP projects and additional restoration projects. The Conservancy's recommendation for 2019 is to evaluate areas where more Acacia can be removed to enhance native habitats in order to support the natural recovery of cactus wren and California gnatcatcher habitats.

12.0 FUNDING NEEDS

PVPLC would benefit from continued funding to control highly invasive species on the Preserve and continually battle back against unauthorized and widening trails that damage habitat. PVPLC continues to apply for funding from federal, state and private sources to increase the amount of acreage restored for the species listed under the plan.

13.0 PALOS VERDES PENINSULA LAND CONSERVANCY BOARD AND STAFF

2018 Board Officers

Allen Franz, President
Amy Friend, Exec. Vice President
Diana Bailey, Secretary

2018 Board of Directors

Bill Ailor, President Emeritus
Scott Ammons
Bob Ford

Rick Wallace, Treasurer

Bill Glantz
Randy Harwood
Rob Kautz
Carolynn Petru
David Snow
Cassie Jones

2018 Staff (as of December 2018)

Executive Director

Andrea Vona

Adrienne Mohan (Interim ED as of December 2018)

Office Administration

Jill Wittman, Administrative Assistant

Land Stewardship

Adrienne Mohan, Conservation Director
Cristian Sarabia, Stewardship Manager

Josh Weinik, Stewardship Associate
Megan Roy, Stewardship Associate
Brittany Goldsmith, Volunteer Program Manager
Johnny Perez, Field Operations Technician
Hugo Morales, Stewardship Technician
Humberto Calderon, Stewardship Technician
Neli Gonzalez, Nursery Technician

Education Program

Connie Smith, Education Director
Holly Gray, Education Program Manager
Ariel Dela Cruz, Naturalist
Cristal Guzman, Naturalist

Development

Susan Wilcox, Development Director
Louise Olfarnes, Communications Manager
Laura Lohnes, Development Associate

APPENDIX A

2018 RESTORATION MONITORING REPORT

In 2018 vegetation surveys were conducted at restoration sites within currently-managed NCCP/HCP restoration projects located at Alta Vicente and Portuguese Bend Reserves to quantify establishment of native plant habitat through measurements of estimated percent cover of native and non-native plants, litter, and bare ground. These data are used to evaluate the success of restoration based on the goals determined in each site-specific restoration plan.

1.0 ALTA VICENTE SURVEY METHODS

Restored habitat areas were surveyed through quantitative and photographic vegetative assessment techniques along 50m permanent transect lines (location of transects: Appendix A1 and A2, Figure 1 and Figure 2) within three habitat types (coastal sage scrub, cactus scrub, and Palos Verdes blue butterfly habitat). Transects were surveyed on April 11th and 12th by PVPLC biologist Josh Weinik. Success criteria was assessed using qualitative methodology (CNPS Rapid Vegetation Assessment Method) in monitoring Years 1 and Year 2 and with quantitative methodology (point-intercept method) in Years 3 and 5. Photopoints were collected in all monitoring years. Areas that had not achieved success by Year 5 according to criteria, were assessed using qualitative methods to determine overall plant health for the restored area. Qualitative measurements of percent cover for native, non-native, species-specific, and bare/litter categories were collected through use of an adapted form of the CNPS Rapid Vegetation Assessment Method. Quantitative measurements of percent cover and plant size (height and width) were collected using the point-intercept method on a 50m transect to evaluate restoration success based on set criteria for Year 3 and Year 5 after planting. Photopoints were taken at both ends of permanent monitoring transects to aid in the assessment of plant health and establishment. Transects not meeting success criteria by Year 5 (end of required monitoring period) were monitored using qualitative measures to assess plant percent cover and overall recovery of the habitat within a 10-m buffer of the transect.

1.1 ALTA VICENTE PHASE 2 SURVEY RESULTS (YEAR 8)

Cactus Scrub

One monitoring transect (AV3) was surveyed within the cactus scrub of Phase 2 restoration. Qualitative survey methods (CNPS Rapid Vegetation Assessment Method) found percent cover of native plant species to be 48% with 11% cactus cover (Table 1). Qualitative methods describe AV3 as achieving success criteria goals for native plant and cactus cover. This transect will be removed from future monitoring activities.

PVB Butterfly Habitat

Two monitoring transects (AV2 and AV5) were surveyed within the PVB butterfly habitat of Phase 2 restored areas. AV2 was surveyed within the PVB habitat of Phase 2 restoration following a relocation from Phase 1. Qualitative survey methods (CNPS Rapid Vegetation Assessment Method) found percent cover of native plant species to be 45% with 3% cover by PVB host plants

(Table 1). Native plant cover is within the success criteria range for Year 5 goals (Table 8) and although host plant cover falls below Year 5 goals, the observed increase of 3% is an improvement from 2017 when host plants were not detected.

At AV5, qualitative survey methods (CNPS Rapid Vegetation Assessment Method) found percent cover by native plant species to be 37% with 4% cover by PVB host plants (Table 1). Qualitative assessments indicate that habitat along AV5 is within success criteria goals for native cover (30-60% in Year 5) and although host plant cover falls below Year 5 goals, the observed increase of 4% is an improvement from 2017 when host plants were not detected.

Coastal Sage Scrub

One monitoring transect (AV6) was surveyed within the coastal sage scrub of Phase 2 restoration. Qualitative survey methods (CNPS Rapid Vegetation Assessment Method) found percent cover of native plant species to be 43% with the highest cover by *Encelia californica* (17%) and *Artemisia californica* (10%) (Table 1). Qualitative methods describe AV6 as not achieving success criteria goals for native plant cover.

1.2 ALTA VICENTE SURVEY RESULTS PHASE 3 (YEAR 1)

Phase 3 restoration in Alta Vicente will not be officially monitored until 2020 (Year 3), however preliminary assessments describe habitat as establishing well and in good health. Using qualitative methods (CNPS Rapid Vegetation Assessment Method) coastal sage scrub and wildflower habitats were found to already be approaching Year 3 goals with native cover above 50% in coastal sage scrub and 28% in wildflower restored areas. (Table 2)

1.3 ALTA VICENTE CONCLUSIONS AND RECOMMENDATIONS

In 2018, one transect (AV3) met success criteria standards, while two transects (AV2, and AV5) did not. Transect AV3 within cactus scrub habitat was successful in meeting performance standards. Perennial species such as *Artemisia californica*, *Encelia californica*, and *Eriogonum fasciculatum* appear to be well established and in good health. Three species of cactus were observed at the site, with highest presence by *Opuntia littoralis*. Increased cactus presence at the site is likely a result of infill planting directed by the 2017 monitoring report and increased detection due to lower non-native plant and *Encelia californica* cover at the transect. The cactus scrub habitat areas in Phase 1 and 2 restoration at Alta Vicente has received additional cactus planting following 2018 in connection with coastal cactus wren recovery efforts at the site. It is recommended that weed control and supplemental watering (during drought conditions) continue at the restoration site to aid 2017 and 2018 planting survival and maintenance of adequate cactus cover at the site.

Palos Verdes blue butterfly restoration areas continued to struggle to meet success criteria standards in 2018. Invasion by non-native plants and the maturity of native perennial shrubs may continue to inhibit host plant establishment. Considerable effort was given to the removal of the invasive plant, crystalline ice plant, in 2016, which was promptly followed by non-native annual grasses colonizing the site. This persistent weed encroachment has required frequent visits from field technicians to reduce weed cover. Following the observed absence of host plant along PVB transects (AV2, AV5) in 2017 monitoring, infill planting later that year (October) reintroduced PVB host plants to the site. These infill plants comprised the majority of host plants detected in 2018 monitoring and produced 3% and 4% cover by host plant species at transects AV2 and AV5. Recent restoration work in October 2018 has added additional host plant and drip line irrigation to further promote host plant establishment. It is recommended that weed removal continue and be more frequently implemented at PVB host plant restoration sites than other perennial dominated habitat types.

2.0 PORTUGUESE BEND SURVEY METHODS (PHASE 1, 2, 3, 4 AND 5)

Restored habitat areas were surveyed through qualitative, quantitative, and photographic vegetative assessment techniques. Qualitative measurements of percent cover for native, non-native, species-specific, and bare/litter were collected through use of an adapted form of the CNPS Rapid Vegetation Assessment Method across nine transects (PB1 - PB9). Quantitative measurements of percent cover and plant size (height and width) were collected through use of the point-intercept method across four transects in their third or fifth year of establishment (PB4, PB5, PB8, and PB9). Photopoint documentation of all restored areas continued, and typically included a photograph being taken at the beginning and end of each monitoring transect. Monitoring surveys were conducted on April 25th and 30th and May 2nd, 8th, and 25th. Locations of monitoring transects and photo points can be found in Appendix A2, Figure 2.

2.1 PORTUGUESE BEND SURVEY RESULTS (PHASE 1 AND 2) YEAR 6

South-facing Coastal Sage Scrub (CSS)

Two monitoring transects (PB1 and PB2) within the south-facing CSS of Phase 1 and 2 restoration did not meet Year 5 success criteria evaluation in 2017 and were subsequently monitored in 2018 using qualitative (CNPS Rapid Vegetation Assessment) methods.

At PB1, the presence of 11 native plant species, a total native plant cover of 32%, and a non-native plant cover of 10% were observed (Table 7). Native plant species with the highest percent cover at this transect included *Artemisia californica* (8%), *Heteromeles arbutifolia* (6%), and *Eriogonum fasciculatum* (6%) (Table 7). PB1 did not meet final success criteria for native plant cover in 2018. At the second monitoring transect, PB2, the presence of 14 native plant species, a total native cover of 34%, and non-native cover of 12% were observed (Table 7). Native species with the highest percent cover at this transect included *Artemisia californica* (9%), *Eriogonum fasciculatum* (7%), and *Encelia californica* (3%) (Table 7). PB2 did not meet final success criteria in 2018. Transects PB1 and PB2 will be monitored using qualitative methods in 2019 to determine site success.

North-facing Coastal Sage Scrub (CSS)

One monitoring transect (PB3) situated within the north-facing CSS of Phase 1 and 2 restoration failed to meet success criteria evaluation in 2017 and was subsequently monitored in 2018 using qualitative methods (CNPS Rapid Vegetation Assessment).

At PB3, the presence of 13 native plant species, a total native plant cover of 45%, and a non-native plant cover of 22% were observed (Table 7). Native plant species with the highest percent cover at this transect included *Baccharis pilularis* (15%), *Heteromeles arbutifolia* (7%), and *Rhus integrifolia* (6%) (Table 7). PB3 did not meet final success criteria for native plant cover in 2018. Transect PB3 will be monitored using qualitative methods in 2019 to determine site success.

Cactus Scrub

One monitoring transect (PB6) situated within cactus scrub of Phase 1 and 2 restoration failed to meet success criteria evaluation in 2017 and was subsequently monitored in 2018 using qualitative methods (CNPS Rapid Vegetation Assessment).

At PB6, the presence of 12 native plant species, a total native plant cover of 55%, and non-native plant cover of 16% at PB6 (Table 7). Native species with the highest percent cover were *Opuntia littoralis* (15%), *Encelia californica* (8%), and *Cylindropuntia prolifera* (8%). Restoration at PB6 has met final success criteria for native plant cover (>40%), cactus cover (≥ 10%), and non-native plant cover (<25%) in 2018. The transect PB6 will be removed from future monitoring activities.

2.2 PORTUGUESE BEND SURVEY RESULTS (PHASE 3) YEAR 5

South-facing Coastal Sage Scrub (CSS)

Two monitoring transects (PB4 and PB5) within south-facing CSS of Phase 3 restoration were evaluated against success criteria in 2018 and surveyed using both quantitative (point intercept) and qualitative (CNPS Rapid Vegetation Assessment) methods.

At PB4, quantitative methods were used to identify the presence of nine native plant species, a total native plant cover of 54% and non-native plant cover of 24% (Table 4). Native plant species with the highest percent cover at this transect included *Encelia californica* (10%), *Eriogonum fasciculatum* (10%), and *Baccharis pilularis* (8%) (Table 4). Qualitative methods (CNPS Rapid Vegetation Assessment) were used to identify the presence of 12 native plants, a total native plant cover of 38%, and non-native cover of 9% (Table 7). Native species with the highest percent cover were *Encelia californica* (7%), *Eriogonum fasciculatum* (6%), and *Salvia leucophylla* (6%) (Table 7). Quantitative measurements describe this transect as meeting criteria for both native and non-native plant cover in Year 5 monitoring. The transect PB4 will be removed from future monitoring activities.

At PB5, quantitative methods were used to identify the presence of seven native plant species, a total native plant cover of 68% and non-native plant cover of 12% (Table 3). Native plant species with the highest percent cover at this transect included *Artemisia californica* (18%), *Eriogonum fasciculatum* (18%), and *Salvia mellifera* (12%) (Table 3). Qualitative methods (CNPS Rapid Vegetation Assessment) were used to identify the presence of 12 native plants, a total native plant cover of 44%, and non-native cover of 8% (Table 7). Native species with the highest percent cover were *Artemisia californica* (12%), *Eriogonum fasciculatum* (8%), and *Salvia mellifera* (7%) (Table 7). Quantitative measurements describe this transect as meeting criteria for both native and non-native plant cover in Year 5 monitoring. The transect PB5 will be removed from future monitoring activities.

2.3 PORTUGUESE BEND SURVEY RESULTS (PHASE 4) YEAR 4

North-facing Coastal Sage Scrub (CSS)

One monitoring transect (PB7) was surveyed within north-facing CSS of Phase 4 restored areas. Although monitoring for this transect was not required in 2018 since it is in Year 4 of growth, staff chose to monitor them nonetheless to track their trajectory to meeting Year 5 criteria in 2019.

Qualitative methods (CNPS Rapid Vegetation Assessment) were used to identify the presence of 15 native plant species, a total native plant cover of 51%, and a non-native plant cover of 15% (Table 8). The native species with the highest percent cover at PB7 was *Artemisia californica* (18%) and *Eriogonum fasciculatum* (10%) (Table 7). This transect is on track to achieve Year 5 success criteria goals in 2019.

2.4 PORTUGUESE BEND SURVEY RESULTS (PHASE 5) YEAR 3

South-facing Coastal Sage Scrub (CSS)

One monitoring transect (PB8) within south-facing CSS of Phase 5 restoration was evaluated against success criteria in 2018 and surveyed using both quantitative (point intercept) and qualitative (CNPS Rapid Vegetation Assessment) methods.

At PB8, quantitative methods were used to identify the presence of nine native plant species, a total native plant cover of 68% and non-native plant cover of 6% (Table 3). Native plant species with the highest percent cover at this transect included *Eriogonum fasciculatum* (24%) and *Artemisia californica* (18%) (Table 8). Qualitative methods (CNPS Rapid Vegetation Assessment) were used to identify the presence of 17 native plants, a total native plant cover of 52%, and non-native cover of 3% (Table 7). Native species with the highest percent cover were *Artemisia californica* (17%) and *Eriogonum fasciculatum* (7%) (Table 7). Quantitative and qualitative measurements describe this transect as meeting criteria for both native and non-native plant cover in Year 3 monitoring.

Cactus Scrub

One monitoring transect (PB9) within cactus scrub of Phase 5 restoration was evaluated against success criteria in 2018 and surveyed using both quantitative (point intercept) and qualitative (CNPS Rapid Vegetation Assessment) methods.

At PB9, quantitative methods were used to identify the presence of eight native plant species, a total native plant cover of 40% and non-native plant cover of 14% (Table 4). Native plant species with the highest percent cover at this transect included *Encelia californica* (18%), *Artemisia californica* (6%), and *Eriogonum parvifolium* (6%) (Table 7). Qualitative methods (CNPS Rapid Vegetation Assessment) were used to identify the presence of 16 native plants, a total native plant cover of 44%, and non-native cover of 8% (Table 7). Native species with the highest percent cover were *Artemisia californica* (11%), *Encelia californica* (5%), and *Eriogonum fasciculatum* (5%) (Table 7). Cactus species presence at the site was low, with only 1% cover by *Opuntia littoralis* being observed in qualitative monitoring with no other cactus species present. This transect did meet criteria measures for native plant cover, yet fell short of achieving the Year 3 cactus cover goal of 5%.

2.5 PORTUGUESE BEND CONCLUSIONS AND RECOMMENDATIONS

All nine transects within restored habitat of Portuguese Bend were evaluated for success criteria in 2018. Of these, four (PB4, PB5, PB8, and PB9) were under quantitative evaluation (Year 3 or Year 5), another four transects (PB1, PB2, PB3, and PB6) were qualitatively evaluated after failing to meet Year 5 success criteria in previous years, and lastly, one transect (PB7) was evaluated for success criteria to gauge progression toward success criteria in 2019.

The majority of transects evaluated were successful, yet several transects within coastal sage scrub habitat (north and south facing) of Phase 1 and 2 continued to struggle to meet success criteria along with one transect in cactus habitat of Phase 5. Phase 1 and 2 are the earliest phases of the now 25 acres of restoration in Portuguese Bend. Monitoring transects in these areas have not met success criteria measures despite good overall health of the vegetation. As mentioned in the 2017 report, several factors may be preventing transects within these phases from being successful; the original planting design and the invasion by the non-native black mustard (*Brassica nigra*) in 2017. Wide on-center spacing at transect sites in plantings prior to 2012, which has since been modified to closer planting densities that have resulted in more successful restoration efforts. This original design may be responsible for a lack of high density cover needed to meet criteria. Also, despite the immediate effort to clear black mustard from the restoration area, native plants may be slow to recover following the strong mustard influx in 2017. A recovery that is likely further hampered by 2018's low rainfall. The cactus restoration in Phase 5 also failed to meet criteria. Despite being one of the most heavily impacted areas by black mustard, the transect did meet native plant criteria, only failing due to a lack of cactus. This failure is not linked to the success vegetation establishment, rather the misplacement cactus plantings outside of the restoration area. It is recommended that Phase 1 and 2 continue to receive infill planting of native species to increase native planting density and improve of former design flaws as well as to continue the removal of black mustard from the site. Infill planting is also recommended for the Phase 5 cactus restoration area, where increases in the presence of cactus is surely needed.

An encouraging sign of the success of most transects within Portuguese Bend is the high and improved native plant cover during intense drought conditions. Despite the lack of rain, natives did well in many areas with evergreen perennials such as *Eriogonum fasciculatum* and *Heteromeles arbutifolia* increasing cover at many sites. Although, supplemental watering occurred early in the year in minimal amounts, the resulting increases should be attributed to other potential factors such as low non-native plant encroachment in restored areas. Also later phases of restoration in Portuguese Bend (Phase 4 and 5) appear to be benefiting from "lessons learned" in earlier phases (Phase 1 and 2) with most transects passing or progressing toward achieving success criteria goals. This is likely attributed to higher density planting design and the use of drip-irrigation as opposed to overhead sprinkler designs. It is recommended that areas with near or qualifying success criteria evaluations continue to receive non-native plant control to maintain positive native plant growth and establishment.

Table 1. Alta Vicente

Percent cover along each 50m transect as observed along 10m swath on each side of the transect.

Species	AV2	AV3	AV5	AV6
Acmispon glaber	3		1	
Amsinckia menziesii	2			
Artemisia californica	14	11	7	10
Astragalus trichopodus			3	
Cylindropuntia prolifera	<1	3	1	
Elymus condensatus	1			
Encelia californica		15	13	17
Eriogonum cinereum	6	10	4	5
Eriogonum parvifolium	1		<1	
Euphorbia albomarginata			1	
Mirabilis californica	2			
Opuntia littoralis	3	6		4
Opuntia oricola		2		
Peritoma arborea	2		1	
Rhus integrifolia	3	1	3	5
Salvia leucophylla	4		2	1
Salvia mellifera	4			
Stipa pulchra				1
Solanum douglasii			<1	
Verbena spp			1	
Total Native Cover	**45**	**48**	**37**	**43**
NNAG	2	3	5	8
NNP	5	<1	8	1
Total Non-native Cover	**7**	**3**	**13**	**9**
Bare	13	39	39	24
Litter	36	10	10	24
Total Bare and Litter	49	49	49	48
Total Plant Cover	52	51	50	52

Sampling dates for Alta Vicente 2018 CNPS Rapid Vegetation Assessment:

AV1 and AV2: April 11, 2018
AV3, AV4, and AV6: April 12, 2018

Table 2. **Alta Vicente Survey Results Phase 3 (YEAR 1)**

Qualitative Results of Year one monitoring (CNPS Rapid Assessment)

Species	Wildflower	CSS1	CSS1
Acmispon glaber		1	1
Artemisia californica		15	13
Astragalus trichopodus		2	1
Baccharis salicifolia			
Brickellia californica		3	4
Convolvulus simulans	<1		
Corethrogyne filaginifolia	1	2	
Elymus condensatus		1	1
Encelia californica		10	11
Eriogonum cinereum		3	4
Eriogonum fasciculatum	2	7	5
Eriogonum parvifolium			
Eschscholzia californica maritima	10		
Euphorbia albomarginata			<1
Isocoma menziesii var. sedoides	1	1	2
Leptosyne maritima	1		
Lupinus succulentus	3		2
Mirabilis californica		1	1
Peritoma arborea			1
Rhus integrifolia	1		
Salvia leucophylla	1	2	3
Salvia mellifera		3	4
Sisyrinchium bellum	2	1	
Stipa pulchra	5		
UN ID 1	1		
Total Native Cover	28	52	53
NNAG	40	25	27
NNP	20	15	8
Total Non-native Cover	60	40	35
Bare	2	3	6
Litter	10	5	6
Total Bare and Litter	12	8	12
Total Plant Cover	88	92	88

Table 3. Portuguese Bend
Number of plants counted along 50m transects.

Species	PB4	PB5	PB8	PB9
Acmispon glaber		1		
Artemisia californica	2	8	9	3
Asclepias fascicularis			3	
Baccharis pilularis	2			
Encelia californica	5	4	1	9
Ericameria ericoides				
Eriogonum cinereum				1
Eriogonum fasciculatum	4	8	12	1
Eriogonum parvifolium	1		2	3
Eriophylum confertiflorum				
Euphorbia albomarginata			1	
Heteromeles arbutifolia				
Isocoma menzieseii var. sedoides	1	3	4	1
Mirabilis californica				1
Salvia leucophylla	2	1		1
Salvia mellifera	3	3	1	
Sambucus nigra ssp caerulea			1	
Stipa pulchra	1			
Total Native Plants	**21**	**28**	**34**	**20**
NNAG	0	6	1	1
NNP	12	0	2	6
Total Non-native Plants	**12**	**6**	**3**	**7**
Bare	7	1	2	4
Litter	4	9	11	19
Total Bare and Litter	**18**	**10**	**13**	**23**
Total Plants	**33**	**34**	**37**	**27**

Table 4. Portuguese Bend
Percent cover for each species observed along the 50-m transects.

Species	PB4	PB5	PB8	PB9
Acmispon glaber		2		
Artemisia californica	6	18	18	6
Asclepias fascicularis			6	
Baccharis pilularis	8			
Encelia californica	10	8	2	18
Ericameria ericoides				
Eriogonum cinereum				2
Eriogonum fasciculatum	10	18	24	2
Eriogonum parvifolium	2		4	6
Euphorbia albomarginata			2	
Isocoma menzieseii var. *sedoides*	2	8	8	2
Mirabilis californica				2
Salvia leucophylla	8	2		2
Salvia mellifera	6	12	2	
Sambucus nigra ssp caerulea			2	
Stipa pulchra	2			
Total Native Plants	**54**	**68**	**68**	**40**
NNAG	0	12	2	2
NNP	24	0	4	12
Total Non-native Plants	**24**	**12**	**6**	**14**
Bare	14	2	4	8
Litter	8	18	22	38
Total Bare and Litter	**22**	**20**	**26**	**46**
Total Plant Cover	**78**	**80**	**74**	**54**

Table 5. Portuguese Bend

Relative percent cover of each plant species to total plant cover.

Species	PB4	PB5	PB8	PB9
Acmispon glaber		3		
Artemisia californica	8	23	24	11
Asclepias fascicularis			8	
Baccharis pilularis	10		3	
Encelia californica	13	10	3	33
Eriogonum cinereum				4
Eriogonum fasciculatum	13	23	32	4
Eriogonum parvifolium			5	11
Euphorbia albomarginata			3	
Heteromeles arbutifolia				
Isocoma menziesii var. *sedoides*	3	10	11	4
Marabilis californica				4
Salvia leucophylla	10	3		4
Salvia mellifera	8	15	3	
Sambucus nigra ssp caerulea			3	
Stipa pulchra	3			
NNAG		15	3	
NNP	31		5	

Sampling dates for Portuguese Bend 2018 point-intercept:

PB4, PB5, and PB8: April 25, 2018

PB9: May 8, 2018

Table 6. Portuguese Bend
Average plant height (cm) by transect.

Species	PB4	PB5	PB8	PB9
Acmispon glaber		38.0		
Artemisia californica	62.7	82.2	83.9	58.3
Asclepias fascicularis			13.7	
Baccharis pilularis	78.3			
Encelia californica	39.3	55.3	8.0	36.8
Eriogonum cinereum				7.0
Eriogonum fasciculatum	48.4	30.3	51.6	38.0
Eriogonum parvifolium	50.0		32.0	17.0
Euphorbia albomarginata			3.0	
Heteromeles arbutifolia				
Isocoma menziesii var. *sedoides*	102.0	39.5	36.3	64.0
Marabilis californica				21.0
Salvia leucophylla	42.0	25.0		4.0
Salvia mellifera	66.3	47.3	45.0	
Sambucus nigra ssp caerulea			61.0	
Stipa pulchra	3.0			

Table 7. Portuguese Bend

Percent cover along each 50m transect as observed along 10m swath on each side of the transect.

Species	PB1	PB2	PB3	PB4	PB5	PB6	PB7	PB8	PB9
Acmispon glaber	<1	1		1	2		2		
Artemisia californica	8	9	3	5	12	6	18	17	11
Asclepias fascicularis							2	1	
Astragalus trichopodus							2	2	
Baccharis pilularis	2	2							
Baccharis salicifolia		<1	15	2		<1		1	1
Corethrogyne filaginifolia							2		1
Calystegia macrostegia									
Cylindropuntia prolifera						8			
Datura wrightii					<1				
Elymus condensatus			2				1		
Encelia californica	2	3	4	7	6	8	3	3	5
Ericameria ericoides							1		
Eriogonum cinereum	<1	2							3
Eriogonum fasciculatum	6	7	1	6	8	4	10	7	5
Eriogonum parvifolium				2	1			2	3
Eschscholzia californica							1		1
Euphorbia albomarginata				1	1	1		1	
Heteromeles arbutifolia	6	2	7		<1	2	2	4	
Isocoma menziesii var. sedoides	1	1	1	3	3		1	3	2
Lupinus succulentus									
Malacothrix saxatilis							1	1	2
Marah macrocarpa			<1						1
Melica imperfecta		1							
Mirabilis californica									3
Opuntia littoralis						15			1
Opuntia oricola						1			
Rhus integrifolia	2	1	6			4		1	
Salivia leucophylla	1	2	2	6	3	2	2	4	3
Salvia mellifera	4	2		2	7	4		2	
Salix goodingii									
Sambucus nigra ssp caerulea			2	1				1	1
Sisyrinchium bellum									
Solanum douglasii			<1					1	1
Stipa lepida									
Stipa pulchra		1	2	2	1		3	1	
Total Native Cover	**32**	**34**	**45**	**38**	**44**	**55**	**51**	**52**	**44**
NNAG	3	2	7	2	3	15	8	1	<1
NNP	7	10	15	7	5	1	7	2	8
Total Non-native Cover	**10**	**12**	**22**	**9**	**8**	**16**	**15**	**3**	**8**
Bare	18	14	10	22	19	9	9	10	15
Litter	40	40	23	31	29	20	25	35	33
Total Bare and Litter	**58**	**54**	**33**	**53**	**48**	**29**	**34**	**45**	**48**
Total Plant Cover	**42**	**46**	**67**	**47**	**52**	**71**	**66**	**55**	**52**

Sampling dates for Portuguese Bend 2017 CNPS Rapid Vegetation Assessment:

PB1, PB2, and PB7: May 2, 2018
PB3, PB4, PB5, PB6, and PB8: April 30, 2018
PB9: May 8, 2018

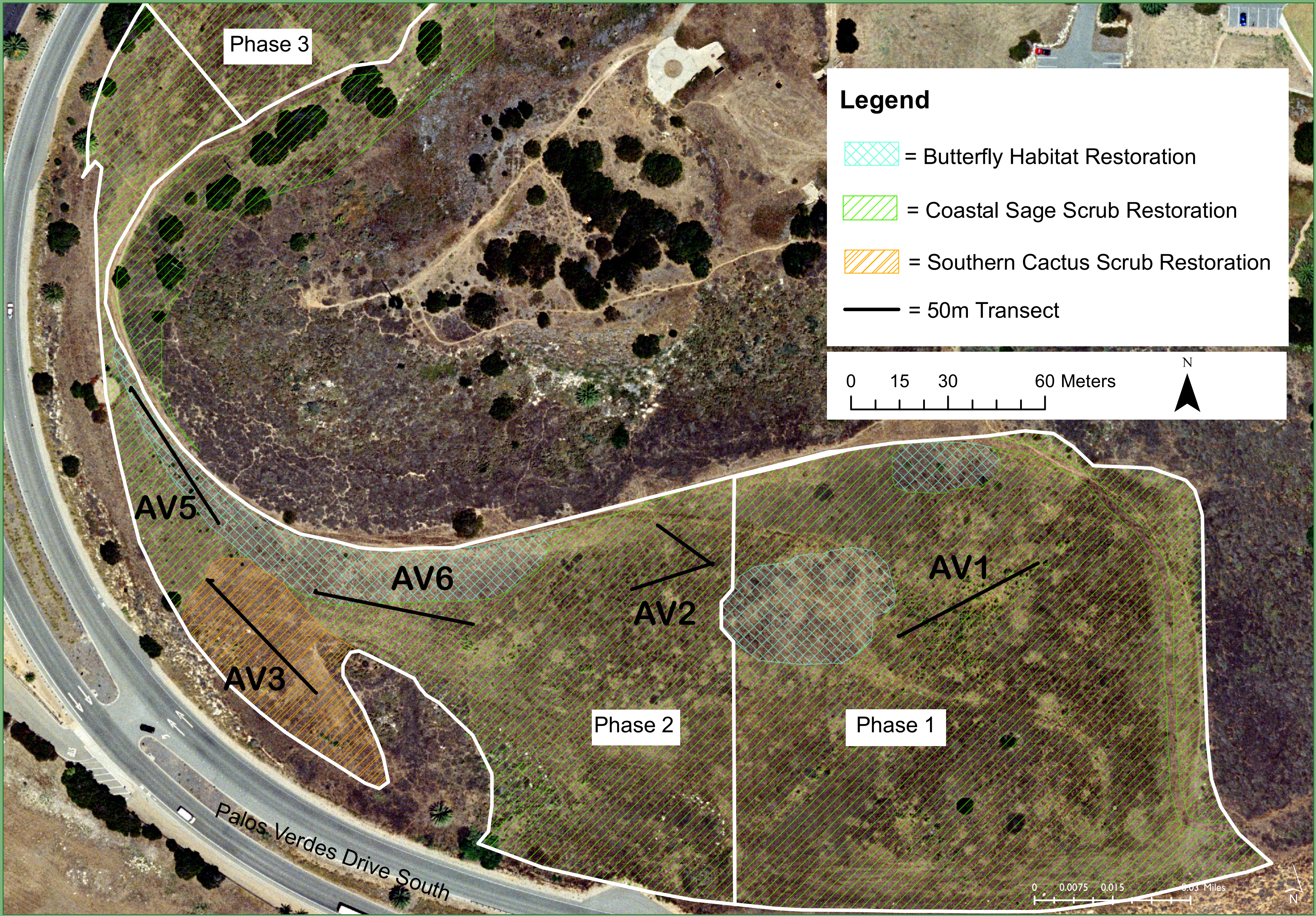
Table 8. Alta Vicente and Portuguese Bend success criteria measures.

		Percent Cover of Native Species (%)			Percent Cover of Non-native Species (%)	
Preserve	**Year**	**CSS**	**Cactus Scrub[1]**	**PVB Habitat[2]**	**CSS**	**Cactus Scrub**
Alta Vicente	Year 1*	10%	10%	10%		
	Year 2*	20%	20%	20%		
	Year 3	>40%	>30%	30%-60% max		
	Year 5	>50%	>40%	30%-60% max		
Portuguese Bend	Year 3	>40% (≥30% perennial)	>30% (≥20% perennial and 5% cactus)			
	Year 5	>50%	>40% (≥ 10% cactus)		<25% (<5% perennials w/ no CAL-IPC List A except NNAG)	<25% (<5% perennials w/ no CAL-IPC List A except NNAG)

* Percentage based on visual estimates.
[1] Percentage coverage of cactus species should be at least 1% for Year 1, 3% for year 2, 5% for Year 3, and 10% for Year 5.
[2] From Year 3 on, there should be at least 10% coverage from *Acmispon glaber* and/or *Astragalus tricopodus* and the woody shrubs should be maintained at 10-20%.
CAL-IPC = California Invasive Plant Council
NNAG = non-native annual grass

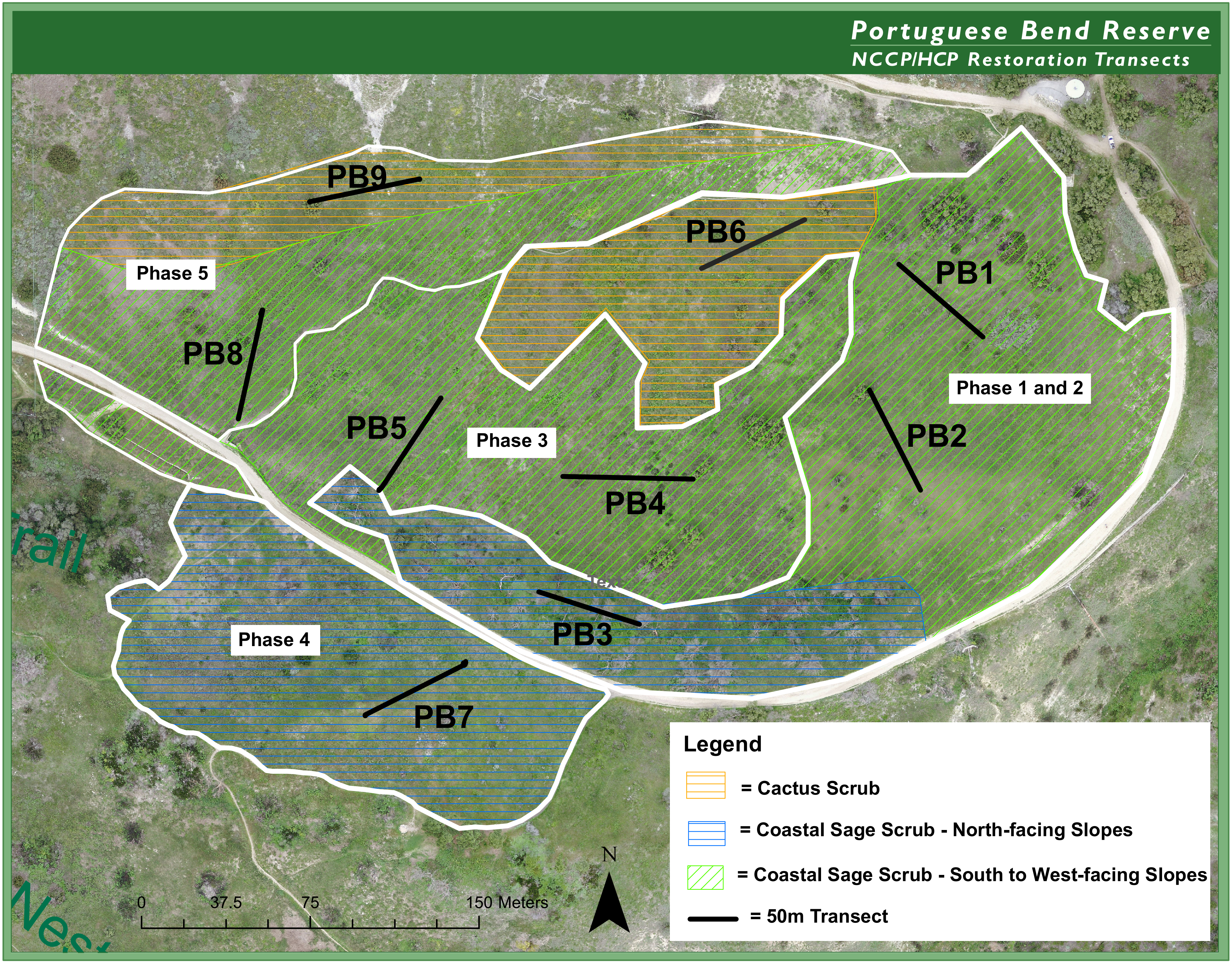
Appendix A1

Alta Vicente Monitoring Transects



Appendix A1 - Alta Vicente Transect Images

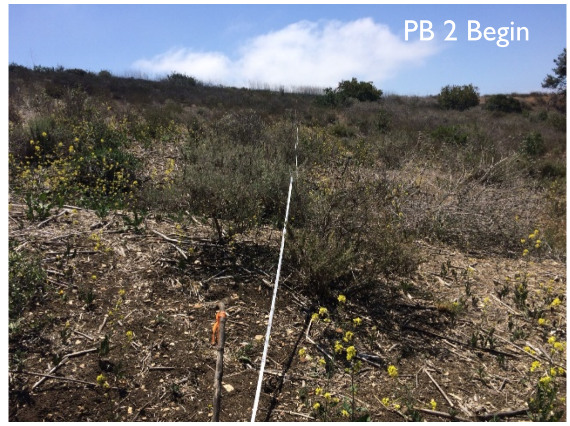

AV 5 End



Portuguese Bend Reserve
NCCP/HCP Restoration Transects
PB9
PB6
PB1
Phase 5
PB8
Phase 1 and 2
PB5
Phase 3
PB2
PB4
PB3
Phase 4
PB7
Legend
= Cactus Scrub
= Coastal Sage Scrub - North-facing Slopes
= Coastal Sage Scrub - South to West-facing Slopes
= 50m Transect
N
0
37.5
75
150 Meters

Appendix A2 – Portuguese Bend Transect Images


PB 1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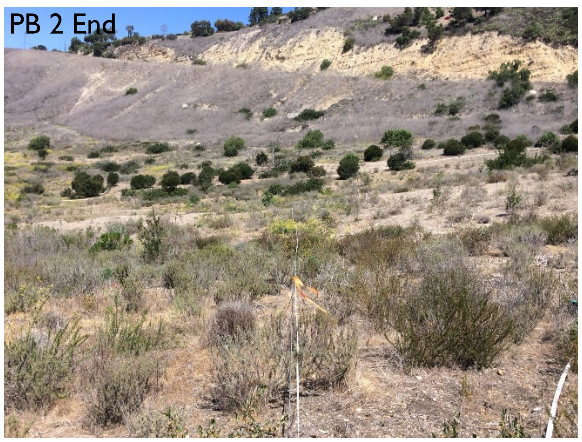
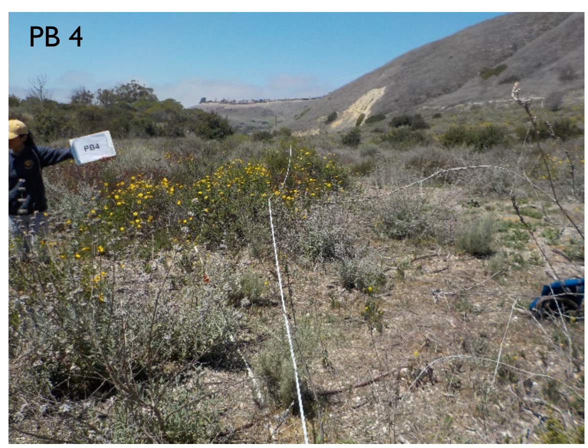

PB 2 End

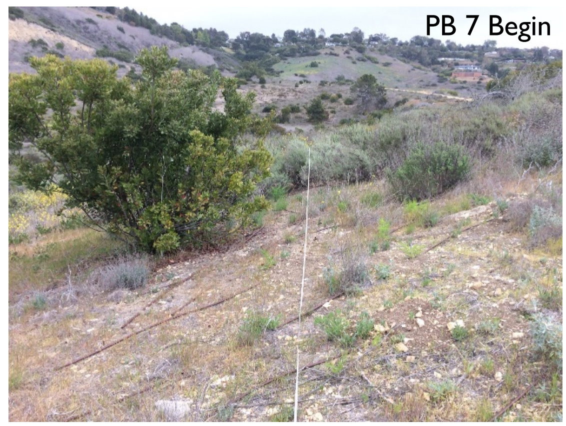

PB 3 Begin


PB 3 End


PB 4

PB 6 Begin

PB 6 End



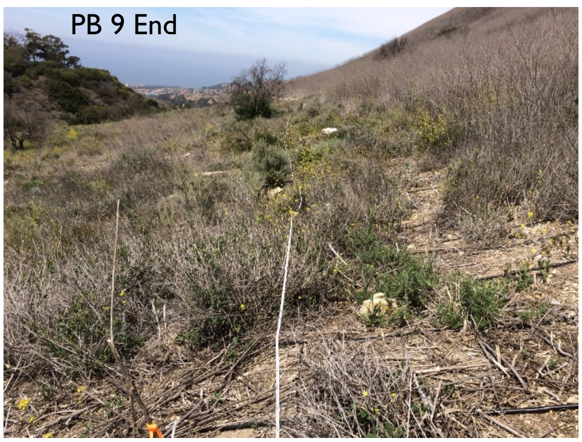
PB 7 Begin

PB 7 End

PB 8 Begin


PB 8 End


PB 9 Begin


PB 9 End

APPENDIX B

ALTA VICENTE

RESTORATION PLAN

Habitat Restoration Plan for the

Alta Vicente Ecological Reserve in the Portuguese Bend Nature Preserve

FEBRUARY 2016

PREPARED BY:

Palos Verdes Peninsula Land Conservancy
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HABITAT RESTORATION PLAN
for the
Alta Vicente Reserve
in the
Palos Verdes Nature Preserve

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FEBRUARY 2016

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APPENDIX

1 INTRODUCTION

This Habitat Restoration Plan (HRP) was prepared for the Alta Vicente Reserve within the Palos Verdes Nature Preserve (PVNP) located in the City of Rancho Palos Verdes, California (Figures 1 and 2). The Alta Vicente Reserve is one of ten ecological reserves within the approximately 1,400-acre PVNP. The PVNP is owned by the City of Rancho Palos Verdes while habitat and conservation protection is managed by the Palos Verdes Peninsula Land Conservancy (PVPLC).

This HRP discusses implementing approximately 12.9 acres of restoration, consisting of 10.4 acres of coastal sage scrub, 1.0 acre of cactus scrub, 1.0 acre of Palos Verdes blue butterfly habitat, and 0.5 acre of wildflower field in a disturbed area of the Alta Vicente Reserve currently dominated by non-native plant species. The HRP addresses restoration design, planting recommendations, installation procedures, maintenance requirements, monitoring methodology, and performance standards.

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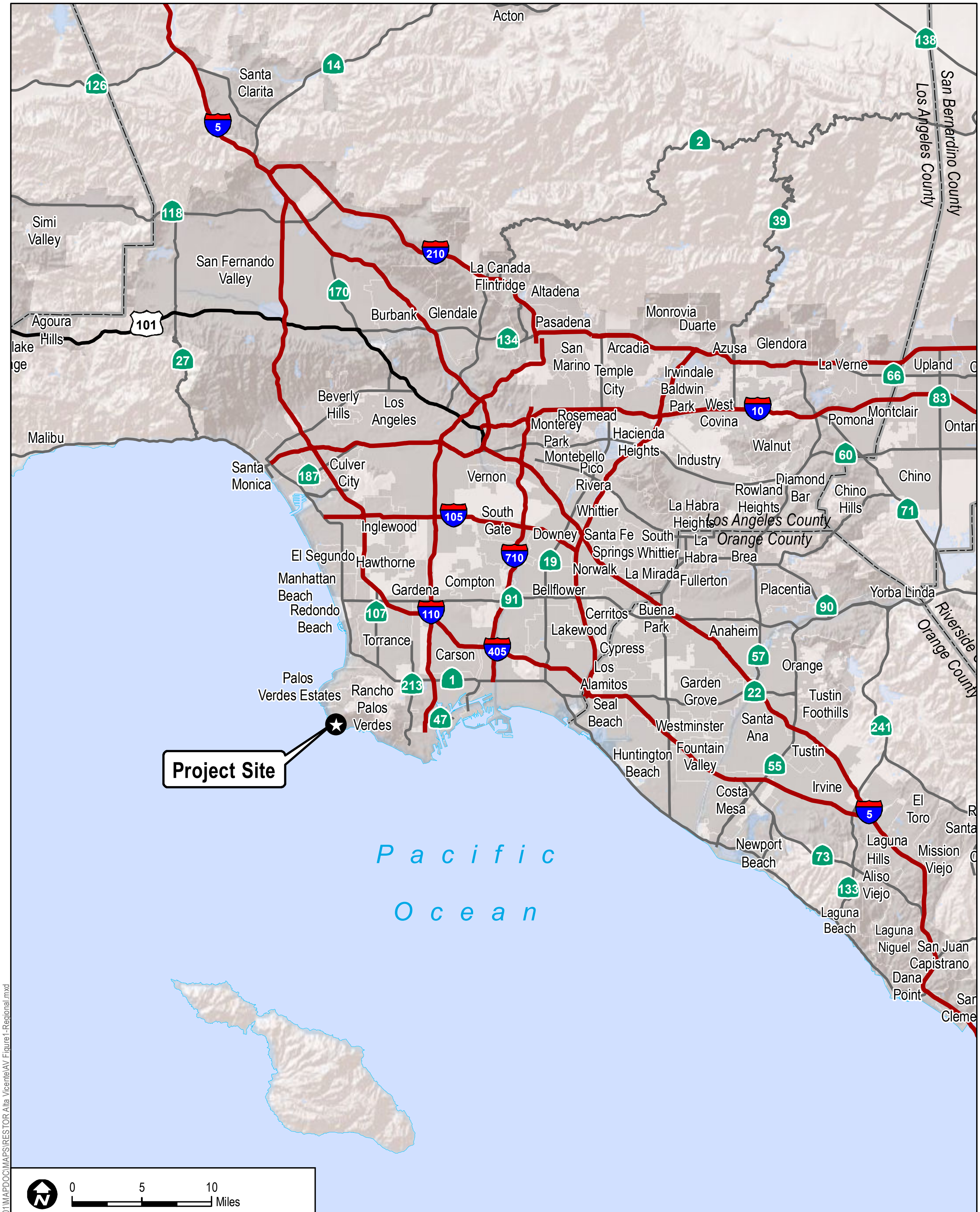

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FIGURE 1

Regional Map

Habitat Restoration Plan for the Alta Vicente Ecological Reserve in the Portuguese Bend Nature Preserve

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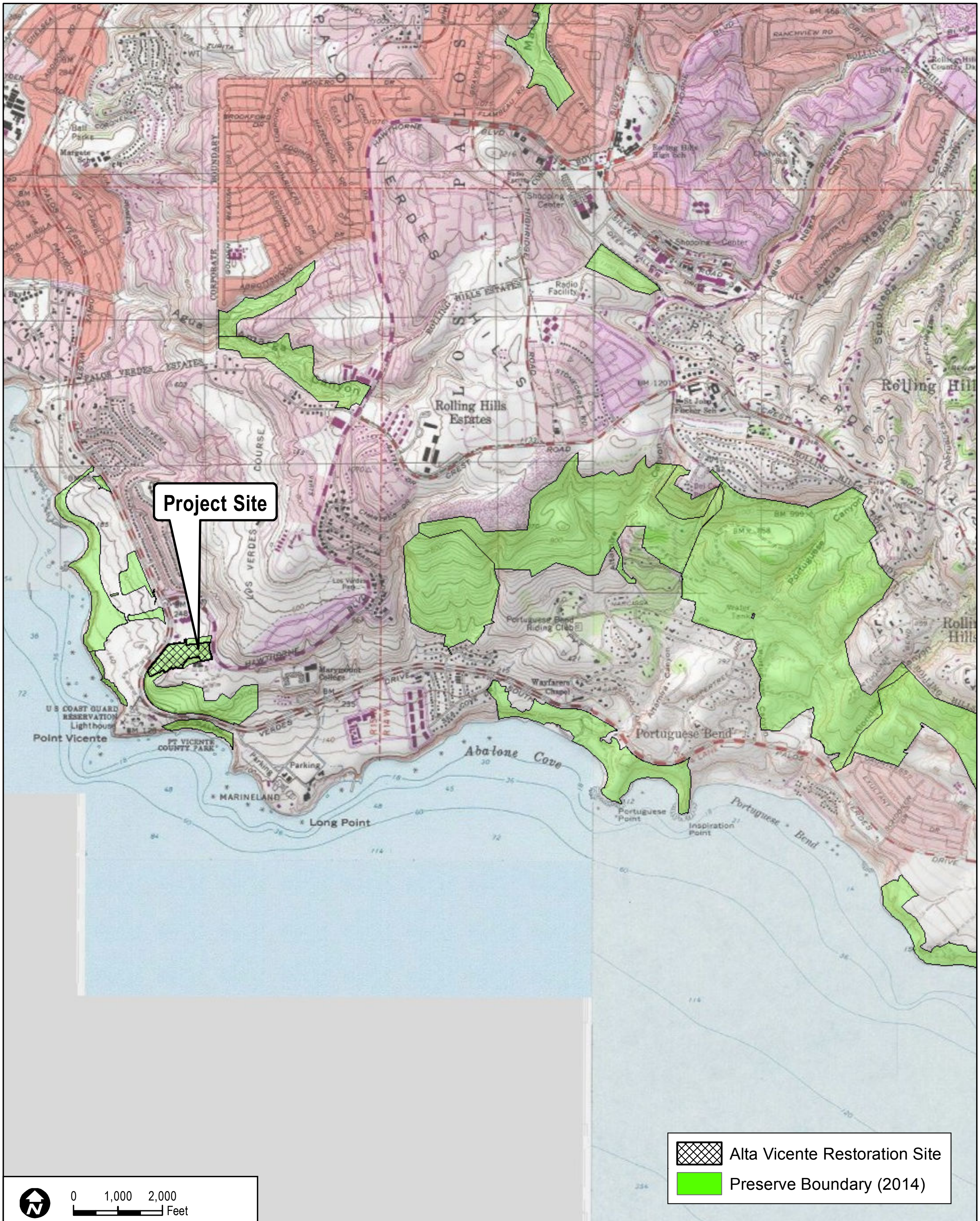

SOURCE: USGS 7.5-Minute Redondo Beach, San Pedro Series Quadrangles.

FIGURE 2
Vicinity Map

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Habitat Restoration Plan for the Alta Vicente Ecological Reserve in the Portuguese Bend Nature Preserve

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2 EXISTING CONDITIONS

2.1 Site Description

The Alta Vicente Reserve is located on the southwestern portion of the Palos Verdes Peninsula near the Rancho Palos Verdes City Administration building (City Hall). The entire Alta Vicente Reserve is approximately 55 acres and is located along the coast of the peninsula. The Reserve is north and east of Palos Verdes Drive West opposite from the Point Vicente Lighthouse. The proposed restoration area is located just north of the City Hall, bounded on the west by Palos Verdes Drive West and on the east by Hawthorn Boulevard (Figures 1 and 2).

2.2 Vegetation Communities

Plant communities and land covers within the Alta Vicente Reserve are typical of plant communities found in this region, exhibiting some level of prior disturbance, but containing some relictual elements of the native plant communities. Vegetation mapping of the reserve was prepared by PVPLC and the California Native Plant Society (CNPS) (PVPLC and CNPS 2010). According to the vegetation mapping conducted by PVPLC and CNPS, the proposed restoration area consists of non-native grassland, disturbed coastal sage scrub, disturbed Saltbush scrub, and exotic woodland. The existing vegetation communities present in the restoration area are described further below.

2.2.1 Non-native Grassland

Non-native grasslands, which were mapped by CNPS as fennel stands, Avena (*A. barbata*, *A. fatua*) stands, Bromus (*B. diandrus, B. hordeaceus*) stands, and California annual and perennial grassland macrogroup dominate the grassland habitat at Alta Vicente Reserve (PVPLC and CNPS 2010). Annual, non-native grassland generally occurs on fine-textured loam or clay soils that are moist or even waterlogged during the winter rainy season and very dry during the summer and fall. This plant community is characterized by dense to sparse cover of annual grasses, often with a combination of native and non-native annual forbs (Holland, 1986). Annual grassland is a disturbance related community that may have replaced native grassland or coastal sage scrub in many localities. On site, grassland habitats generally consist of brome grasses (*Bromus diandrus*, *B. hordeaceus, B. rubens*), wild oat (*Avena fatua, A. barbata*), fennel (*Foeniculum vulgare*) and other annual grasses (PVPLC and CNPS 2010).

2.2.2 Disturbed Coastal Sage Scrub

Disturbed coastal sage scrub within the Alta Vicente restoration area was mapped by CNPS as Non-native/naturalized Mediterranean scrub vegetation, and *Artemisia californica* association

(PVPLC and CNPS 2010). Coastal Sage Scrub is composed of low, subshrubs approximately 1 meter (3 feet) high, many of which are drought-deciduous (Holland, 1986). Dominant shrub type varies across this vegetation type, depending on localized factors and levels of disturbance, but often includes California Sagebrush (*Artemisia californica*) and California Brittlebush (*Encelia californica*). In this community the shrub layer primarily forms a continuous canopy, but it contains areas with an open canopy and a fairly well-developed understory.

2.2.3 Disturbed Saltbrush Scrub

Saltbrush scrub is dominated by quailbush (*Atriplex lentiformis*). Shrubs are less than 3 meters (10 feet) tall with closed to open canopies (Sawyer and Keeler-Wolf, 1995). The saltbrush scrub on site, mapped by CNPS as *Atriplex lentiformis* alliance, has an open canopy and an understory consisting primarily of non-native annuals (PVPLC and CNPS 2010).

2.2.4 Exotic Woodland

The exotic woodland in the restoration area is composed of non-native, and in some cases invasive, tree species. CNPS mapped these areas as acacia cyclops, but they include the additional exotic species Brazilian pepper (*Schinus terebinthifolius*), gum tree (*Eucalyptus* sp.), and Phoenix palm (*Phoenix canariensis*) among others (PVPLC and CNPS 2010).

2.3 Geology and Soils

The Palos Verdes Peninsula is primarily an old marine terrace with relatively steep eroded canyons which drain southwesterly into the Pacific Ocean. The underlying geologic material consists of marine sedimentary and basaltic rocks. The area is seismically active, with active Palos Verdes and San Pedro fault zones that have caused the peninsula to uplift relative to the adjacent Los Angeles Basin and the offshore bedrock.

According to the Report and General Soil Map for Los Angeles County (USDA 1969), the soils within the Alta Vicente Reserve are composed of the Altamont-Diablo association (30–50% slopes) and the Diablo-Altamont association (2%-9% slopes). Soils of the Altamont-Diablo association occur on gently sloping to rolling foothills throughout the Los Angeles basin as far north as Point Dume. Altamont soils are described to be 24–36 inches deep, are well drained, and have slow subsoil permeability. Diablo soils are described to be 22–52 inches deep, are well drained, and have slow subsoil permeability. They have dark brown, neutral, clay surface layers about 12 inches thick underlain by a brown, calcareous clay subsoil. The Altamont-Diablo association is comprised of approximately 60% Altamont soils and 30% Diablo soils, while the Diablo-Altamont association is composed of approximately 60% Diablo soils and 30% Altamont soils.

Three site specific soil samples were collected from the proposed restoration area (Figure 5). The soil samples consisted of composite samples representative of the general soil conditions at various locations on site. The composite samples were submitted to Wallace Laboratories for analysis of standard soil constituents, agricultural suitability, texture, and cation exchange capacity. Based on the results of the analysis, the soils are clay, with a slow infiltration rate and fair organic matter (Appendix A). The soils on site are slightly alkaline (pH = 7.87 - 7.95) and the salinity is low (ECe = 0.40 – 0.55 mho/cm). However, sodium is very high at soil sample site 1 with 536 mg/kg soil. The sodium adsorption ratio (SAR) is also high (6.8) at soil sample site 1 (increasing problems start at 3) but low at soil sample sites 2 and 3 (2.0 – 2.4). Additionally, major nutrients (nitrogen and phosphorus) are low.

The soil chemistry found in the restoration site is generally what is expected given the location and site characteristics. The soils appear to be suitable for establishment of the target habitats without soil remediation or extensive soil amendments. Seed germination may be limited by elevated sodium and the moderately high SAR at sample site 1, but many species of native plants should be able to tolerate the elevated sodium if planted as container plants.

While the soils on site pose no significant problems to establishment of native habitat, as native soils they have low levels of major nutrients. Native species are adapted to lower nutrient soils, but will benefit from some supplemental nutrient augmentation during planting to initiate establishment (e.g., slow-release fertilizer packet).

2.4 Special-Status Species

Two special-status wildlife species have been documented within the Alta Vicente Reserve, though not in the specific area identified for restoration. Coastal California gnatcatcher (*Polioptila californica californica*) (CAGN) has been observed just south of the restoration area (Dudek and PVPLC 2007). Additionally, cactus wren (*Campylorhynchus brunneicapillus*) (CAWR) has been observed south of the restoration area (PVPLC 2012) (Figure 3). Additionally, Catalina mariposa lily (*Calochortus catalinae*), which is included on the CNPS Inventory of Rare and Endangered Plants list as a rank 4.2 species, exists on the boundaries (south and east) of the proposed restoration area (CNPS 2015; PVPLC and CNPS 2010) (Figure 3).

In addition to special-status species, the host plant coastal buckwheat (*Eriogonum parvifolium*) for the federally listed, endangered, El Segundo blue butterfly (*Euphilotes battoides allyni*) is known to occur in the vicinity of the proposed restoration area and was observed at Alta Vicente in 2015 (A. Dalkey [PVPLC] personal communication). The host plant, locoweed (*Astragalus trichopodus* var. *lonchus*) for the federally listed, endangered, Palos Verdes blue butterfly (*Glaucopsyche lygdamus palosverdesensis*) also occurs within the Alta Vicente Reserve.

2.5 Non-Native Invasive Species

Non-native species are abundant within the areas identified for restoration, and compose the majority of the existing vegetative cover. Controlling non-native species during the plant establishment phase will present a significant challenge, and should be prioritized as the most critical aspect of the maintenance program. The most predominant non-native species include non-native annual grasses, coastal wattle (*Acacia cyclops*), and fennel. These species, as well as additional non-native species observed or expected on site, are provided in Table 1 with their associated rating in the California Invasive Plant Council's (Cal-IPC) Inventory of Invasive Plant Species (2015).

Table 1
Non-Native Plant Species and Associated Cal-IPC Ratings

High
Bromus madritensis ssp. *madritensis*—compact brome
Carpobrotus edulis—hottentot fig
Foeniculum vulgare—fennel
Moderate
Atriplex semibaccata—Australian saltbush
Avena barbata—slender oat
Brachypodium distachyon – false brome
Brassica nigra – black mustard
Bromus diandrus—ripgut brome
Centaurea melitensis—Maltese star-thistle
Euphorbia terracina—Geraldton carnation weed
Glebionis coronaria—crowndaisy
Hordeum murinum—mouse barley
Mesembryanthemum crystallinum—common iceplant
Myoporum laetum—myoporum
Pennisetum setaceum—crimson fountaingrass
Limited
Bromus hordeaceus—soft brome
***Eucalyptus* spp. – red gum, blue gum
Erodium cicutarium—redstem stork's bill
Helminthotheca echioides – bristly ox-tongue
Marrubium vulgare—horehound
Olea europaea—olive
***Phoenix canariensis*—Phoenix palm
Ricinus communis—castorbean
Salsola tragus—prickly Russian thistle
Schinus terebinthifolius—Brazilian peppertree

Table 1
Non-Native Plant Species and Associated Cal-IPC Ratings

None
**Acacia cyclops*—coastal wattle
**Malva parviflora*—cheeseweed mallow
**Melilotus indicus*—annual yellow sweetclover
***Pinus* sp.—pine
**Tropaeolum majus*—nasturtium

* Note that while there are several species on the list that do not have a Cal-IPC rating for the state of California, that some of these species can be locally invasive. Species with an asterisk are considered to be moderately invasive within the region and should be aggressively controlled. The Targeted Exotic Removal Program for Plants (TERPP) provides additional target invasive species (PVPLC 2013) that may occur on site

** Note that some of these mature non-native ornamental trees that are not presenting a significant threat of invasion will be left in place and not removed in order to retain avian habitat and the general character of the site. Seedlings and young saplings less than 5 feet tall will be removed.

2.6 Additional Considerations

A fifteen foot wide sewer easement currently bisects the restoration area, from north to south, along the visible access road (Alta Vicente Trail). The City of Rancho Palos Verdes granted a perpetual easement to the County Sanitation District No. 5 of Los Angeles County, allowing right-of-way for sewer purposes, with the requirement to repair and replace the surface of the ground and its improvements if damaged during operation. No buffers for restoration are required but it is suggested that restoration activities do not impede access to the man holes along the access road.

In addition, one or more electric utility poles intersect the restoration area on the southwestern border. Restoration activities should allow a 15-foot buffer around utility poles, with these areas being monitored and managed for only particularly weeds identified as highly invasive by Cal IPC, that threaten to spread into the restoration areas. Fuel modification areas on the periphery of the reserve, adjacent to built areas, will be managed in a similar manner.

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SOURCES: Palos Verdes Peninsula Land Conservancy 2012; Bing Maps 2015

FIGURE 3

Existing Conditions

Habitat Restoration Plan for the Alta Vicente Ecological Reserve in the Portuguese Bend Nature Preserve

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3 RESTORATION PROGRAM

This HRP outlines the restoration implementation strategy for upland habitat at the Alta Vicente Reserve and proposes to provide for the restoration of approximately 12.9 acres of habitat restoration. The approach to restoration in this HRP is to assist the recovery of the degraded ecosystem through planting and seeding in order to re-establish or enhance biological functions and services within portions of the Alta Vicente Reserve.

3.1 Restoration Site Goals and Objectives

The disturbed habitat that exists in the proposed restoration location has limited wildlife value and provides opportunity for the spread and establishment of invasive weed species to native habitat and previously restored areas within the Alta Vicente Reserve. The planting of native habitat is intended to improve habitat contiguity and provide increased nesting, cover, and foraging opportunities for wildlife. In particular, the overarching goal of this restoration plan is to provide habitat for coastal California gnatcatcher, coastal cactus wren and the Palos Verdes blue butterfly.

The habitat restoration program will focus on the establishment of habitat for the covered species listed in the NCCP/HCP with the objective of increasing the overall habitat carrying capacity for the target species populations. Coastal scrub restoration is intended to provide improved foraging habitat for resident and migrating wildlife species, and potential nesting and foraging habitat for target species such as the coastal California gnatcatcher, southern California rufous-crowned sparrow, and other sensitive wildlife species. Palos Verdes blue butterfly habitat restoration is meant to provide improved habitat and increased numbers of larval host plants for the Palos Verdes blue butterfly. Cactus scrub restoration is meant to provide habitat for the coastal cactus wren. Achievement of the performance standards described herein would create suitable habitat for these species. However, occupation of the site by these species is not a requirement for successful project completion.

In addition to these broad goals, the following site-specific objectives for the Alta Vicente Reserve restoration site have been incorporated into this HRP in the interest of minimizing adverse impacts to biological resources:

- Avoid additional or unplanned disturbance to existing native habitats during implementation of the project construction and long-term maintenance activities;
- Prevent any impacts to sensitive plant or wildlife species during implementation of the project construction and long-term maintenance activities;

- Control non-native invasive weed species considered to be highly or moderately invasive on the Cal-IPC Invasive Plant Inventory (2015), and others identified by PVPLC as locally invasive (PVPLC 2013);
- Utilize erosion control measures in the form of "Best Management Practices" (BMPs) on the site as conditions necessitate;
- Reintroduce special-status plant species listed in the NCCP/HCP as components of the planting plans where feasible and as appropriate.

3.2 Habitats to be Established

The habitat restoration program consists of site preparation (primarily non-native plant species removal), native planting, seeding, supplemental watering, maintenance, and monitoring. Proposed planting for the target habitat types will focus primarily on the installation of container plants to achieve the project goals. A native seed mix will also be applied as a supplemental measure to increase cover and diversity.

The habitat restoration area is currently dominated by non-native species. The existing grasslands in the western and central portions of the restoration area are composed largely of non-native annual herbs, including fennel, brome grasses, Russian thistle, and wild oat grasses (Figure 4). A number of non-native perennials, such as coastal wattle, Phoenix palm, and Brazilian pepper are also common within the restoration area.

Coastal sage scrub habitat will make up the majority of the restored habitat within the restoration area (Figure 5). Additionally, cactus scrub is planned for the slope immediately west of Hawthorne Boulevard and Palos Verdes blue butterfly habitat is planned for the gently sloping area in the eastern portion of the restoration site. A wildflower field to provide habitat for pollinators has also been planned for an approximately 0.5-acre area in the northwestern portion of the restoration area near Palos Verdes Drive West. Each specific habitat type to be restored is described below. It is expected that all planting will be installed to mimic the natural distribution and vegetation mosaic of adjacent healthy habitats.

Photo 1: Representative view of lower restoration area (facing north)

Photo 2: Non-native plants in the lower restoration area (black mustard, brome grasses, coastal wattle)

Photo 3: Trail on the southern side of the restoration area

Photo 4: Northern border of the restoration area (facing south-west)

Photo 5: Invasive perennial weeds in the eastern section of the restoration area (Coastal wattle, Phoenix palm)

Photo 6: Invasive annual weeds in the restoration site (Fennel, black mustard, wild oat)

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FIGURE 4
Site Photographs

Habitat Restoration Plan for the Alta Vicente Ecological Reserve in the Palos Verdes Nature Preserve

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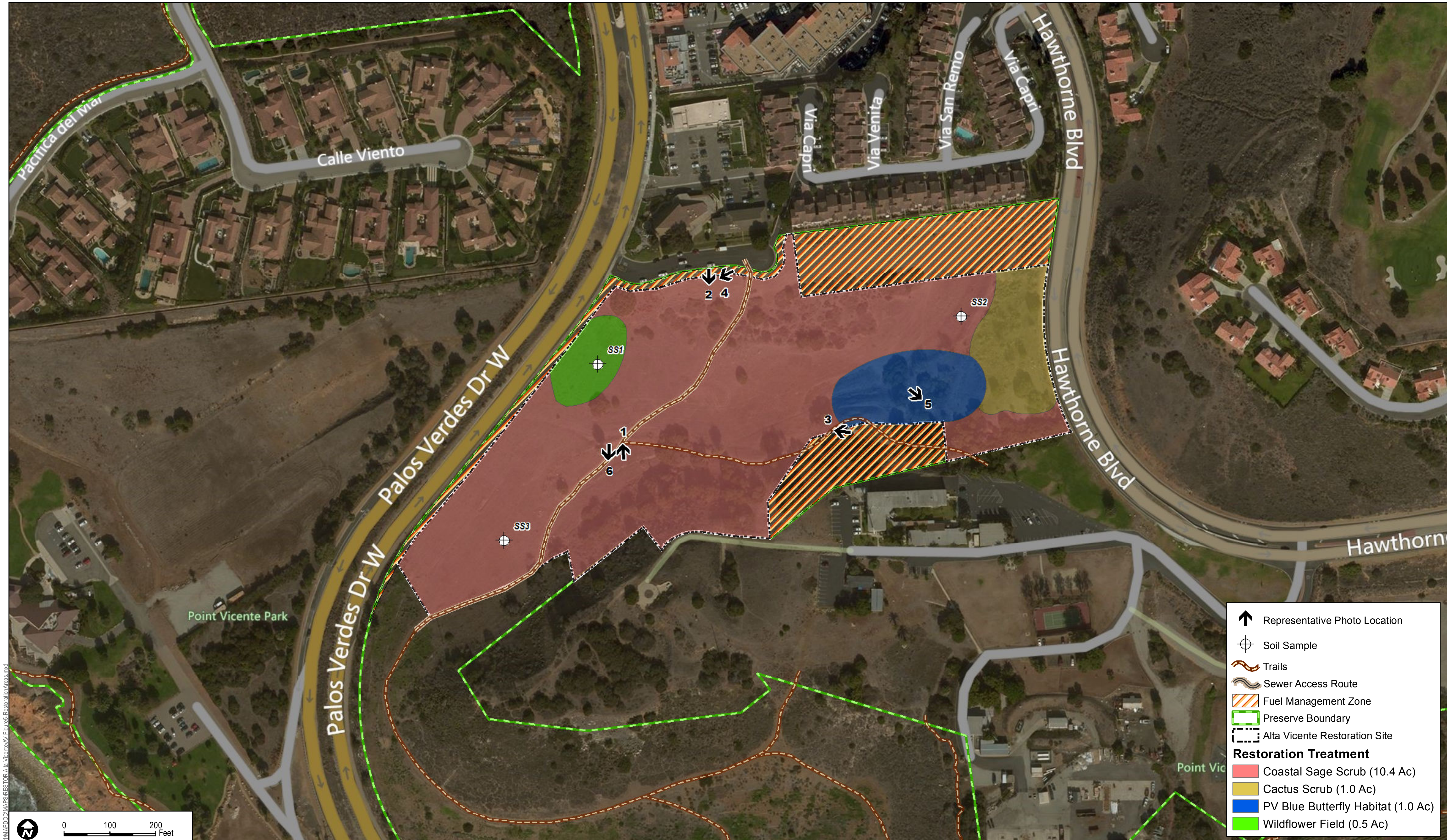

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SOURCES: Palos Verdes Peninsula Land Conservancy, 2014; Bing Maps 2015

FIGURE 5

Alta Vicente Restoration Area

Habitat Restoration Plan for the Alta Vicente Ecological Reserve in the Portuguese Bend Nature Preserve

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3.2.1 Coastal Sage Scrub

The restoration strategy for coastal sage scrub habitat on the Alta Vicente Reserve restoration site includes reintroducing locally appropriate native coastal sage scrub species that are currently present in adjacent native habitats. The plant palette includes a container plant and seed mix composition (Table 2) that has been designed to replicate the native composition of a healthy coastal sage scrub plant community similar to existing coastal sage scrub habitat present on the Alta Vicente Reserve site, and with the specific intent to provide habitat suitable for occupation by coastal California gnatcatcher. The planting palette has thus been designed to contain a composition of shrub species that are dominant in coastal sage scrub habitat occupied by coastal California gnatcatcher (Atwood et al. 1994). On the Palos Verdes Peninsula, the primary coastal sage scrub dominants include California sagebrush, California brittlebush, and coastal buckwheat, with coast goldenbush, common deerweed, lemonadeberry, California buckwheat, sages, bladderpod, coast prickly-pear, and wishbone bush as common constituents. The plant palette assumes 100% coverage of container plants. The seed mix is provided for erosion control and species diversity, and will be applied as a supplemental measure as needed, and as determined by PVPLC.

Table 2
Proposed Coastal Sage Scrub Planting Palette (Approximately 10.4 Acres)

Botanical Name	Common Name	Container Size	Spacing (on center)	Group Size	Quantity (per acre)	Total # Plants
Container Plants						
Artemisia californica	California sagebrush	D40	5	5	659	6,852
Astragalus trichopodus var. *lonchus*	Ocean locoweed	D40	2	7	54	566
Brickellia californica	California bricklebush	D40	5	3	87	906
Corethrogyne filaginifolia	Common sandaster	D40	3	3	24	252
*Cylindropuntia prolifera***	Coastal cholla	1-gallon	4	5	27	283
**Dudleya lanceolata*	Lanceleaf liveforever	1-gallon	2	3	11	113
Elymus condensatus	Giant wildrye	D40	5	3	42	435
Encelia californica	California brittlebush	D40	4	5	350	3,640
Eriogonum cinereum	Coastal buckwheat	D40	5	5	87	906
Eriogonum fasciculatum	California buckwheat	D40	5	5	232	2412
Eriophyllum confertiflorum	Golden yarrow	D40	2	3	54	566
Heteromeles arbutifolia	Toyon	D40	8	1	14	142
Isocoma menziesii	Coast goldenbush	D40	5	3	87	906
Mirabilis laevis var. *crassifolia*	Wishbone bush	D40	4	5	82	849
*Opuntia littoralis/oricola***	Prickly-pear cactus	1-gallon	6	3	12	126
Peritoma arborea	Bladderpod	D40	6	5	36	378

Table 2
Proposed Coastal Sage Scrub Planting Palette (Approximately 10.4 Acres)

Botanical Name	Common Name	Container Size	Spacing (on center)	Group Size	Quantity (per acre)	Total # Plants
Rhus integrifolia	Lemonadeberry	D40	12	1	3	31
Salvia leucophylla	Purple sage	D40	6	5	61	629
Salvia mellifera	Black sage	D40	5	3	87	906
				Total Container Plants	**2,009**	**20,898**
Seed Mix						
Botanical Name	*Common Name*	*Pure Live Seed*	*Lbs. Per Acre*		*Total Lbs.*	
Asclepias fascicularis	narrow leaved milkweed	50	1.0		10.4	
Castilleja exserta	purple owl's clover	25	0.5		5.2	
Clarkia purpurea	winecup clarkia	80	0.5		5.2	
Deinandra fasciculata	fascicled tarplant	3	1.0		10.4	
Eschscholzia californica var maritima	California poppy	74	2.0		20.8	
Lupinus bicolor	pygmy lupine	78	2.0		20.8	
Lupinus succulentus	arroyo lupine	81	4.0		41.6	
Melica imperfecta	coast melic grass	54	0.5		5.2	
Pseudognaphalium californicum	California everlasting	3	0.5		5.2	
Stipa lepida	foothill needlegrass	54	2.0		20.8	
Stipa pulchra	Purple needlegrass	42	8.0		83.2	
		Total Lbs.	**22.0**		**228.8**	

* Lanceleaf liveforever (*Dudleya lanceolata*) should be planted in rock outcrops.
** Larger (5 or 10 gallon) container size plants will be installed as available.

3.2.2 Cactus Scrub

The restoration strategy for cactus scrub is comparable to that described for coastal sage scrub, except that the composition of species has been modified to allow coast prickly-pear cactus (*Opuntia littoralis*) and coast cholla (*Cylindropuntia prolifera*) to dominate. The plant palette includes a container plant and seed mix composition (Table 3) that has been designed to replicate the native composition of a healthy cactus scrub plant community, and with the specific intent to provide habitat suitable for occupation by cactus wren.

Table 3
Proposed Cactus Scrub Planting Palette (1.0 Acre)

Botanical Name	Common Name	Container Size	Spacing (on center)	Group Size	Quantity (per acre)	Total # Plants
Container Plants						
Artemisia californica	California sagebrush	D40	5	5	313	313
Astragalus trichopodus var. *lonchus*	Ocean locoweed	D40	3	7	24	24
Baccharis pilularis	Coyote brush	D40	6	5	12	12
Brickellia californica	California bricklebush	D40	5	5	17	17
Corethrogyne filaginifolia	Common sandaster	D40	3	3	24	24
*Cylindropuntia prolifera***	Coastal cholla	1-gallon	4	10	408	408
Encelia californica	California brittlebush	D40	5	3	87	87
Eriogonum fasciculatum	California buckwheat	D40	5	5	174	174
Isocoma menziesii	Coast goldenbush	D40	5	5	17	17
Mirabilis laevis var. crassifolia	Wishbone bush	D40	4	5	27	27
*Opuntia littoralis/oricola***	Coast prickly-pear	1-gallon	6	25	523	523
Peritoma arborea	Bladderpod	D40	6	5	12	12
Rhus integrifolia	Lemonadeberry	D40	15	1	2	2
Salvia mellifera	Black sage	D40	5	3	87	87
				Total Container Plants	**1,727**	**1,727**
Seed Mix						
Botanical Name	*Common Name*	*Pure Live Seed*	*Lbs. Per Acre*			*Total Lbs.*
Eschscholzia californica var. *maritima*	California poppy	74	3.0			3.0
Lupinus bicolor	Miniature lupine	78	2.0			2.0
Phacelia cicutaria	Caterpillar phacelia	80	1.0			1.0
Salvia columbariae	Chia	54	1.0			1.0
Stipa lepida	Foothill needlegrass	54	2.0			2.0
Stipa pulchra	Purple needle-grass	42	8.0			8.0
		Total Lbs. Per Acre	**17.0**			**17.0**

** Larger (5 or 10 gallon) container size plants will be installed as available.

3.2.3 Palos Verdes Blue Butterfly Habitat

The restoration strategy for Palos Verdes blue butterfly habitat is comparable to that described for coastal sage scrub, except that the composition of species was modified to be dominated by locoweed, the Palos Verdes blue butterfly host plant that was historically present at the site (Table 4). This plant species is considered early successional and is often found in the open areas of coastal sage scrub communities.

Historically this host plant species was associated with natural occurrences such as fire, landslides, and animal burrowing. With the introduction of human intervention, this natural cycle of disturbance and growth has changed. Humans have introduced many highly adaptable annual exotic grasses that flourish in these same open areas inhabited by ocean locoweed and out-compete the native species for both water and nutrients. In addition, fire suppression has resulted in the establishment of continuous bands of mature coastal sage scrub communities, whereby not only is species diversity decreased, but open areas required for the establishment and development of species such as ocean locoweed are decreased as well.

To maximize the potential for the continued presence of the two Palos Verdes blue butterfly host plant species, restoration efforts must follow a two-fold approach. First, is the establishment of additional Palos Verdes Blue butterfly habitat to provide the necessary resources to support the blue butterfly. In addition, newly established habitat must be maintained on a continuous basis to ensure the continued existence of gaps which provide the open areas necessary for the host plant to persist. Since fire, in the form of controlled burns, is not an option at the Alta Vicente site, open areas may require regular through mechanical means.

The shrub spacing provided in the planting palette is slightly greater than in the CSS restoration areas and the planting palette is designed for only 50% coverage (including 30% coverage of ocean locoweed and 20% coverage of other shrubs) to allow for more openings in the habitat.

Table 4
Proposed Palos Verdes Blue Butterfly Habitat Planting Palette (1.0 Acre)

Botanical Name	Common Name	Container Size	Spacing (on center)	Group Size	Quantity (per acre)	Total # Plants
Container Plants						
Artemisia californica	California sagebrush	D40	6	5	61	61
Astragalus trichopodus var. *lonchus*	Ocean locoweed	D40	2	7	1,634	1,634
Corethrogyne filaginifolia	Common sandaster	D40	3	3	145	145
**Dudleya lanceolata*	Lanceleaf liveforever	1-gallon	2	3	54	54
Elymus condensatus	Giant wildrye	D40	6	3	6	6
Encelia californica	California brittlebush	D40	6	3	12	12
Eriogonum fasciculatum	California buckwheat	D40	6	5	24	24
Eriogonum parvifolium	Coast buckwheat	D40	6	5	12	12
Eriophyllum confertiflorum	Golden yarrow	D40	3	3	97	97
Mirabilis laevis var. *crassifolia*	Wishbone bush	D40	4	5	54	54
Peritoma arborea	Bladderpod	D40	6	5	12	12
Salvia leucophylla	Purple sage	D40	6	5	12	12
Salvia mellifera	Black sage	D40	6	3	12	12
				Total Container Plants	**2,135**	**2,135**

Table 4
Proposed Palos Verdes Blue Butterfly Habitat Planting Palette (1.0 Acre)

Seed Mix				
Botanical Name	*Common Name*	*Pure Live Seed*	*Lbs. Per Acre*	*Total Lbs.*
Asclepias fascicularis	narrow leaved milkweed	50	1.0	1.0
Castilleja exserta	purple owl clover	25	0.5	0.5
Clarkia purpurea	winecup clarkia	80	0.5	0.5
Deinandra fasciculata	fascicled tarplant	3	1.0	1.0
Eschscholzia californica var. *maritima*	California poppy	74	2.0	2.0
Lasthenia californica	California goldfields	30	1.0	1.0
Layia platyglossa	tidy tips	60	1.0	1.0
Lupinus bicolor	pygmy lupine	78	2.0	2.0
Lupinus succulentus	arroyo lupine	81	4.0	4.0
Stipa lepida	foothill needlegrass	54	2.0	2.0
Stipa pulchra	purple needlegrass	42	8.0	8.0
		Total Lbs.	**23.0**	**23.0**

* Lanceleaf liveforever (*Dudleya lanceolata*) should be planted in rock outcrops.

3.2.4 Wildflower Field

The wildflower field planting is included in the HRP by request of the Palos Verdes Peninsula Land Conservancy. The location for the wildflower field was selected because the high clay content soil creates favorable conditions for the establishment of annual wildflower habitat (Table 5). Showy native wildflower species have been selected for this planting area. Additionally, a few shrubs have been included in the planting palette to develop a patchy structure to the planting, and provide for perimeter perennial plants along the roadway. A few bulb species are also included in the planting palette to be incorporated by PVPLC as available.

Table 5
Proposed wildflower field Planting Palette (Approximately 0.5 Acre)

Botanical Name	Common Name	Container Size	Spacing (on center)	Group Size	Quantity (per acre)	Total # Plants
Container Plants						
Bloomeria crocea[1]	Goldenstar	Bulb	1	1	as available	TBD
Brodiaea jolonensis[1]	Jolon brodiaea	Bulb	1	1	as available	TBD
Calochortus catalinae[1]	Catalina mariposa lily	Bulb	1	1	as available	TBD

Table 5
Proposed wildflower field Planting Palette (Approximately 0.5 Acre)

Botanical Name	Common Name	Container Size	Spacing (on center)	Group Size	Quantity (per acre)	Total # Plants
Dichelostemma capitatum[1]	Blue Dicks	Bulb	1	1	as available	TBD
Dudleya virens	Bright green dudleya	D40	2	3	218	109
Epilobium canum	California fuchsia	D40	3	5	145	73
Eriophyllum confertiflorum	Golden yarrow	D40	2	3	327	163
Eschscholzia californica var. *maritima*	California poppy	D40	2	5	545	272
Mirabilis laevis var. *crassifolia*	Wishbone bush	D40	4	3	163	82
Verbena lasiostachys	Western vervain	D40	4	3	82	41
				Total Container Plants	**1,480**	**740**

Seed Mix				
Botanical Name	*Common Name*	*Pure Live Seed*	*Lbs. Per Acre*	*Total Lbs.*
Amsinckia intermedia	Common Fiddleneck	49	1.0	0.5
Antirrhinum nuttallianum	Purple Snapdragon	10	0.5	0.25
Asclepias fascicularis	Narrowleaf milkweed	50	1.0	0.5
Castilleja exserta	Purple owl's clover	25	0.5	0.25
Clarkia purpurea	Winecup clarkia	80	0.5	0.25
Corethrogyne filaginifolia	California-aster	80	2.0	1.0
Deinandra fasciculata	*fascicled tarplant*	0.1	1.0	0.5
Emmenanthe penduliflora	Whispering Bells	3	0.5	0.25
Eschscholzia californica var. *maritima*	California poppy	50	2.0	1.0
Lasthenia californica	California goldfields	74	0.5	0.25
Layia platyglossa	Tidy tips	30	1.0	0.5
Lupinus bicolor	Miniature lupine	60	2.0	1.0
Lupinus succulentus	Arroyo lupine	78	6.0	3.0
Nemophila menziesii	Baby blue eyes	81	0.5	0.25
Phacelia cicutaria	Caterpillar phacelia	83	0.5	0.25
Phacelia ramosissima	Branching phacelia	80	0.5	0.25
Salvia columbariae	Chia	80	1.0	0.5
Sisyrinchium bellum	Blue-eyed grass	54	3.0	1.5
Stipa lepida	Foothill needlegrass	71	2.0	1.0
Stipa pulchra	Purple needlegrass	54	8.0	4.0
		Total Lbs. Per Acre	**34.0**	**17.0**

1 The PVPLC has propagated limited numbers of these species
TBD = To be determined

3.3 Revegetation Materials

Plant materials for the restoration planting area will include container stock and seed of coastal scrub and species, as indicated in the plant palettes provided in Tables 2-5. As much as feasible, the container plant materials will be grown at the PVPLC nursery from native seed collected on the Palos Verdes Peninsula. The nursery will grow the plants in D40 Deepots. Additionally, for the seed mixes, PVPLC will collect available seed from the peninsula for application at the restoration site. If some species cannot be grown as container stock at the PVPLC nursery, or local seed is not available for collection, the planting palettes may be adjusted, or another source may be used for acquiring locally sourced plant materials.

3.4 Target Functions and Values

The primary functional goal of restoring coastal sage scrub, cactus scrub, Palos Verdes blue butterfly habitat, and wildflower field habitat is to restore vegetation that contains a diversity of native coastal scrub plant species and that provides habitat value for sensitive wildlife species, particularly the coastal California gnatcatcher, coastal cactus wren and Palos Verdes blue butterfly. Additionally, a secondary consideration is to create contiguous and intact habitat which can resist the re-establishment of invasive plant species.

3.5 Time Lapse

The length of time to develop high quality habitat depends on a variety of factors including weather, soil conditions, herbivory, weed competition, and maintenance quality. Under optimal conditions, coastal sage scrub may take approximately three years from the application of seed and installation of container plants to develop the appropriate structure to provide the functions and values needed for habitation of wildlife, including suitable nesting habitat for California gnatcatcher and other coastal scrub species. In an unirrigated setting, and with drought conditions, scrub development may take longer than three years to mature enough to be suitable for nesting. As a hedge against drought, the addition of supplemental watering will increase plant survival, improve establishment, and hasten habitat development.

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4 RATIONALE FOR EXPECTING SUCCESS

The identified locations for restoration on the Alta Vicente Reserve are directly adjacent to viable and self-sustaining target habitats, indicating appropriate environmental conditions to support the intended upland habitats. This HRP includes a provision for supplemental watering to promote establishment and survival of native species included in the plant palette. The HRP also includes a 5-year maintenance plan, wherein invasive non-native weeds within the restoration site will be controlled to aid native plant establishment. Additionally, native plant materials will be grown or collected from sources on the Palos Verdes Peninsula, thus preserving genetic integrity and increasing the potential for long-term success.

4.1 Preliminary Schedule

Appropriate timing of planting and seeding will minimize the need for supplemental watering and will increase the survival rate of the installed plants. For unirrigated restoration sites, or sites with limitations on irrigation systems, the best survival rates are achieved when container plants and seed are installed at the onset of the rainy season or soon thereafter (November through January). Planting and seeding at the site should be timed to take advantage of seasonal rainfall patterns and most appropriate growing season temperatures (see Charts 1-2 and Table 6). Seed application will occur only after container plants have had a full year to become established, and will be used to increase species density and diversity as needed.

Table 6
Preliminary Restoration Project Schedule

Task	Date
Site clearing	Fall 2015
Invasive weed species control and grow-kill cycles	Winter and Spring 2016
Installation of supplemental watering system*	Summer 2016
Planting container stock	Fall and Early Winter 2016
Seed application	Fall and Early Winter 2017
Monitoring and maintenance	To begin upon successful installation of container plants

* Supplemental watering system may not be installed if supplemental watering is to be conducted using a watering truck.

Chart 1
Average Monthly Precipitation for the Portuguese Bend Nature Preserve

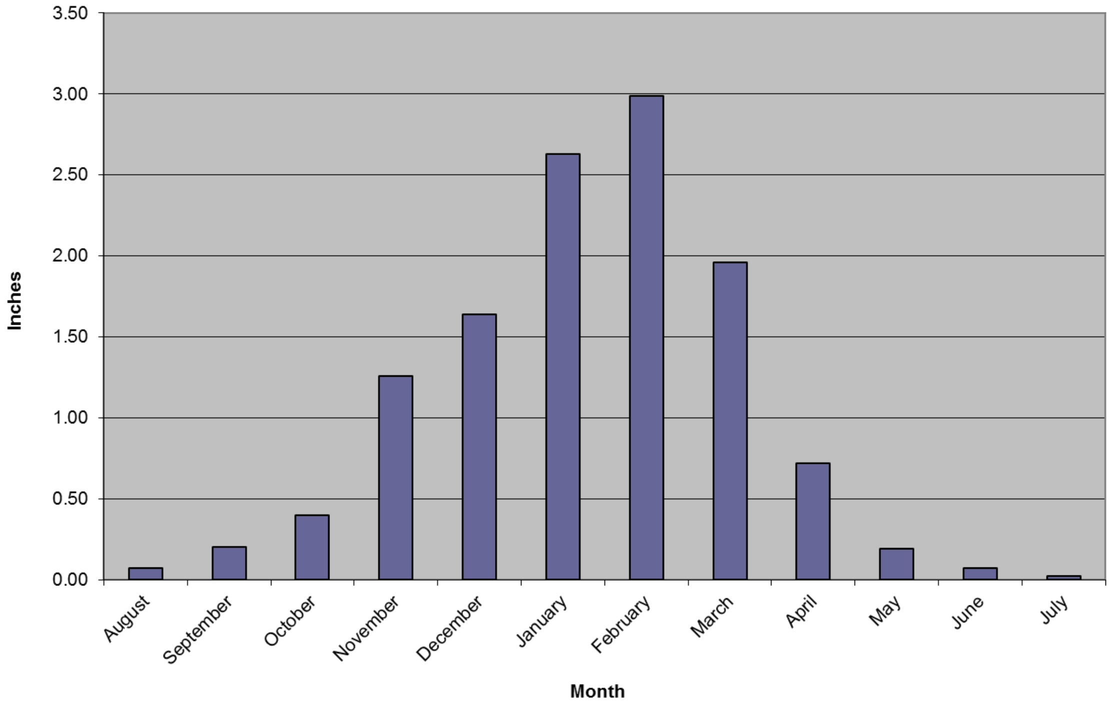
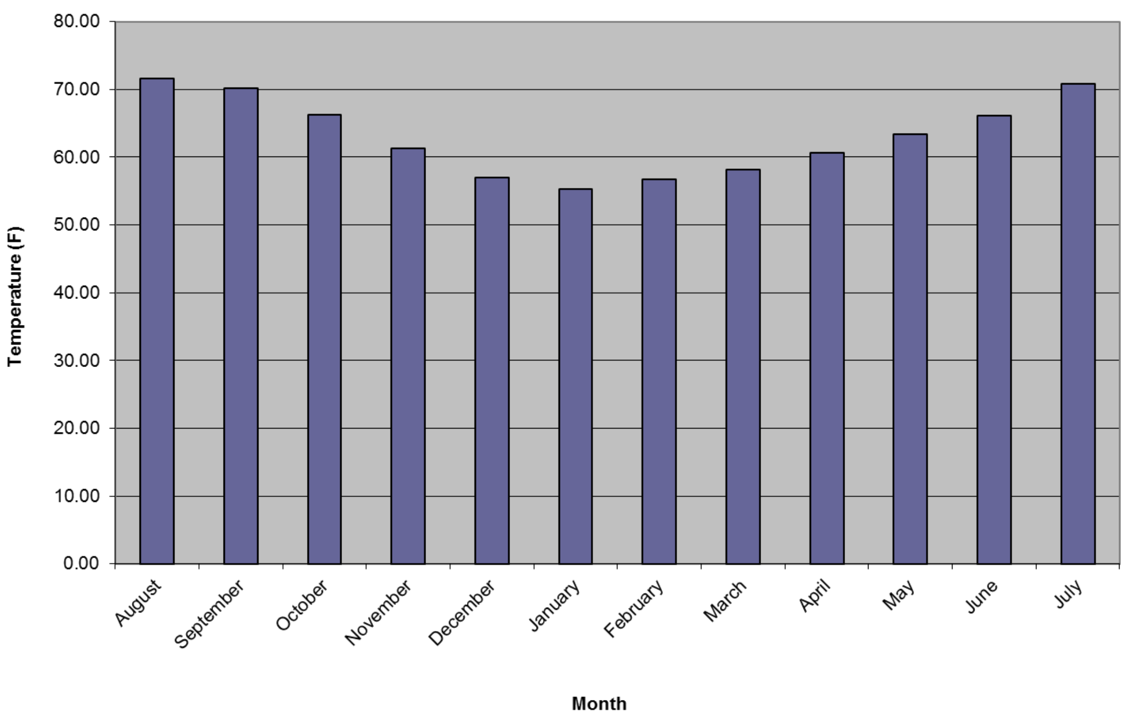


Chart 2
Average Monthly Temperatures for the Portuguese Bend Nature Preserve



4.1.1 Site Preparation

Site preparation includes control of invasive weed species and soil preparation in the restoration area. If any clearing of weeds is planned to be performed during the migratory bird nesting season (February 15–September 15), a nesting bird survey should be conducted by a qualified wildlife biologist within 72 hours prior to vegetation removal in accordance with the Migratory Bird Treaty Act (16 U.S.G. 703-712).

During site preparation, all invasive weed species, particularly non-native annual grasses, black mustard, fennel, and castor bean should be killed and removed from the restoration area. Invasive species control should also include exotic trees and shrubs such as Brazilian pepper, acacia, and palms as directed by PVPLC staff.

The initial weed control effort will involve a combination of chemical and mechanical treatment. Prior to the installation of native plant materials, "grow and kill" weed removal treatments should be conducted by allowing non-native seedling emergence in the winter and spring. When weeds have begun to grow, and before they begin to develop flowers or flowering structures, a foliar application of an appropriate systemic herbicide should be applied to kill target weeds. If adequate rainfall has occurred during this period, multiple grow-kill cycles should be repeated. The restoration ecologist will provide weed control recommendations to the restoration maintenance staff that are specific to the target weed species identified for control. Any use of herbicides shall be in accordance with label instructions, following the recommendations of a licensed Pest Control Advisor, and any application shall be applied under the direction of a state-certified Qualified Applicator.

4.1.2 Supplemental Watering System

The planned method of providing supplemental watering at the proposed restoration area is with a temporary above-ground drip irrigation system. This will help ensure that native container plants and seed installed on site will become adequately established. The supplemental watering system would only be used until the plants are established such that they can survive on their own between periods of rainfall. It is expected that, depending upon the level of plant establishment, the watering system would be removed after two to three years of use. Watering on site will gradually be decreased prior to the removal of the system so the plants can become acclimated to the site's natural conditions.

The PVPLC may establish temporary on-grade mainlines leading from the point of connection at City Hall, which was established for a previous restoration project within the Alta Vicente Reserve. The system should be designed by a landscape architect to ensure that the system has adequate water pressure and provides good coverage. The supplemental watering system would be installed as an above-ground system, so that irrigation equipment may be removed once the system has been decommissioned, and the container plants planted on site have become established.

4.1.3 Erosion Control

Where needed, erosion control measures, such as the installation of sandbags, fiber rolls, silt fencing, and/or erosion-control matting may be necessary to control erosion until target vegetation is established. At a minimum, silt fencing should be installed at the toe of slopes that are unvegetated after removing non-native species. No erosion control devices should be used that contain seed from non-native plants. The need and location of erosion control will be determined in the field by the project's restoration ecologist.

4.1.4 Plant Installation

Standard planting procedures will be employed for installing container stock. Planting holes shall be approximately twice the width of the rootball, and as deep. If dry soil conditions exist at the time of plant installation, planting holes will be filled with water and allowed to drain immediately prior to planting. A fertilizer packet with controlled-release fertilizer (e.g., Best Paks 20-10-5) will be placed in the bottom of each hole prior to planting.

4.1.5 Seed Application

Seed shall be broadcast throughout the restoration site using hydroseed equipment or other method as recommended by the restoration ecologist.

If the seed is applied through hydroseeding, seed will be mixed uniformly in a slurry composed of water and virgin wood fiber mulch at the following rates:

- Seed mixture at indicated lbs. per acre.
- 100 percent Virgin wood fiber mulch at 2,500 Lbs. per acre.

The seed mix can also be hand broadcast, as the seed mix is primarily a supplemental feature to increase diversity and will not occur until the second year of the Restoration Program. If hand broadcast, the seeding sites should be prepared by removing weedy vegetation to expose the soil surface. The seed should be raked into the soil so there is good seed-soil contact. Seeding should be timed to occur prior to or early in the rainy season.

5 MAINTENANCE PLAN

The purpose of the maintenance plan is to provide guidelines for long-term maintenance of the restoration site during the establishment period. Maintenance activities will be initiated during the weed reduction period (i.e., grow-kill cycles), and will occur at the direction of the project's restoration ecologist on an as-needed basis. The maintenance period will intensify after the installation of the container plants. Maintenance will be necessary until the habitats are fully established, which is estimated to take approximately five years.

Because the goal of this project is to establish a natural system that can support itself with little or no maintenance, the primary focus of the maintenance plan is concentrated in the first few seasons of plant growth following the revegetation effort, at a time when weeds can easily out-compete native plants. The intensity of the maintenance activity is expected to subside each year as the native plants become established, and local competition from non-native plants for resources is minimized through direct removal and treatment of non-native plants.

5.1 Maintenance Activities

Maintenance activities will be primarily related to non-native invasive plant species control. Supplemental watering, supplemental planting, trash removal, and erosion control will also be conducted, as necessary.

- Non-native plant species should be controlled as soon as they begin to establish. Recommended control methods should be tailored to each specific weed species and should include the most effective control measures for the species and time of year. Control methods may include a combination of manual, mechanical, and chemical control.
- Container plants should be watered when natural rainfall is not adequate to sustain the establishing plants. The project's restoration ecologist will be responsible for scheduling the supplemental watering to promote plant establishment. Supplemental watering should be conducted as deep, soaking watering to promote deep rooting.
- Generally, the site will not be fertilized during the maintenance period unless determined to be necessary by the project's restoration ecologist as a remedial measure to correct soil nutrient deficiencies.
- Deadwood and leaf litter of native vegetation should not be removed. Deadwood and leaf litter provide valuable microhabitats for invertebrates, reptiles, small mammals, and birds. Non-organic trash and debris should be removed from the revegetation area on a regular basis.

- Erosion control materials should be maintained in working order until they are deemed no longer necessary by the project's restoration ecologist. Maintenance of erosion control materials may include repairing or replacing dilapidated, damaged, or ineffective materials.

5.2 General Habitat Maintenance Guidelines

5.2.1 Weed Control

Weeds are expected to be the primary pest problem in the restoration area during the first several years of the maintenance period. Weeds should be controlled so they do not prevent the establishment of the native species or invade adjacent areas. A combination of physical removal, mechanical treatments (weed whipping) and appropriate herbicide treatments should be used to control the non-native/invasive plant species. Weeds should be controlled prior to setting seed, and should be removed from the site if they become large enough to block sunlight to developing native plants.

Re-establishment of non-native plants onto the site can be adequately minimized by regular and timely maintenance visits with implementation of effective weed control measures. Weed control will require constant diligence by the maintenance personnel. Invasive plant species, such as those listed in Table 1 should be controlled wherever possible within the restoration area. Mature invasive tree species will be retained at the discretion of the PVPLC and the Wildlife Agencies, though the majority of individuals should considered for removal so the source of weed propagules is diminished.

Removal of weeds by hand where practicable and effective is the most desirable method of control and should be done around individual plantings and native seedlings to avoid inadvertent damage to the native species. However, several of the invasive species may be more effectively controlled with herbicide due to their tenacious and spreading root systems, their size, or their ability to re-sprout from root fragments. All herbicides shall be used in accordance with label instructions, following the recommendations of a licensed Pest Control Advisor, and any application shall be applied under the direction of a state-certified Qualified Applicator. The project's restoration ecologist should monitor control efforts to ensure that the target weed species are being adequately addressed without impacting the native plants.

The non-native Bagrada bug (*Bagrada hilaris*) has been documented on the Palos Verdes Peninsula, and is known to cause substantial damage to plant species from the mustard family (*Brassicaceae*) (County of Los Angeles 2013; University of California, Riverside 2013). As black mustard is one of the predominant species within the proposed restoration site, the Bagrada bug may occur; however, it is expected that the damage caused by this insect would be to non-native mustard species, and not native plants. However, if this species becomes problematic as a pest species on the native plants, then the restoration ecologist will evaluate whether or not control measures are necessary. Similarly, if other deleterious pests (e.g., beetles on bladderpod) become so problematic as to cause container plant mortality, the restoration ecologist may recommend measures to minimize pests and promote healthy plant establishment.

5.2.2 Supplemental Watering System

Supplemental watering will be provided for two to three years after planting to help the container plants become established. Supplemental watering will likely be provided through a drip irrigation system. Supplemental watering would likely be necessary every 3–4 weeks during the dry season, and more frequently immediately after installation if natural rainfall does not provide adequate moisture. If a temporary, on-grade supplemental watering system is installed, it would need to be maintained and repaired as necessary.

The watering system shall be checked regularly to ensure proper operation and adequate coverage of the restoration areas. Problems with the watering system shall be repaired immediately to reduce potential plant mortality or erosion. The frequency and duration of irrigation applications shall be adjusted seasonally in coordination with the project's restoration ecologist to meet habitat needs.

Supplemental watering will be terminated when the plants are well established, as deemed appropriate by the project's restoration ecologist. All above-ground components of the watering system should be removed from the site at the successful completion of the project. The timing for cessation and removal of the irrigation system shall be determined by the project's restoration ecologist.

5.2.3 Clearing and Trash Removal

Trash consists of all man-made materials, equipment, or debris dumped, thrown, washed into, or left within the restoration area. Pruning or clearing of native vegetation is not anticipated to be necessary within the restoration area, unless extensive growth is causing a maintenance problem for a utility or for an area outside of the restoration area. Any pruning or clearing of native vegetation should be approved by the project's restoration ecologist. Deadwood and leaf litter of native vegetation will be left in place to replenish soil nutrients and organic matter.

5.3 Schedule of Maintenance Inspections

The project's restoration ecologist will perform quarterly maintenance/monitoring inspections during the scheduled maintenance and monitoring period. Recommendations for maintenance efforts will be based upon these site observation visits. Weed control shall be conducted as needed to ensure adequate control to promote healthy establishment of the target habitat types. It is anticipated that weed control will be necessary on a monthly basis during the winter and early spring when weeds are vigorously growing. Weed control during other times of the year will likely be diminished, but conducted as necessary, and as directed

6 MONITORING PLAN

Monitoring of the restoration site has a two-fold purpose: **(1)** To monitor the progress of the Alta Vicente Reserve restoration area by assessing native habitat establishment relative to the established performance standards; and **(2)** To direct and monitor the maintenance activities and determine remedial actions in a manner that ensures that appropriate maintenance occurs in a timely manner. The monitoring will be performed by the project's restoration ecologist.

The project's restoration ecologist will be responsible for monitoring activities of all the work crews during preparation of the restoration area including site clearing and soil preparation, weed control, container plant and seed application, and quarterly monitoring for the duration of the 5-year maintenance and monitoring period.

Reports will be prepared for the restoration areas for five years after the installation is complete. Each report will include qualitative data, photo documentation, and future recommendations for site maintenance as described below.

6.1 Performance Standards

Performance standards have been established for the habitat restoration area based on the guidelines in the draft NCCP/HCP and on expected vegetative development relative to undisturbed habitat of the same type (Table 7). The following performance standards apply to the Alta Vicente restoration site:

1. Soil at the site is stable and shows no significant erosion.
2. After five years, non-native plant cover is less than 25% with less than 15% cover of invasive perennial species. After five years, there will be no presence of species on Cal-IPC List A with the possible exception of Cal-IPC List A non-native annual grasses.
3. Native plant cover after three years in the CSS community should be greater than 40% with at least 30% cover from perennial species. At five years, total native cover should be greater than 50% percent with appropriate species diversity.
4. Native plant cover after three years in the cactus scrub community should be greater than 30% with at least 20% cover from perennial species and 5% cover from cactus species. Native plant cover after five years in the cactus scrub community should be greater than 40% with at least 10% cover from cactus.
5. Native plant cover after three years in Palos Verdes blue butterfly habitat should be greater than 30%, but not more than 70%. The remainder should be bare ground.

Perennial (shrub) species should be maintained at between 10% and 50% cover. Ocean locoweed (*Astragalus trichopodus* var. *lonchus*) should constitute at least 10% cover.

6. Native plant cover after three years in the wildflower field should be greater than 30%. Native plant cover after five years should be greater than 40%.

Table 7
Performance Standards

Year	Percent Cover of Native Species (%)				Non-native Cover (for all habitat types)	
	Coastal Sage Scrub	*Cactus Scrub*	*PV Blue Butterfly Habitat*	*Wildflower*	*Invasive Perennial Species Cover*	*Total Non-native Species Cover*
Year 3	>40% (>30% perennial)	>30% (>20% perennial and >5% cacti)	30%-70% native cover; 10%-50% max. shrub cover; >10% host plant cover	>30%	<15% (0% of Cal-IPC List A)*	<25%
Year 5	>50%	>40% (>10% cacti)	30%-70% native cover; 10%-50% max. shrub cover; >10% host plant cover	>40%	<15% (0% of Cal-IPC List A)*	<25%

* The NCCP/HCP success criteria allow an exception to the requirement for 0% Cal-IPC List A for non-native annual grasses. In other words, Cal-IPC List A grass species would not count toward the 0% criteria, but would count toward the 25% criteria for total non-native species cover.

The Year 3 performance standards will be utilized to assess the annual progress of the restoration area, and are regarded as interim project objectives designed to reach the final Year 5 goals. Fulfillment of these standards will indicate that the restoration area on the project site is progressing toward the habitat type and functions that constitute the long-term goals of the plan. If the restoration efforts fail to meet the performance standards in any year, the project's restoration ecologist may recommend remedial action to be implemented the following year with the intent to enhance the vegetation to a level of conformance with the original standard. These remedial actions may include re-seeding, re-planting, applying soil amendments, additional weed control measures, erosion control, or adjustments to the watering and maintenance practices.

6.2 Monitoring Methods and Schedule

Annual qualitative assessments will be conducted through visual analysis of the coastal sage scrub, cactus scrub, butterfly habitat and wildflower field to assess vegetation development, weed presence, and plant establishment. Qualitative monitoring will include reviewing the health and vigor of container plants and seed plantings, assessing survival/mortality, checking for the presence of pests and disease, soil moisture content, and the effectiveness of the supplemental watering, erosion problems, invasion of weeds, and the occurrence of trash and/or vandalism. Representative photographs of the restoration site from stationary photo points will be taken annually.

Permanent vegetation sampling sites will be established within the coastal sage scrub, cactus scrub and the butterfly habitat restoration areas at randomized representative locations. A minimum of one transect shall be established for each two acres of restoration area, and at least one transect for each habitat type. No transects will be established in the wildflower field. Transect data will be collected in Years 3 and 5 from the restoration sites in the spring and will be used to determine compliance and achievement of the restoration performance standards. Transect data will be collected using the point-intercept method to determine percent target vegetation cover and weed cover. If the restoration project is in compliance with the Year 5 performance standards in an earlier monitoring period, then qualitative assessments may be substituted for the quantitative monitoring until the end of the 5-year restoration program. If the restoration site is performing below the interim performance standards, the project’s restoration ecologist will determine if remedial measures are necessary.

Each monitoring visit will be followed by a summary of observations, recommendations, and conclusions. Results from the annual monitoring will be used to evaluate the progress of each habitat toward the ultimate goals of the project, and to recommend appropriate management actions.

6.3 Monitoring Reports

The PVPLC will monitor and report on the restoration work underway in the Alta Vicente Reserve. The restoration area will be monitored for five years, with reports prepared annually. Monitoring reports should provide concise, meaningful summaries of the restoration progress and provide direction and maintenance recommendations for future work.

Annual reports will include the following:

1. A description of the restoration and maintenance activities (e.g., seeding, irrigation, weed control, trash removal) conducted on the site during the previous year including the dates the activities were conducted.
2. A description of existing conditions within the restoration site, including descriptions of vegetation composition, weed species, and erosion problems, if any.
3. Qualitative and quantitative monitoring data related to proposed target goals including a comparative analysis of data over the years the project has been monitored.
4. Recommendations for remedial measures to correct problems or deficiencies, if any.
5. Representative photographs of notable observations on site and from fixed photo viewpoints.

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APPENDIX A

Soil Test Results

WALLACE LABS	SOILS REPORT	Print Date	July 17, 2015	Receive Date	7/16/15
365 Coral Circle	Location	Palos Verdes Peninsula, Job No. 9085			
El Segundo, CA 90245	Requester	Andy Thomson and Jake Marcon, Dudek			
(310) 615-0116	graphic interpretation: * very low, ** low, *** moderate				
ammonium bicarbonate/DTPA		* * * * high, * * * * * very high			

extractable - mg/kg soil	Sample ID Number	15-198-01		15-198-02		15-198-03		
Interpretation of data	Sample Description	AV #1		AV #2		AV #3		
low medium high	elements		graphic		graphic		graphic	
0 - 7 8-15 over 15	phosphorus	1.77	*	3.28	**	2.64	*	
0-60 60 -120 121-180	potassium	154.88	****	111.48	***	139.59	****	
0 - 4 4 - 10 over 10	iron	2.36	*	2.54	**	2.13	*	
0- 0.5 0.6- 1 over 1	manganese	1.44	****	2.18	****	1.30	****	
0 - 1 1 - 1.5 over 1.5	zinc	0.86	**	0.81	**	0.87	**	
0- 0.2 0.3- 0.5 over 0.5	copper	4.44	*****	2.83	****	3.85	*****	
0- 0.2 0.2- 0.5 over 1	boron	0.30	***	0.21	***	0.23	***	
	calcium	201.11	***	189.13	***	295.01	***	
	magnesium	520.68	*****	247.46	*****	393.25	*****	
	sodium	536.41	*****	141.94	***	192.61	***	
	sulfur	9.32	*	10.83	*	11.04	*	
	molybdenum	n d	*	0.03	***	0.05	***	
	nickel	0.60	*	1.74	**	1.59	**	
The following trace	aluminum	n d	*	n d	*	n d	*	
elements may be toxic	arsenic	0.05	*	n d	*	0.03	*	
The degree of toxicity	barium	2.62	*	1.86	*	3.41	**	
depends upon the pH of	cadmium	0.23	*	0.24	*	0.39	*	
the soil, soil texture,	chromium	n d	*	n d	*	n d	*	
organic matter, and the	cobalt	0.04	*	0.03	*	0.08	*	
concentrations of the	lead	1.63	**	0.93	*	2.01	**	
individual elements as	lithium	0.30	*	0.26	*	0.40	*	
well as to their interactions.	mercury	0.11	*	n d	*	n d	*	
	selenium	n d	*	n d	*	n d	*	
The pH optimum depends	silver	n d	*	n d	*	n d	*	
upon soil organic	strontium	0.50	*	0.34	*	0.45	*	
matter and clay content-	tin	n d	*	n d	*	n d	*	
for clay and loam soils:	vanadium	1.31	**	0.77	*	1.29	**	
under 5.2 is too acidic								
6.5 to 7 is ideal	Saturation Extract							
over 8.0 is too alkaline	pH value	7.91	****	7.95	****	7.87	****	
The ECe is a measure of	ECe (milli-	0.55	**	0.47	**	0.40	**	
the soil salinity:	mho/cm)		millieq/l		millieq/l		millieq/l	
1-2 affects a few plants	calcium	6.8	0.3	18.6	0.9	18.6	0.9	
2-4 affects some plants,	magnesium	2.0	0.2	6.3	0.5	6.5	0.5	
> 4 affects many plants.	sodium	78.5	3.4	47.8	2.1	39.6	1.7	
	potassium	-0.9	0.0	0.7	0.0	-0.8	0.0	
	cation sum		3.9		3.6		3.2	
problems over 150 ppm	chloride	70	2.0	50	1.4	26	0.7	
good 20 - 30 ppm	nitrate as N	3	0.2	2	0.1	5	0.4	
	phosphorus as P	0.2	0.0	0.2	0.0	0.0	0.0	
toxic over 800	sulfate as S	8.7	0.5	7.6	0.5	6.6	0.4	
	anion sum		2.7		2.0		1.5	
toxic over 1 for many plants	boron as B	0.21	**	0.41	***	0.15	*	
increasing problems start at 3	SAR	6.8	****	2.4	**	2.0	**	
est. gypsum requirement-lbs./1000 sq. ft.		181		24		80		
	relative infiltration rate	slow	sand - 9.8%	slow	sand - 16.8%	slow	sand - 16.5%	
	soil texture	clay	silt - 29.2%	clay	silt - 35.6%	clay	silt - 37.1%	
	lime (calcium carbonate)	yes	clay - 61.0%	high	clay - 47.7%	slight	clay - 46.5%	
	organic matter	fair		fair		fair		
	moisture content of soil	12.5%	gravel over 2 mm	10.7%	gravel over 2 mm	12.6%	gravel over 2 mm	
	half saturation percentage	44.0%	0.4%	40.7%	12.1%	39.3%	1.7%	

Elements are expressed as mg/kg dry soil or mg/l for saturation extract.
pH and ECe are measured in a saturation paste extract. nd means not detected.
Sand, silt, clay and mineral content based on fraction passing a 2 mm screen.

APPENDIX B1

Portuguese Bend

NCCP/HCP

Restoration Plan

APPENDIX B. PORTUGUESE BEND NCCP/HCP SITE PROPOSED REVISED RESTORATION PLAN FOR PHASE 4 AND 5

3.5 SEEDING AND PLANTING SPECIFICATIONS

The following methods will be used to seed and plant during the restoration of coastal sage scrub and cactus scrub habitats within the Portuguese Bend Reserve. Seeding and planting should be implemented in October 2012 to take advantage of the entire rain season.

3.5.1 Seeding

Seed shall be applied by hand with a belly grinder in the areas between container plant groupings as well as in between the plants among the container plant groups in all restoration areas. The seed will be mixed together as specified for the seed mix. Specified VAM will be spread by hand with a belly grinder over the seeding area prior to seeding. The seed shall be broadcast and raked, where practical, into the ground to no more than a quarter of an inch to incorporate the seed into the soil to increase germination success. The seed palettes are the same as in the 2010 Restoration Plan (see Table 2, 4, 6).

3.5.2 Planting

Container plant palettes were based on the seed palette in the 2010 Restoration plan (Tables 1, 3, 5).

Container plants consist of dominant shrubs and 40 to 60 plants will be planted in groups of mixed species throughout the restoration area. However, cactus species will be planted in the 2 acre restoration area with no other species planted within the group. The layout for container plants will be determined for each area based on micro topographic features and planting sites will be marked on the site using different colored pin flags under the supervision of the restoration ecologist or PVPLC biologist. Spacing of plants within the groups will follow the specifications presented in the tables for container plant palettes. Groups of container plants will be spaced in a natural looking mosaic in each area.

All container plants are to be planted to the following specifications:

- Planting holes shall be made with the minimum disturbance to accommodate the containers.
- Prior to planting, the planting hole shall be filled with water, and allowed to drain.

- Plants shall be set in the planting hole so that the crown of the root ball is approximately 0.25 inch above finish grade. Under no circumstance should the plant crown be buried.
- A watering basin shall be provided around each plant from 18 – 24 inches in diameter.
- Watering basins shall be filled with water after planting, at least twice.
- The irrigation system should be tested to ensure that all emitters are functioning.

3.6 IRRIGATION SYSTEM

A temporary above ground irrigation system is specified for the groups of container plants within the coastal sage scrub restoration areas. The irrigation system will be used, as necessary to supplement the annual rainfall during the establishment period. The temporary irrigation system will be installed in summer prior to planting to permit "grow and kill" weed treatments.

The temporary above ground irrigation system will be used in the early fall and late spring seasons. The irrigation system will slightly lengthen the growing season to maximize the development of the habitat. Depending on rainfall, irrigation likely will be required for the first two growing seasons for establishment.

3.7 SITE MAINTENANCE

One of the goals for the restoration is to provide self-sustaining habitats. However, initially, maintenance of the restoration area will be necessary to establish the newly planted and seeded areas. Maintenance will include any activities required to meet the performance standards set forth in this plan, in the estimation of the restoration specialist or PVPLC biologist. For the Three Sisters Reserve, these include the following:

- Weed control, at a minimum for fennel, acacia, mustards, wild oats and purple false brome;
- Irrigation for the container plants;
- Replacement hand seeding in areas of more than 200 sq. ft where target seed germination failed after one good season of rainfall;
- Replacement of container plants in areas with less than 80 percent survival in years two and three, based on visual observations of substantial mortality; and
- Pest and disease control, if necessary.

The establishment maintenance period is generally three years duration with the most intense maintenance in the first and second year, and only seasonal weeding activities in the third year. The amount of maintenance each year will depend on weather conditions and how well the site develops. The following specifications for maintenance may require adjustments as determined by the restoration specialist or PVPLC biologist over the three-year maintenance period.

3.7.1 Weed Control

During the active maintenance period, the target cover from exotic weed species will be generally 10 percent or less. Control of the wild oats and purple false brome is especially important because annual grasses have been shown to compete with shrub species in restoration (Eliason and Allen 1997; Corbin and D'Antonio 2004). Purple false brome is a relatively recent invader to southern California, and the habitat of this species is relative dense growth.

Weeds will be controlled during late winter through early summer, as necessary, before they set seed and/or before they reach approximately 12 inches in height. Three weeding events should be estimated for a normal rainfall season, with more or less as dictated by rainfall. Weeds, such as purple false brome will be removed from the site if seeds have set prior to weeding. Since removal of weeded material is expensive, weeded material may be left on site as organic mulch material if seeds have not yet set. Removal of herbicide treated material is not an issue.

Weed control will mainly employ hand pulling, mechanical methods, and spot spraying of herbicides for certain species such as fennel and acacia as described in Section 3.2.1.

3.7.2 Irrigation of Container Plants

Temporary irrigation will only be used in the areas where groups of container plants are to be planted. Irrigation will be used in the first two seasons from planting to extend the rainy season and establish the shrubs, as necessary. The timing of irrigation events will depend on evapo-transpiration between irrigation events and soil moisture. The following management scheme is anticipated as a guideline for water management of native trees and shrubs:

- Irrigate soil to full field capacity to the desired depth (approximately 18 inches after planting; and 18–24 inches during plant establishment).
- Allow soil to dry down to approximately 50-60 percent of field capacity in the top 6-12 inches before the next irrigation cycle. Depth of soil dry down between irrigation events will depend on development of container plants.

Wetting of the full root zone and drying of the soil between irrigation events is essential to the maintenance of the plants and the promotion of a deep root zone that will support the vegetation in the years after establishment. A soil probe or shovel should be used to examine soil moisture and rooting depth directly.

3.7.3 Seeding and Plant Replacement

Target values for relative cover of the native vegetation, including nurse and erosion control species, will be as follows with at least 20 percent cover in Year 1, 30 percent in Year 2, and 40 percent in Year 3. Actual cover values will depend mainly on weather conditions (seasonal rainfall and temperature) during the establishment period.

Areas of significant erosion shall be repaired and re-seeded in the first fall season after damage. Re-seeding will occur in areas if coverage is less than 20 percent of native species over any contiguous area of 200 sq ft.

Survival of the container plants within the first growing season should be 80 percent. Plants shall be replaced if survivorship falls below 80 percent in the first season. Replacements will be planted as previously specified and maintained for one growing season, as necessary. As sites develop, it is impractical to implement direct counts of all the container plants. Replacement planting after the first season shall only be specified if the visual estimate indicates substantial mortality and the function of these species has not been replaced by seeded material and natural recruitment.

Table 1
Northerly Facing Slope Coastal Sage Scrub Container Plant Palette

Species	Spacing	# of plants per acre
Artemisia californica	5'	148
Encelia californica	4'	111
Eriogonum cinereum	4'	148
Eriogonum fasciculatum	4'	222
Hazardia squarrosa	4'	37
Heteromeles arbutifolia	5'	7
Leymus condensatus	5'	74
Isocoma menziessi	5'	111
Lotus scoparius	4'	74
Malosma laurina	15'	7
Melica imperfecta	4'	148
Rhus integrifolia	15'	7
Salvia leucophylla	5'	111

Table 2
Northerly Facing Slope Coastal Sage Scrub Seed Mix

Species	Lbs. Per Acre
Artemisia californica	2
Castilleja exserta	0.5
Deinandra fasciculata	1.5
Encelia californica	1.5
Eriogonum cinereum	2
Eriogonum fasciculatum	3
Eschscholzia californica var. maritima	1.5
Hazardia squarrosa	0.5
Gnaphalium californicum	0.5
Heteromeles arbutifolia	0.1
Leymus condensatus	1
Isocoma menziessi	1.5
Lotus strigosus	1
Lotus scoparius	1
Lupinus succulentus	1
Lupinus bicolor	1
Malosma laurina	0.1
Melica imperfecta	2
Nassella lepida	1
N. pulchra	1
Phacelia cicutaria	0.4
Plantago insularis	20
Rhus integrifolia	0.1
Salvia leucophylla	1.5
Vulpia microstachys	1
Bloomeria crocea	as available
Dichelostemma capitatum	as available
Calochortus catalinae	as available
Total Lbs./Grams per Acre	**46.7**

Table 3
Southerly and Westerly Facing Slope Coastal Sage Scrub Plant Palette

Species	Spacing	# of plants per acre
Artemisia californica	5'	125
Encelia californica	4'	125
Eriogonum cinereum	4'	125
Eriogonum fasciculata	4'	375
Heteromeles arbutifolia	5'	19
Isocoma menziessi	5'	94
Lotus scoparius	4'	94
Malosma laurina	15'	6
Melica imperfecta	5'	63
Rhus integrifolia	15'	6
Salvia mellifera	5'	94

Table 4
Southerly and Westerly Facing Slope Coastal Sage Scrub Seed Mix

Species	Lbs. Per Acre
Artemisia californica	2
Castilleja exserta	0.5
Deinandra fasciculata	1.5
Encelia californica	2
Eriogonum cinereum	2
Eriogonum fasciculata	6
Eschscholzia californica var. maritima	1.5
Gnaphalium californicum	0.5
Heteromeles arbutifolia	0.3
Isocoma menziessi	1.5
Lotus strigosus	1.5
Lotus scoparius	1.5
Lupinus succulentus	1
Lupinus bicolor	1.5
Malosma laurina	0.1
Melica imperfecta	1
Nassella lepida	3.5
N. pulchra	1.5
Phacelia cicutaria	0.4
Plantago insularis	20
Rhus integrifolia	0.1
Salvia mellifera	1.5
Sisyrinchium bellum	0.5
Vulpia microstachys	2
Bloomeria crocea	as available
Dichelostemma capitatum	as available
Calochortus catalinae	as available
Total Lbs./Grams per Acre	**53.9**

Table 5
Cactus Scrub Container Plant Palette

Scientific Name	Common Name	Container Size[1]	Container Plant Spacing[2]	Plants per Acre[3]
Cylindropuntia prolifera	coastal cholla	1-gallon	3'	40
Opuntia littoralis	coast prickly pear	1-gallon	3'	120
			TOTAL	160

[1] A combination of pads, 1-gallon, and 5-gallon cactus can be used.

[2] Spacing = feet on-center distance from other cactus within planting groups. Spacing of 5-gallon cactus should be 6' from next closest cactus.

[3] Cactus should be planted in groups of 30. Planting groups can consist of a combination of cactus pads, 1-gallon, and 5-gallon plants at the specified number of plants per acre.

Table 6
Cactus Scrub Seed Mix

Scientific Name	Common Name	Pounds of bulk seed per acre
Artemisia californica	California sagebrush	2.0
Deinandra fasciculata	fascicled tarweed	1.5
Encelia californica	California encelia	1.5
Eriogonum cinereum	ashyleaf buckwheat	2.0
Eriogonum fasciculatum	California buckwheat	6.0
Gnaphalium californicum	California everlasting	0.5
Isocoma menziesii	coast goldenbush	1.5
Lotus scoparius	deerweed	6.0
Lotus strigosus	strigose lotus	1.5
Lupinus bicolor	miniature lupine	3.0
Lupinus succulentus	arroyo lupine	1.0
Melica imperfecta	melic grass	2.0
Nassella lepida[3]	foothill needlegrass	2.5
Phacelia ramosissima	branching phacelia	0.4
Plantago insularis[4]	wooly plantain	20.0
Rhus integrifolia	lemonadeberry	0.1
Salvia mellifera	black sage	0.5
Sambucus Mexicana	Mexican elderberry	0.5
Sisyrinchium bellum	blue-eyed grass	0.5
Vulpia microstachys[4]	small fescue	6.0

APPENDIX C

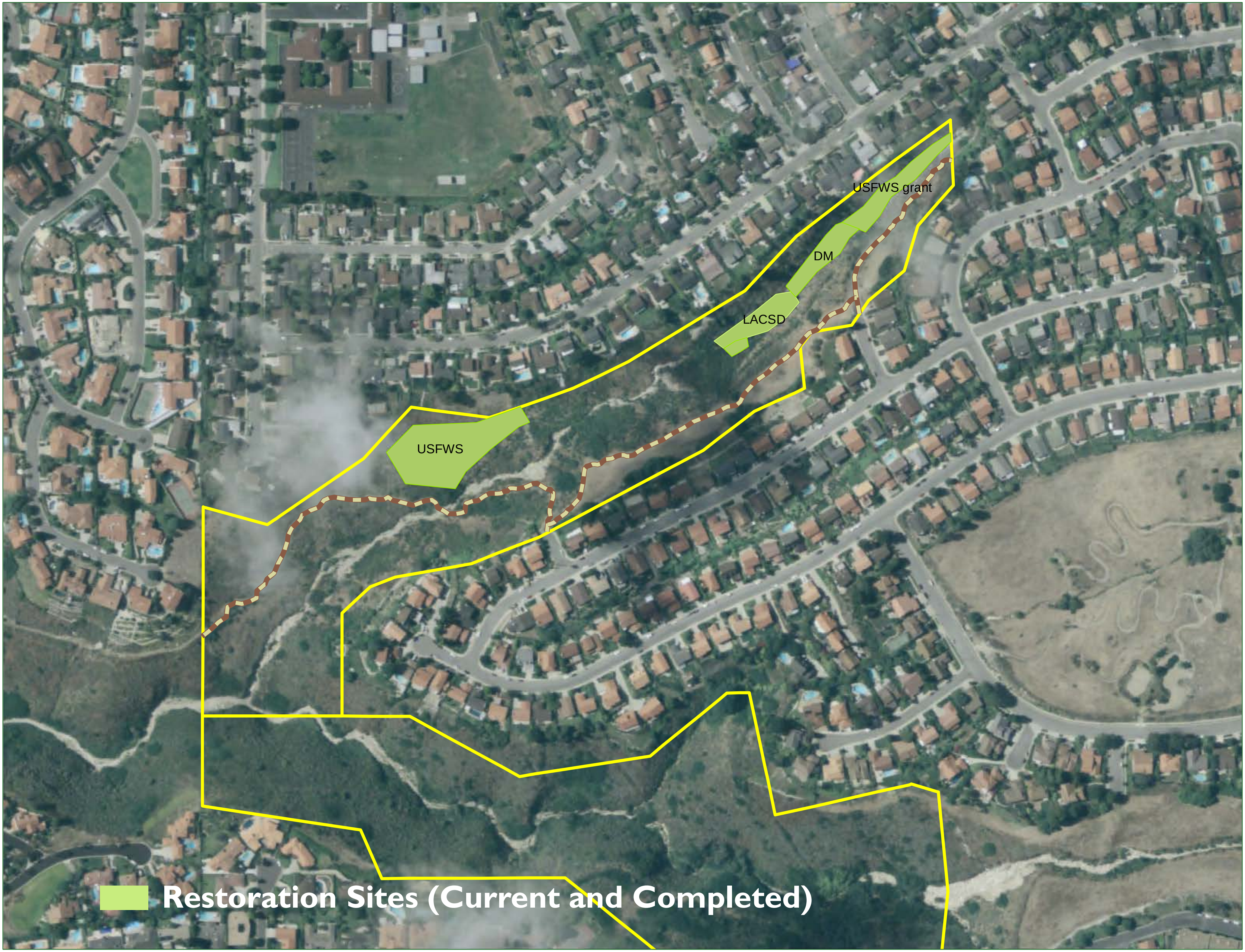
ALL RESTORATION PROJECTS

APPENDIX C. PALOS VERDES NATURE PRESERVE RESTORATION PROJECTS THROUGH 2017

	Funding source	Location	Habitat Type	Acres	Status	Start Date	End Date
NCCP/HCP							
Alta Vicente	NCCP/HCP	Phase 1	CSS	4.5	completed	2007	2014
Alta Vicente	NCCP/HCP	Phase 1	PVB habitat	0.5	completed	2007	2014
Alta Vicente	NCCP/HCP	Phase 2	CSS	4	active	2008	2015
Alta Vicente	NCCP/HCP	Phase 2	cactus scrub	0.5	active	2008	2015
Alta Vicente	NCCP/HCP	Phase 2	PVB habitat	0.5	active	2008	2015
Alta Vicente	NCCP/HCP/LA County Grant	Phase 3	CSS	4.5	active	2016	2021
Alta Vicente	NCCP/HCP/LA County Grant	Phase 3	wildlflowers	0.5	active	2016	2021
Alta Vicente	NCCP/HCP/LA County Grant	Phase 4	cactus scrub	1	active	2017	2022
Alta Vicente	NCCP/HCP/LA County Grant	Phase 4	PVB habitat	1	active	2017	2022
Alta Vicente	NCCP/HCP/LA County Grant	Phase 4	CSS	5	active	2017	2022
Portuguese Bend	NCCP/HCP	Phase 1 and 2	CSS	8	active	2010	2017
Portuguese Bend	NCCP/HCP	Phase 1 and 2	cactus scrub	2	active	2010	2017
Portuguese Bend	NCCP/HCP	Phase 3	CSS	5	active	2012	2018
Portuguese Bend	NCCP/HCP	Phase 4	CSS	5	active	2013	2019
Portuguese Bend	NCCP/HCP	Phase 5	CSS	4	active	2014	2020
Portuguese Bend	NCCP/HCP	Phase 5	cactus scrub	1	active	2014	2020
Additional Projects							
Abalone Cove	Coastal Conservancy, NFWF, SMBRC, USFWS		CSS	5	completed	2013	2016
Agua Amarga	USFWS		CSS	2	completed	2001	2003
Agua Amarga	USFWS		riparian	0.5	completed	2004	2005
Agua Amarga	LACSD		riparian	0.25	completed	2011	2016
Agua Amarga	D&M		riparian	0.2	completed	2012	2017
Portuguese Bend	El Segundo Mitigation	Ishibashi	CSS and grassland	9.5	completed	2010	2015
Portuguese Bend	HCF grant	Ishibashi	CSS	0.25	completed	2012	2015
Portuguese Bend	HCF grant	Peppertree	CSS	0.5	completed	2012	2015
Portuguese Bend	Local Assistance Grant		cactus scrub	3	completed	2010	2011

	Funding source	Location	Habitat Type	Acres	Status	Start Date	End Date
Three Sisters	LAWA		CSS	13.3	completed	2007	2013
Three Sisters	LAWA		grassland	7.7	completed	2007	2013
Three Sisters/McCarrell's Canyon	Coastal Conservancy		riparian	0.5	completed	2009	2012
Three Sisters/McCarrell's Canyon	Coastal Conservancy		CSS	2	completed	2009	2012
Vicente Bluffs	Coastal Conservancy		coastal scrub	2	completed	2009	2014
Vicente Bluffs	PVPLC	Adpot-a-Plot	ESB habitat	0.1	active	2016	ongoing

TOTAL	93.8


USFWS grant
DM
LACSD
USFWS
Restoration Sites (Current and Completed)


Phase 4
Phase 3
Phase 2
Phase 1
Coastal Conservancy Grant
Restoration Sites (Current and Completed)


LAG Cactus
NCCP Phase 5
NCCP Phase 1 & 2
NCCP Phase 3
NCCP Phase 4
El Segundo Mitigation
Ishibashi
LAWA
McCarrell Canyon
Peppertree
NCCP/HCP
Grant
Restoration Sites (Current and Completed)

APPENDIX D

TARGETED EXOTIC REMOVAL PROGRAM FOR PLANTS (TERPP)

1.0 INTRODUCTION

The Palos Verdes Peninsula Land Conservancy (PVPLC), as manager of the Palos Verdes Nature Preserve (PVNP), conducts strategic weed control activities throughout the year as part of the Targeted Exotic Plant Removal Plan for Plants (TERPP). As directed in the draft Rancho Palos Verdes Natural Communities Conservation Plan (NCCP/HCP), PVPLC selects five acres or 20 small sites of invasive plants for removal each year. The overall goal of this program is to systematically target invasive species throughout the PVNP to increase the success of native plant growth and create greater habitat opportunities for wildlife.

The TERPP is an element of the NCCP/HCP that includes a specific protocol for ranking exotic species populations and strategically removing those species over time (Appendix D1-D7). The 2018 TERPP Report documents PVPLC's effort over the past year to remove exotic plant species that threaten native vegetation in the PVNP. It details the methods of assessing the threat of individual exotic species to native vegetation, field methods for removal and provides site-specific documentation related to every completed removal site.

2.0 SITE ASSESSMENT

Invasive species control is included in PVPLC's annual conservation planning strategy where Stewardship staff prioritize potential TERPP sites and assess best practice methods for removal. PVPLC staff locate TERPP sites to target for the calendar year, assess the best method for eradication, photo document and map the population/s, and conduct weed removal accordingly.

The PVPLC weighs potential areas for exotic species control based on several criteria:

1. Threat to native vegetation, particularly populations of NCCP/HCP-covered species;
2. Feasibility of eradication, which includes limiting disturbance to native habitat and ease of access, and;
3. Invasiveness of exotic species, using a synthesized rating system drawn from plant invasiveness rankings from both the California Invasive Plant Council (Cal-IPC) and the California Department of Food and Agriculture (CDFA).

Through regular property reviews and viewing fine scale imagery through the Geographic Information System (GIS), ArcGIS, PVPLC plans for invasive species control across the entire Preserve area.

A sample of the TERPP field data collection form is in Appendix D1. The forms provide basic information about the species targeted, including site identification number and property, approximate location, removal methods used, and general comments related to the removal activities. PVPLC also includes photo documentation: staff photographs the sites before work takes place and after the removal of the individual or population of exotic species. Photo documentation not only confirms completion of the work, but also provides a snapshot of the surrounding environment at the time of the TERPP-related activities. This record helps to create a historical record of the presence of non-native plant species on the sites, which may inform future restoration efforts.

Each TERPP site is tracked via GIS, a tool that aids planning and monitoring efforts. PVPLC has treated 116 individual TERPP sites since 2006. As *Euphorbia terracina* is a high priority invasive and may take multiple treatments to control, these populations are treated in numerous years. In 2018, 21 TERPP sites were treated. These include 18 *Euphorbia terracina* populations as well as 3 Acacia removal sites within Cactus Wren Habitat (Table 1). The 3 Acacia removal sites totaled approximately 6.2 acres.

3.0 FIELD METHODS

PVPLC staff uses best practice, the most effective and least intrusive, methods at all times when conducting TERPP-related activities. High priority areas may occur near rare or endangered biological populations. Care is taken to minimize soil erosion, fire risk, disturbance to surrounding native vegetation and further dispersal of the exotic species. PVPLC utilizes a combination of methods to conduct exotic species removal, generally limited to the following:

- Mechanical removal - staff may use tools with motorized blades to fell larger species;
- Hand removal - staff conduct most removals by hand pulling and/or with small hand tools for pruning and cutting;
- Chemical control - trained staff applies herbicides at the appropriate phase of vegetative growth;
- Growth and seed maturation, and;
- Disposal - City of Rancho Palos Verdes staff coordinate with waste companies to supply green waste and trash containers.

Qualified Licensed Applicator(s) develop all recommendations for chemical pest control and senior staff supervises field staff and contractors in sensitive areas. Additionally, field staff has an integral role in the TERPP and often have crucial, site-specific knowledge related to the sites.

4.0 2018 TREATMENTS

In 2018, PVPLC treated 21 populations of invasive plants across seven reserves (Table 1, photopoints in Appendix D9). Of these, 18 were populations of *Euphorbia terracina* (Geraldton spurge, Euphorbia). Euphorbia grows rapidly in disturbed areas, is a prolific seeder and is rapidly expanding its distribution in southern California. Invaded areas show reduced ecological quality and reduced habitat quality compared to un-invaded areas. Euphorbia shows a broad habitat tolerance in southern California, invading both cool coastal areas and hot, dry, interior areas. Most of the populations of Euphorbia have been treated for several years, in attempts to keep it from spreading further into the Preserve. In addition to Euphorbia treatments, the 2018 TERPP treated three populations of *Acacia cyclops* (Coastal Wattle) at Filiorum, Three Sisters and Alta Vicente. These areas had occupied Cactus Wren habitat areas where Acacia had begun to overtake native cactus patches. In response to a decline in Cactus Wren populations, those were chosen as priorities for Acacia removal.

Table 1. 2018 TERRP Sites and Treatment Description

Stand ID	Reserve	Name	Stand Size	Number Individuals	Treatment	Percent Treated
AA_EuTe_01	Agua Amarga	*Euphorbia terracina*	10 – 100ft	50 - 100	Hand pull	75 - 100%
AA_EuTe_02	Agua Amarga	*Euphorbia terracina*	10 – 100ft	100 - 200	Herbicide	75 – 100%
AC_EuTe_05	Abalone Cove	*Euphorbia terracina*	300 - 600ft	100-200	Herbicide	75 - 100%
AV_EuTe_02	Alta Vicente	*Euphorbia terracina*	10 - 100ft	50-100	Herbicide	75 - 100%
AV_EuTe_03	Alta Vicente	*Euphorbia terracina*	300 - 600ft	200-500	Hand pull	75 - 100%
AV_EuTe_04	Alta Vicente	*Euphorbia terracina*	300 - 600ft	200-500	Herbicide	75 - 100%
PB_EuTe_02	Portuguese Bend	*Euphorbia terracina*	1 – 10ft	1 - 10	Hand pull	75 – 100%
PB_EuTe_03	Portuguese Bend	*Euphorbia terracina*	1 – 10ft	1 - 10	Hand pull	75 -100%
PB_EuTe_04	Portuguese Bend	*Euphorbia terracina*	10 – 100ft	10 - 50	Hand pull	75 – 100%

PB_EuTe_05	Portuguese Bend	*Euphorbia terracina*	1 – 10ft	1 - 10	Hand pull	75 – 100%
PB_EuTe_07	Portuguese Bend	*Euphorbia terracina*	100 – 300ft	50 - 100	Herbicide	75 – 100%
PB_EuTe_08	Portuguese Bend	*Euphorbia terracina*	>1,000ft	100 - 200	Hand pull	75 – 100%
PB_EuTe_09	Portuguese Bend	*Euphorbia terracina*	300 – 600ft	100 - 200	Herbicide	75 – 100%
PB_EuTe_10	Portuguese Bend	*Euphorbia terracina*	1 – 10ft	10 - 50	Hand pull	75 – 100%
TS_EuTe_01	Three Sisters	*Euphorbia terracina*	600 - 1000ft	500 - 1000	Herbicide	75 - 100%
TS_EuTe_02	Three Sisters	*Euphorbia terracina*	300 - 600ft	500 - 1000	Hand pull	50 - 75%
TS_EuTe_03	Three Sisters	*Euphorbia terracina*	100 – 300ft	200 - 500	Herbicide	75 – 100%
VB_EuTe_02	Vicente Bluffs	*Euphorbia terracina*	1 - 10ft	20	Hand pull	75 - 100%
AV_AcCy_01	Alta Vicente	*Acacia cyclops*	.82 acres		Cut Stump	75 - 100%
TS_AcCy_03	Three Sisters	*Acacia cyclops*	2.3 acres		Cut Stump	75 - 100%
FI_AcCy_01	Filiorum	*Acacia cyclops*	3.08		Cut Stump	75 - 100%

5.0 REFERENCES

California Invasive Plant Council 2006. California Invasive Plant Inventory. February. California Invasive Plant Council: Berkley, CA.

Palos Verdes Peninsula Land Conservancy 2007a. 2007 Targeted Exotic Removal Plan for Plants for the Portuguese Bend Nature Preserve For the Rancho Palos Verdes Draft Natural Community Conservation Plan and Habitat Conservation Plan. April.

Palos Verdes Peninsula Land Conservancy 2008. 2008 Annual Report for the Targeted Exotic Removal Program for Plants for the Portuguese Bend Nature Preserve For the Rancho Palos Verdes Draft Natural Community Conservation Plan and Habitat Conservation Plan. September.

State of California 2007. Department of Food and Agriculture Division of Plant Health & Prevention Services Noxious Weed Ratings. Retrieved September 2007, from: <http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/pdfs/noxiousweed_ratings.pdf>.

URS 2006. City of Rancho Palos Verdes Draft Natural Community Conservation Plan and Habitat Conservation Plan. June 9.

APPENDIX D1: SAMPLE TERPP FORM

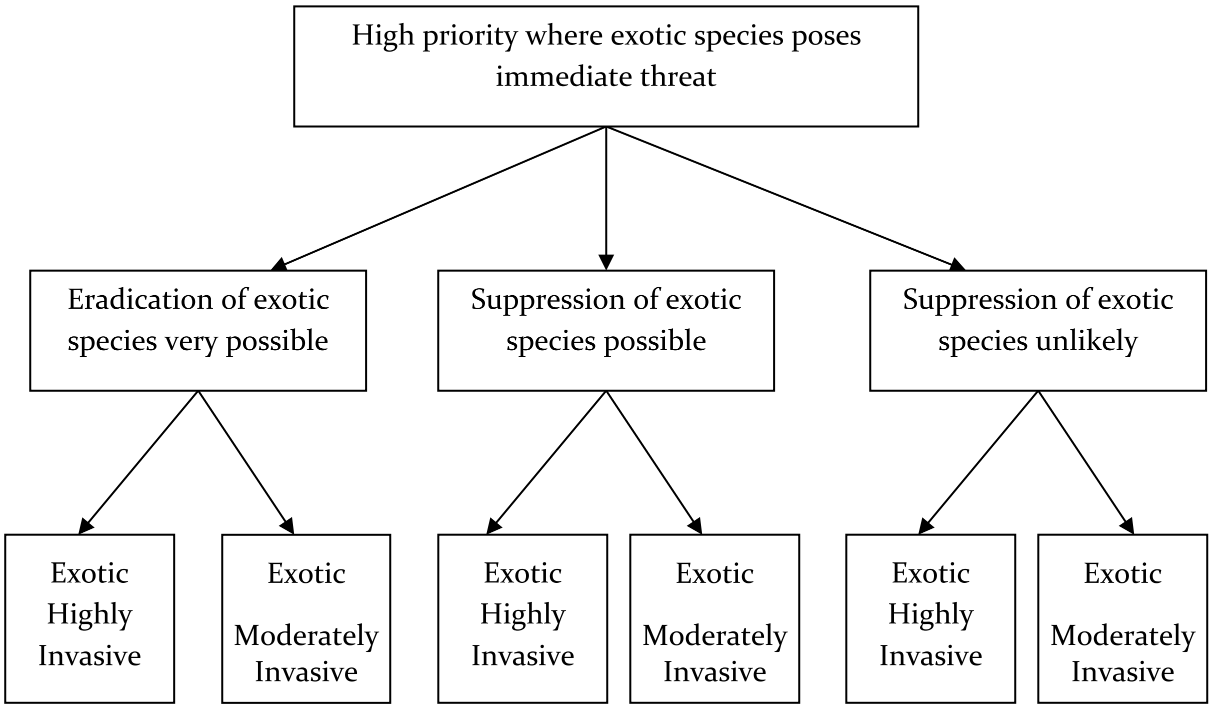
Invasive Weed Mapping Field Datasheet

Survey Type New Infestation Assesment Treatment	**Surveyor's Name**
Date **Species** **Preserve**	**Location Description:**
Stand ID **Stand Size** 1 ft^2 - 10 ft^2 10 ft^2 - 100 ft^2 100 ft^2 -300ft^2 300 ft^2 - 600 ft^2 600 ft^2 - 1000 ft^2 > 1000 ft^2	**Surrounding Vegetation Type:** cactus scrub coastal sage scrub riparian bluff grassland non-native plants trail non-native annual grass (NNAG) Other
No. Individuals 1-10 10-50 50-100 100-200 200-500 500-1000 >1000 **Percent Canopy Cover** 1-5% 5-10% 10-25% 25-50% 50-75% +75% **Plant Phenology** Flowering Non-Flowering Fruiting **Plant Age** Seedling Juvenile Mature Dead	**Stand Comments:**
Treatment Type Hand pull Herbicide Hand-pull/Herbicide Weed-whip Mulch Tree removal Other **Area Treated** 1 ft^2 - 10 ft^2 10 ft^2 - 100 ft^2 100 ft^2 - 300 ft^2 300 ft^2 - 600 ft^2 600 ft^2 - 1000 ft^2 > 1000 ft^2 **Percent of Infestation Treated** 0-25% 25-50% 50-75% 75-100%	**Treatment Comments:**
Photo Image Numbers:	**Additional Comments:**

Stand ID Example: AC_EuTe_01_yyyy.mm.dd.jpg
Preserve abbreviations:
AA - Agua Amarga AC - Abalone Cove AV - Alta Vicente CP - Chandler Preserve DF - DFSP GF - George F
FI - Filiorum FO - Forrestal OT - Ocean Trails PB - Portugeuese Bend SR - San Ramon
TS - Three Sisters VB - Vicente Bluffs VN - Vista del Norte WP - White Point OR - Other

Rev 3/13

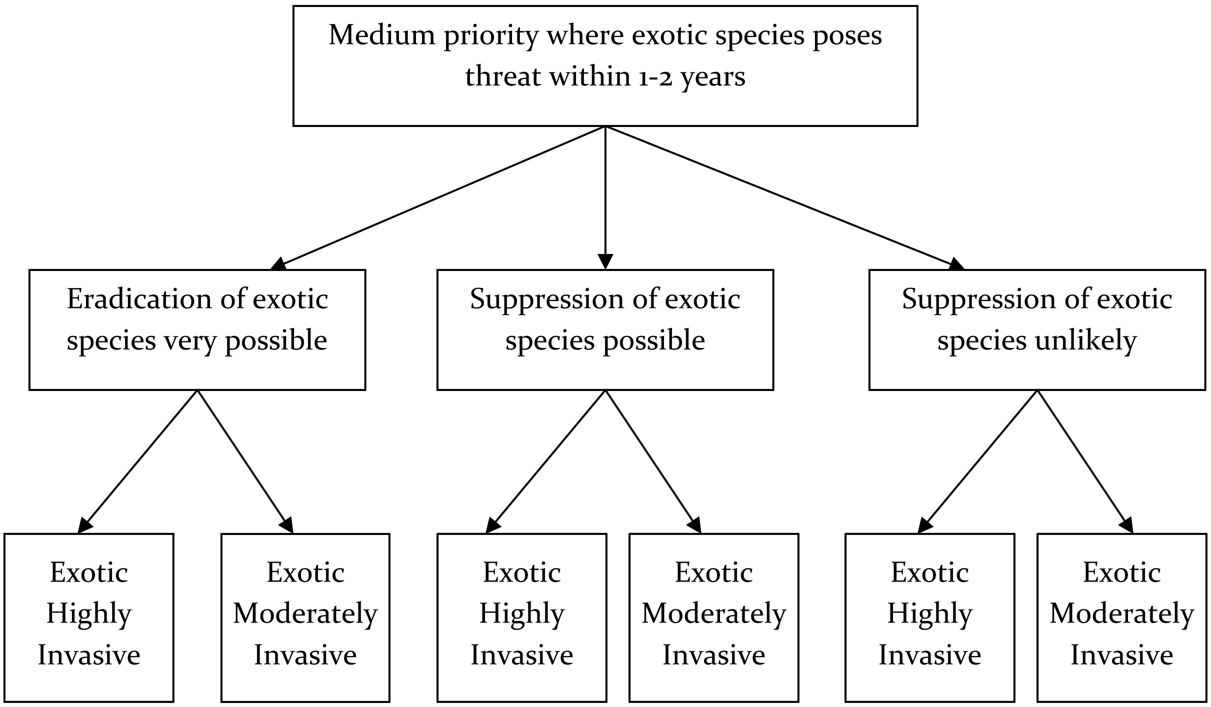
APPENDIX D2: FLOWCHART FOR HIGH PRIORITY THREAT TO NATIVE VEGETATION



Priority Ranking For Control of Exotic Species

1-3= Low priority 4-7= Medium priority 8-10= High priority

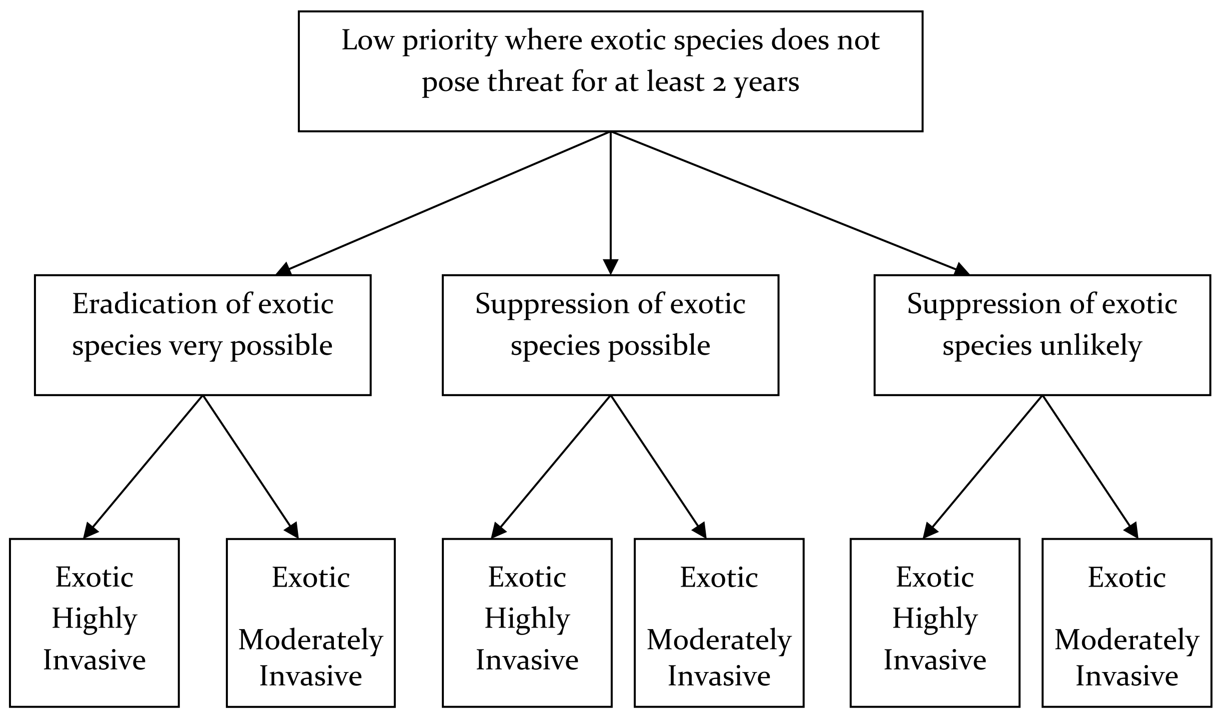
APPENDIX D3: FLOWCHART FOR MEDIUM PRIORITY DEGREE OF THREAT TO NATIVE VEGETATION



Priority Ranking For Control of Exotic Species

1-3= Low priority   4-7= Medium priority   8-10= High priority

APPENDIX D4: FLOWCHART FOR LOW PRIORITY DEGREE OF THREAT TO NATIVE VEGETATION



Priority Ranking For Control of Exotic Species

1-3= Low priority   4-7= Medium priority   8-10= High priority

APPENDIX D5: HIGHLY INVASIVE SPECIES

Genus species	**Common name**
Arundo donax	Giant reed
Asparagus asparaagoides	Bridal creeper
Avena barbata	Slender oat
Avena fatua	Wild oat
Brachypodium distachyon	False brome
Brassica nigra	Black mustard
Bromus diandrus	Ripgut grass
Bromus madritensis ssp. rubens	Red brome
Carpobrotus edulis	Hottentot fig
Caesalpinia spinosa	Spiny holdback
Centaurea melitensis	Tocalote
Chrysanthemum coronarium	Garland chrysanthemum
Cortaderia selloana	Pampas grass
Cynodon dactylon	Bermuda grass
Euphorbia terracina	Spurge
Foeniculum vulgare	Fennel
Malva nicaeensis	Bull mallow
Malva parviflora	Cheeseweed
Malva sylvestris	Mallow
Mesembryanthemum crystallinum	Annual iceplant
Nicotiana glauca	Tree tobacco
Pennisetum clandestinum	Kikuyu grass
Pennisetum setaceum	Fountain grass
Picris echioides	Bristly ox-tongue
Pistacia atlantica	Pistachio

Pittosporum undulatum	Pittosporum
Raphanus sativus	Wild radish
Ricinus communis	Castor bean
Salsola tragus	Russian thistle
Silybum marianum	Milk thistle
Sonchus asper	Prickly sow thistle
Sonchus oleraceus	Sow thistle
Spartium junceum	Spanish broom
Tamarix species	Tamarisk
Tropaeolum majus	Garden nasturtium

APPENDIX D6: MODERATELY INVASIVE SPECIES

Genus species	Common Name	Genus species	Common Name
Acacia cyclops	Acacia	*Limonium perezii*	Sea lavender
Acacia species	Acacia	*Limonium sinuatum*	Sea lavender
Aegilops cylindrica	Jointed goat grass	*Lobularia maritima*	Sweet alyssum
Ageratina adenophorum	Eupatory	*Lolium multiflorum*	Italian rye
Atriplex semibaccata	Australian saltbush	*Lolium perenne*	Perennial ryegrass
Bassia hyssopifolia	Five-Hook bassia	*Marrubium vulgare*	Horehound
Bromus hordeaceus (mollis)	Soft brome	*Medicago polymorpha*	Bur clover
Bromus catharticus	Rescue grass	*Medicago sativa*	Alfalfa
Cakiel maritime	Sea rocket	*Melilotus albus*	White sweet clover
Carduus pycnocephalus	Italian thistle	*Melilotus indicus*	Yellow sweet clover
Carpobrotus aequilaterus	Sea Fig	*Myoporum laetum*	Myoporum
Carpobrotus chilensis iceplant	Fig-Marigold	*Olea europea*	Olive
		Oxalis pes-caprae	Bermuda buttercup
Conium maculatum	Poison hemlock	*Pelargonium zonale*	Zonal geranium
Convolvulus arvensis	Bindweed	*Phalaris minor*	Phalaris
Erodium cicutarium	Red stem filaree	*Phoenix canariensis*	Phoenix palm
Eucalyptus camaldulensis	Red gum tree	*Piptatherum miliacea*	Smilo grass
Eucalyptus globulus	Blue gum tree	*Pittosporum undulatum*	Pittosporum
Eucalyptus species	Gum tree	*Plantago lanceolata*	English plantain
Hirschfeldia incana	Annual mustard	*Polygonum aviculare*	Knotweed
Hordeum murinum leporinum	Foxtail barley	*Polypogon monspessulensis*	Rabbitsfoot
Hordeum vulgare	Common barley	*Pyracantha sp.*	Firethorn
Lactuca serriola	Compass plant	*Rumex crispus*	Curly dock
Lathyrus tangianus	Tangier pea		

Schinus molle	Mexican pepper	*Washington robusta*	Mexican fan palm
Schinus terebinthifolius	Brazilian pepper	*Vicia sativa*	Spring vetch
Sisymbrium irio	London rocket	*Vulpia myuros varhirsuta*	Annual fescue
Trifolium hirtum	Rose clover	*Vulpia myuros var myuros*	Rattail fescue

APPENDIX D7: EXOTIC, NON-INVASIVE SPECIES

Scientific Name	Common Name	Genus species	Common Name
Amaranthus albus	Tumbleweed	*Gnaphalium luteo-album*	White cudweed
Anagallis arvensis	Pimpernel	*Koehlreuteria species*	Koehlreuteria
Apium graveolens	Celery	*Lamarckia aurea*	Goldentop
Aptenia cordifolia	Baby sun-rose	*Lantana montevidensis*	Lantana
Atriplex glauca	Saltbush	*Lathyrus odoratus*	Sweet pea
Bidnes pilosa	Common beggar-ticks	*Lycium species*	Lycium
Capsella bursa-pastoris	Shepherd's purse	*Lycopersicon esculentum*	Garden tomato
Centranthus rubber	Red valerian	*Malephora crocea*	Mesemb
Ceratonia siliqua	Locust bean tree	*Melaleuca species*	Melaleuca
Chamaesyce maculata	Spotted spurge	*Mesembryanthemum nodiflorum*	Iceplant
Chenopodium album	Lamb's quarters	*Osteoapermu fruticosum*	African daisy
Chenopodium ambrosioides	Mexican tea	*Oxalis corniculata*	Woodsorrel
Chenopodium murale	Nettleleaf goosefoot	*Paspalum dilatatum*	Dallis grass
Conyza canariensis	Horseweed	*Pinus halepensis*	Alepppo pine
Coronilla valentina	Coronilla	*Plantago major*	Plantain
Cyperus involucratus	Umbrella plant	*Poa annua*	Bluegrass
Digitaria sanguinalis	Hairy crabgrass	*Polygonum arenastrum*	Knotweed
Echium fastuosum	Pride of madeira	*Senecio vulgaris*	Groundsel
Erodium botrys	Long-beaked filaree	*Silene gallica*	Common catchfly
Euphorbia lathyris	Gopher plant	*Triticum aestivum*	Cultivated wheat
Euphorbia peplus	Petty spurge	*Urtica urens*	Dwarf nettle
Filago gallica	Narrow-leaf filago	*Veronica anagallis-aquatica*	Water speedwell
Fraxinus uhdei	Shamel ash	*Yucca species*	Spanish bayonet
Gazania species	Gazania		
Geranium carolinianum	Geranium		

APPENDIX D

2018 TARGETED EXOTIC REMOVAL PROGRAM FOR PLANTS (TERPP) PHOTOS (Before & After)

AA_EuTe_01

AA_EuTe_02

AC_EuTe_05

AV_EuTe_02

AV_EuTe_03

AV_EuTe_04

PB_EuTe_02

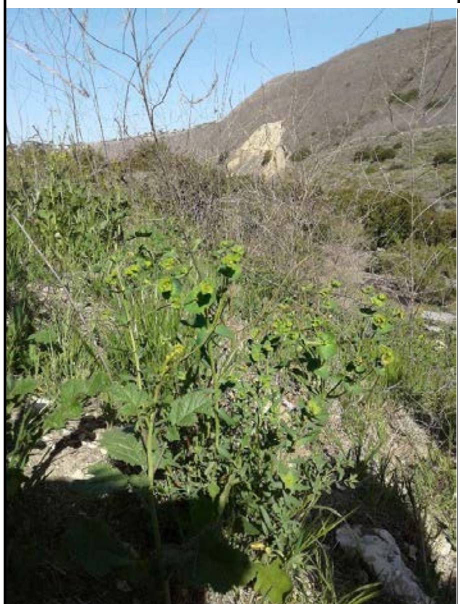
PB_EuTe_03

PB_EuTe_04

PB_EuTe_05

PB_EuTe_07

PB_EuTe_08



PB_EuTe_09

PB_EuTe_10

TS_EuTe_01

TS_EuTe_02

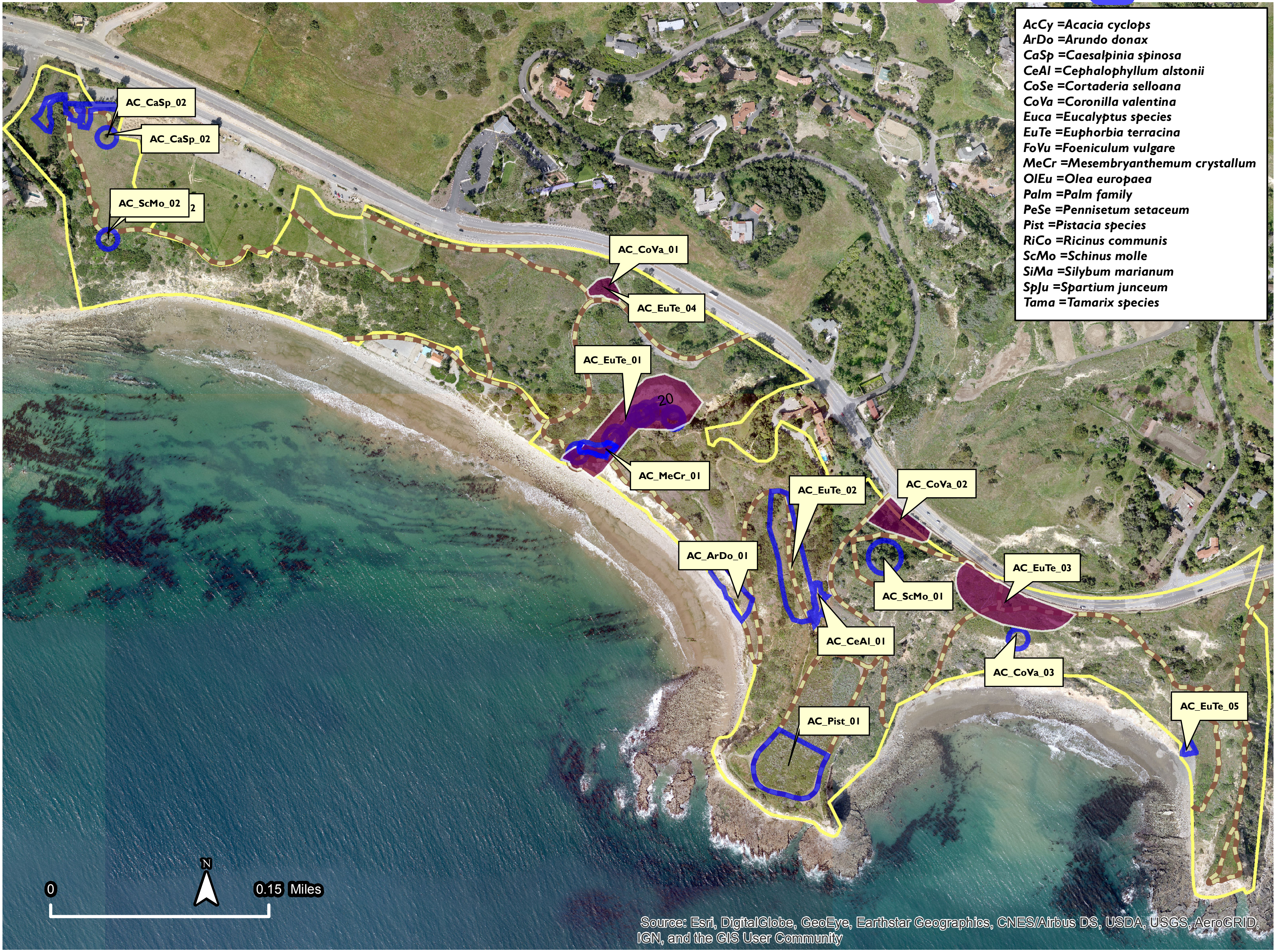
VB_EuTe_02

TERPP Sites: ***AGUA AMARGA***

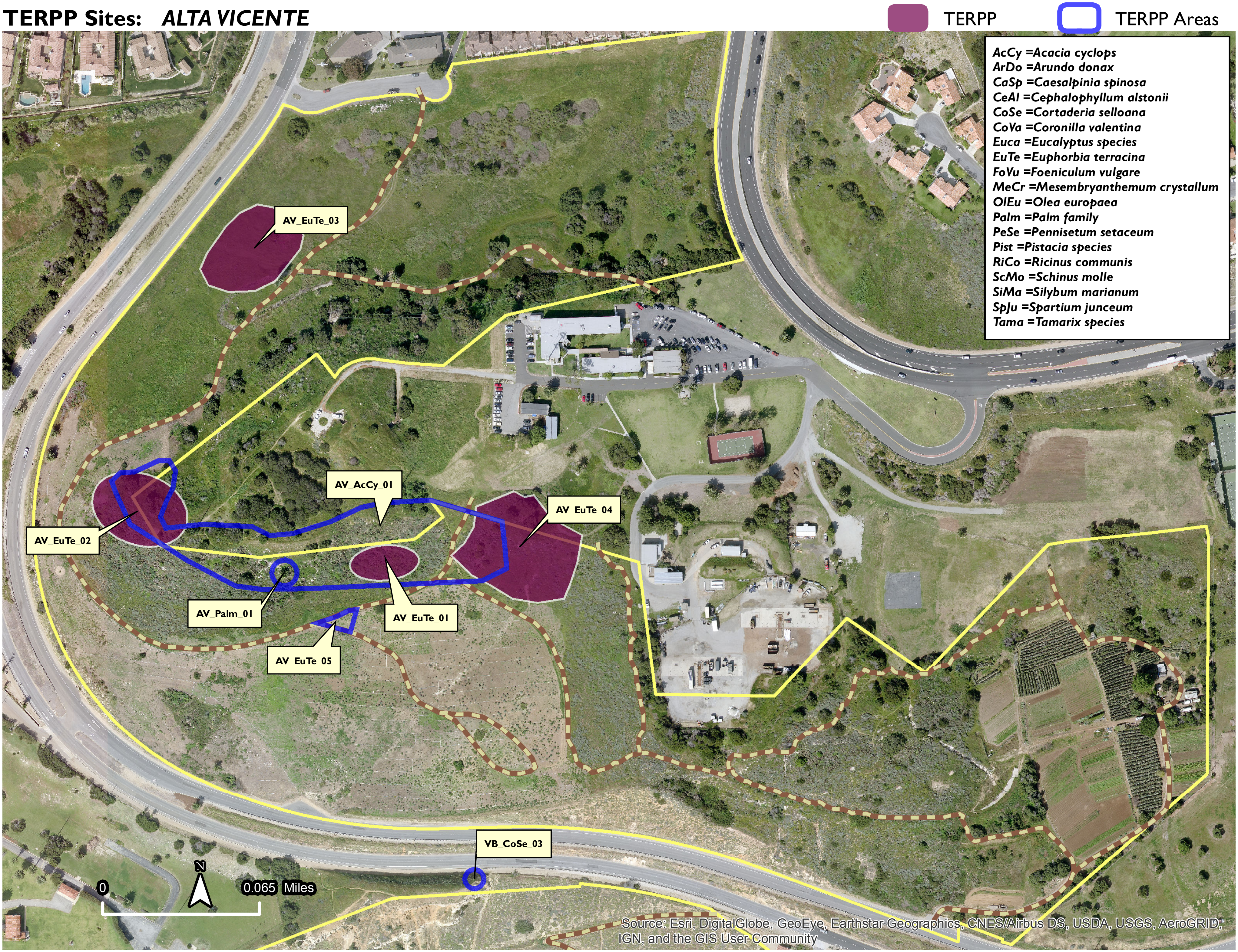
TERPP TERPP Areas

TERPP Sites: *ABALONE COVE*

TERPP
TERPP Areas



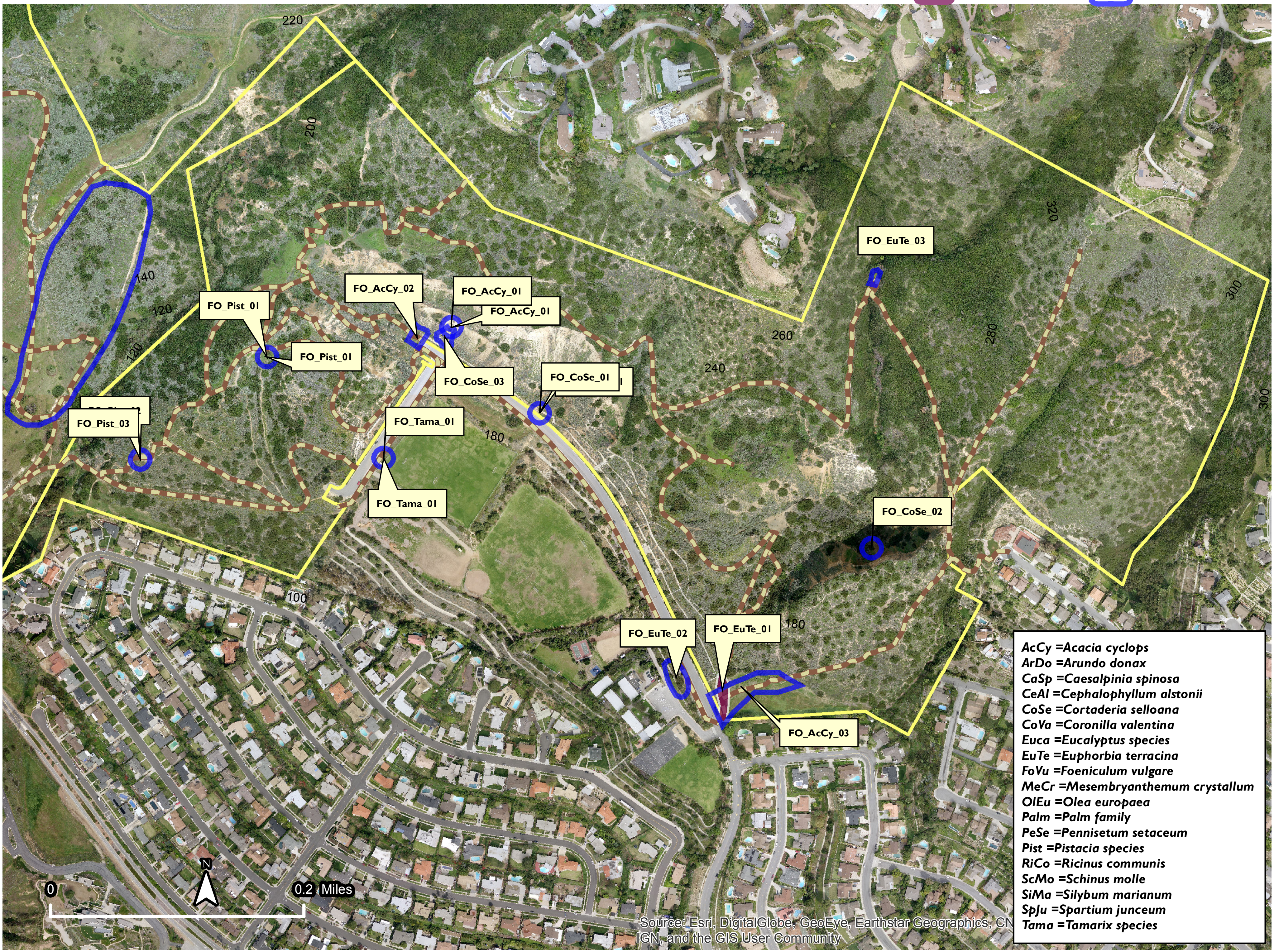
TERPP Sites: *ALTA VICENTE*



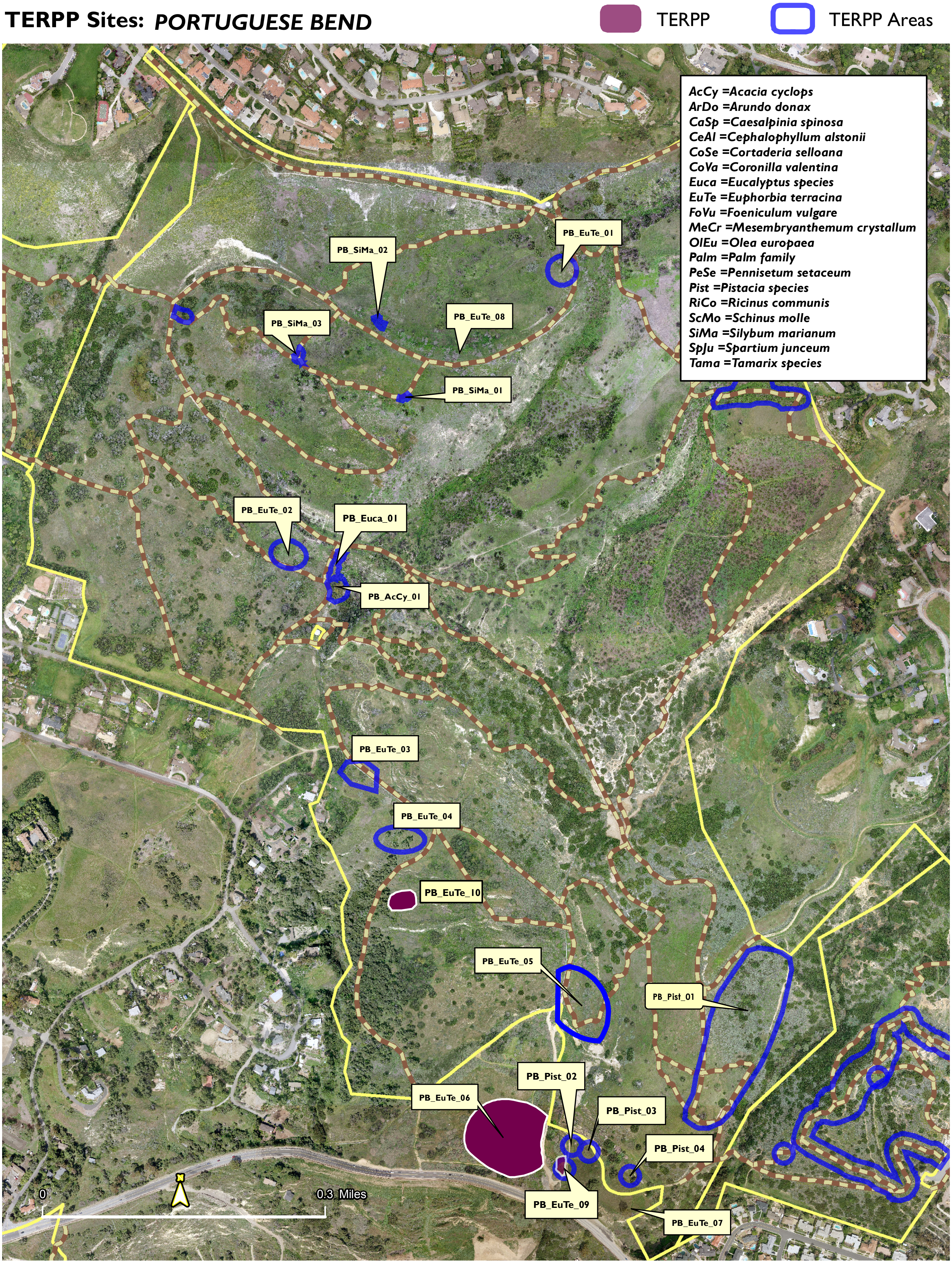
TERPP Sites: *FILIORUM*

TERPP Sites: *FORRESTAL*

TERPP
TERPP Areas



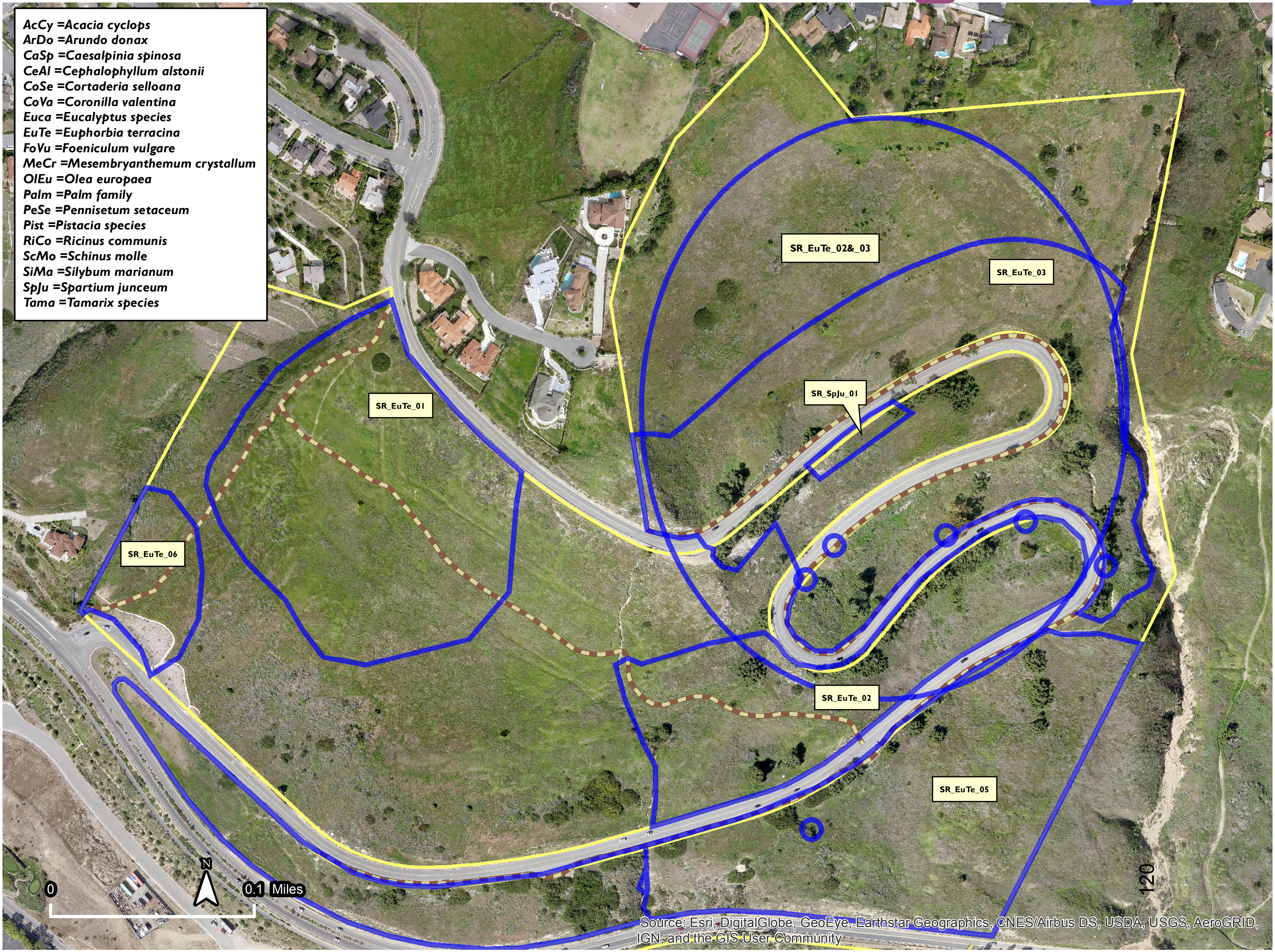
TERPP Sites: *PORTUGUESE BEND*



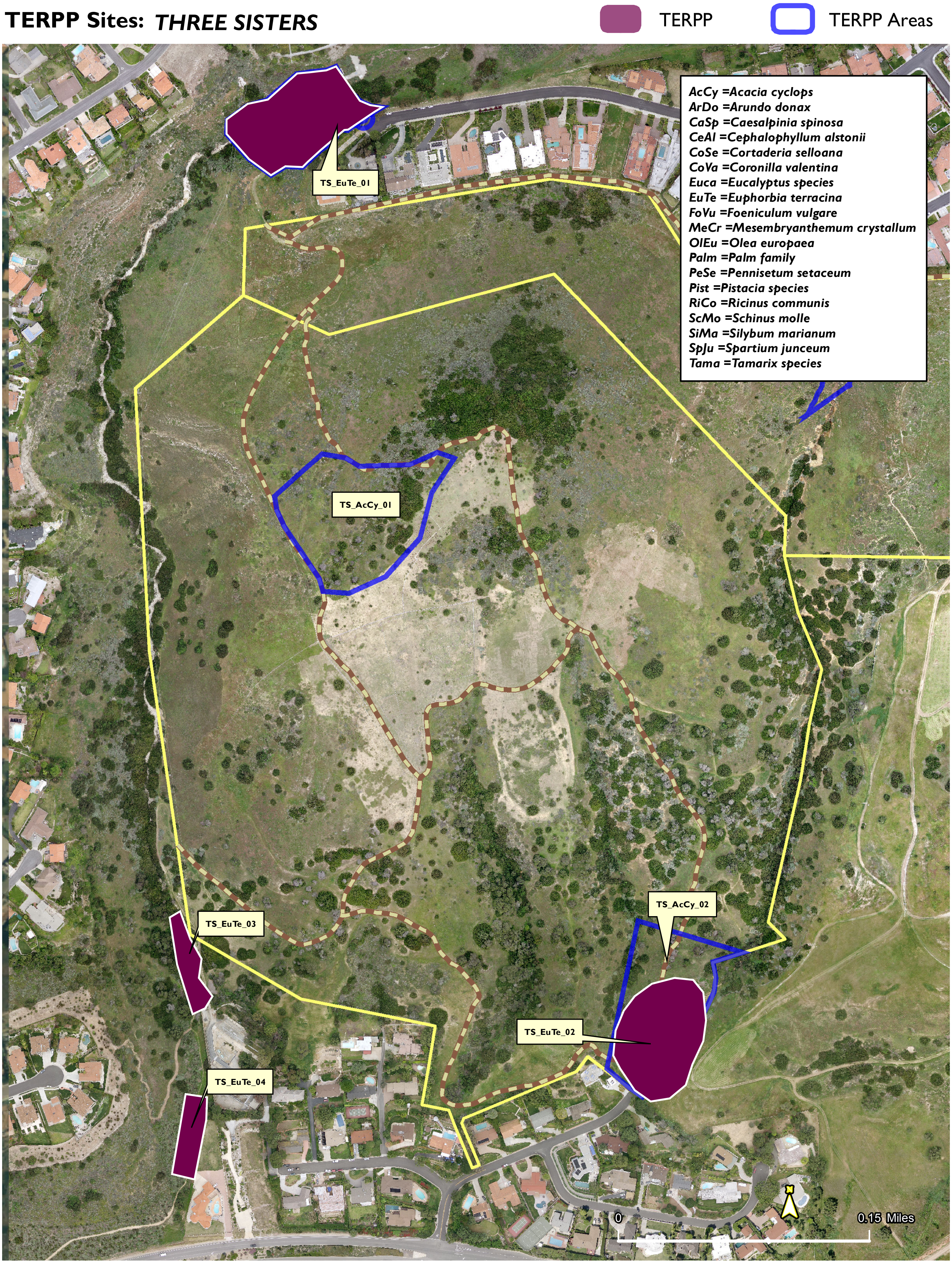
TERPP Sites: ***SAN RAMON***

TERPP

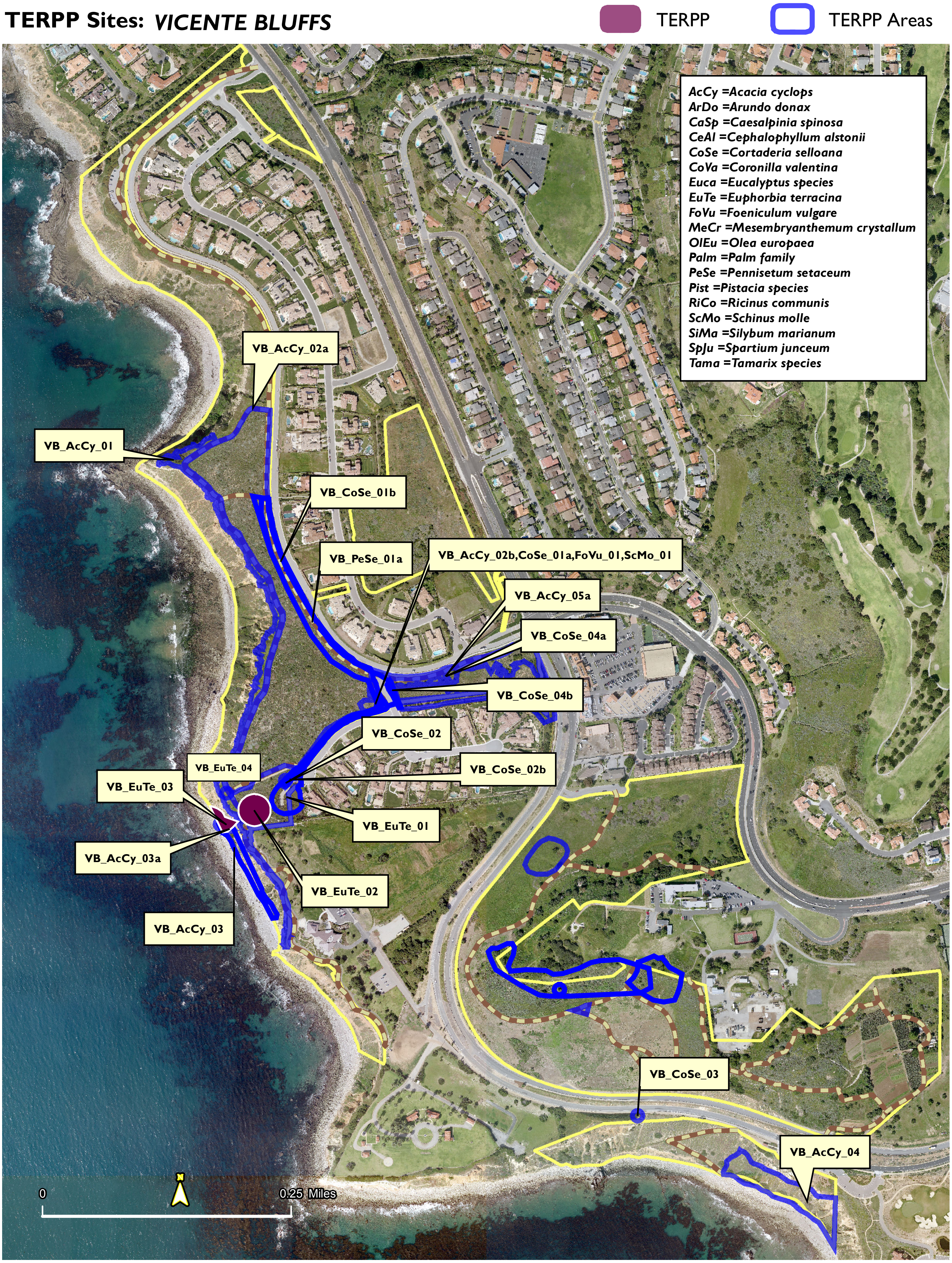
TERPP Areas



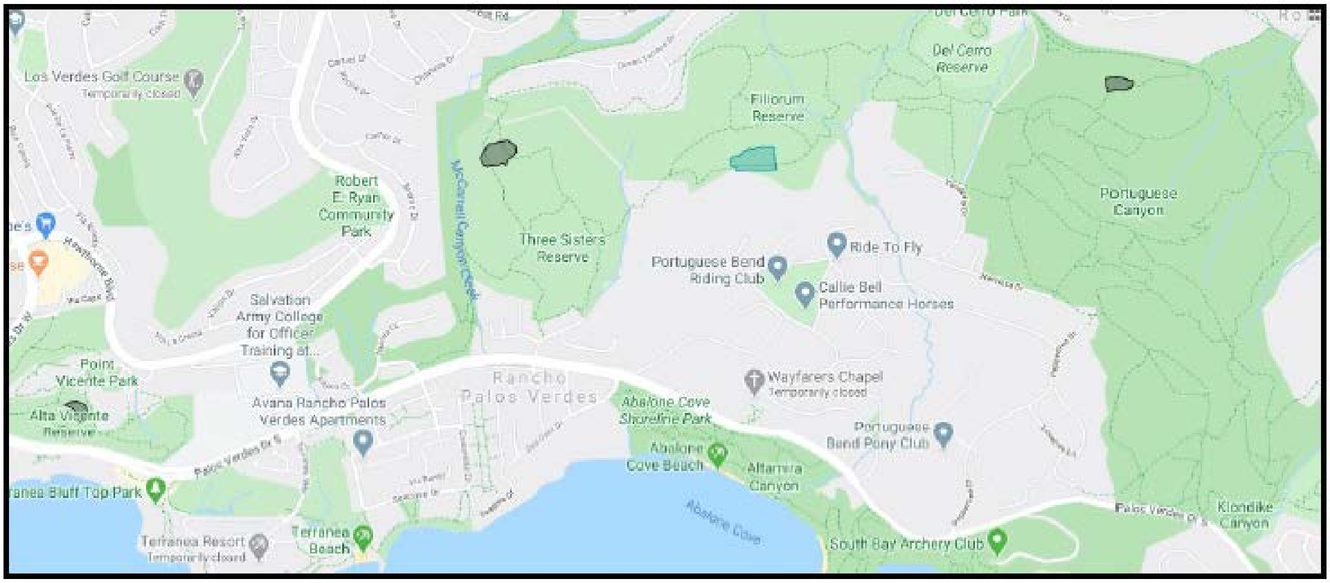
TERPP Sites: ***THREE SISTERS***



TERPP Sites: *VICENTE BLUFFS*



Acacia Removal sites for Cactus Enhancement



APPENDIX E

CITIZEN SCIENCE AND EDUCATION PROGRAMS

1.0 INTRODUCTION

PVPLC implements an integrated approach to stewardship by involving students and community volunteers in programs that addresses specific conservation issues related to the management of the Palos Verdes Native Preserve. In 2018, high school and university students as well as community members participated in research that not only satisfied their educational and/or personal goals, but also contributed to informing PVPLC land management activities. The Citizen Science Program, initiated in Fall 2013, has brought volunteers to PVPLC for focused studies in the preserves. Citizen Science projects completed in 2018 include the Cactus Wren Monitoring Program and the Wildlife Tracking Program.

University professors are crucial for the success of research, as they provide expertise and technical guidance in managing several research projects. Land Conservancy staff provides access to the preserves as well as technical support to participants.

This report covers the Research and Education Program's activities via the major categories:

- High School Research
- University Researchers
- Citizen Science Programs

2.0 HIGH SCHOOL RESEARCH

High school and college students are important to PVPLC's field research. By participating in PVPLC's research program with professionals and university researchers, high school students obtain field and analytical skills in the natural science fields. Additionally, students increase their appreciation of nature while expanding their awareness of opportunities that the natural science fields have to offer. As a result, PVPLC students often win honors in science fairs and are able to leverage their experience for gaining entrance into top universities, satisfying course credits, or obtaining paid internships. In 2018, no High School students conducted research with PVPLC.

3.0 UNIVERSITY STUDENTS

College students from local universities participate in research under the umbrella of the Conservancy's Intern and Citizen Science programs (Table. 1). Students participate in activities integral to land management and conservation, which provides the students valuable hands-on experience. PVPLC's stewardship staff conducts a variety of surveys throughout the preserves for assessing habitat quality as well as documenting the progress of our restoration efforts. The Conservancy's Interns participated in vegetation assessment surveys as well as entered the resulting data into the database. They also developed data tables for reports and conducted the initial stages of the report writing.

In addition to gaining work experience, many students leverage their internships for entrance into a professional job or graduate school. While the Conservancy benefits from their work, the students benefit from experience and training that will benefit them in future careers.

Table 1. 2018 Collegiate research conducted

Student	Project Title	Academic Institution
Noortje Grijseels	Yard futures: alternative futures for American residential macrosystem	*University of Utah*
Emma Romero	Effect of noise and light pollution on insect populations with urban Los Angeles County	*Whittier College*

4.0 CITIZEN SCIENCE PROGRAMS

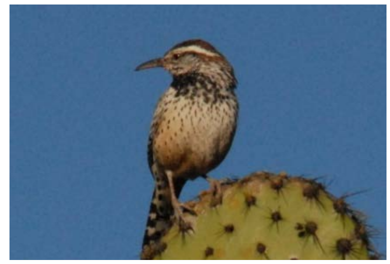
Volunteers are important for PVPLC, not only helping with growing plants, habitat restoration, guiding walks, and special events, but also with science research and education. Our volunteers travel from throughout the Peninsula and surrounding areas to help out.

Volunteers learn the basics of cactus wren observations before starting the first Citizen Science Cactus Wren monitoring season.

The Citizen Science program blossomed in 2013 with the initiation of the Cactus Wren Program along with the ongoing Wildlife Tracking Program. The initial Cactus Wren Program resulted in detailed analysis of how the birds utilize mature cactus scrub habitat and newly-restored habitat at Alta Vicente Reserve. In addition, the volunteers were able to obtain detailed documentation of a single pair of cactus wrens as the wrens built a nest, incubated eggs, and successfully fledged three chicks. Monitoring work in 2018 focused on cactus wren occupancy of specific delineated cactus patches within the Palos Verdes Nature Preserve. This information described varying levels of cactus wren occupancy across the Preserve and made possible the inference of breeding activity based on a number of criteria.

The 2018 Wildlife Tracking Program took place in the fall, beginning with training the volunteers for tracking coyotes, red fox, and gray fox, among many other species in the Preserve. Once volunteers were confident in identifying tracks and scat of a particular species, they individually conducted regular surveys along specific routes. The data were submitted to the Conservancy for use in its management. A map was also created to illustrate the location of scat or track observations. Motion-sensor cameras were integrated in the Wildlife Tracking Program and captured both images and video of wild canid species. High quality images allowed for the identification of individual coyotes providing insight into coyote population dynamics and movement throughout the Preserve.

Coastal Cactus Wren
(*Campylorhynchus brunneicapillus*)
Citizen Science Monitoring
2018



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Surveyed by: Dan Loether, Cristy Varni, Joe Gutierez, Ben Smith and class, Dee Edridge, Tania Morris, Jim Rassler, Sarah Valdez, Ann Dalkey, Mike Bell, Dana Blasingame, Willow Eichler, Maria Valdez, Joan Krause, Donna McLaughlin, Lynn Yamaoka, and Gary Scimeca.

INTRODUCTION

The coastal cactus wren (*Campylorhynchus brunneicapillus*) (CAWR) on the Palos Verdes Peninsula is a special status species that lives exclusively in coastal sage scrub habitat areas. They prefer areas of at least one acre in size containing 30% prickly pear cactus (*Opuntia spp.*) and large specimens of coastal cholla (*Cylindropuntia prolifera*). Habitat preferences for nesting are strict, with nesting substrate almost entirely restricted to prickly pear and cholla (Rea and Weaver 1990). Ninety percent of their foraging time is spent on the ground, feeding on insects year-round, and feeding on fruit and plants during cooler months. Adult birds are highly sedentary and tend to return to the same breeding territory each year. In a 1993-1997 study on the Palos Verdes Peninsula, ornithologist Jon Atwood found that 65% of the juveniles dispersed less than one kilometer from their natal territory (Atwood 1998). The wren's natural tendency to stay close to its natal territory and not move great distances underscores the importance of having quality habitat throughout the preserves

Following the formal establishment of the Citizen Science Cactus Wren Program in 2014, volunteer work focused on assessing how CAWR utilize their habitat. The goal was to obtain data that would inform the Conservancy how to better manage cactus habitat for the bird and to build new habitat. Those two years were quite successful in meeting that goal, as we now have a better understanding of how close the wrens stay to their habitat (very close) and how much they explore developing habitat (infrequently, unless they are feeding growing chicks and need to expand their forage area).

Despite the ability of previous surveys to identify the CAWR behavior relating to dispersal, locating areas of CAWR inhabitance has proven challenging. As shown by ornithologist Dan Cooper, who conducted comprehensive triennial cactus wren surveys in 2009, 2012, and 2015, the numbers of CAWR has varied over time, counting the same number of territories in 2009 and 2015 (25) and more counted in 2012 (48). Because of the triennial frequency of the surveys, it is difficult to determine whether or not these trends are true or an artifact of sampling.

Participants in the Citizen Science Cactus Wren Program can help answer the question: Where are cactus wrens found in the preserves? To address this question, teams of volunteers regularly hike the trails, noting when CAWR are heard and/or seen, beginning in April and continuing through July. This period coincides with the more active period for the wrens when they are nesting and caring for newly fledged chicks. These repeated visits provide data that indicates where birds are likely to be, and the variation of their distribution year-to-year to augment the triennial surveys conducted by the Conservancy's ornithologist

METHODS

Study Area:

The study area was within seven reserves (Portuguese Bend, Alta Vicente, San Ramon, Ocean Trails, Forrestal, Filiorum, and Three Sisters) of the Palos Verdes Nature Preserve located in the city of Rancho Palos Verdes, CA. The reserves surveyed were those which had been documented to support CAWR activity or extensive patches of prickly pear (*Opuntia littoralis* and *O. oricola*) and cholla *(Cylindropuntia prolifer*a) (Cooper Ecological Monitoring 2013).

Figure 1. Study area within the Palos Verdes Peninsula Nature Preserve.

Data Collection:
Volunteers for the Citizen Science Program met prior to the start of the monitoring season to learn how to identify CAWR in their habitat, how to record field observations, and how to generate and send data electronically on Excel spreadsheets to the Conservancy. Teams were formed for the monitoring season, pairing more experienced volunteers with those having little or no birding experience. The enthusiastic volunteers then took to the field outfitted with binoculars, spotting scopes, and cameras equipped with telephoto lenses.

The volunteers conducted at least two surveys for each month of the survey period (April through July). Volunteers walked their predetermined trail route documenting visual or audial observations of CAWR. This information was recorded on field data sheets (Figure 1). Additionally, weather and wind observations were included because the birds' presence is impacted unduly by weather. No surveys were conducted during rainy days and high winds greater than 19 mph (30 km/hr). Surveys were typically conducted during late morning. All electronic field observations were archived in the Conservancy's database, and maps depicting wren inhabitance were archived in PDF format on the Conservancy's server.

Data Analysis:
Collected data were analyzed on the basis of four criteria that describe the level of CAWR inhabitance specific to each cactus patches surveyed. These criteria allowed each cactus patch to receive a rating category reflecting the level of CAWR inhabitance observed. These ratings assist in the interpretation of survey data and specifically allow for the inference, in general terms, of potential CAWR behavior, habitat quality, and other factors relative to inhabitance. Categorization is also helpful in providing a scale of inhabitance for each cactus patch that can be mapped. Subsequent ratings associated with each patch were mapped using ArcMap 10.3 which allowed for a color gradient to describe the various

inhabitance ratings throughout the surveyed reserves (Figures 2-9) as well as a map depicting the highest rating found within each reserve (Figure 10).

Inhabitance Rating Categories

Categories were developed to assist in the interpretation of survey data and to infer in general terms potential CAWR behavior, habitat quality, and other factors related to CAWR inhabitance. This categorization is also helpful in providing a scale of inhabitance that can be mapped such that different levels of inhabitance may be compared to each other. Categorical ratings based on four descriptors were extracted from the data:

Inhabitance Descriptors (4):
1) **Observation Rate**
# of visits with a CAWR observation / total number of visits

2) **Multiple Month Observation**
Sighting of a CAWR in more than one month of the survey period

3) **Multiple CAWR Observation**
Sighting of multiple CAWRs during a single survey or site visit.

4) **Nest**
Sighting of a nest that appears to have been used by CAWR within the survey period.

Inhabitance Rating Categories (5):

RARE
Indicates rare habitation of a cactus patch, which is defined by an observation rate below 25% and a lack of any additional inhabitance descriptor. Rare habitation is expected to include behaviors associated with short term inhabitance such as foraging or dispersal and suggests a lack of nesting. A patch categorized as “rare” may also indicate poor habitat quality or the presence of residence inhibiting factors (i.e. competition, predation, or disturbance).

OCCASSIONAL
Indicates occasional habitation of a cactus patch, which is defined as an observation rate below 25% and having one or more additional inhabitance descriptors associated with that patch. Occasional habitation is expected to include behaviors associated with short term inhabitance (i.e. foraging or dispersal) and suggests a lack of nesting. A patch categorized as “occasional” may also indicate poor habitat quality or the presence of residence-inhibiting factors.

PERIODIC
Indicates periodic habitation of a cactus patch, which is described by an observation rate of 26-50% and one or more additional inhabitance descriptors. Periodic habitation is expected to include behaviors such as repeated visitation for foraging and/or dispersal. This rating could be considered a weak indicator of nesting. A patch categorized as “periodic” may also indicate higher quality habitat and a decrease in residence inhibiting factors in compared to un-ranked or patches ranked patches or those ranked as “rare” or “occasional”.

REGULAR
Indicates regular habitation of a cactus patch, which is defined as an observation rate of 50-75% and at least two additional inhabitance descriptors. A patch categorized as "regular" may indicate CAWR nesting, high quality habitat, and a lack of residence-inhibiting factors.

CONSISTENT
Indicates consistent habitation of a cactus patch, which is defined as an observation rate of 75-100% and at least two additional inhabitance descriptors. A patch categorized as "consistent" may be a strong indicator of CAWR nesting, high quality habitat, and a lack of residence-inhibiting factors.

RESULTS

Table 1. Inhabitance criteria and rating of cactus patches where CAWR were observed in 2018.

				Inhabitance Criteria				
Reserve	Cactus Patch ID	Total # of Surveys	Surveys w/ CAWR Observations	Observation Rate (%)	Multiple CAWR Observation	Multiple Month Observation	CAWR Nest	Inhabitance Rating
Alta Vicente	**AV2**	**18**	**9**	**50**	**X**	**X**	**-**	**periodic**
Filiorum	**FI1**	**8**	**5**	**63**	**X**	**X**	**-**	**periodic**
Filiorum	**FI4**	**8**	**6**	**75**	**X**	**X**	**X**	**regular**
Filiorum	FI5	8	2	25				occasional
Three Sisters	TS1	19	2	10				rare
Three Sisters	TS10	19	3	16		X		rare
Three Sisters	TS4	19	1	5				rare
Three Sisters	TS8	19	3	16	X	X		occasional
Three Sisters	**TS9**	**19**	**4**	**21**	**X**	**X**	**X**	**occasional**
Ocean Trails	OT4	8	1	13				rare
Ocean Trails	OT7	24	4	17		X	X	rare
Ocean Trails	OT8	18	8	33		X		periodic
Ocean Trails	OT9	18	5	28				periodic
Ocean Trails	OT10	18	3	17		X		occasional
Ocean Trails	OT11	18	7	39		X		periodic
Ocean Trails	OT12	18	17	17		X		periodic
Ocean Trails	OT13	18	1	6				rare

Green rows indicate the high likelihood of cactus wren breeding within associated cactus patch.

DISCUSSION

The cactus wren population of the Palos Verdes Nature Preserve have experiencing a markedly steep decline in observed territorial breeding behavior with similar declines being expected present in their actual population size.

The 2018 breeding season for cactus wren was monitored by both contracted biologist Dan Cooper and the Citizen Science Cactus Wren Monitoring Program coordinated by the Palos Verdes Peninsula Land Conservancy. From both accounts, cactus wren were found in fewer reserves and in lower abundance within each reserve since monitoring began in 2006. Cooper noted a 75% decrease in the number of cactus wren observations in 2018 from 2015. His report goes on to describe the identification of only 5 potential breeding territories. The volunteer program also noted a reduced number of cactus wren breeding territories and overall observation of the species in 2018 as compared to all previous survey years.

The cactus wren was exclusively found in reserves providing the highest quality habitat with large expanses of cactus (*Opuntia littoralis*, *O. oricola*, and *Cylindropuntoa prolifera*) and specifically mature cactus plants. These locations, such as Three Sisters, Alta Vicente, and Filiorum, are considered "core habitat" or locations of central importance to cactus wren breeding in previous years. Species retractions to solely core habitat often signals a population under extreme stress. The observed cactus wren absence of previously occupied marginal habitat areas, such as Forrestal, San Ramon, and Portuguese Bend reserves, and exclusive use of core habitat areas may signal the presence of highly stressful conditions under which persistence and successful breeding is difficult.

Several causes of cactus wren decline have been identified as potential and likely drivers of declining regional presence and nesting success of cactus wren. These include: invasion by non-native plant species, heightened predation pressure in urban areas, unfavorable weather conditions (drought, seasonal shifts in rainfall, and cool early spring temperatures), and human disturbance. Both survey programs have found evidence to support each of these factors as present in the Preserve. It is expected that these issues are working synergistically creating a complex set of overlapping challenges.

To meet or mitigate challenges faced by cactus wren in the preserve, Dan Cooper and PVPLC staff have determined several management activities to improve the viability of the PV cactus wren population. Recommended activities include the removal of invasive non-native plants (especially trees) from cactus rich areas, installation of new cactus plantings, creation of foraging habitat (bare ground) surrounding cactus patches, and the implementation of nesting boxes.

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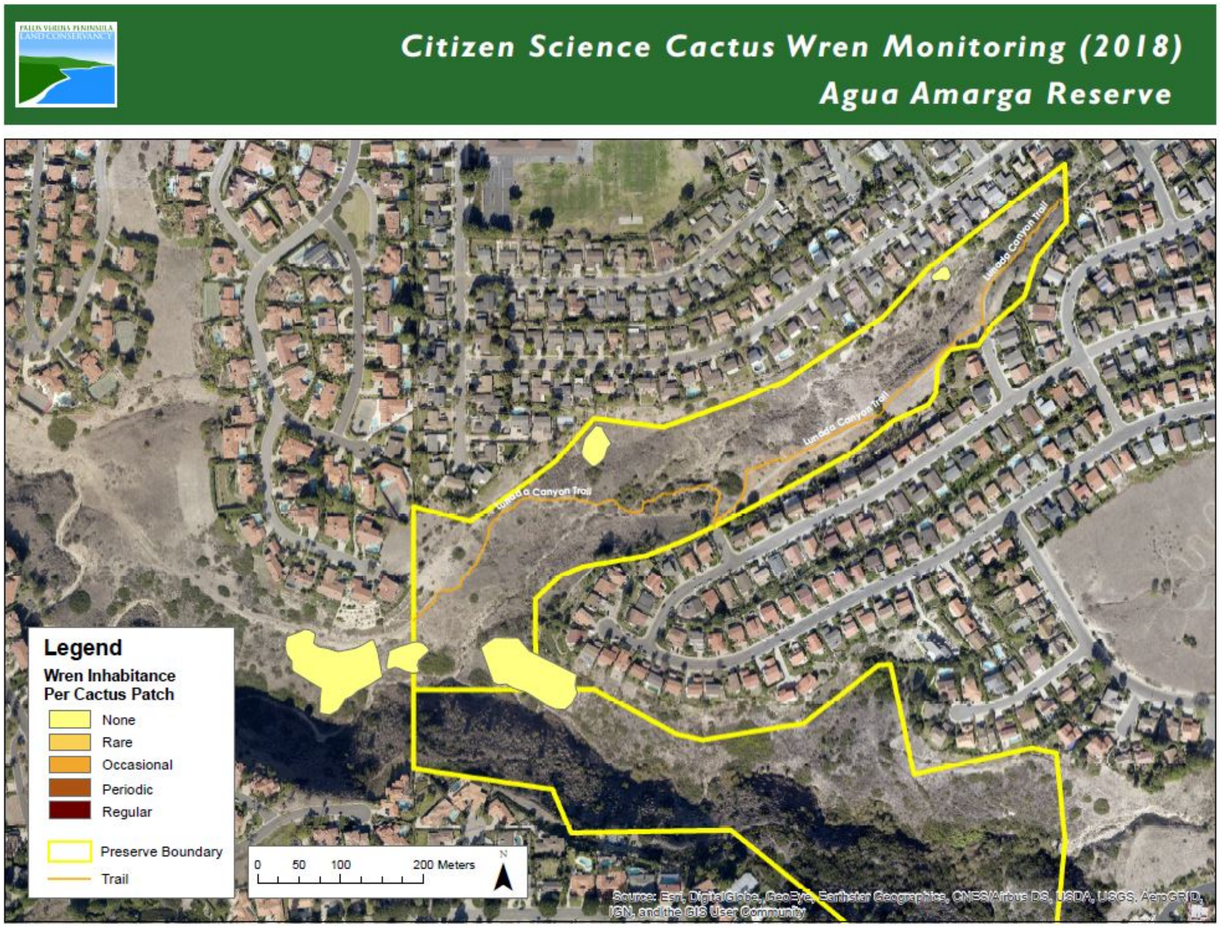
Atwood, J.L. 1998. "Studies of California gnatcatchers and cactus wrens in southern California." Monument Center for Conservation Sciences and the University of California Irvine.

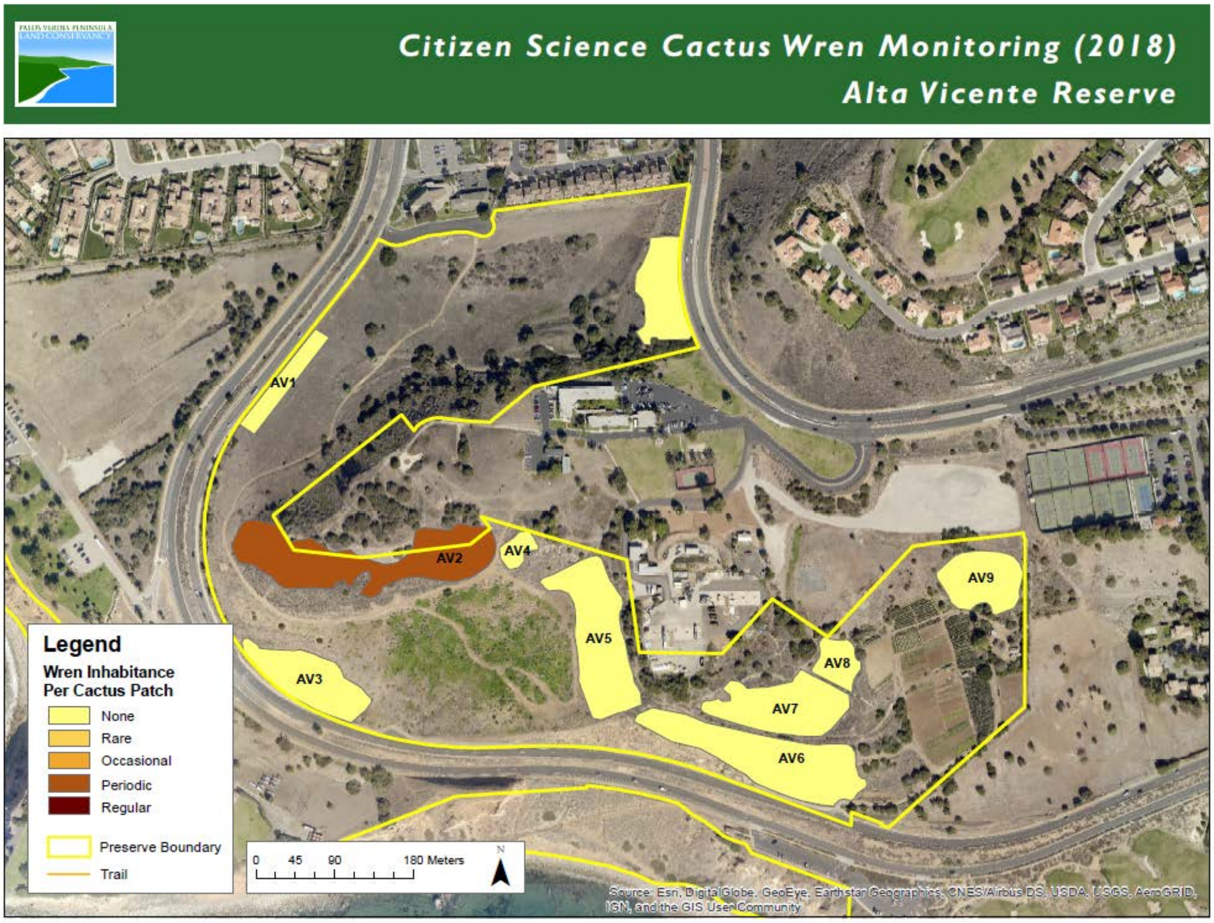
Cooper Ecological Monitoring, Inc. ("CEM") 2013. Palos Verdes Nature Preserve survey for the California gnatcatcher and the cactus wren (2012), Palos Verdes Peninsula Land Conservancy, Los Angeles County. Final report to the PVPLC. January 3, 2013.

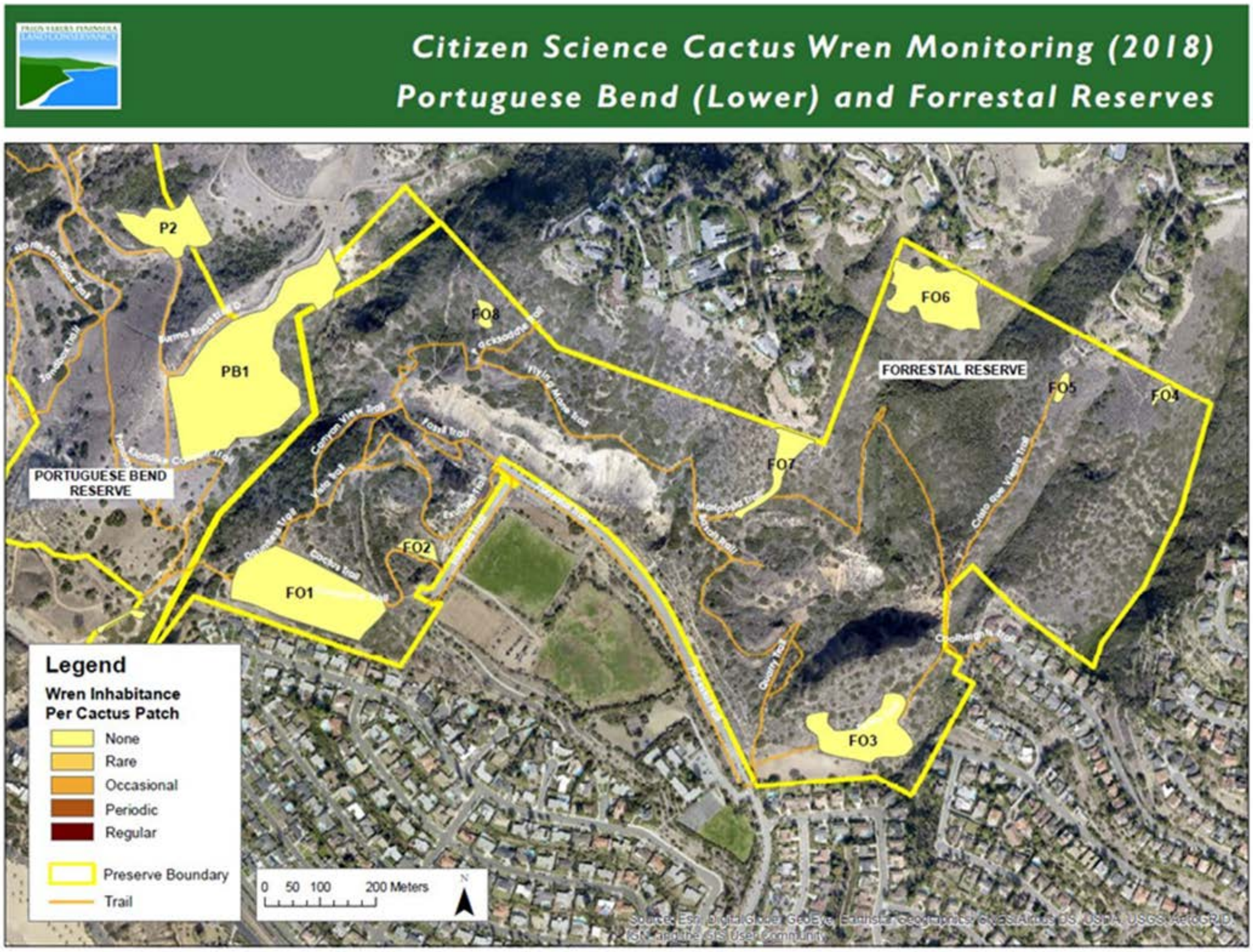
Rea, A. M. and K. Weaver. 1990. "The taxonomy, distribution, and status of coastal California Cactus Wrens." Western Birds 21: 81-126.

APPENDIX A

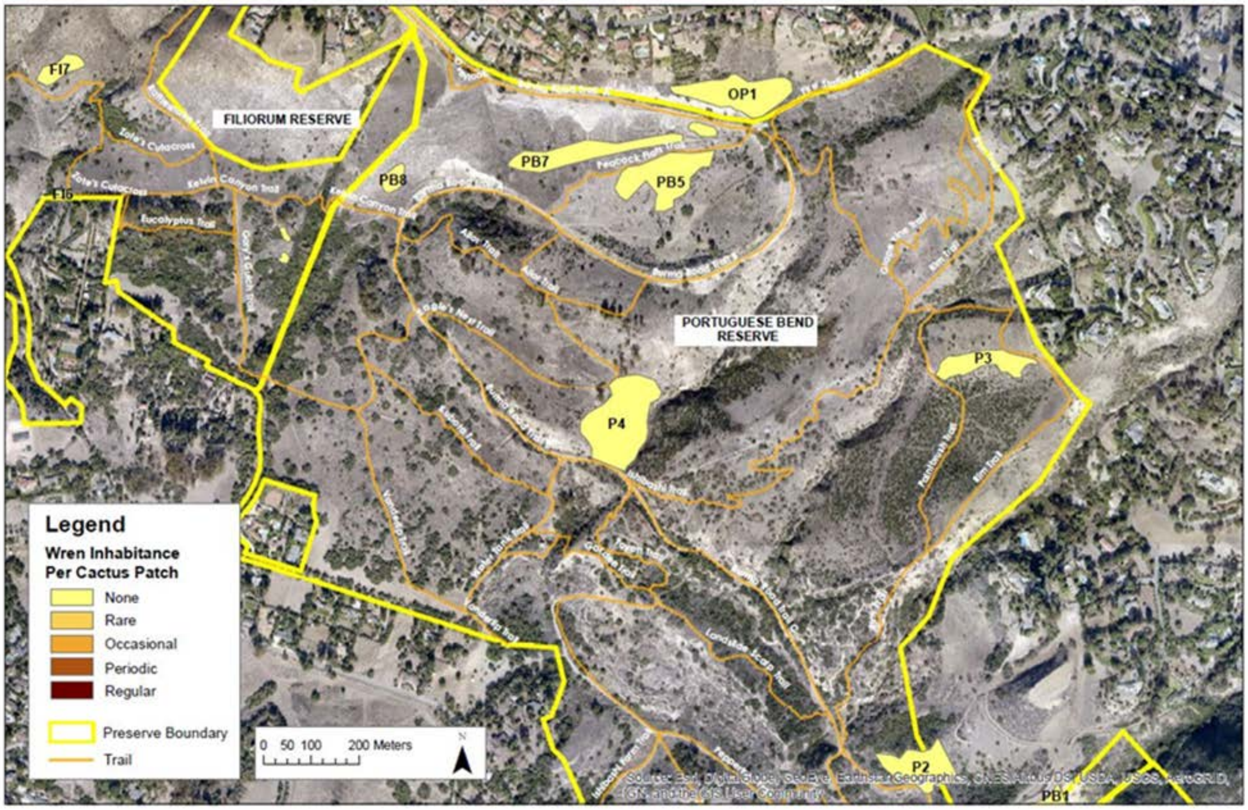
Mappped results of cactus inhabitance per catus patch survyed.

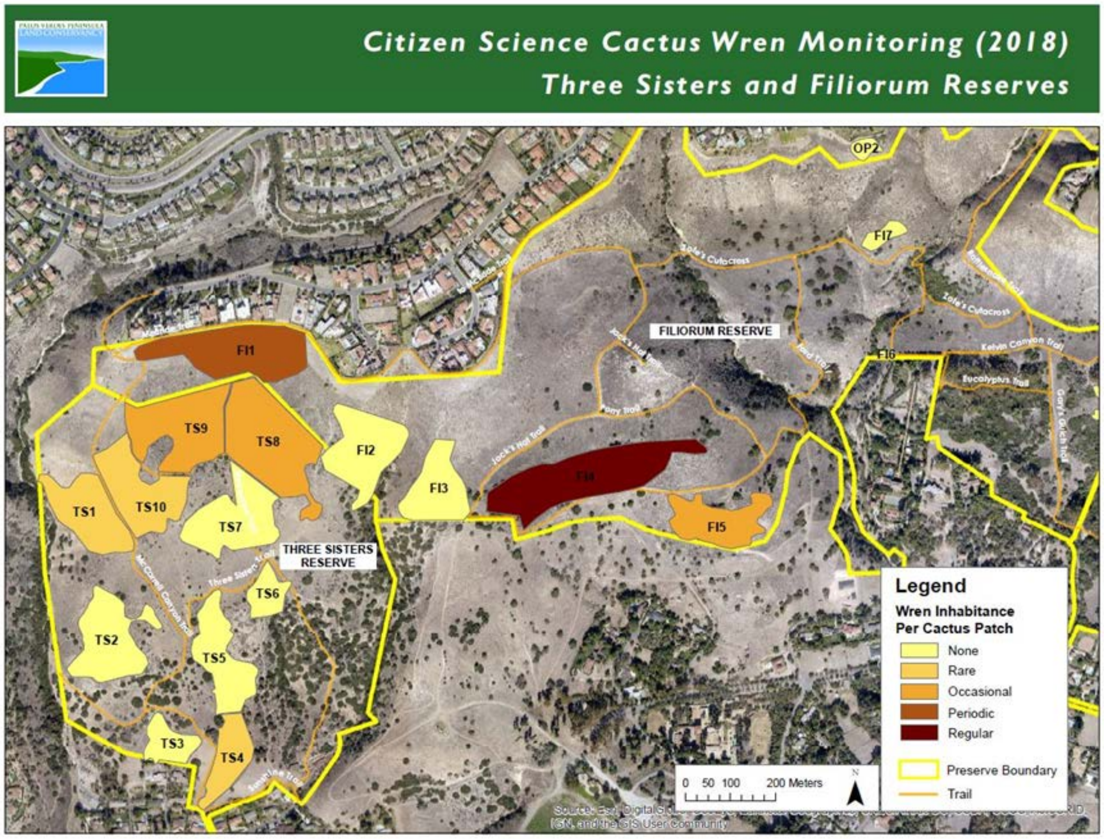

Citizen Science Cactus Wren Monitoring (2018)
Agua Amarga Reserve
Lunada Canyon Trail
Lunada Canyon Trail
Lunada Canyon Trail
Legend
Wren Inhabitance Per Cactus Patch
None
Rare
Occasional
Periodic
Regular
Preserve Boundary
Trail
0 50 100 200 Meters
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Citizen Science Cactus Wren Monitoring (2018)
Alta Vicente Reserve
AV1
AV2
AV3
AV4
AV5
AV6
AV7
AV8
AV9
Legend
Wren Inhabitance
Per Cactus Patch
None
Rare
Occasional
Periodic
Regular
Preserve Boundary
Trail
0 45 90 180 Meters
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

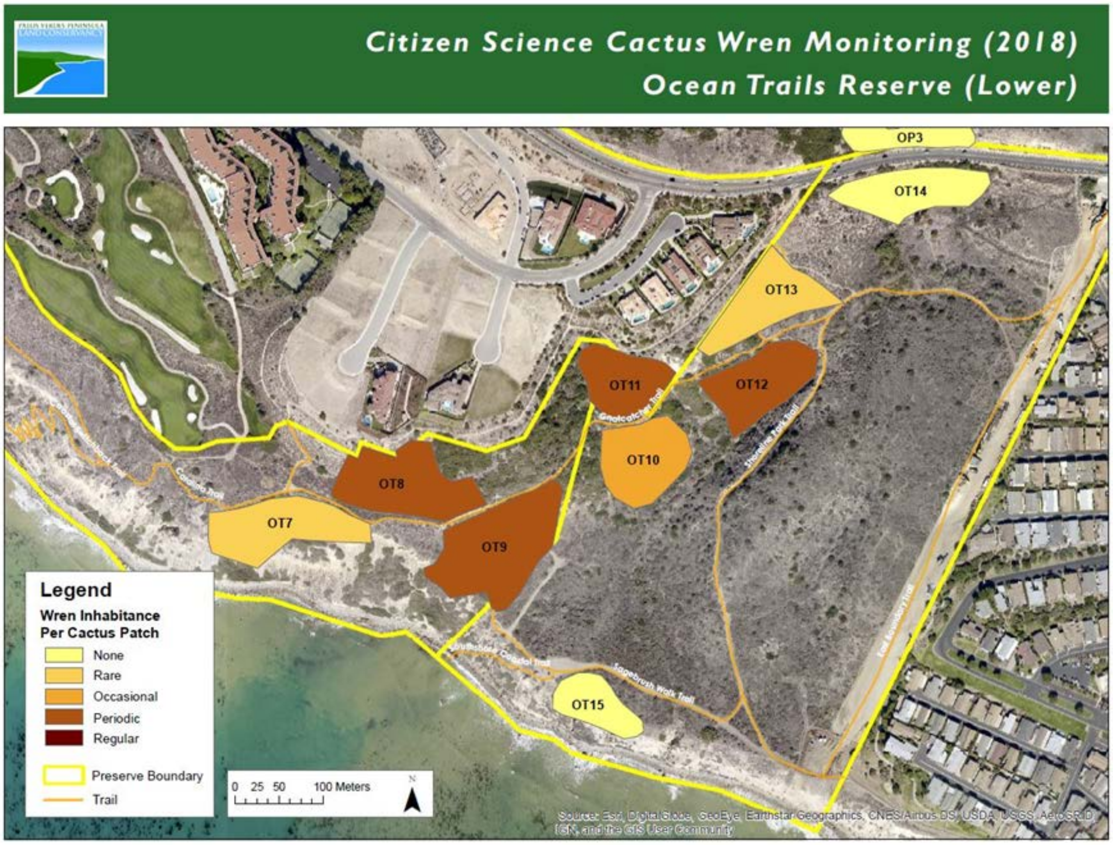

Citizen Science Cactus Wren Monitoring (2018)
Portuguese Bend (Lower) and Forrestal Reserves
P2
PB1
FO8
FO6
FORRESTAL RESERVE
FO5
FO4
FO7
PORTUGUESE BEND RESERVE
FO2
FO1
FO3
Legend
Wren Inhabitance Per Cactus Patch
None
Rare
Occasional
Periodic
Regular
Preserve Boundary
Trail
0 50 100 200 Meters
N

Citizen Science Cactus Wren Monitoring (2018)
Portuguese Bend (Upper) and Filiorum Reserves




Citizen Science Cactus Wren Monitoring (2018)
Three Sisters and Filiorum Reserves
OP2
FI7
FILIORUM RESERVE
FI6
FI1
TS9
TS8
FI2
FI3
FI4
FI5
TS1
TS10
TS7
THREE SISTERS RESERVE
TS6
TS2
TS5
TS3
TS4
Kelvin Canyon Trail
Eucalyptus Trail
Legend
Wren Inhabitance Per Cactus Patch
None
Rare
Occasional
Periodic
Regular
Preserve Boundary
Trail
0 50 100 200 Meters
N


PALOS VERDES PENINSULA LAND CONSERVANCY
Citizen Science Cactus Wren Monitoring (2018)
Ocean Trails Reserve (Upper)
West Portal Trail
West Bluff Trail
Sunset Trail
Sunrise Trail
Catalina Trail
to Catalina Trail
Caddie Trail
OT1
OT2
OT3
OT4
OT5
OT6
OT7
OT8
Coastal Switchback Trail
Legend
Wren Inhabitance Per Cactus Patch
None
Rare
Occasional
Periodic
Regular
Preserve Boundary
Trail
0 37.5 75 150 Meters
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Citizen Science Cactus Wren Monitoring (2018)
Ocean Trails Reserve (Lower)
OP3
OT14
OT13
OT11
OT12
OT10
OT8
OT7
OT9
OT15
Legend
Wren Inhabitance Per Cactus Patch
None
Rare
Occasional
Periodic
Regular
Preserve Boundary
Trail
0 25 50 100 Meters
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Wildlife Tracking
Citizen Science Monitoring
2018

INTRODUCTION

Top predators are an important ecological component of natural ecosystems. In southern California Coyotes are now considered top predators, where they control the population of several tertiary food web members, including intermediate meso-predators. The regulation of intermediate predators is important to maintaining healthy populations of other wildlife species including protected songbirds such as the California gnatcatcher *Polioptila californica californica* (FTE). The Rancho Palos Verdes Natural Communities Conservation Plan describes the need for collecting new biological data on wildlife movements and the importance of monitoring predator presence within the reserve.

The Citizen Science Wildlife Tracking program is a monitoring project that surveys the Preserve for the presence of coyotes and other species. Volunteer participants walk trail segments in search of tracks or scat which are mapped and photographed. Results of this survey are compiled to create maps of areas used by coyotes and foxes within each reserve. Mapped observations of track and scat work to describe locations of high and low coyote and fox activity. A relative population index can be used to evaluate population trends from year to year.

The Wildlife Camera project was designed to complement the Citizen Science Wildlife Tracking Program and further investigate findings of the Tracking Program such as areas of exclusion or territorial boundaries. This project has evolved from that original goal to include providing data to identify individual coyotes through analyzing coat patterns and other distinguishing physical features, which has further increased our ability to estimate coyote population size and movement of coyotes across the Preserve.

METHODS

Study Area:

The study area was within six Reserves (Alta Vicente, Filiorum, Forrestal, Ocean Trails, Portuguese Bend and Three Sisters) of the Palos Verdes Peninsula Nature Preserve located in the city of Rancho Palos Verdes, CA. The Reserves areas surveyed were those which were contiguous and comprise the majority of land managed by the Conservancy.

Data Collection:
The monitoring is conducted when the animals are most active, November through March, by walking along specific routes in the Preserve. While walking along marked trails, surveyors search for evidence of coyotes, gray fox, and red fox, and other species which is usually in the form of scat or track imprints. Scat is the most frequent observation made, with tracks a distant second. Once found, a clear photograph must be taken and location along with appropriate comments noted on a datasheet. When scat is found, a closer look is required to determine, if possible, what the predator has eaten. When tracks are found, the length and width of the track is measured along with a measurement of the animal's stride, when possible.

Training is required for participants to develop the necessary skills for optimal accuracy in identifying scat, its contents, and tracks. At minimum, initial training requires three 2-3 hour sessions, which are conducted on Saturdays in October. Additionally Citizen Science participants are encouraged to accompany advanced trackers to enhance their skills. Photographs of observations are an important tool for confirming the accuracy of observations. The Conservancy provides support as needed to the wildlife tracking volunteers.

Recorded data are submitted electronically to the Conservancy using photos or scanned images of field datasheets. These data are uploaded into the Conservancy's Monitoring Database for data assessment and reporting. It is not unusual to have no observations during a survey. In this case, surveyors must submit a data sheet for no sightings on a particular day. This information is necessary in order to determine visitation frequency that is calculated from the total number of surveys for each specific preserve section.

RESULTS

Figure 1. Location and rating of Coyote Observations by Reserve

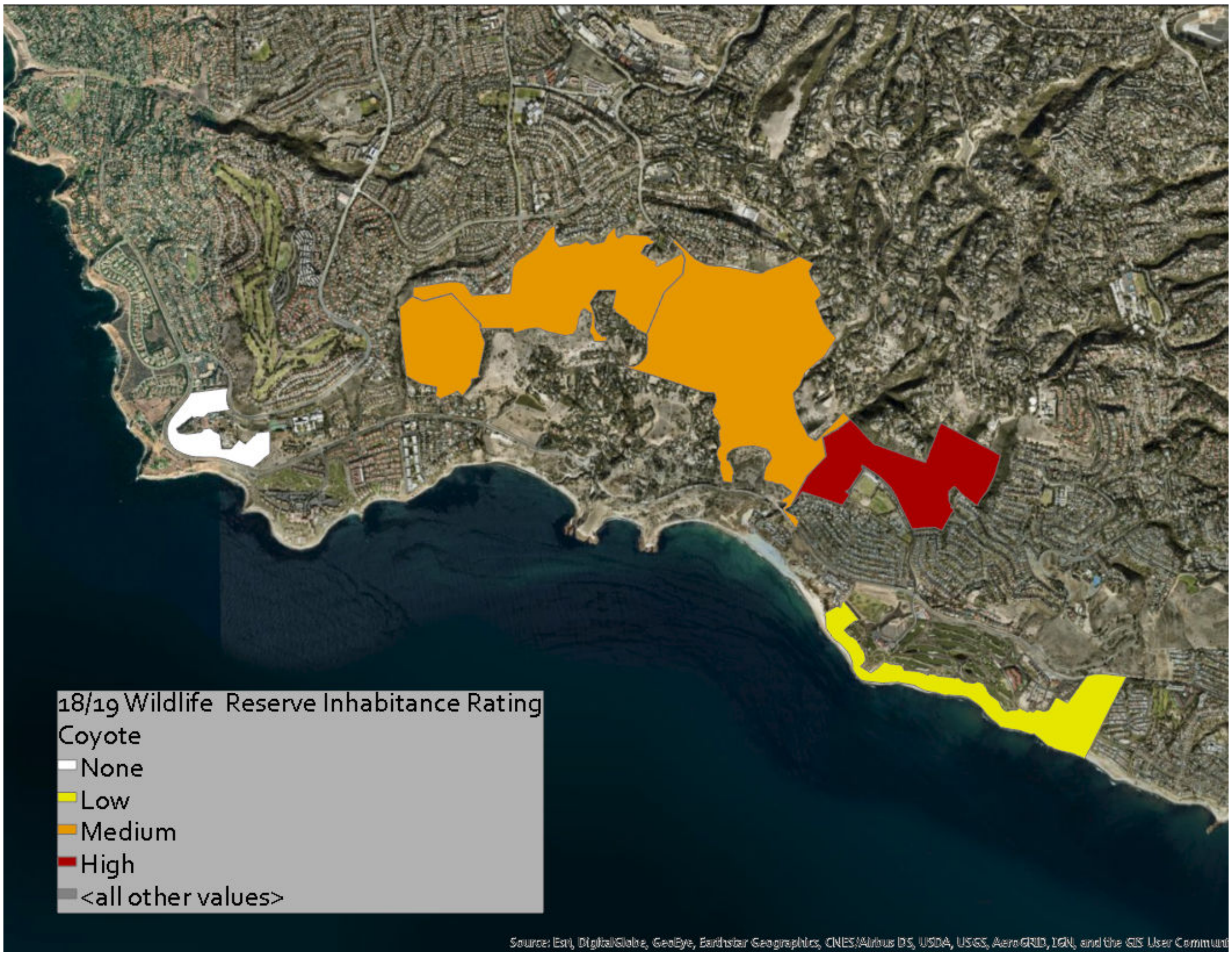


Figure 2. Location and rating of Fox observations Reserve

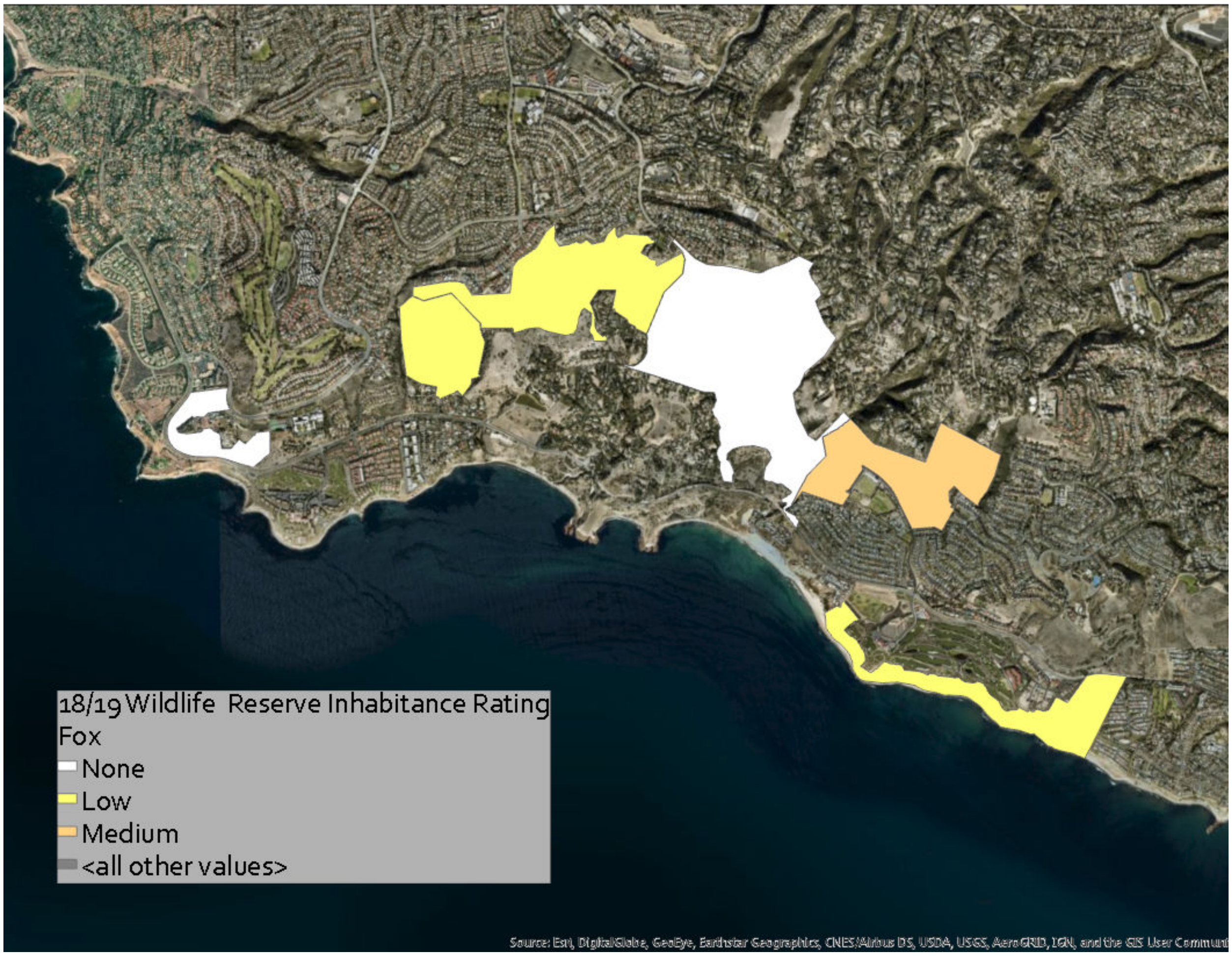


Table 1. Number of observations per reserve.

Reserve	Coyote	Fox	Survey Trips
Alta Vicente	0	0	4
Filiorum	24	1	4
Forrestal	73	14	8
Ocean Trails	8	4	4
Portuguese Bend	29	0	3
Three Sisters	33	6	4

The 2018-19 wildlife tracking survey identified a total of 192 wild canid observations in the survey area. Coyote observations were the most common found with 167 scat and tracks being identified as coyote and 25 as fox. This disparity may imply that the coyote is the most abundant wild canid within the Palos Verdes Nature Preserve. Despite the coyote's potential dominance, smaller canids, the red and gray fox were also observed. Although no scat or tracks were identified specifically to gray fox, several video captures have been made of the gray fox within the Forrestal Nature Reserve. Coyote observations were found across all reserves studied, except for Alta Vicente.

DISCUSSION

The presence of top predators within wildlife habitats has been documented as crucial to ensuring healthy ecosystem function. In the Palos Verdes Nature Preserve the success of nesting songbirds, namely the federally protected California gnatcatcher and state protected coastal cactus wren, can be positively influenced by the presence of predators through their control of lower predator (i.e.: striped skunk and raccoon) populations. The presence of coyotes is specifically indicated by the Rancho Palos Verdes Natural Community Conservation Plan as an important ecological element necessary for successful nesting conditions. Considering the presence of coyotes in these terms, the broad range of the coyote observed within the Palos Verdes Nature Preserve indicates the existence of an important meso-predator control dynamic. Further research looking into the presence of Grey Fox in the PVNP is suggested to monitor the declining population.

APPENDIX F
Volunteer Program

I. INTRODUCTION AND SUMMARY

1.1 Volunteer Programs

This report describes the components included within the larger Volunteer Program that serviced the Palos Verdes Nature Preserve. Specific activities are detailed for the reporting period January 1, 2018 to December 31, 2018.

Since 1988, volunteers have played an essential role in fulfilling the Palos Verdes Peninsula Land Conservancy's (PVPLC) mission to preserve land and restore habitat for the education and enjoyment of all. PVPLC is a non-profit organization that relies heavily on the support of community involvement to perform many of the tasks necessary to manage the Nature Preserves. Volunteers donate thousands of hours each year to help with office assistance, event planning, community education, habitat restoration, trail maintenance, and much more. This report divides the various volunteer programs into two categories: Community Involvement Volunteers and Stewardship Volunteers.

The first category, Community Involvement Volunteers, supports volunteer activities that focus on friend making, fundraising, and recommendations to staff on a variety of topics. This category is further divided into four sections which are detailed within the report:

- Committees and Advisory Boards
- Special Events and Office Assistance
- Education Docents and Nature Walk Leaders
- Interns

The second category, Stewardship Volunteers, supports activities that are performed on the land to assist with habitat management of the Preserve. In all, there are seven elements within this category that are described in more detail in the Stewardship Volunteer section of this report. The backbone of the program is our regularly scheduled Saturday Outdoor Volunteer Days that are open to participation by all and require no long-term commitment. Periodically, there are also individuals or groups that complete stewardship projects outside of the normally scheduled outdoor events. Boy Scouts and Girls Scouts interested in obtaining their final awards are two such groups. There are also several Stewardship Volunteer opportunities that require long term commitments. The seven programs are listed below:

- Outdoor Volunteer Days
- Team Leaders
- Scout Projects
- Adopt-a-plot
- Trail Crew
- Volunteer Trail Watch
- Citizen Science

In 2018, volunteers provided a grand total of **19384.36** hours (an increase of 406.85 hours from 2017) of service to support conservation, restoration and management of the Palos Verdes Nature Preserve. According to the Independent Sector, volunteer time in California is valued at $29.09 per hour (based on Dollar Value of a Volunteer Hour, by State: 2017, Independent Sector), thus generating a total of $563,899.76 of in- kind services. The amount of volunteer hours donated at each Nature Preserve or for a specific volunteer category depends on the size of property or specific projects that transpired during the reporting period.

2. COMMUNITY INVOLVEMENT

2.1 Committees and Advisory Boards

PVPLC is driven and supported by a fifteen-member volunteer board, which meets on a regular basis to strategize and direct the organization's mission. The PVPLC maintains numerous committees and advisory boards as well for the following purposes:

- To provide review and recommendations regarding organizational plans and policies
- To provide assistance with the operations of the organization
- To provide community input for PVPLC activities
- To provide a training and evaluation ground for potential members of the Board of Directors

This year, the Conservancy's committees contributed 1502.25 hours in serving the Land Conservancy's mission. Hours for committee-involved board members are compiled with their board volunteer time. The committees that were active during the reporting period are listed below:

- Board of Directors
- Audit Committee
- Finance Committee
- Development Committee
- Investment Committee
- Special Events Committee(s)

2.2 Special Events and Office Assistance Volunteers

The PVPLC relies on individual volunteers and community groups, such as the National Charity League (NCL) to assist PVPLC staff with all major fundraising and friend-raising events. We have built very strong and fulfilling relationships with these groups and strive to provide an environment that lets volunteers know they are indispensable and an integral part of our organization. Special events supported by committees and volunteers this year such as Palos Verdes Pastoral held at Terranea Resort.

2.3 Nature Walks

Nature Walk Leaders donated a total of 349.5 hours in 2018. PVPLC Board of Directors member Allen Franz and volunteer, Cindy Akiyama co-coordinate this group of dedicated volunteers and each prospective walk leader must have a high level of knowledge the local ecosystem, particularly the native and non-native plants found on the Peninsula. Leaders must go through extensive training and be willing to research and learn about local history, geology, flora and fauna. Continued research and exploration serves to add to a walk leader's knowledge base, preparing them to give accurate and in-depth presentations to the public.

Walks are held all over the Peninsula, from the edge of the coast to deep within the canyons. Each leader designs his or her presentation to include special attributes and stories particular to a site. Nature walks occur once a month every month throughout the year, featuring a different location every time.

2.4 Internships

Interns dedicate much of their volunteer time to helping the Land Conservancy's mission to educate and restore. In 2018, 32 interns dedicated a total of 1671.75 hours to various projects such as educational outreach, field trips, weed mapping, native plant propagation, wildlife monitoring and much more.

3. STEWARDSHIP VOLUNTEERS

Volunteers play an integral part in helping PVPLC staff exceed our goals for restoring land in the Preserve. Outdoor volunteer days provide an opportunity for public volunteers to contribute to habitat and trail restoration efforts. Team Leaders provide leadership on Saturday events, the Trail Crew class volunteers build skills to maintain the trail system, and Volunteer Trail Watch reports vandalism and trail maintenance needs. The Adopt-a-Plot program, Citizen Science wildlife monitoring, scout projects, local environmental clubs and nursery volunteers are also Stewardship volunteers that support Conservancy conservation efforts within the Palos Verdes Nature Preserve, the native plant nursery and other management areas (PVNP and nursery are the only metrics outlined for this report).

Palos Verdes Nature Preserve Stewardship volunteer highlights in 2018:

- 19369.36 hours of volunteer time, an increase of 406.85 hours from 2017
- Grant from REI Inc. to support volunteer programs, youth engagement, and restoration initiatives
- Grant from South Bay Audubon to support adopt-a-plot independent habitat restoration in Agua Amarga Reserve.

3.1 Outdoor Volunteer Days

The PVPLC holds outdoor volunteer days nearly every Saturday of the year, held from 9am-12pm, excluding holiday weekends. The focus of these events is to restore native habitat, maintain the trail system, and do general maintenance of lands. We engage and empower young people through these programs to ensure education and stewardship on the Preserves in perpetuity. We work with local schools and colleges to have teachers bring groups of students or give incentives such as extra credit and service-learning hours for students who participate on the Saturday volunteer events. Also included in this summary are events catered for special groups and corporations. Rapid Response is an Outdoor Volunteer Opportunity held almost every Friday and Saturday from 9am to 12pm. During these events volunteers are invited to work alongside staff closing spur trails. Refer to Appendix G for maps of spur trail closures.

3.1.1 Native Plant Nursery

Activities in the Native Plant Nursery include transplanting seedlings from flats into individual containers, removing weeds from the containers. On occasion, groups and scouts help maintain the shade structure, build plant benches and repair the weed barrier cloth. Volunteers help at the nursery on select Saturday events as well as during the week throughout the year. A total of 3664.25 volunteer hours were contributed to nursery efforts in 2018.

3.2 Team Leader Program

The Team Leader program began in 2007 in response to the growing number of volunteers that were attending the Outdoor Volunteer Days. Team Leaders are volunteers, sixteen years or older, who assist in supervising the Saturday outdoor volunteer activities. They ensure that volunteers have adequate instruction and the tools necessary to complete the task. They also assist in educating the public about the PVPLC.

The program requires that interested volunteers go through an application and interview process. Candidates then attend a half-day weekend workshop where they learn the skills necessary to motivate and supervise volunteers during Saturday Outdoor Volunteer Days. Training involves practicing leadership skills and communicating restoration techniques. Team Leaders commit to working at least four volunteer days within one season or half-year. The goal of the PVPLC is to hold two Team Leader workshops each year and train a minimum of six new Team Leaders at each one. In 2018, five workshops were held which trained 92 leaders at White Point Preserve and Alta Vicente Reserve on Mar 31st, May 19th, June 9th, June 23rd and September 8th.

The Team Leader Program has helped develop leadership skills in participants and has greatly contributed to the success of our Outdoor Volunteer Days. The quality of work from regular volunteers has increased with the guidance of Team Leaders. In addition to adult participants, many of the Team Leaders attend local high schools and universities. During the reporting period, the program has allowed these students to build leadership skills that they will find useful in their future

3.3 Scout Projects

The PVPLC encourages Boy Scouts and Girl Scouts who are looking for projects to complete their final awards, Eagle Awards for Boy Scouts and Gold Awards for Girl Scouts, by providing them with opportunities to complete their projects on preserves the PVPLC co-manages. This collaboration is beneficial to the scout groups, the PVPLC, and the public that uses the preserves. Scouts work under the mentorship of one of the PVPLC staff to complete their projects and are steered toward objectives that meet the PVPLC stewardship goals. In 2018, scout projects accumulated 798.17 hours of volunteer service.

3.4 Trail Crew Program

The Volunteer Trail Crew class offered is based on the Basic Trail Maintenance class developed by Frank Padilla, Jr. (retired California State Parks Supervisor), and Kurt Loheit. Originally started in 1992, the class focused on both volunteer and agency skill building. Adopted by the Los Angeles District of California State Parks and later the Southern California Trails Coalition, it became the first step in advanced classes for crew leader training and design and construction classes, allowing a structured path for participants to build skills associated with trails from basic maintenance to highly advanced techniques. The class is a combination of classroom and hands-on training to familiarize the participants in all aspects of trail maintenance. The course emphasizes safety, assessments, basic maintenance skills, water control, erosion sources, terminology, proper tool use, basic survey skills, resource considerations, and user experience and maintenance value. Volunteers who demonstrate proficiency in each learned skill and fulfill a yearly indoctrination will maintain status as a qualified Trail Crew member.

In 2018, the volunteer Trail Crew contributed a total of 369 hours to maintaining the Preserve's trail system. These hours include the second-Saturday monthly class trainings as described below, as well as additional trail work, such as weed whacking or spur trail closures, executed by Trail Crew members outside of the classes. This year, Leadership Training was offered for graduates and dedicated Trail Crew members through two workshops to help prepare volunteers to initiate additional trail projects with smaller teams outside of the monthly Trail Crew classes.

Participants must be at least 18 years old and must first take the introductory course. The 50-hour course can be taken at the participant's own pace and it is estimated to take about a year to complete. There are scheduled Trail Crew Skills Classes that coordinate with the trail instructor's availability and the PVPLC Outdoor Volunteer Workday schedule.

Table 1. Trail Crew training classes

Date	# Volunteer Hours	Location	Project/Skill Learned
January 13	20	Portuguese Bend	Brushing and tread repair on Ishibashi Farm Trail
February 10	48	PVPLC office	Introductory Course
February 17	40	Portuguese Bend	Grade dips and outsloping on Sandbox Trail
March 10	32	Portuguese Bend	Tread Repair on Sandbox
April 14	21	Portuguese Bend	Burma Rd & Vanderlip Tread Repair
June 19	36	Forrestal	Pirate & Mariposa trail Tread repair, check dams, grade dips
July 21	44	Abalone Cove	Sacred Cove View and Cliffside Retaining Wall, Tread
Aug 18	52	Abalone Cove	Olmstead Trail Rock Retaining Wall, tread repair
November 10	21	Vista del Norte	Del Norte bench cut and tread repair
December 8	18	Abalone Cove	Chapel view and Cliffside retaining wall and tread repair

3.5 Volunteer Trail Watch Program

The mission of the Palos Verdes Nature Preserve Volunteer Trail Watch Program is to serve as eyes and ears of the City of Rancho Palos Verdes and the Palos Verdes Peninsula Land Conservancy with a view to 1) protect the natural resources of the Palos Verdes Nature Preserve, including the flora and fauna as well as the geology, topography and scenic landscape, and 2) enhance the safety of, and promote an enjoyable experience for all Preserve visitors. The Volunteer Trail Watch Program was initiated in 2013 to help educate trail users about appropriate trail use and monitor preserve misuse. In 2018, volunteers dedicated 3942.74 hours to the program through training and field implementation activities, and reporting observations through the web portal for record keeping. A large portion of this year's hours was contributed by the Volunteer Trail Watch co-coordinators, who dedicated much of their time to training and coordinating the program's volunteers in addition to their time as VTW volunteers on the trails.

3.6 Citizen Science

Volunteers help the PVPLC monitor wildlife on the Preserve in order to document populations and their response to restoration efforts. Citizen Science volunteers contributed 784 hours to documenting the behavior of cactus wrens and the evidence of mammalian populations like coyotes and foxes through tracking efforts.

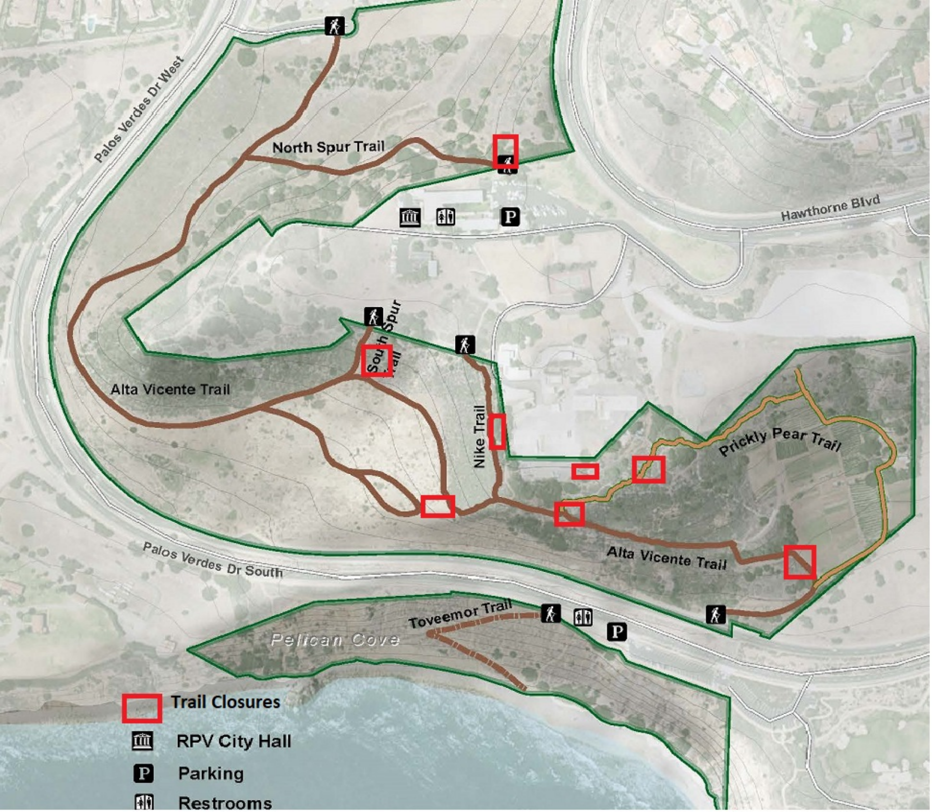
4. GRANTS SUPPORTING VOLUNTEER ENGAGEMENT

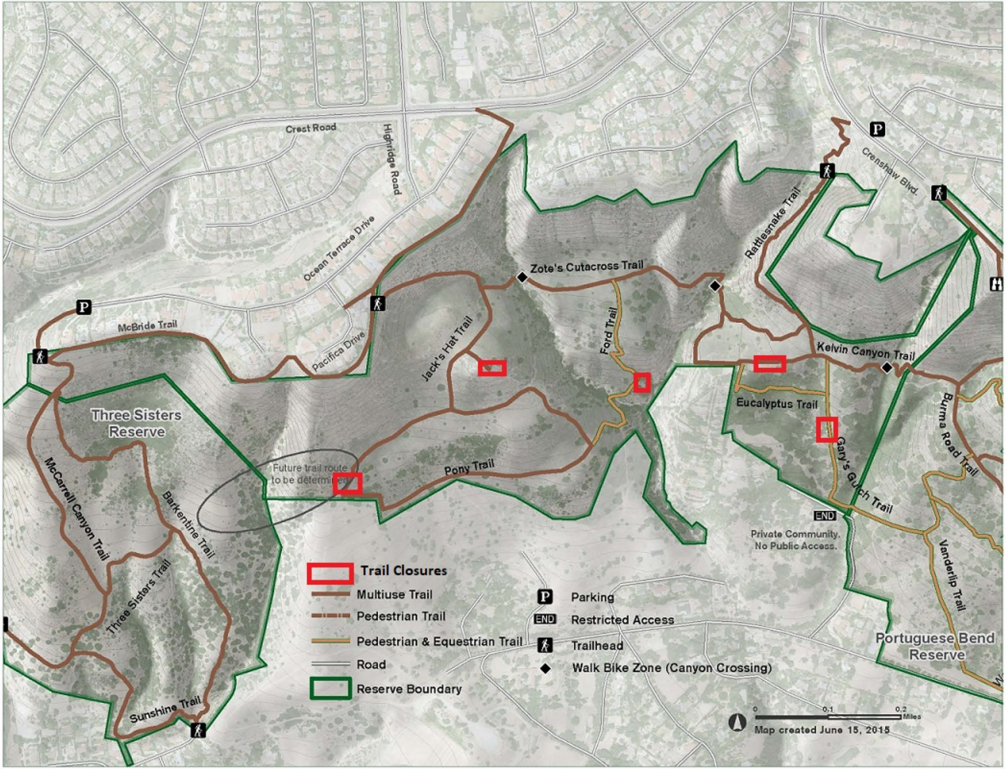
In 2018, the Conservancy received a grant from REI for $5,000 to help with volunteer efforts to build trails and restore habitat. We also received $1,000 in support from South Bay Audubon to supply plants to adopt-a-plot habitat restoration efforts at Agua Amarga Reserve.

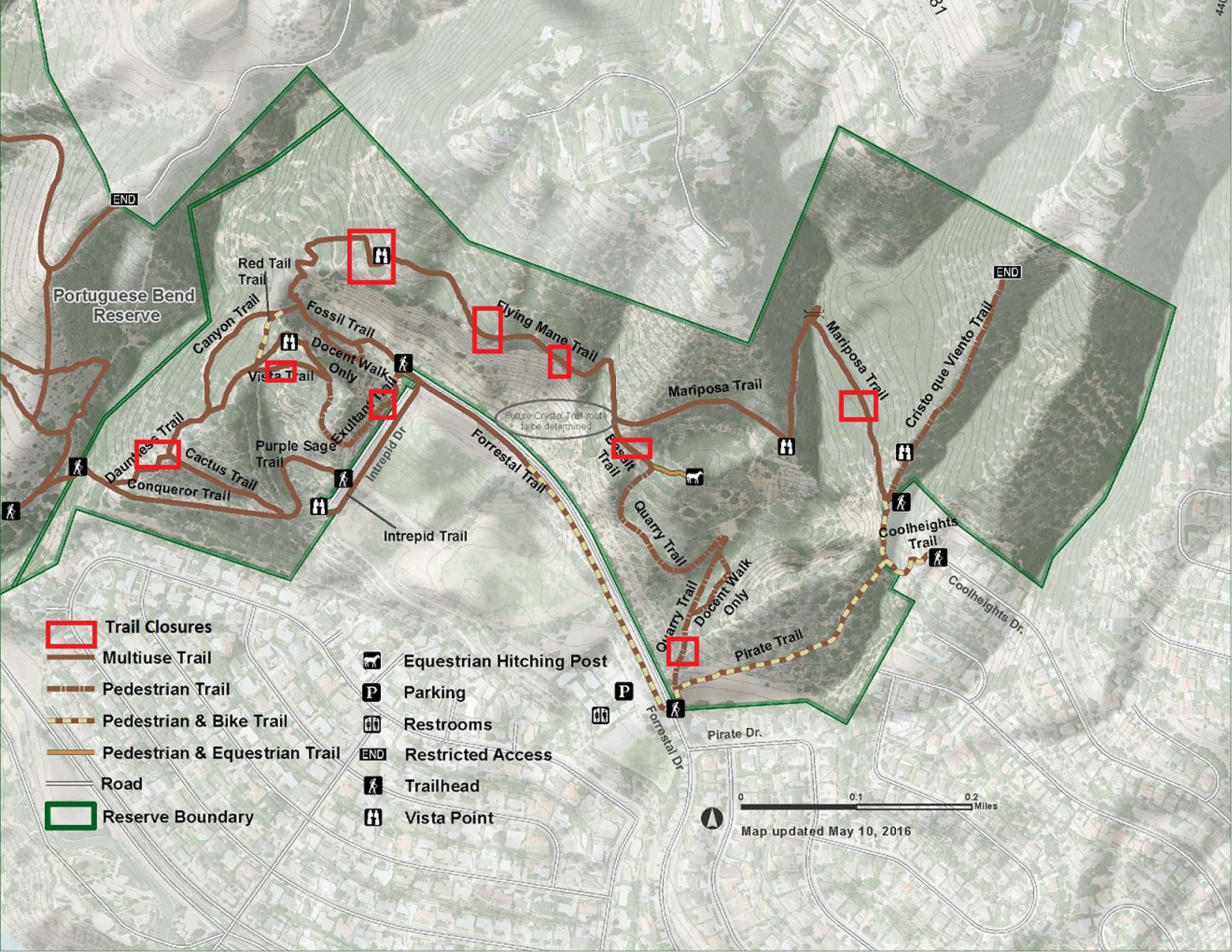
APPENDIX G

2018 UNAUTHORIZED TRAIL CLOSURES


Sea Cove Dr.
Palos Verdes Drive South
Via de Campo Trail
Abalone Cove Trail
Chapel View Trail
Beach School Trail
Narcissa Dr.
Sea Dahlia Trail
Olmsted Trail
Portuguese Point Loop Trail
Smuggler's Trail
Sacred Cove View Trail
Peppertree Dr.
Cave Trail
Cliffside Trail
Inspiration Point Trail
Trail Closures
Reserve Boundary
Parking Lot
Restrooms
Trailhead
Vista Point
Multiuse Trail
Pedestrian Trail
Pedestrian & Bike Trail
0
0.1
0.2
Miles
Map updated May 10, 2016


Palos Verdes Dr West
North Spur Trail
Hawthorne Blvd
P
South Spur Trail
Alta Vicente Trail
Nike Trail
Prickly Pear Trail
Palos Verdes Dr South
Alta Vicente Trail
Toveemor Trail
P
Pelican Cove
Trail Closures
RPV City Hall
Parking
Restrooms


Crest Road
Highridge Road
Ocean Terrace Drive
Pacifica Drive
McBride Trail
Zote's Cutacross Trail
Ford Trail
Rattlesnake Trail
Crenshaw Blvd.
Jack's Hat Trail
Kelvin Canyon Trail
Eucalyptus Trail
Gary's Gulch Trail
Burma Road Trail
Vanderlip Trail
Three Sisters Reserve
Future trail route to be determined
Pony Trail
McCarrell Canyon Trail
Barkentine Trail
Three Sisters Trail
Sunshine Trail
Private Community. No Public Access.
Portuguese Bend Reserve
Trail Closures
Multiuse Trail
Pedestrian Trail
Pedestrian & Equestrian Trail
Road
Reserve Boundary
Parking
Restricted Access
Trailhead
Walk Bike Zone (Canyon Crossing)
0
0.1
0.2
Miles
Map created June 15, 2015



Portuguese Bend Reserve
END
Red Tail Trail
Canyon Trail
Fossil Trail
Docent Walk Only
Vista Trail
Exultant Trail
Dauntless Trail
Cactus Trail
Conqueror Trail
Purple Sage Trail
Intrepid Dr
Intrepid Trail
Flying Mane Trail
Forrestal Trail
Future Crystal Trail route to be determined
Basalt Trail
Mariposa Trail
Quarry Trail
Docent Walk Only
Pirate Trail
Cristo que Viento Trail
Coolheights Trail
Coolheights Dr.
Pirate Dr.
Forrestal Dr
Trail Closures
Multiuse Trail
Pedestrian Trail
Pedestrian & Bike Trail
Pedestrian & Equestrian Trail
Road
Reserve Boundary
Equestrian Hitching Post
Parking
Restrooms
Restricted Access
Trailhead
Vista Point
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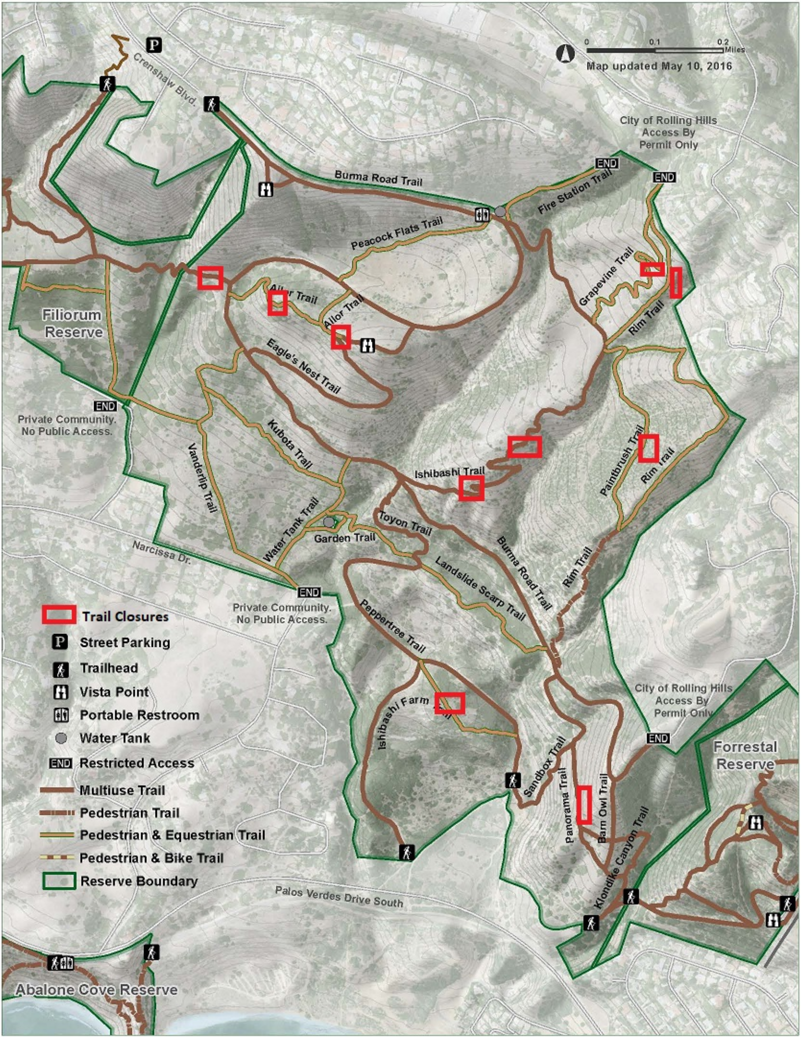
Miles
Map updated May 10, 2016



Map updated May 10, 2016
0
0.1
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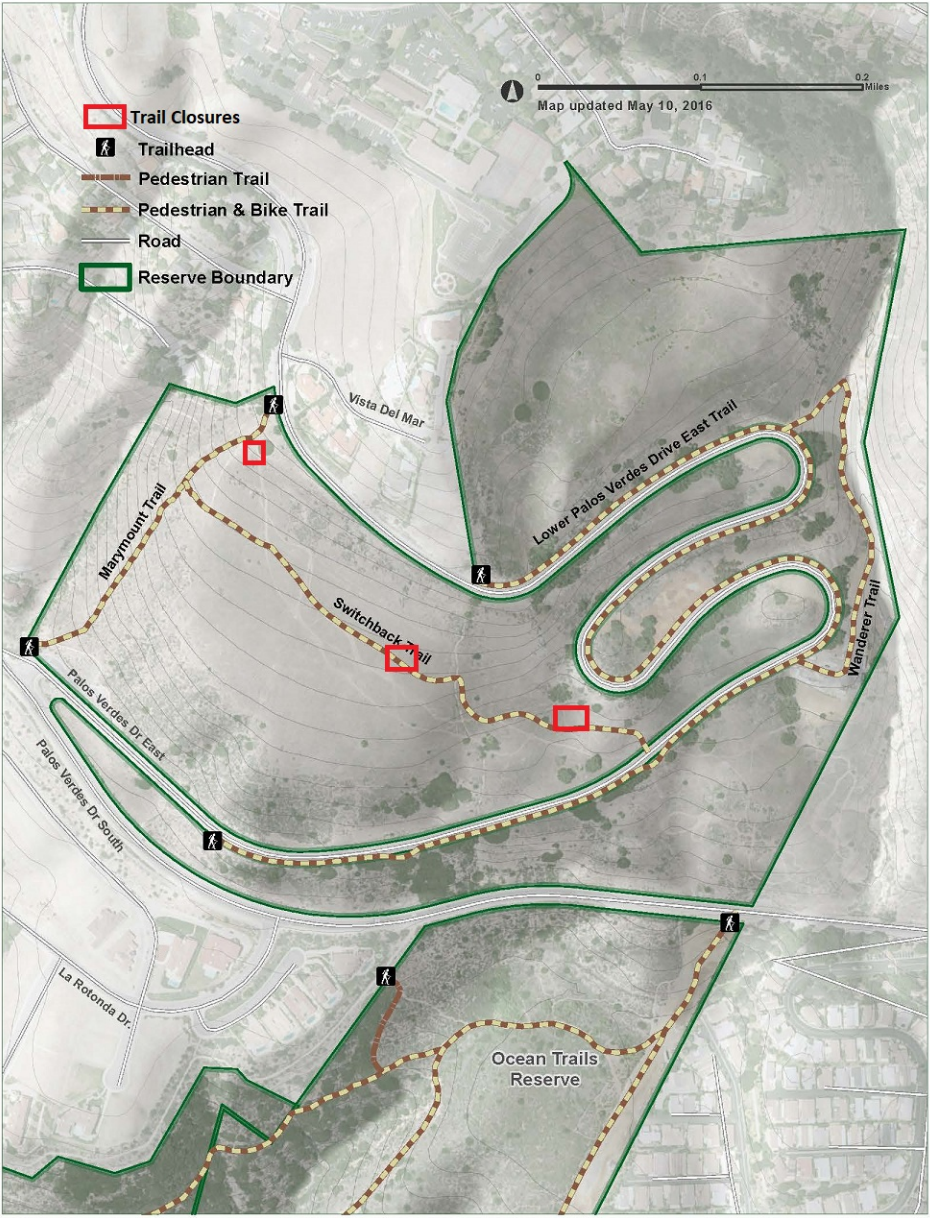
Miles
Crenshaw Blvd.
City of Rolling Hills
Access By
Permit Only
END
Burma Road Trail
Fire Station Trail
Peacock Flats Trail
Grapevine Trail
Rim Trail
Filiorum
Reserve
Allor Trail
Eagle's Nest Trail
Private Community.
No Public Access.
Kubota Trail
Vanderip Trail
Ishibashi Trail
Paintbrush Trail
Water Tank Trail
Garden Trail
Toyon Trail
Narcissa Dr.
Landslide Scarp Trail
Burma Road Trail
Peppertree Trail
Ishibashi Farm Trail
Sandbox Trail
Panorama Trail
Barn Owl Trail
Klondike Canyon Trail
Forrestal
Reserve
Palos Verdes Drive South
Abalone Cove Reserve
Trail Closures
Street Parking
Trailhead
Vista Point
Portable Restroom
Water Tank
Restricted Access
Multiuse Trail
Pedestrian Trail
Pedestrian & Equestrian Trail
Pedestrian & Bike Trail
Reserve Boundary



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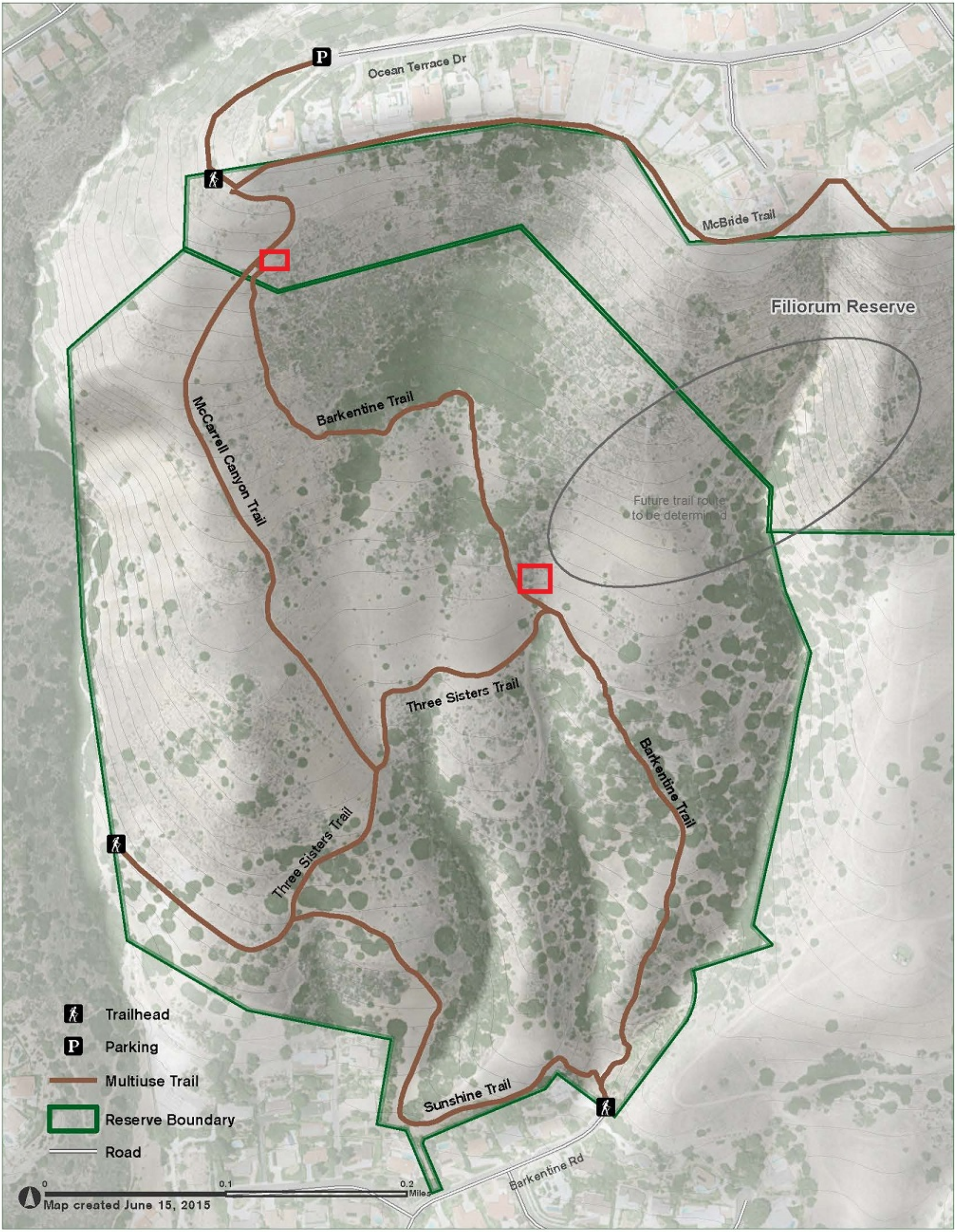
Miles
Map updated May 10, 2016
Trail Closures
Trailhead
Pedestrian Trail
Pedestrian & Bike Trail
Road
Reserve Boundary
Vista Del Mar
Lower Palos Verdes Drive East Trail
Marymount Trail
Switchback Trail
Wanderer Trail
Palos Verdes Dr East
Palos Verdes Dr South
La Rotonda Dr.
Ocean Trails Reserve



Ocean Terrace Dr
McBride Trail
Filiorum Reserve
Barkentine Trail
McCarrell Canyon Trail
Future trail route to be determined
Three Sisters Trail
Barkentine Trail
Three Sisters Trail
Sunshine Trail
Barkentine Rd
Trailhead
Parking
Multiuse Trail
Reserve Boundary
Road
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Miles
Map created June 15, 2015

APPENDIX H

FUTURE TRAIL PROJECTS LIST

2019 Trail Projects List

The following is a list of trail projects planned for the year based on priority and funding opportunities. This list is intended to outline project needs including trail repairs, spur trail closures and signage improvements but may be amended as conditions may change. Projects not completed will carry over to the following year and projects may be added to the list on an ongoing basis. In addition to the list below, smaller-scale projects including spur trail closures, signage repairs, tread repairs, etc. may be accomplished by the Volunteer Trail Crew, PVPLC Staff or City of Rancho Palos Verdes staff on an as-needed basis.

Priority Ranking:

The following projects are ranked low to high with consideration of impacts to habitat, user safety, severity of damage and other issues. These rankings also take other considerations such as funding, feasibility, availability of staff or volunteers to accomplish project, and other factors into account.

High = poses immediate safety concern, significant impact to habitat, trespassing, etc.
Medium = spur trails and erosion issues that affect trail quality, may cause user dissatisfaction, or mildly impact habitat
Low = spur trails and erosion issues that are minor and may not impact habitat, but may not meet user satisfaction

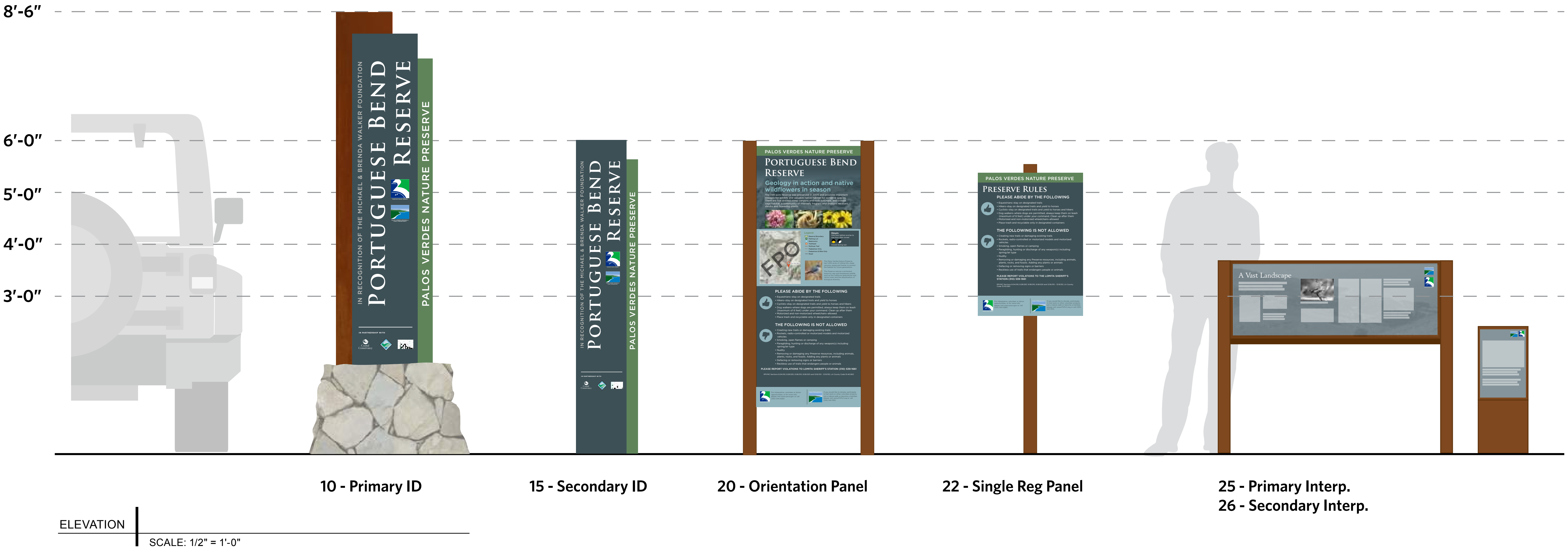
Reserve Name	Trail Name	Issues	Priority
Abalone Cove			
	Cave Trail	Trail erosion repairs. Closed until fixed.	High
	Sacred Cove (West to beach)	Trail erosion	High
	Olmstead Trail	Spur trail closures	Medium -- Ongoing
	Sea Dahlia Trail	Repair trail	High
	Sea Dahlia Trail	Spur Trail Closures	Low – Ongoing
	Smuggler's Trail	Spur Trail Closures	Medium – Ongoing
	Sacred Cove View Trail	Spur Trail Closures	Medium
	Sacred Cove View Trail	Repair trail erosion damage	Medium
Agua Amarga			
Alta Vicente			
	Prickly Pear Trail	Spur trail closures	Medium – Ongoing
Filiorum			
	Jack's Hat	Maintain spur trail closure	Low – Ongoing
	Pony Trail	Maintain spur trail closure across Barkentine Canyon	Low – Ongoing
Forrestal			
	Crystal Trail	Develop trail alignment per PTP	Low

	Quarry Trail	Spur trail closure	Low - ongoing
	Cool Overlook	Spur trail closure	Low - ongoing
	Dauntless Trail	Spur trail closure (upper section) and repair trail erosion (lower section)	Medium
	Vista Trail	Spur trail closure	Low - ongoing
	Exultant Trail	Maintain spur trail closure	Low - ongoing
	Cristo que Viento Trail	Spur trail closure	Low - ongoing
	Flying Mane Trail	Maintain spur trail closure	Medium - ongoing
	Pirate Trail	Maintain post and cable repair and check dams	Low - ongoing
Portuguese Bend			
	Ishibashi Trail	Maintain spur trail closures and remove embankments	Medium - ongoing
	Ishibashi Trail	Evaluate measures to improve user safety	High
	Barn Owl Trail	Trail erosion and spur trail closure	Medium - ongoing
	Rim Trail	Consider Reroute to reopen lower segment of trail	Low
	Fire Station Trail	Maintain closure into private property	Low - ongoing
	Toyon Trail	Restore widened trail to appropriate trail width	Low -- Ongoing
San Ramon			
	Switchback trail	Delineate single path	Low
Three Sisters			
	Barkentine Trail	Spur trail closure	Medium
	McCarrell Canyon Trail	Trail erosion and spur trail closure	Medium – Ongoing
Vicente Bluffs			
	Tovemor Trail	Close spur trail	Low -- Ongoing
Vista del Norte			

APPENDIX I

PVNP SIGNAGE DESIGNS

Family of Sign Types



APPENDIX J

HABITAT IMPACTS

Habitat Impacts Summary

In the fall of 2018, .22 acres of habitat was recorded as impacted during the McGee Landslide surveys. This habitat impact occurred as vegetation was cleared for access to survey points (Appendix J1).

Table 1. Habitat Impacts in the PVNP in 2018

Date	Project	Impact	Size
Fall	McGee Landslide Surveys	Vegetation Clearance for Access	.22 acres

Vegetation Clearance Survey for Access to Landslide Sensor Locations

October 2018

The City of Rancho Palos Verdes contracted the Stay Green landscaping company to remove vegetation from routes connecting official trails to land slide sensors surveyed by Michael McGee. Stay Green cleared vegetation to accommodate walking path access trails to 1 meter in width and vehicle access routes to 3 meters in width. Following the vegetation clearance, Palos Verdes Peninsula Land Conservancy staff collected measurements at each survey route located within the Palos Verdes Nature Preserve to estimate the acreage of vegetation removed during this project. The acreage estimated to have been cleared from survey points PB20, PB21, PB25, PB29, FT07 and KC01 (Figure 1) was found to be **0.22 acres** in total. Photographs collected during the visit are located below in the Photo Exhibit section.

Figure 1. Locations of landslide sensors and access routes.

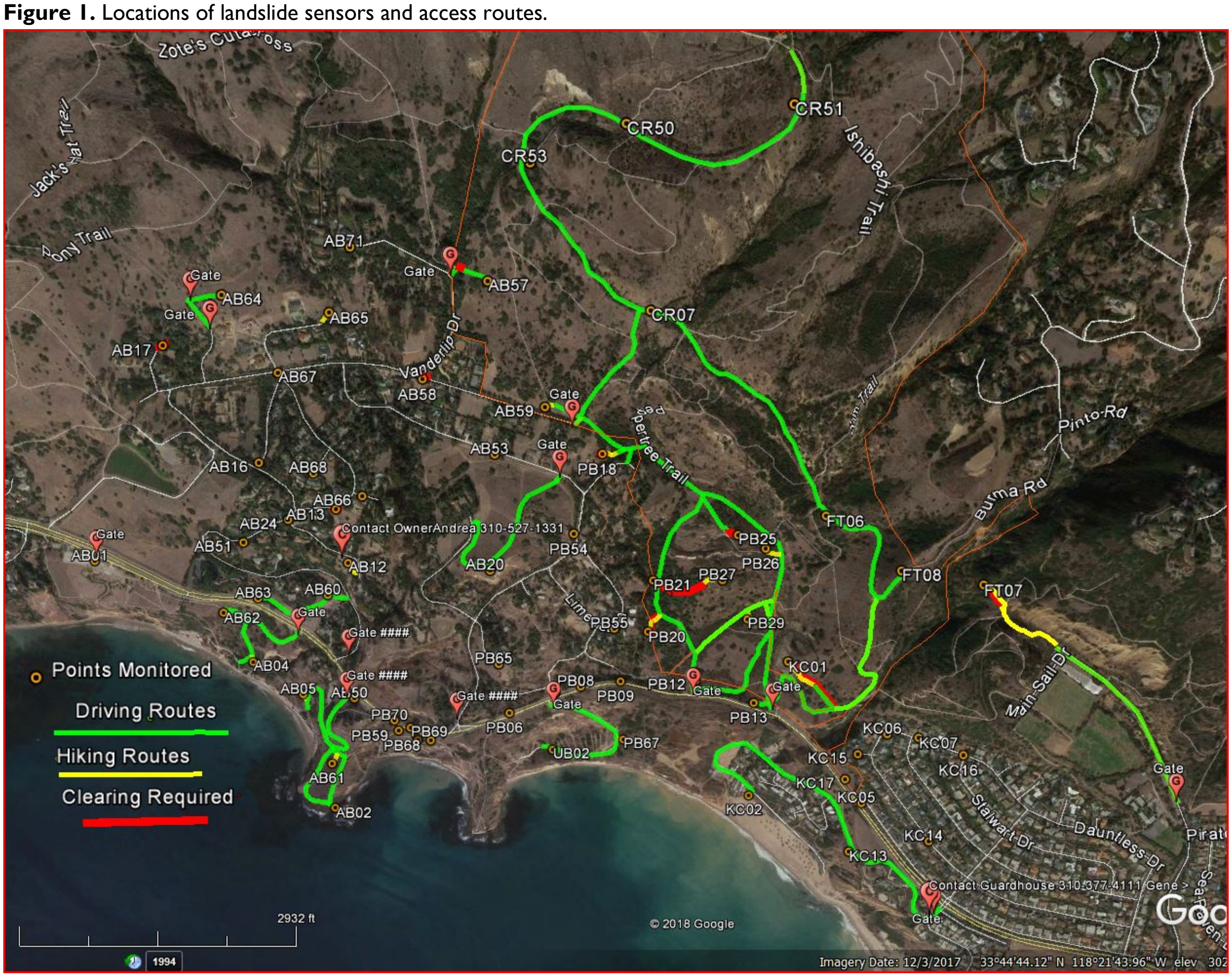


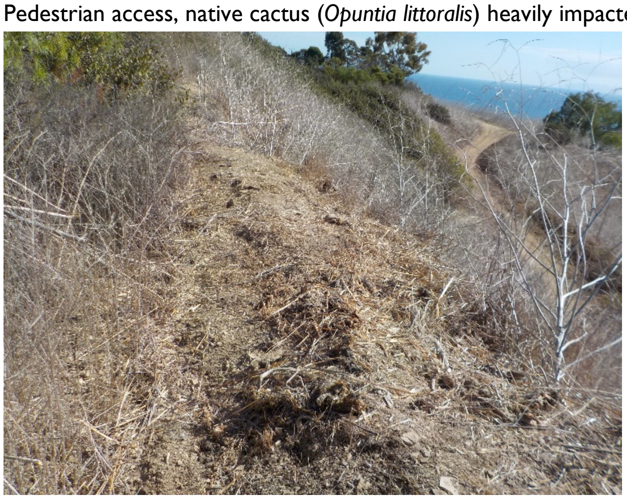
PHOTO EXHIBIT

Land Slide Sensor: KCO1

Vehicle access from Klondike Canyon trail, showing grass removal to reduce fire risk.

Pedestrian access, native vegetation trimmed.

Pedestrian access, native cactus (*Opuntia littoralis*) heavily impacted.



Landslide Sensor: PB25

Vehicle access, non-native annual grass removed.

Vehicle access continued, non-native shrub (*Acacia cyclops*) trimmed.

Landslide Sensor: PB27

Vehicle access, non-native shrubs (*Acacia cyclops*) trimmed.

Vehicle access, non-native shrubs (*Acacia cyclops*) trimmed.

Pedestrian access, native and non-native plants trimmed or removed.

Landslide Sensor: PB21

Sensor vicinity cleared, non-native shrubs (*Acacia cyclops*) trimmed and non-native annual grass cleared.

Landslide Sensor: PB20

Pedestrian access, non-native shrub (*Acacia cyclops*) removed.

Sensor vicinity, native plant (Atriplex lentiformis) trimmed.

Landslide Sensor: FT07

Pedestrian access, non-native vegetation cleared.

Pedestrian access, native vegetation (Rhus integrifolia, Artemisia californica, and Eriogonum cinereum) trimmed.

Pedestrian access, close-up of native vegetation (Rhus integrifolia, Artemisia californica, and Eriogonum cinereum) trimmed.

Sensor vicinity, non-native vegetation cleared and native vegetation trimmed.

APPENDIX K

CITY OF RPV
2018 NIGHT HIKE ACTIVITY

2018 Night Hike Activity

Palos Verdes Nature Preserve

Sierra Club Night Hikes via City Permit:

1/15/18 (15 participants)

1/22/18 (15 participants)

1/29/18 (15 participants)

2/5/18 (15 participants)

2/12/18 (15 participants)

2/19/18 (15 participants)

2/26/18 (15 participants)

3/5/18 (15 participants)

Sierra Club night hikes: 120 participants

TOTAL NIGHT HIKE PARTICIPATION: 120