PALOS VERDES PENINSULA LAND CONSERVANCY

PRESERVING LAND AND RESTORING HABITAT FOR THE EDUCATION AND ENJOYMENT OF ALL

July 26, 2018

Ara Mihranian
Community Development Director
City of Rancho Palos Verdes
30940 Hawthorne Boulevard
Rancho Palos Verdes, CA 90275

Re: Palos Verdes Nature Preserve Annual Report for January 1 to December 31, 2017 for the Rancho Palos Verdes Draft Natural Community Conservation Plan and Habitat Conservation Plan

Dear Mr. Mihranian,

We are pleased to submit to you the 2017 Palos Verdes Nature Preserve Annual Report for the Rancho Palos Verdes Draft Natural Community Conservation Plan and Habitat Conservation Plan. An additional appendix needed in the Report, which the City of Rancho Palos Verdes should provide, is the habitat tracking matrix. Also, please forward this report to any other City staff who may need this documentation for their files.

Please contact me with any questions.

Thank you!

Adrienne Mohan
Conservation Director

Andrea Vona
Executive Director

Palos Verdes Peninsula
Land Conservancy

PALOS VERDES PENINSULA
LAND CONSERVANCY

January -- December 2017

PALOS VERDES NATURE PRESERVE

ANNUAL REPORT

FOR THE

RANCHO PALOS VERDES
NATURAL COMMUNITY CONSERVATION PLAN

July 2018

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2017 ANNUAL REPORT

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1.0 INTRODUCTION

The 2017 Palos Verdes Nature Preserve Report for the Rancho Palos Verdes Natural Community Conservation Plan/Habitat Conservation Plan 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, 2017 through December 31, 2017. 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.

PVPLC provides habitat management 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 a Draft Natural Community Conservation Plan (NCCP) 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, 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 draft NCCP and under 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 draft 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. The plan outlined restoration of 15 acres at Alta Vicente Reserve. However, after the 2009 fire at Portuguese Bend, restoration shifted focused to this reserve, and a restoration plan was developed for 25 acres at Portuguese Bend Reserve. The 25 acre Portuguese Bend project has been implemented and the remaining acreage at Alta Vicente Reserve is currently undergoing implementation. PVPLC seeks additional funding when possible, to perform restoration on more than the minimum five acres per year required in the NCCP. Several opportunities of this nature occurred during the reporting period that enabled PVPLC to conduct additional restoration as detailed below. Additionally, PVPLC implements 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.

The NCCP Implementing Agreement has not been signed by the regulatory agencies, and therefore, the NCCP is technically not officially executed. However, because it is anticipated that this agreement and federal/state permits will be signed in the near future, this annual report is intended function as the framework management and monitoring plan for the upcoming federal/state NCCP and has been provided to satisfy the requirements the Management Agreement between PVPLC and the City. Annual reporting requirements for the Draft NCCP are detailed below and will be updated once the final NCCP is approved. Additionally, once every three years, a Comprehensive Report is required under the NCCP. To date, three Comprehensive Reports have been completed, covering the periods 2007 through 2009, 2010 through 2012, and 2013 through 2015. The next Comprehensive Report will be issued in 2019 covering the 2016 through 2018 reporting period.

Annual Submittals (Included in This Report)

1. Restoration plans for the NCCP and other projects
2. NCCP 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 Project Impact Tracking

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 Canyon Reserve**	Vista del Norte Reserve
* Not managed by PVPLC, but managed under Habitat Conservation Plan ** Will be added to the Preserve when NCCP is adopted	

2.0 HABITAT RESTORATION PLAN

The initial Preserve Habitat Management Plan (PHMP) for the Draft NCCP 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. 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 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

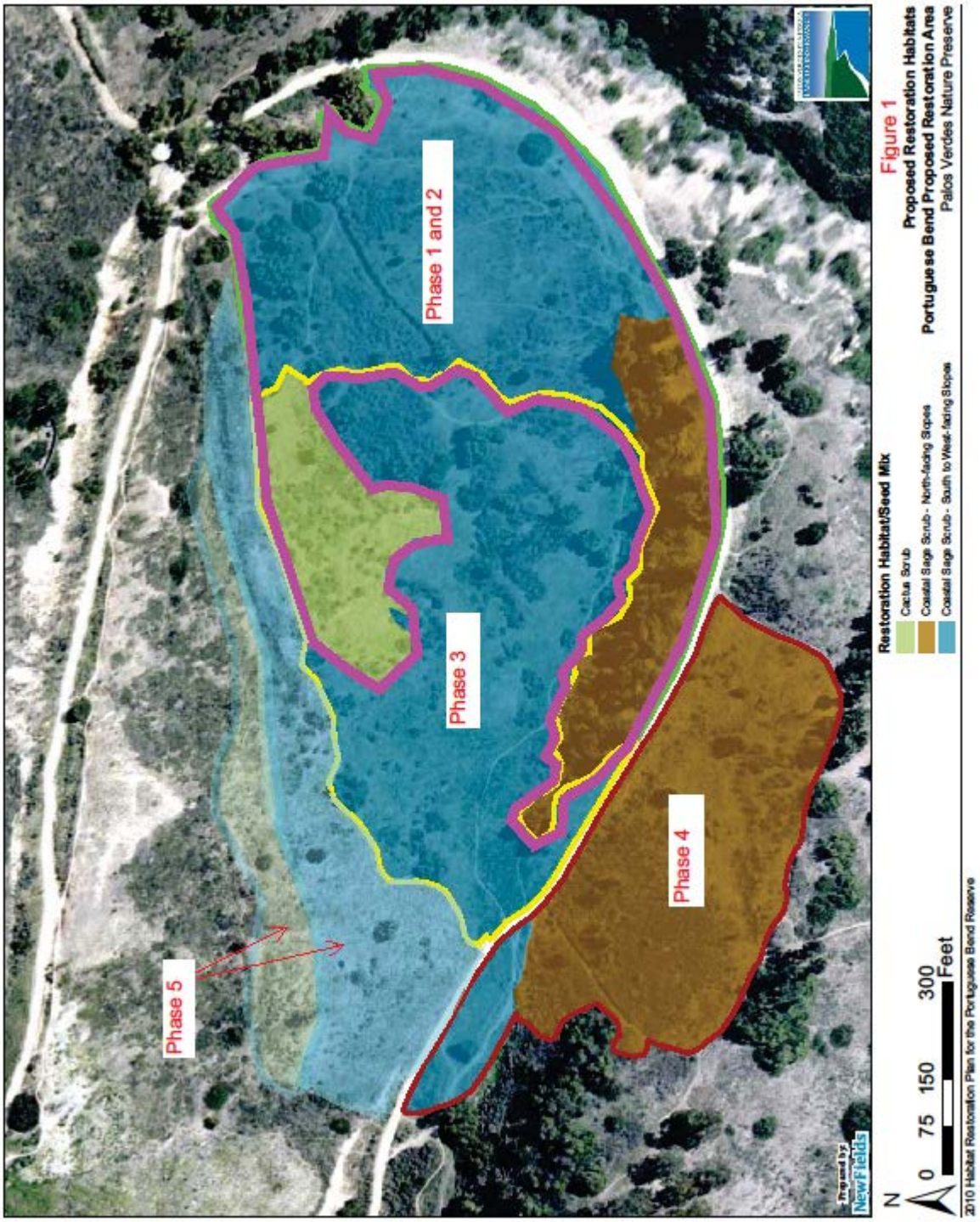
The habitat restoration plan for Portuguese Bend is to complete 25 acres in five phases (Table 2, Figure 2). Site preparation at Portuguese Bend began in February 2010. Field staff weeded (hand/herbicide) the burn area in 2010. In February 2011, goats were deployed to clear vegetation. Due to the high 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 to 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 will began in spring 2017. 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, with Year 1 monitoring to begin spring 2018.

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 2017-Spring 2021
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 2018-Spring 2022

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

3.0 ADDITIONAL RESTORATION ACTIVITIES IN 2017

PVPLC seeks additional funding, to perform restoration on more than the minimum five acres per year required in the NCCP. Several opportunities occurred during the reporting period. Table 4 shows the timeline for each additional restoration project. Figure 4 provides a site map for all restoration projects active in 2017, including the restoration at Alta Vicente and Portuguese Bend Reserves that fulfills the requirements of the NCCP 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 will be completed in 2018.

3.2 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, and 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 are 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. Final reporting and closeout will take place 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. Volunteers have continued to plant host plants and remove weeds through 2017 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. This work is ongoing through 2017 with closeout of this grant anticipated in 2018.

Figure 4. Site map for active 2017 restoration projects in the Palos Verdes Nature Preserve.

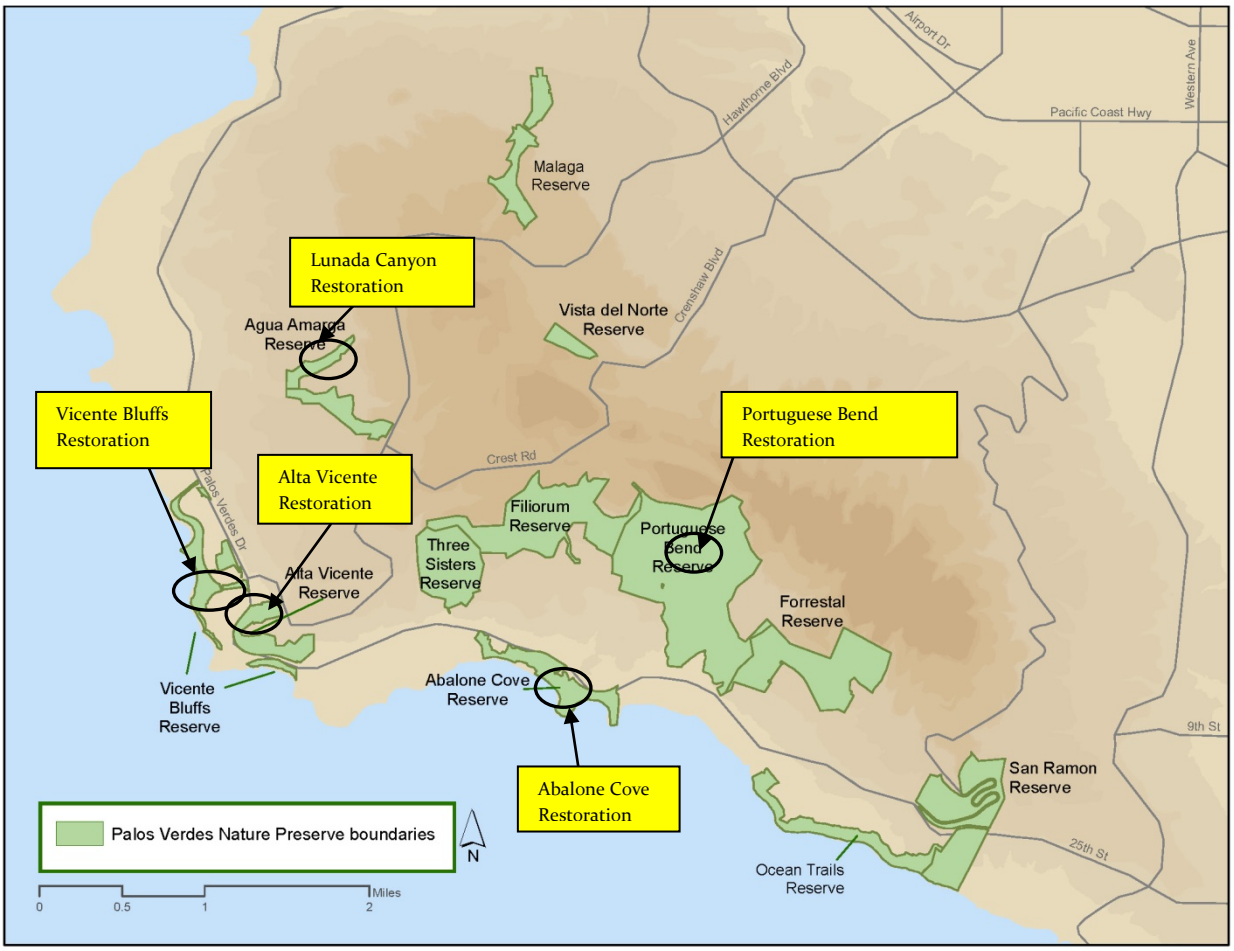


Table 4
Restoration Project Schedule for Additional Restoration in Palos Verdes Nature Preserve.

	Task	Date
Abalone Cove Grants (5 acres)	Remove invasive plants	Spring 2013-Fall 2013
	Install native plants	Fall 2013, 2014, 2015
	Weed and maintain site	Through August 2018
Agua Amarga Grants (0.55 acres)	Remove invasive plants	Spring – Fall 2011
	Install native plants	Fall 2011 – Fall 2015
	Weed, maintenance and monitoring	Through spring 2017
Vicente Bluffs Grants (0.75 acres)	Remove invasive plants	Spring – Fall 2012
	Install native plants	Fall 2012
	Weed and maintain site	Through 2016
Portuguese Bend Grants (0.75 acres)	Remove invasive plants	Spring – Fall 2012
	Install native plants	Fall 2012
	Weed and maintain site	Through 2017

4.0 MONITORING

4.1 RESTORATION MONITORING

PVPLC's stewardship staff conducted surveys at the restoration sites throughout the preserves, 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 2017, 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 (40-49% observed). There remain gaps in native vegetation due to low seed germination, likely a result of prolonged drought conditions. 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. In 2018 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 will be monitored for its Year 1 analysis in 2018.

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 5 after plant installation for the 2017 monitoring. Plants were healthy, and recruitment from seed was observed at the site, however the three transects in these two phases did not meet quantitative success criteria of 50% native plant cover (34-44% observed). The Conservancy will plant in less dense areas to aid in native plant percent cover in these areas in 2018. At Portuguese Bend in Phase 3 (Year 4) native plant cover has achieved qualitative success criteria and is on track for achieving Year 5 standards in 2018. Phase 4 (Year 2) has surpassed the success criteria for a more mature Year 5 restoration. Phase 5 (Year 1) is meeting the year-one goal for coastal sage scrub cover, however cactus cover has not yet met goals for the second year. Therefore, fill-in cactus planting and early-season weed control will take place in 2018 to bolster cactus vegetation in Phase 5.

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 2013-2015 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 were 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 will take place in 2018.

4.3 MONITORING CITY PROJECTS

PVPLC provided monitoring and consultation for five projects in 2017 – the La Rotonda Drainage Repair Project at Ocean Trails; the ACLAD dewatering wells in Portuguese Bend Reserve; the CalWater pipeline rupture repairs on Burma Road Trail in Portuguese Bend Reserve; the Toyon Trail remediation project in Portuguese Bend Reserve; and Portuguese Bend Reserve trail repairs resulting from rain damage. A table of habitat impacts is shown in Appendix J.

The La Rotonda Drainage Repair Project began in 2015 and repaired underground pipelines along the southern edge of Ocean Trails Reserve in the Shoreline Park area. The project occurred within the vicinity of known *Atriplex pacifica* plant populations and CSS habitat. Staff flagged individual *Atriplex* plants near the roadsides, which were avoided during construction. The project was completed in early 2017, and our staff verified that no permanent damage incurred to CSS or the *Atriplex* vegetation.

The Abalone Cove Landslide Abatement District (ACLAD) dewatering well project began summer 2016 and concluded in the summer of 2017. Four new well sites were drilled – two of Burma Road south of Water Tank Trail and two along Ishibashi Farm Trail. Approximately 0.1 acres of CSS was permanently removed and 0.1 acres of non-native annual grasses. Mitigation at a 2:1 ratio for the CSS impacts will be required for this project and has not yet been performed at the time of this report. The Conservancy recommends to the City that a restoration plan be developed and implemented to mitigate for impacts to CSS resulting from this project.

In August 2016, a CalWater pipeline failure caused the emergency removal of habitat in Portuguese Bend Reserve in order to access and repair the underground pipeline. The location of the impacted areas are adjacent to Burma Road, south of the intersection of Eagles Nest trail. According to the draft NCCP, this impact requires restoration at a 2:1 ratio for coastal sage scrub (CSS) and 0.5:1 ration for non-native annual grassland (NNAG). The measured area of impact is 0.04 acres of CSS and 0.03 acres of NNAG, therefore the resulting restoration required is 0.08 acres of CSS and 650 sq. ft. of NNAG. The City hired PVPLC to perform the restoration, where appropriate CSS species were planted and seeds dispersed in the affected areas. PVPLC monitored this project in 2017 and planted additional shrubs, and the site is establishing successfully. Maintenance and monitoring will continue through 2019.

The Toyon Trail and Peppertree Trail in Portuguese Bend were accidently graded in October 2014 by a City contractor, impacting 0.3 acres of trailside CSS. The City and PVPLC coordinated repairs to the Toyon trail to restore its historic width in the impacted area by planting approximately 400 plants and installing post-and-rope and boulders to protect the plants from trampling. The City hired PVPLC to perform a site assessment in January 2017, which found that plant survival was low (about 25% survival rate) and weeds (namely *Brassica*)

were encroaching into the restoration area. PVPLC recommends the City replant bare areas in fall 2018 to successfully remediate this damage.

Significant rains in late 2016 through early 2017 caused significant erosion damage to many trails, largely concentrated in Portuguese Bend Reserve (Vanderlip Trail, Burma Road Trail, Peppertree Trail, and Sandbox Trail), causing the trails to be temporarily closed until repaired in the summer of 2017. 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.

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 in 2018 or 2019 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 Draft NCCP 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 2017, 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.

At Alta Vicente, *Cortaderia selloana* was removed. At Abalone Cove, a population of *Coronilla valentina* that had previously been treated experienced some new germination and was retreated. Maps and detailed reports of the TERPP program are found in Appendix D.

7.0 BRUSH CLEARANCE

Brush clearance is the clearing or minimizing of vegetation in areas that occur immediately adjacent to residential structures and roads. RPV is responsible for brush clearance within the Preserve, to provide an appropriate level of fire protection, emphasizing the protection of life, public safety, and property values in the urban-wildlife interface areas while minimizing environmental impacts of fire suppression and control. PVPLC has collaborated with RPV to develop clear protocols to ensure that all Best Management Practices associated with fuel modification activities are consistently followed. In 2017, RPV staff successfully collaborated with PVPLC to ensure that bird surveys were completed prior to fuel modification activities.

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 2017. 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 2017 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-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 March 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 2017 for trail management:

Area Closed Signs Installed	6 signs
Decals Replaced	160 decals
Graffiti Removed	9 removed
New/Repaired Carsonite markers	6 markers
Trail Maintenance Projects	39 projects
New Spur Trail Closures	34 closures
Repaired/Fortified Spur Closures/Delineate wide trails	40 closures
Brush Trimming/Weed clearance	112 projects
Trail Crew Events (Maintenance Projects)	18 events
Rapid Response Volunteer Days	58 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 (Appendix I). 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. The City and PVPLC are seeking additional funding to implement the signage plan throughout the remaining Reserve areas.

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 2017, focal areas were Filiorum (Eucalyptus Trail, Gary's Gulch Trail, Kelvin Canyon Trail and the trail that connects to Three Sisters); Portuguese Bend (Ishibashi Trail, Toyon Trail, Rim Trail, Sandbox Trail, Barn Owl Trail and Ishibashi Farm Trail); Forrestal (Flying Mane Trail, Quarry Trail, Vista Trail, Dauntless Trail, Cactus Trail and Exultant Trail); and Abalone Cove Reserves (Sea Dahlia Trail, Smuggler's 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, including the repair of trails that suffered erosion damage resulting from the 2016-17 rains. The following lists the trail projects that the PVPLC Volunteer Trail Crew conducted in 2017:

Abalone Cove

- Repaired rock stairs on Sea Dahlia Trail (January, May and December)
- Repaired tread on Cliffside Trail (May)

Alta Vicente

- Installed check dam/stairs on North Spur Trail (July)
- Repaired tread and installed grade dips for erosion control on Alta Vicente Trail and North Spur Trail (September)

Filiorum

- Repaired tread erosion issues and canyon crossings on Zote's Cutacross (February and August)
- Cleared path through landslides to reopen Rattlesnake Trail (March and April)
- Installed a retaining wall, grade dips and repaired erosion damage on Ford Trail (November)

Portuguese Bend

- Repair tread erosion to reopen Vanderlip Trail (June)

Three Sisters

- Installed grade dips, a retaining wall, and repaired erosion damage on Sunshine Trail and Barkentine Trail (October)

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. Eleven new volunteers completed the fourth 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.

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 2017, volunteers contributed over 18,977 hours of service totaling $540,100 of in-kind service in support of conservation, restoration, education and management of the Palos Verdes Nature Preserve. The 2017 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 have been working diligently to update figures and finalize the language in the draft NCCP. However, this process has delayed the finalization of the Plan and has resulted in a delayed permit for the City who would like to implement projects in the Preserve for which they do not have take permit authorization. The completion of the NCCP must remain a priority so that plans can be finalized and all operations protocols can be confirmed.

PVPLC has been successful at completing restoration under the NCCP, monitoring NCCP covered species, and meeting the goals for targeted invasive plant removal. However, because *Euphorbia terracina* has been difficult to eradicate, and has required treatment over several years, many of the same areas have been treated through the TERPP program since 2009. Additionally, the prolonged drought from 2013 to 2016 put great stress on habitat, restoration projects and covered species, as observed in our monitoring efforts. The tremendous rains that we received in 2017 caused an extreme bloom in non-native species which drove much of our trail management activities and restoration project tasks through the year.

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 LA County Sheriff Department's Preserve Deputies 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 staff and the Wildlife Agencies, that a new 5-acre NCCP restoration project is not initiated until the fall of 2019, effectively skipping a new project initiation in 2018. Instead in 2018, the Conservancy will continue to manage its current NCCP projects and additional restoration projects by in-fill planting areas to achieve success criteria and control invasive weed growth. This decision was made as an adaptive management approach to combat the negative effects of long-term drought on the restoration projects which inhibited growth of cactus habitat and butterfly habitat areas as well as encouraged the proliferation of highly-invasive species such as crystalline iceplant, euphorbia, and tumbleweed. This effort to focus attention on existing projects will also allow more lead time to propagate hearty plant material for the 2019 planting year.

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

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Allen Franz, Exec. Vice President
Diana Bailey, Secretary
John Spielman, Treasurer

2017 Board of Directors

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Executive Director

Andrea Vona

Office Administration

Jill Wittman, Administrative Assistant
Sue Cody, Accountant

Land Stewardship

Adrienne Mohan, Conservation Director
Cristian Sarabia, Stewardship Manager
Josh Weinick, 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
Neil Uelman, Naturalist

Development

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

APPENDIX A

2017 RESTORATION MONITORING REPORT

In 2017 vegetation surveys were conducted at restoration sites within currently-managed NCCP 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 qualitative, 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 3rd, 6th, 13th, and May 28th 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 I SURVEY RESULTS (YEAR 8)

Monitoring transects (AV1 – AV3, AV5, and AV6) in Alta Vicente did not meet success criteria by the fifth year of monitoring. These transects were monitored after their fifth year since they have yet to meet final success criteria standards.

Coastal Sage Scrub (CSS):

One monitoring transect (AV1) was surveyed within the CSS of Phase I restoration. Qualitative survey methods (CNPS Rapid Vegetation Assessment) found percent cover by native plant species to be 59% (Table 5). Photopoints show that many plants have increased in size and appear to be in good health (Appendix A1). Qualitative methods and photographic assessments indicate that habitat along AV1 is healthy and has met final success goals for native plant cover (>50% in Year 5). The transect AV1 will be removed from future monitoring activities.

1.2 ALTA VICENTE PHASE 2 (YEAR 7)

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 59% with 7% cactus cover (Table 5). Quantitative methods describe AV3 as achieving success criteria goals for native plant cover, yet falling 4% short of success criteria goals for cactus species. Qualitative methods identified cactus cover as 9% at AV3, within 1% of the Year 5 success goal (10% cactus cover goal). This transect will be monitored using qualitative methods in 2018 to track growth of cactus.

PVB Butterfly Habitat

Two monitoring transect (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 43% (Table 5). Native plant cover is within the success criteria range for Year 5 goals (Table 11). PVB host plants were not detected despite monitoring occurring in March/April as recommended in the 2016 report. At AV5, qualitative survey methods (CNPS Rapid Vegetation Assessment Method) found percent cover by native plant species to be 33% (Table 5). Qualitative assessments indicate that habitat along AV5 is within success criteria goals for native cover (30-60% in Year 5) although monitoring failed to capture the presence of PVB Butterfly host plants (*Astragalus tricopodus* or *Acmispon glaber*).

Coastal Sage Scrub (CSS)

Transect (AV6) in Phase 2 restoration at Alta Vicente was incorrectly aligned since 2014. The correction was made post-monitoring in 2016, with 2017 monitoring following the original and correct transect alignment. Qualitative survey methods (CNPS Rapid Vegetation Assessment Method) found percent cover of native species to be 52% (Table 5). Transect AV6 has met final success criteria goals (>50% native cover) and will be removed from future monitoring activities.

1.3 ALTA VICENTE CONCLUSIONS AND RECOMMENDATIONS

In 2017, two transects (AV1 and AV6) met success criteria standards, while three transects (AV2, AV3, and AV5) did not. Transects (AV1 and AV6) within coastal sage scrub habitat areas were 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. *E. californica* exhibited particularly healthy gains, increasing in percent cover over 2016 measures by 22% at AV3 and 18% at AV6. Other habitat types struggled to meet success criteria standards. Transects within Palos Verdes blue butterfly habitat (AV2 and AV5) or cactus scrub habitat (AV3) were not successful. The inability of these restoration areas to meet success criteria standards is

likely related to physiological traits of each targeted group of plant species, cactus or PVB host plants. Slow growth rates of cactus (*Opuntia littoralis* and *Cylindropuntia prolifera*) and the vulnerability to invasion by non-native weeds and sensitivity to shifts in environmental conditions of PVB host plants (*Astragalus tricpodus* and *Acmispon glaber*) have likely contributed to the failure to meet criteria standards. PVB host plants (*Acmispon glaber* and *Astragalus tricopodus*) have not established at the site despite intensive removal of the invasive plant *Mesembrythemum crystallinum* and the creation of bare ground. Instead, *M. crystallinum* has been replaced by non-native annual grasses which appear to have restricted host plant establishment. Cactus species within restored cactus scrub habitat continue to increase in percent cover, although have not met expected growth schedules. While cactus scrub habitat may only require additional time to reach performance standards, PVB habitat areas are expected to need more intensive management to achieve performance standard goals and/or ideal environmental conditions. It is recommended that infill planting occur within transects not meeting criteria to improve plant density and achieve desired cover by native plant species. It is also recommended that PVB habitat receive regular invasive species removal in addition to infill planting to control non-native grass or other non-native species that may represent a competitive challenge to PVB host plant establishment.

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 two transects in their third year of establishment (PB4 and PB5). 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 17th, 20th, 28th and May 4th, 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 5

South-facing Coastal Sage Scrub (CSS)

Two monitoring transects (PB1 and PB2) within the south-facing CSS of Phase 1 and 2 restoration were evaluated against success criteria in 2017 and surveyed using both quantitative (point intercept) and qualitative (CNPS Rapid Vegetation Assessment) methods.

At PB1, quantitative methods were used to identify the presence of four native plant species, a total native plant cover of 26%, and a non-native plant cover of 38% (Table 2). Native plant species with the highest percent cover at this transect included *Artemisia californica* (10%), *Heteromeles arbutifolia* (10%), and *Eriogonum fasciculatum* (4%) (Table 7). PB1 did not meet Year 5 success criteria for native plant cover in 2017 according to point-intercept methods. Qualitative methods identified an additional six (10 in total) native plant species, although native plant cover remained below criteria standards at 34%. At the second monitoring transect, PB2, quantitative methods were used to identify the presence of 6 native plant species, a total native cover of 42%, and non-native cover of 16% (Table 2). Native species with the highest percent cover at this transect included *Artemisia californica* (14%), *Eriogonum fasciculatum* (6%), and *Encelia californica* (6%) (Table 7). PB2 did not meet final success criteria in 2017 (Year 5), yet is expected to meet the final success criteria for native plant cover (50%) and non-native plant cover (<25%) in 2018. Qualitative methods identified the presence of an additional 10 native plant species and a total 44% native plant cover. Transects PB1 and PB2 will be monitored using qualitative methods in 2018 to determine site success.

North-facing Coastal Sage Scrub (CSS)

One monitoring transect (PB3) is situated within the north-facing CSS of Phase 1 and 2 restoration and was surveyed using quantitative and qualitative methods for Year 5 criteria evaluation in 2017.

At PB3, quantitative methods (point intercept) were used to identify the presence of three native plant species, a total native plant cover of 8%, and a non-native plant cover of 32% (Table 7). The native species with the highest percent cover at PB3 was *Stipa pulchra* (4%) (Table 7). PB3 did not meet Year 5 success criteria for native or non-native plant cover in 2017. Qualitative methods (CNPS Rapid Vegetation Assessment Method) were used to identify the presence of 11 native plant species, a total native plant cover of 37%, and a non-native plant cover of 20% at PB3 (Table 10). Native plant species with the highest percent cover at this transect included *Baccharis pilularis* (11%), *Heteromeles arbutifolia* (7%), and *Rhus integrifolia* (5%) (Table 10). Transect PB3 will be monitored using qualitative methods in 2018 to determine site success.

Cactus Scrub

At PB6, quantitative methods (point intercept) were used to identify the presence of four native plant species, a total native plant cover of 18%, and a non-native plant cover of 2% (Table 7). The native species with the highest percent cover at PB6 were *Encelia californica* (8%) and *Opuntia littoralis* (6%) (Table 7). PB6 did not meet Year 5 success criteria for native or cactus plant cover, but did meet non-native plant cover criteria in 2017. Qualitative methods (CNPS Rapid Vegetation Assessment Method) were used to identify the presence of 9 native plant species, a total native plant cover of 48%, and non-native plant cover of 18% at PB6 (Table 10). Native species with the highest percent cover were *Opuntia litoralis* (11%), *Encelia californica* (10%), and

Cylindropuntia prolifera (6%) (Table 10). PB6 is expected to meet final success criteria for native plant cover (>40%), cactus cover (≥ 10%), and non-native plant cover (<25%) in 2018.

2.2 PORTUGUESE BEND SURVEY RESULTS (PHASE 3) YEAR 4

South-facing Coastal Sage Scrub (CSS)

Two monitoring transects (PB4 and PB5) were surveyed within the south-facing CSS of Phase 3 restoration. Although monitoring for these transects was not required in 2017 since they are in Year 4 of growth, staff chose to monitor them anyway to track their trajectory to meeting Year 5 criteria in 2018. At PB4, qualitative methods (CNPS Rapid Vegetation Assessment) were used to identify the presence of 14 native plants, a total native plant cover of 47%, non-native cover of 18%, and bare ground/litter cover of 34% (Table 6 and 7). Native species with the highest percent cover were *Encelia californica* (7%) and *Artemisia californica* (6%) (Table 7). At PB5, qualitative methods (CNPS Rapid Vegetation Method) were used to identify the presence of 10 native species, a total native plant cover of 38%, non-native cover of 4%, and bare ground/litter cover of 58% (Table 6 and 7). Native species with the highest percent cover were *Salvia mellifera* (8%), *Artemisia californica* (7%), and *Eriogonum fasciculatum* (6%) (Table 7). These transects show good plant growth and are on track for meeting Year 5 success criteria in 2018.

2.3 PORTUGUESE BEND SURVEY RESULTS (PHASE 4) YEAR 3

North-facing Coastal Sage Scrub (CSS)

One monitoring transect (PB7) was surveyed within north-facing CSS of Phase 4 restored areas. Quantitative methods (point intercept) were used to identify the presence of nine native plant species, a total native plant cover of 44%, and a non-native plant cover of 2% (Table 7). The native species with the highest percent cover at PB3 was *Artemisia californica* (18%) (Table 7). PB7 met Year 3 success criteria for native or non-native plant cover in 2017.

2.4 PORTUGUESE BEND SURVEY RESULTS (PHASE 5) YEAR 2

South-facing Coastal Sage Scrub (CSS)

One monitoring transect (PB8) was surveyed within the south-facing CSS of Phase 5 restoration, and although monitoring PB8 was not required in 2017 staff conducted an assessment to track its trajectory to meeting Year 3 goals. Qualitative methods (CNPS Rapid Vegetation Assessment Method) were used to identify the presence of 15 native plant species, a total native cover of 58%, and a non-native plant cover of 17% (Table 10). Native species with the highest percent cover were *Artemisia californica* (20%), *Astragalus tricopodus* (5%), and *Eriogonum fasciculatum* (5%).

Based on these results, native vegetation is expected to achieve success criteria goals in Year 3 monitoring (2018).

Cactus Scrub

One monitoring transect (PB9) was surveyed within the cactus scrub of Phase 5 restoration, and although monitoring PB9 was not required in 2017 staff conducted an assessment to track its trajectory to meeting Year 3 goals. Qualitative methods (CNPS Rapid Vegetation Assessment Method) were used to identify the presence of 18 native plant species, a total native cover of 36%, and a non-native plant cover of 26% (Table 10). Native species with the highest percent cover were *Encelia californica* (7%) and *Artemisia californica* (5%). *Opuntia littoralis* was not identified at PB9. Native cover at PB9 is on track for meeting Year 3 goals, however cactus maturity cover is low is expected to fall short of success criteria without additional in-fill planting (5% cactus cover).

2.5 PORTUGUESE BEND CONCLUSIONS AND RECOMMENDATIONS

Four transects were evaluated for quantitative success criteria in 2017. One transect (PB7) effectively met success criteria measures, while the remaining transects (PB1, PB2, PB3, and PB6) did not. The monitoring transect PB7, for Year 3 quantitative success criteria evaluation, exceeded standards for native and non-native plant cover. PB7 is expected to also meet success criteria during the next evaluation period (Year 5 monitoring) in 2019, earlier than projected standards. Vegetation at the other three transects fell below outlined measures for native plant cover. An obstacle to meeting criteria may be resulting from 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. At PB1, native plants have become well established, however spacing of natives may be contributing to percent cover measurements below guidelines observed in 2017 monitoring. Infill planting will likely increase native cover and achieve success criteria in the next few years. Another factor likely inhibiting fulfillment of success criteria goals is high competitive pressures from non-native plant species. Many restored areas in Portuguese Bend were heavily invaded by the non-native, *Brassica nigra* during the early months of the growing season (February – March). Native species at PB 2 and PB 3 were likely impacted by the dense *B. nigra* presence within the restored area, despite subsequent removal by stewardship technicians. Dense cover by *B. nigra* may have existed long enough to exert considerable competitive pressures on native species, effectively reducing established plant growth and inhibiting further recruitment of native species. The removal of existing *B. nigra* and early removal in 2018 are recommended to improve growth potential and recruitment by native plant species.

Although not evaluated against success goals in 2017, four transects (PB4, PB5, PB8, and PB9) were monitored using qualitative methods to provide an opportunity for adaptive management and increase the potential to meet success criteria in 2018. Qualitative methods describe all transects to be nearing goals for native plant cover, with PB8 already exceeding Year 5 monitoring requirements

(>50%) in just the second year of monitoring. Despite seemingly strong cover by native plant species, cactus species (*Opuntia littoralis* or *Cylindropuntia prolifera*) were not detected at transect PB9 within cactus scrub habitat. This transect was heavily invaded by the non-native *Brassica nigra* which has likely impacted by the native plant establishment and detection. Such impacts may have led to the mortality of cactus plantings or reduced growth, either of which would possibly limit detection within the dense stand of *B. nigra*. It is recommended that restoration sites within Portuguese Bend receive non-native plant removal early in the growing season to reduce negative impacts to native species as well as infill of cactus plantings at PB9.

Table 1. Alta Vicente
Number of plants per 50m transect with point intercept methods, 1m interval.

Species	AV1	AV2	AV3	AV5	AV6
Amsinckia menziesii	0	2	0	0	0
Artemisia californica	5	5	5	1	2
Elymus condensatus	0	1	0	0	0
Encelia californica	0	0	15	1	15
Eriogonum cinereum	2	1	10	1	2
Hazardia squarrosa	1	0	0	0	0
Opuntia littoralis	1	0	3	0	0
Peritoma arborea	2	0	0	0	0
Rhus integrifolia	2	0	0	0	3
Salvia leucophylla	2	0	0	0	0
Salvia mellifera	0	1	0	0	0
Total Native Plants	**14**	**10**	**33**	**3**	**22**
NNAG	0	7	0	6	0
NNP	3	2	5	2	2
Total Non-native Plants	**3**	**9**	**5**	**8**	**2**
Bare	1	3	2	2	1
Litter	24	26	10	37	22
Total Bare and Litter	**25**	**29**	**12**	**39**	**23**
Total Plant Cover	**17**	**19**	**38**	**11**	**26**

Table 2. Alta Vicente
Percent cover along 50m transect with point intercept method, 1m interval.

Species	AV1	AV2	AV3	AV5	AV6
Amsinckia menziesii	0	4	0	0	0
Artemisia californica	16	14	10	2	4
Elymus condensatus	0	2	0	0	0
Encelia californica	0	0	30	2	30
Eriogonum cinereum	4	2	20	2	4
Hazardia squarrosa	4	0	0	0	0
Opuntia littoralis	2	0	6	0	0
Peritoma arborea	6	0	0	0	0
Rhus integrifolia	2	0	0	0	6
Salvia leucophylla	6	0	0	0	0
Salvia mellifera	0	2	0	0	0
Total Native Plants	**40**	**24**	**66**	**6**	**44**
NNAG	0	14	0	12	0
NNP	6	4	10	4	4
Total Non-native Plants	**6**	**18**	**10**	**16**	**4**
Bare	4	6	4	4	2
Litter	50	52	20	74	42
Total Bare and Litter	**54**	**58**	**24**	**78**	**48**
Total Plant Cover	**46**	**42**	**76**	**22**	**52**

Table 3. Alta Vicente
Relative percent coverage among all species along the 50-m transects.

Species	AV1	AV2	AV3	AV5	AV6
Amsinckia menziesii	0	10	0	0	0
Artemisia californica	35	33	13	9	7
Elymus condensatus	0	5	0	0	0
Encelia californica	0	0	39	9	56
Eriogonum cinereum	9	5	26	9	7
Hazardia squarrosa	9	0	0	0	0
Opuntia littoralis	4	0	8	0	0
Peritoma arborea	13	0	0	0	0
Rhus integrifolia	4	0	0	0	22
Salvia leucophylla	13	0	0	0	0
Salvia mellifera	0	5	0	0	7
Total Native Plants	**87**	**57**	**87**	**27**	**93**
NNAG	0	33	0	55	0
NNP	13	10	13	18	7
Total Non-native Plants	**13**	**43**	**13**	**73**	**7**

Table 4. Alta Vicente
Average plant height (cm) by transect.

Species	AV1	AV2	AV3	AV5	AV6
Amsinckia menziesii		11.5			
Artemisia californica	84.9	58.6	48.8	28	68.5
Elymus condensatus		5			
Encelia californica			46.9	43	58.3
Eriogonum cinereum	66.5	39	40	36	73.5
Hazardia squarrosa					
Opuntia littoralis	23.7		23.7		
Peritoma arborea	73.5				
Rhus integrifolia	103				75.3
Salvia leucophylla	45.5	27			
Salvia mellifera					

Sampling Dates for Alta Vicente 2017 point intercept:
AV1: April 13, 2017
AV2: May 28, 2017
AV3: April 6, 2017
AV5: April 3, 2017
AV6: April 6, 2017

Table 5. Alta Vicente
Percent plant cover along each 50m transect as observed along 10m swath on each side of transect line.

Species	AV1	AV2	AV3	AV5	AV6
Artemisia californica	13	8	8	6	10
Astragalus trichopodus				1	
Cylindropuntia prolifera	1	1	2	1	1
Deinandra paniculata				1	
Elymus condensatus	1	2			
Encelia californica			9	6	13
Eriogonum cinereum	8	4	9	3	8
Eriogonum fasciculatum	1				
Eriogonum parvifolium	1	1			2
Heteromeles arbutifolia	2	1			
Isocoma menziesii var. sedoides	1		1		
Lupinus succulentus				1	
Malosma laurina	5	1			
Marah macrocarpa					1
Mirabilis californica		1			
Opuntia littoralis	2	3	7	1	5
Peritoma arborea	2	2		1	1
Rhus integrifolia	7	2	1	2	2
Ricinus communis				1	
Salvia leucophylla	3	3		2	1
Salvia mellifera	2	2			1
Stipa pulchra				1	
Total Native Cover	49	31	37	27	45
NNAG	2	4	2	5	1
NNP	19	34	24	31	22
Total Non-native Cover	21	38	26	36	23
Bare	17	24	36	40	35
Litter	13	7	1	1	1
Total Bare and Litter	30	31	37	41	36
Total Plant Cover	70	69	63	63	68

Sampling dates for Alta Vicente 2017 CNPS Rapid Vegetation Assessment:
AV2: March 28, 2017
AV5: April 3, 2017
AV3: April 6, 2017
AV6: April 11, 2017
AV1: April 13, 2017

Table 6. Portuguese Bend
Number of plants counted along 50m transects.

Species	PB1	PB2	PB3	PB7
Artemisia californica	5	7		8
Astragalus tricopodus				2
Baccharis pilularis				
Encelia californica		3		2
Ericameria ericoides				1
Eriogonum fasciculatum	2	3		2
Eriophylum confert		1		
Heteromeles arbutifolia	2	1		1
Isocoma menzieseii var. sedoides				1
Lupinus succulentus				1
Marah macrocarpus			1	
Melica imperfecta		6		
Salvia leucophylla			1	2
Salvia mellifera	1			
Stipa pulchra			2	
Total Native Plants	**13**	**21**	**4**	**22**
NNAG	7	3	13	0
NNP	12	5	3	1
Total Non-native Plants	**19**	**8**	**16**	**1**
Bare	1	1	1	1
Litter	17	20	29	26
Total Bare and Litter	**18**	**21**	**30**	**27**
Total Plant Cover	**32**	**29**	**20**	**23**

Table 7. Portuguese Bend
Percent cover for each species observed along the 50-m transects.

Species	PB1	PB2	PB3	PB7
Acmispon glaber				
Artemisia californica	10	14		18
Astragalus tricopodus				4
Baccharis pilularis				
Encelia californica		6		4
Ericameria ericoides				2
Eriogonum fasciculatum	4	6		4
Eriophylum confert		2		
Heteromeles arbutifolia	10	2		2
Isocoma menzieseii var. sedoides				4
Lupinus succulentus				2
Marah macrocarpus			2	
Melica imperfecta		12		
Salvia leucophylla			2	4
Salvia mellifera	2			
Stipa pulchra			4	
Total Native Plants	**26**	**42**	**8**	**44**
NNAG	14	6	26	0
NNP	24	10	6	2
Total Non-native Plants	**38**	**16**	**32**	**2**
Bare	2	2	2	2
Litter	34	40	58	52
Total Bare and Litter	**36**	**42**	**60**	**54**
Total Plant Cover	**64**	**58**	**40**	**46**

Table 8. Portuguese Bend
Relative percent cover of each plant species to total plant cover.

Species	PB1	PB2	PB3	PB7
Acmispon glaber				
Artemisia californica	16	24		39
Baccharis pilularis				
Encelia californica				9
Ericameria ericoides				4
Eriogonum fasciculatum	6	10		9
Heteromeles arbutifolia	16	3		4
Isocoma menziesii var. *sedoides*				9
Lupinus succulentus				4
Marah macrocarpa			4	
Salvia leucophylla			4	9
Salvia mellifera	3			
Stipa pulchra			9	
Total Native Plants	**41**	**72**	**17**	**96**
NNAG	28	12	24	
NNP	38	17	57	4
Total Non-native Plants	**59**	**28**	**83**	**4**

Sampling dates for Portuguese Bend 2017 point-intercept:
PB1, PB2: April 20, 2017
PB 3: April 17, 2017
PB 7: May 4, 2017

Table 9. Portuguese Bend
Average plant height (cm) by transect.

Species	PB1	PB2	PB3	PB 7
Artemisia californica	58.40	52.57		66.22
Astragulus tricopodus				30
Baccharis pilularis				61
Encelia californica		37.33		117.5
Ericameria ericoides				56
Eriogonum fasciculatum	45	23.17		
Eriophylum confertiflorum		10		
Heteromeles arbutifolia	173.7	26		215
Isocoma menzeiesii var sedoides				27.5
Lupinus succulentus				24
Marah macrocarpa			26	
Mellica imperfecta		26.33		
Salvia leucophylla			14	82
Salvia mellifera	6			
Stipa pulchra			24	

Table 10. 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	2			2	2		3		
Alium angustifolium									
Artemisia californica	9	10	1	6	7	6	15	20	5
Asclepias fascicularis							1	2	
Astragalus trichopodus							2	5	
Baccharis pilularis	2	3	11	3					
Baccharis salicifolia		1						1	
Calystegia macrostegia									
Corethrogyne filaginifolia							2		
Cylindropuntia prolifera						6			
Deinandra fasciculata		2							
Dichelostemma capitatum									
Elymus condensatus			1				1		
Encelia californica	1	5		7	6	10	2	3	7
Ericameria ericoides							1		
Eriogonum cinereum		1							3
Eriogonum fasciculatum	5	8		3	6	3	8	5	4
Eriogonum parvifolium				1				2	
Eschscholzia californica				2			1	2	1
Hazardia squarrosa									
Heteromeles arbutifolia	6	2	7	4	<1	2	2	4	
Isocoma menziesii var. sedoides		<1	1		3		3	4	3
Lupinus succulentus							1		<1
Malacothrix saxatilis							3	2	3
Marah macrocarpa			3						1
Melica imperfecta	1	2		1					
Mirabilis californica									3
Opuntia littoralis						11			
Phacelia cicutaria							1		1
Plantago sp.									
Pseudognaphalium biolettii		1							
Pseudognaphalium californicum									
Pseudognaphalium sp							1		
Rhus integrifolia	2	1	5	3		3	1	1	
Salivia mellifera		2						2	
Salix gooddingii		1							
Salvia leucophylla	2	2	1	7	3	3	5	3	3
Salvia mellifera	4			4	8	4			
Sambucus nigra subsp caerulea			2					2	1
Sisyrinchium bellum									
Solanum douglasii			<1						1
Stipa lepida				2					

Stipa pulchra		2	4	2	2		2		
Total Native Cover	**34**	**44**	**37**	**47**	**38**	**48**	**55**	**58**	**36**
NNAG	20	2	15	9	1	2	10	9	1
NNP	8	12	5	9	3	16	5	8	25
Total Non-native Cover	**28**	**14**	**20**	**18**	**4**	**18**	**15**	**17**	**26**
Bare	10	10	2	10	9	8	4	5	5
Litter	28	30	41	24	49	26	26	20	33
Total Bare and Litter	**38**	**50**	**43**	**34**	**58**	**34**	**30**	**25**	**38**
Total Plant Cover	**62**	**58**	**57**	**65**	**42**	**66**	**70**	**75**	**62**

Sampling dates for Portuguese Bend 2017 CNPS Rapid Vegetation Assessment:

PB3, PB4: April 17, 2017

PB1, PB6: April 20, 2017

PB8, PB9: April 28, 2017

PB7: May 4, 2017

PB2, PB5: May 25, 2017

Table 11. 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.

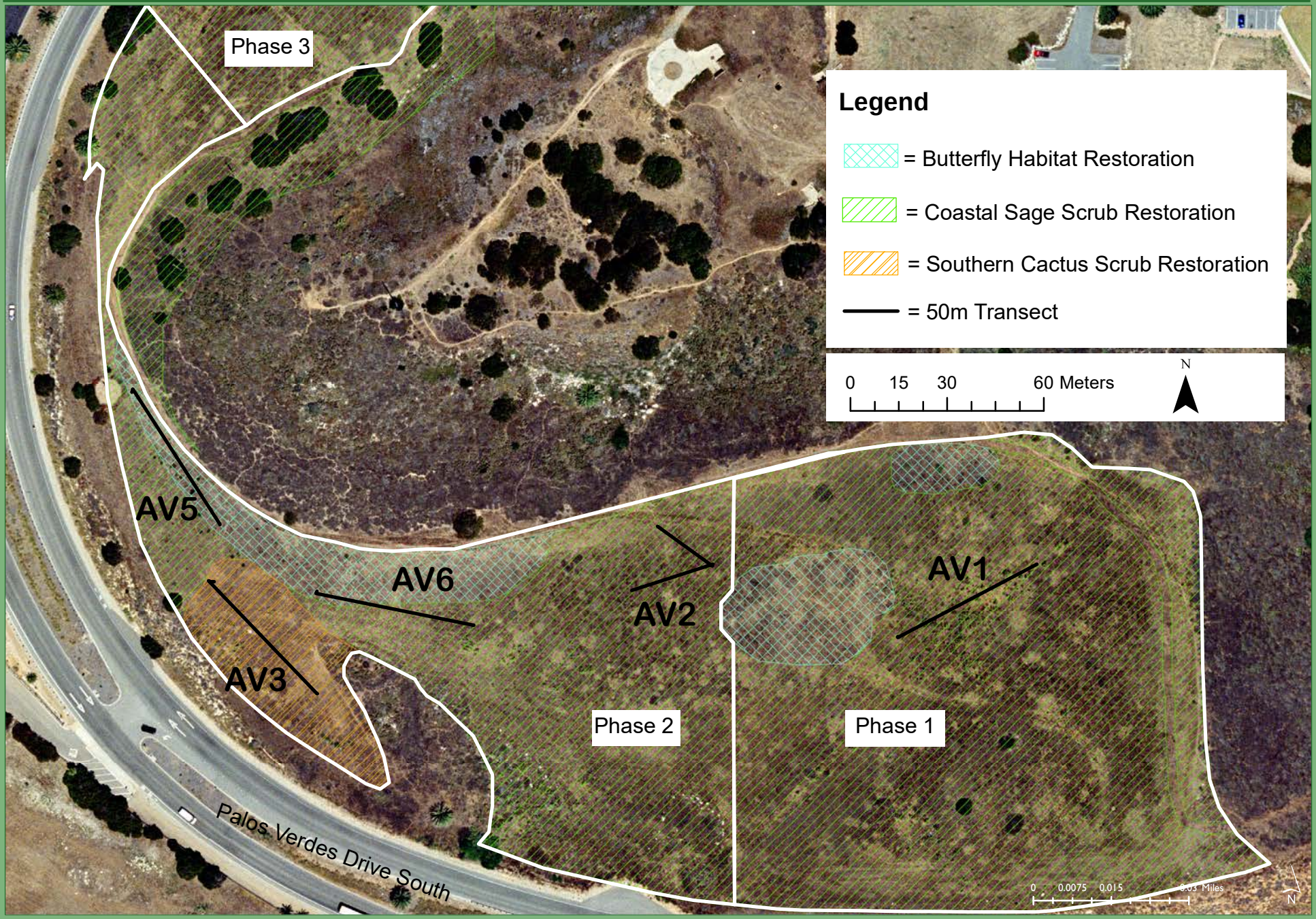
[2] From Year 3 on, there should be at least 10% coverage from *Acmispon glaber* and/or *Astragalus tricopodus* and the woody shrubs should be maintained at 10-20%.

CAL-IPC = California Invasive Plant Council

NNAG = non-native annual grass

Appendix A1

Alta Vicente Monitoring Transects



Appendix A1 - Alta Vicente Transect Images

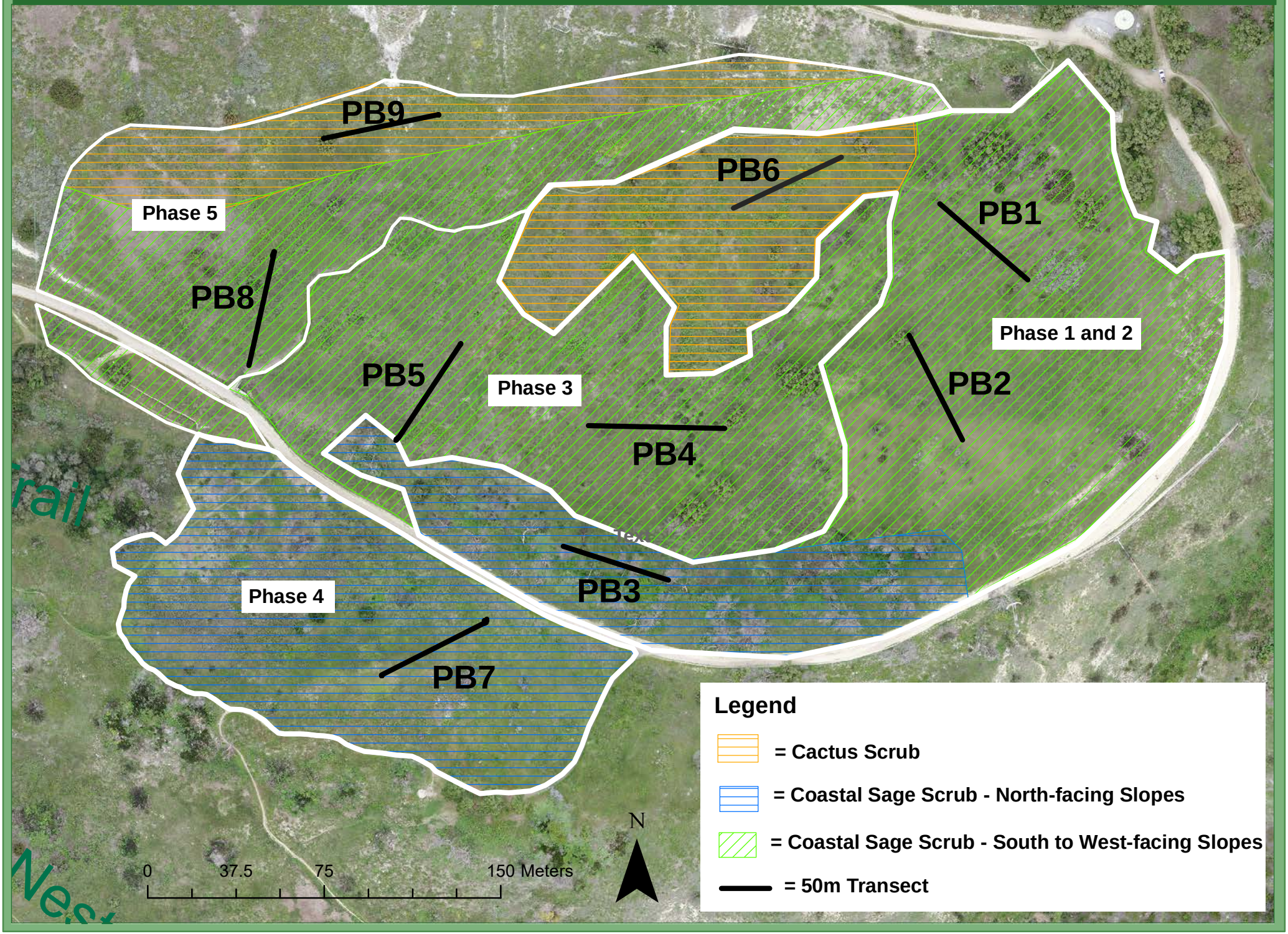
AV 5 End

AV 6 Begin

AV 6 End

Appendix A2

Portuguese Bend Reserve
NCCP Restoration Transects



Appendix A2 – 2017 Portuguese Bend Transect Images

PB1 Begin

PB1 End

PB2 Begin

PB2 End

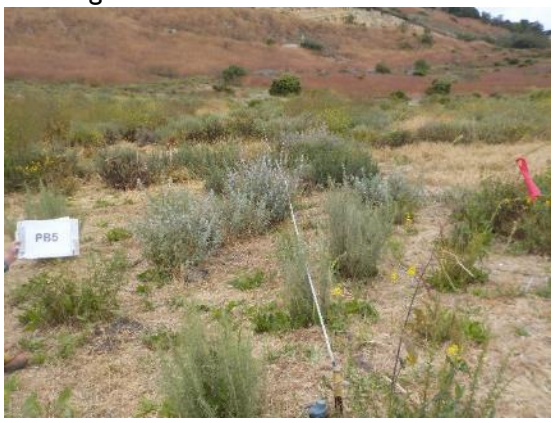
PB3 Begin

PB3 End

PB4 Begin

PB4 End

PB5 Begin



PB5 End

PB6 Begin

PB6 End

PB7 Begin

PB7 End

PB8 Begin

PB8 End

PB9

APPENDIX B

ABALONE COVE 2019 RESTORATION PLAN

Habitat Restoration Plan for the

Abalone Cove Ecological Reserve in the Palos Verdes Nature Preserve




FEBRUARY 2016

PREPARED BY:

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HABITAT RESTORATION PLAN
for the
Abalone Cove 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 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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FIGURE 1

Regional Map

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

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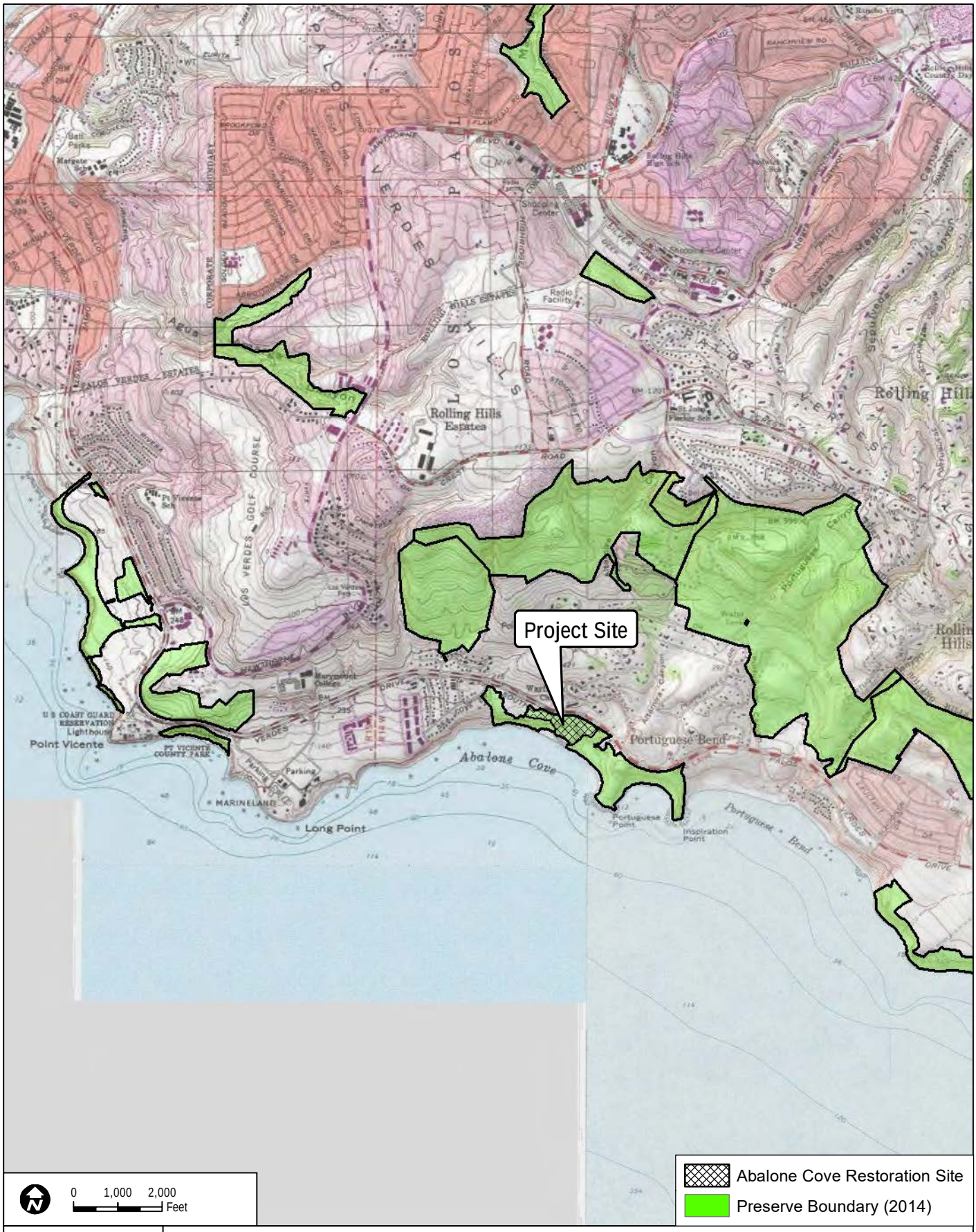

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SOURCE: USGS 7.5-Minute Redondo Beach, San Pedro Series Quadrangles.

FIGURE 2
Vicinity Map

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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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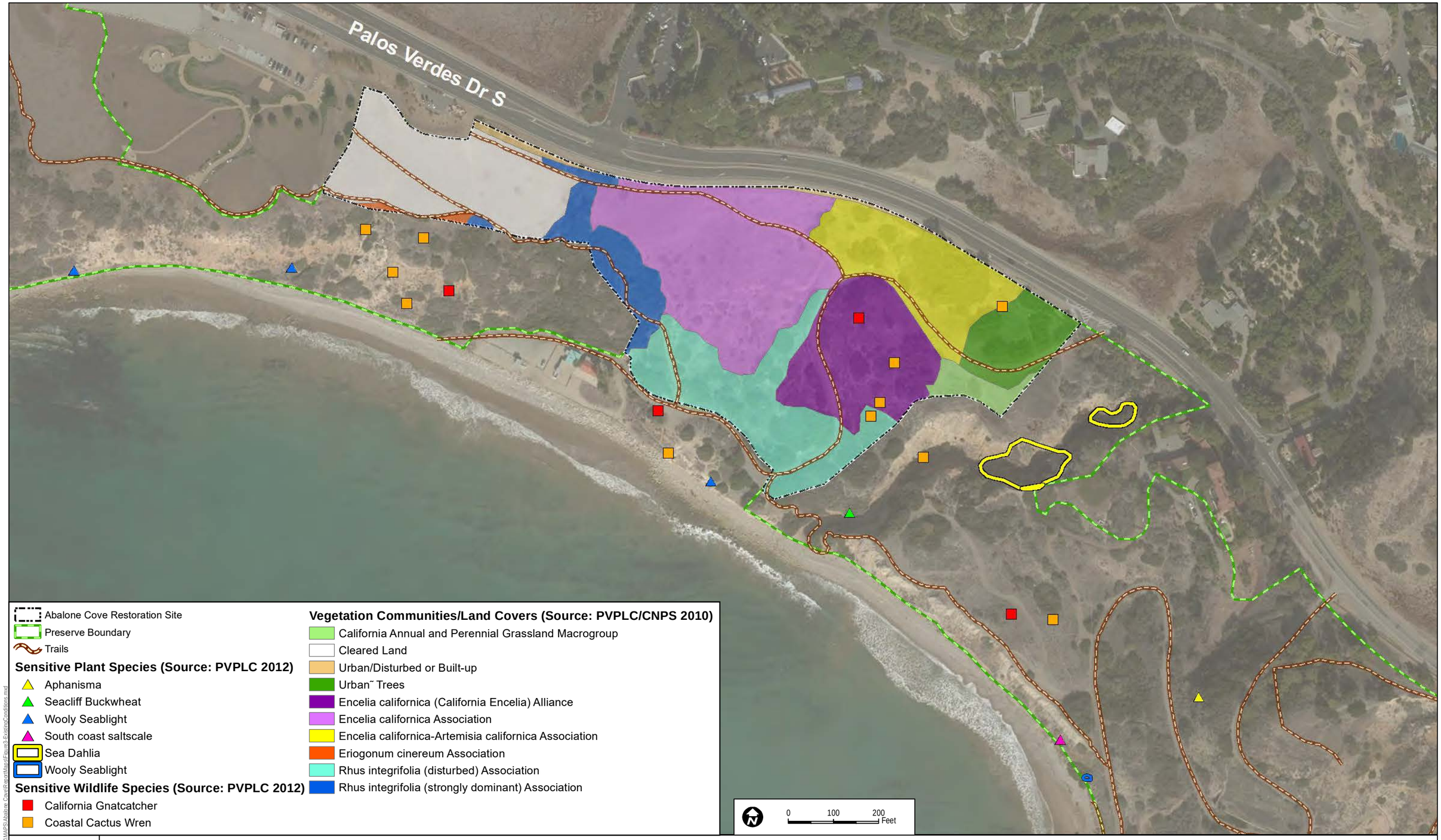

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SOURCES: Palos Verdes Peninsula Land Conservancy 2012; Bing Maps, 2015

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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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

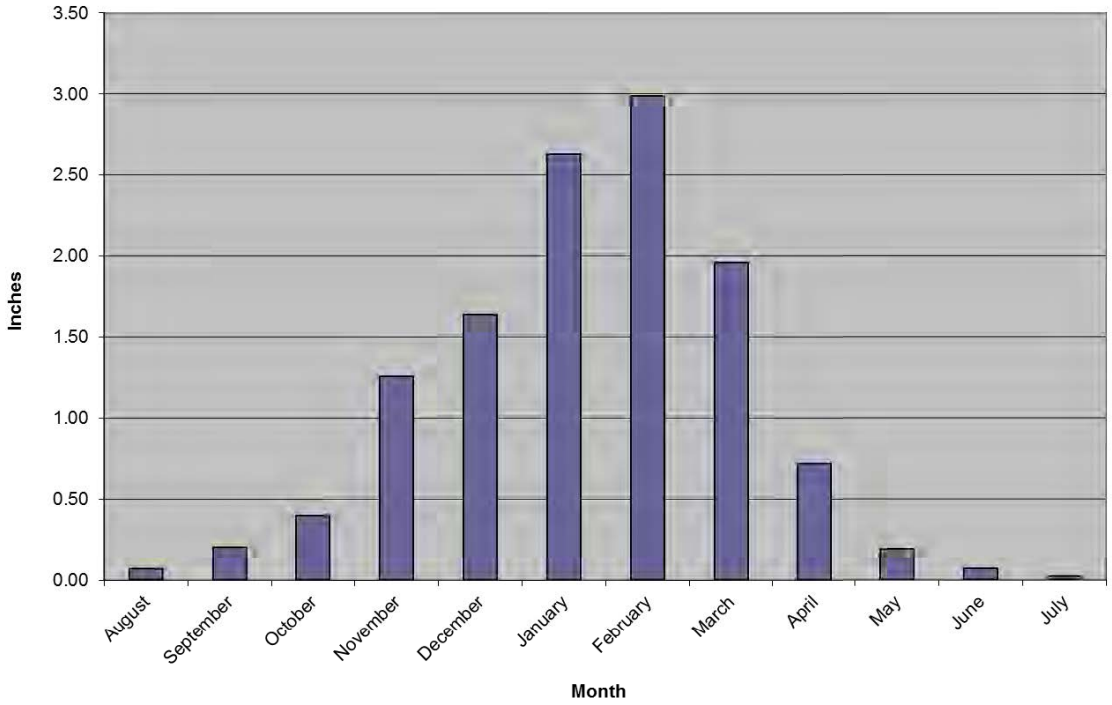
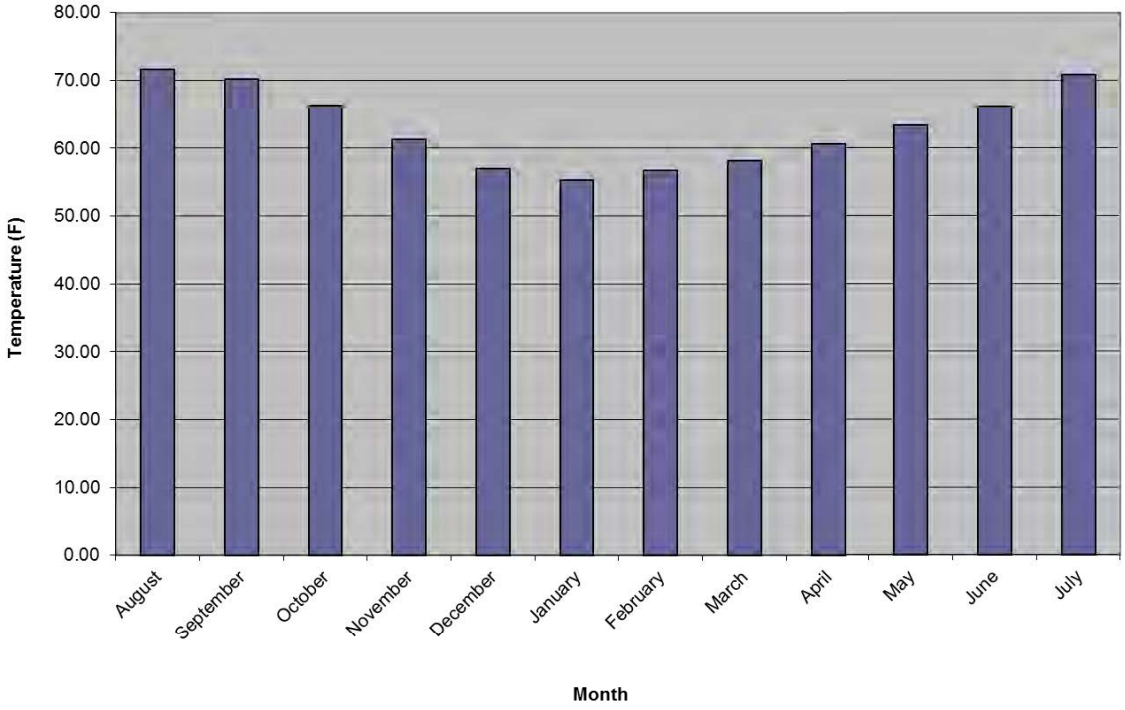


Chart 2
Average Monthly Temperatures for the Portuguese Bend Nature Preserve



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 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 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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ABALONE COVE HABITAT RESTORATION PLAN

APPENDIX A

Soil Test Results

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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

ammonium bicarbonate/DTPA

* * * * high, * * * * * very high

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.

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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							
Alta Vicente	NCCP*	Phase 1	CSS	4.5	completed	2007	2014
Alta Vicente	NCCP	Phase 1	PVB habitat	0.5	completed	2007	2014
Alta Vicente	NCCP	Phase 2	CSS	4	active	2008	2015
Alta Vicente	NCCP	Phase 2	cactus scrub	0.5	active	2008	2015
Alta Vicente	NCCP	Phase 2	PVB habitat	0.5	active	2008	2015
Alta Vicente	NCCP/LA County Grant	Phase 3	CSS	4.5	active	2016	2021
Alta Vicente	NCCP/LA County Grant	Phase 3	wildlflowers	0.5	active	2016	2021
Alta Vicente	NCCP/LA County Grant	Phase 4	cactus scrub	1	active	2017	2022
Alta Vicente	NCCP/LA County Grant	Phase 4	PVB habitat	1	active	2017	2022
Alta Vicente	NCCP/LA County Grant	Phase 4	CSS	5	active	2017	2022
Portuguese Bend	NCCP	Phase 1 and 2	CSS	8	active	2010	2017
Portuguese Bend	NCCP	Phase 1 and 2	cactus scrub	2	active	2010	2017
Portuguese Bend	NCCP	Phase 3	CSS	5	active	2012	2018
Portuguese Bend	NCCP	Phase 4	CSS	5	active	2013	2019
Portuguese Bend	NCCP	Phase 5	CSS	4	active	2014	2020
Portuguese Bend	NCCP	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

*NCCP Funding Sources include a combination of sources including the City of Rancho Palos Verdes Management Agreement, community contributions, and grants to name a few.


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 3
NCCP Phase 1 & 2
NCCP Phase 4
El Segundo Mitigation
Ishibashi
LAWA
McCarrell Canyon
Peppertree
Various Grants
Restoration Sites (Current and Completed)

APPENDIX D

2017 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 (TEPRP). As directed in the draft Rancho Palos Verdes Natural Communities Conservation Plan (NCCP), 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 that includes a specific protocol for ranking exotic species populations and strategically removing those species over time (Appendix D1-D7). The 2017 TEPRP 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-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 112 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 2017, 21 TERPP sites were treated. These include 19 *Euphorbia terracina* populations as well as previously treated sites of *Cortaderia selloana* and *Coronilla valentina* (Table 1).

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 2017 TREATMENTS

In 2017, PVPLC treated 21 populations of invasive plants across eight reserves (Table 1, photopoints in Appendix D9). Of these, 19 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 2017 TERPP treated one population of *Coronilla valentina* at Abalone Cove and one population of *Cortaderia selloana* at Alta Vicente.

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%

5.0 REFERENCES

California Invasive Plant Council 2006. California Invasive Plant Inventory. February. California Invasive Plant Council: Berkley, CA.

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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>.

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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	**Stand Comments:**
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	
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:**

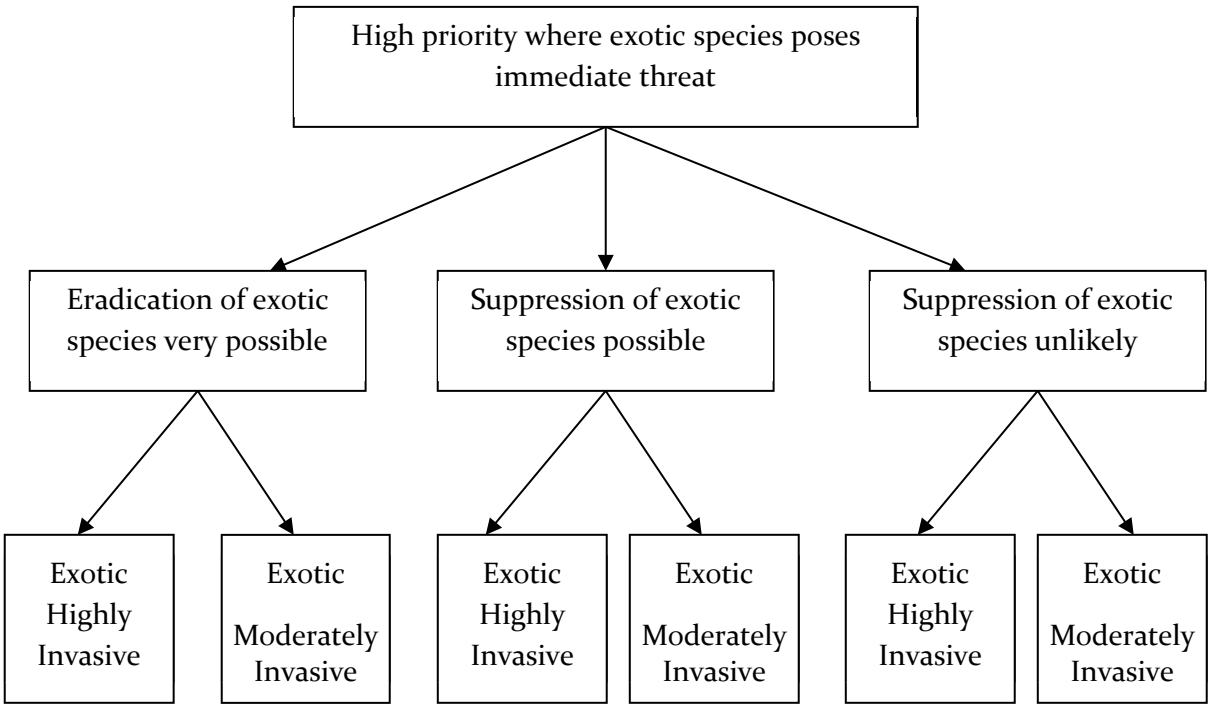
Stand ID Example: AC_EuTe_01_yyyy.mm.dd.jpg

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

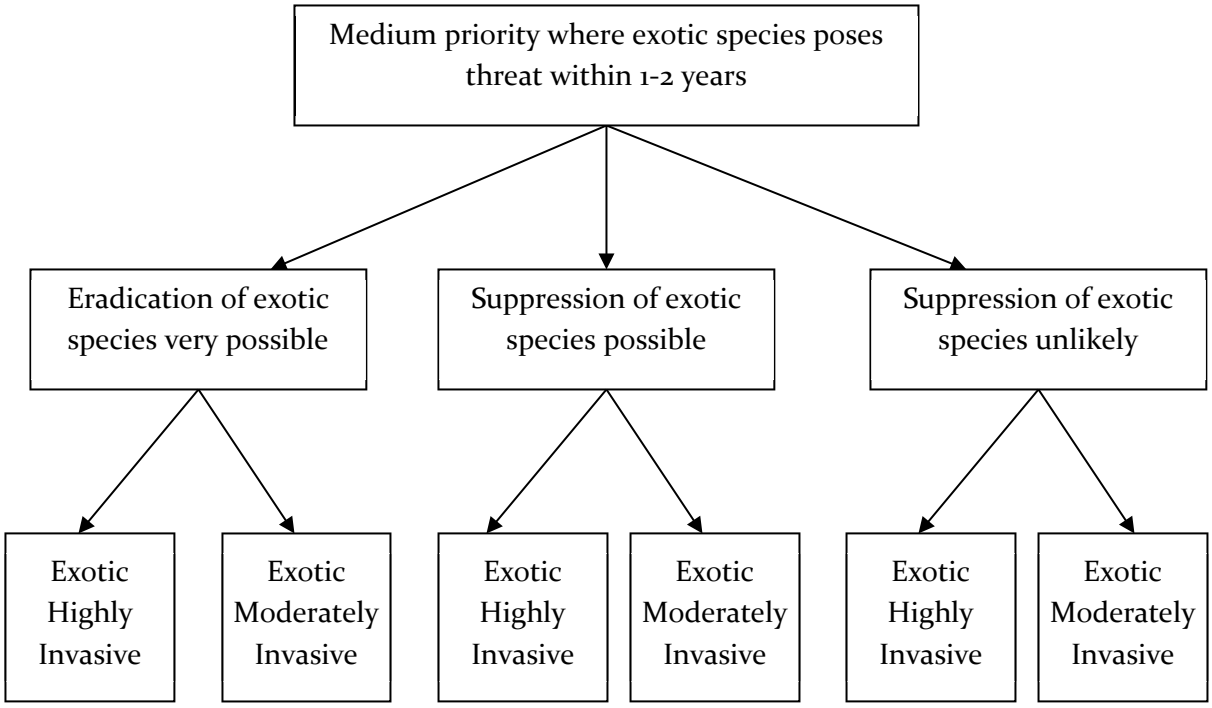
APPENDIX D2: FLOWCHART FOR HIGH PRIORITY THREAT TO NATIVE VEGETATION



Priority Ranking For Control of Exotic Species

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

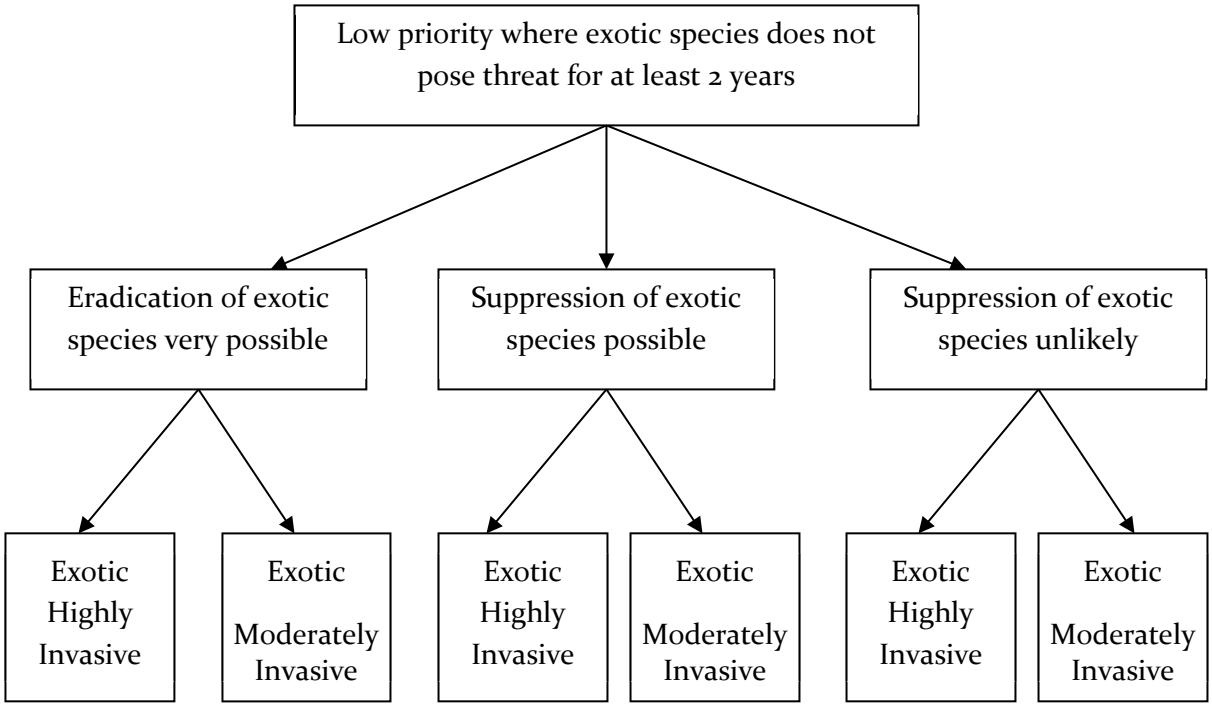
APPENDIX D3: FLOWCHART FOR MEDIUM PRIORITY DEGREE OF THREAT TO NATIVE VEGETATION



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
Conium maculatum	Poison hemlock	*Oxalis pes-caprae*	Bermuda buttercup
Convolvulus arvensis	Bindweed	*Pelargonium zonale*	Zonal geranium
Erodium cicutarium	Red stem filaree	*Phalaris minor*	Phalaris
Eucalyptus camaldulensis	Red gum tree	*Phoenix canariensis*	Phoenix palm
Eucalyptus globulus	Blue gum tree	*Piptatherum miliacea*	Smilo grass
Eucalyptus species	Gum tree	*Pittosporum undulatum*	Pittosporum
Hirschfeldia incana	Annual mustard	*Plantago lanceolata*	English plantain
Hordeum murinum leporinum	Foxtail barley	*Polygonum aviculare*	Knotweed
Hordeum vulgare	Common barley	*Polypogon monspessulensis*	Rabbitsfoot
Lactuca serriola	Compass plant	*Pyracantha sp.*	Firethorn
Lathyrus tangianus	Tangier pea	*Rumex crispus*	Curly dock

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

2017 TARGETED EXOTIC REMOVAL PROGRAM FOR PLANTS (TERPP) PHOTOS (Before Treatment)

AA_EuTe_01

AC_CoVa_02

AC_EuTe_01

AC_EuTe_03

AC_EuTe_04

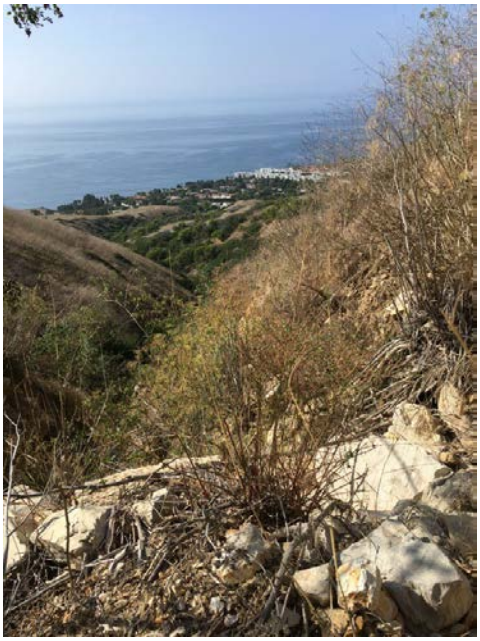
AV_Cose_01

AV_EuTe_01

AV_EuTe_02

AV_EuTe_03

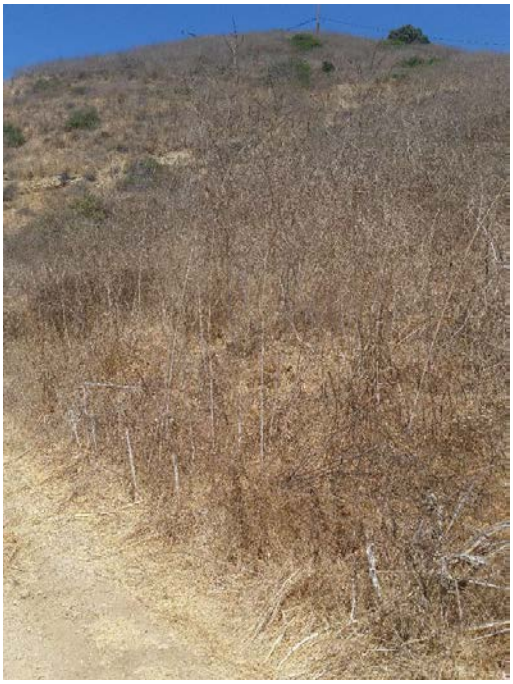
FI_EuTe_01



FO_EuTe_01

PB_EuTe_06

PB_EuTe_09



PB_EuTe_10

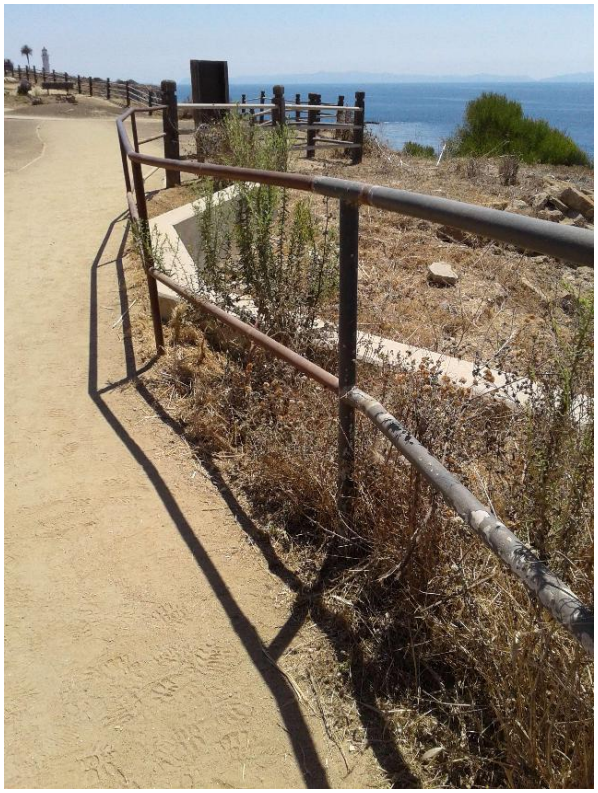
TS_EuTe_01

TS_EuTe_02

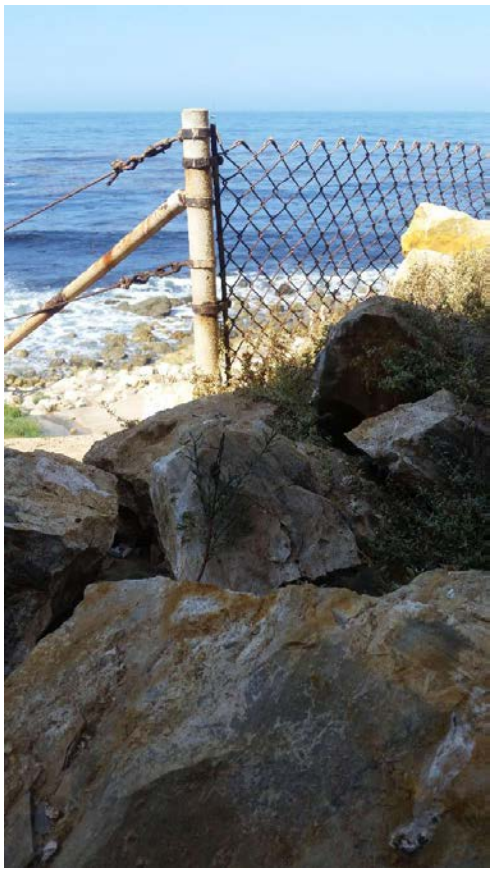
TS_EuTe_03

TS_EuTe_04

VB_EuTe_02



VB_EuTe_03

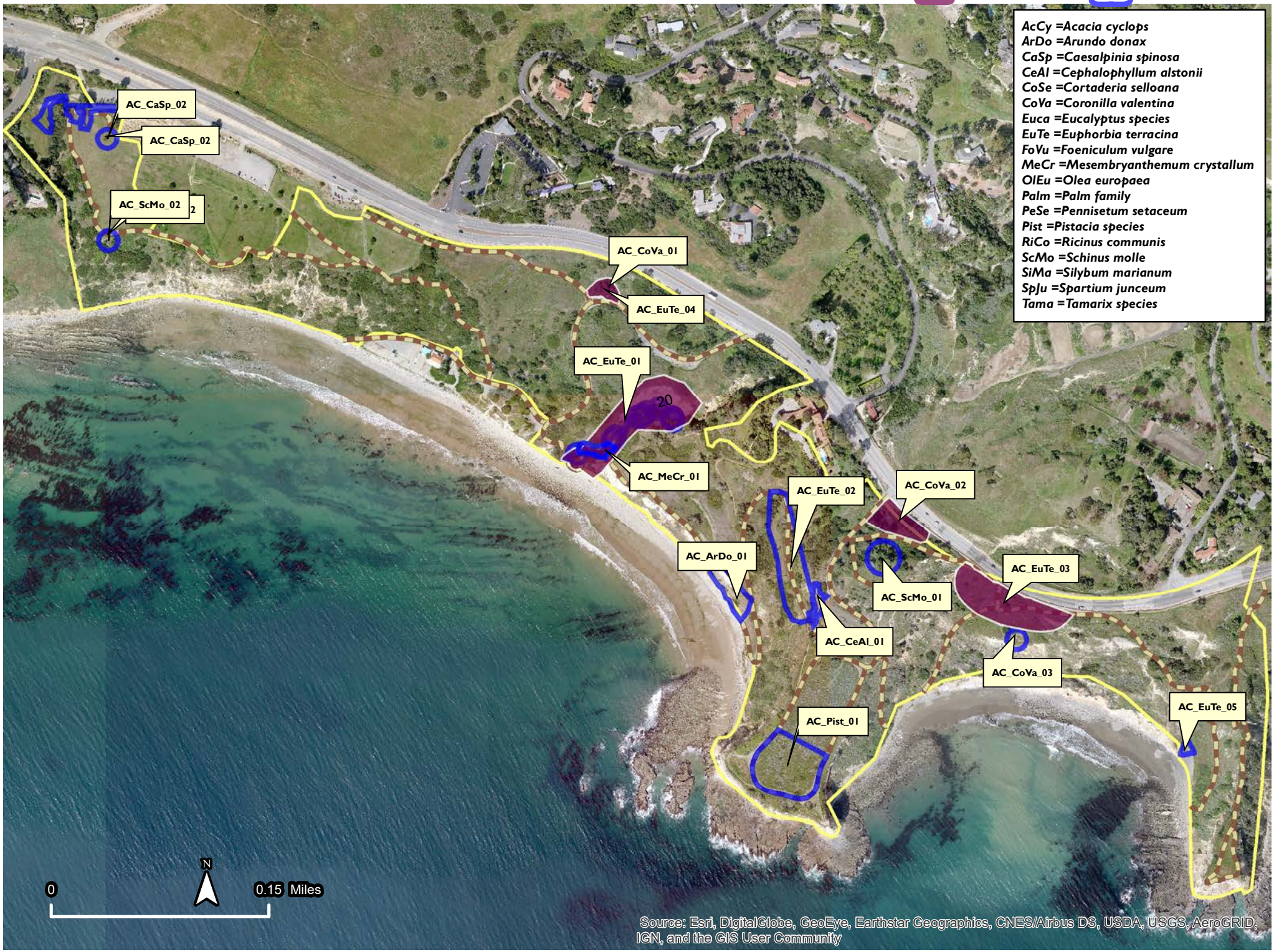


TERPP Sites: *AGUA AMARGA*

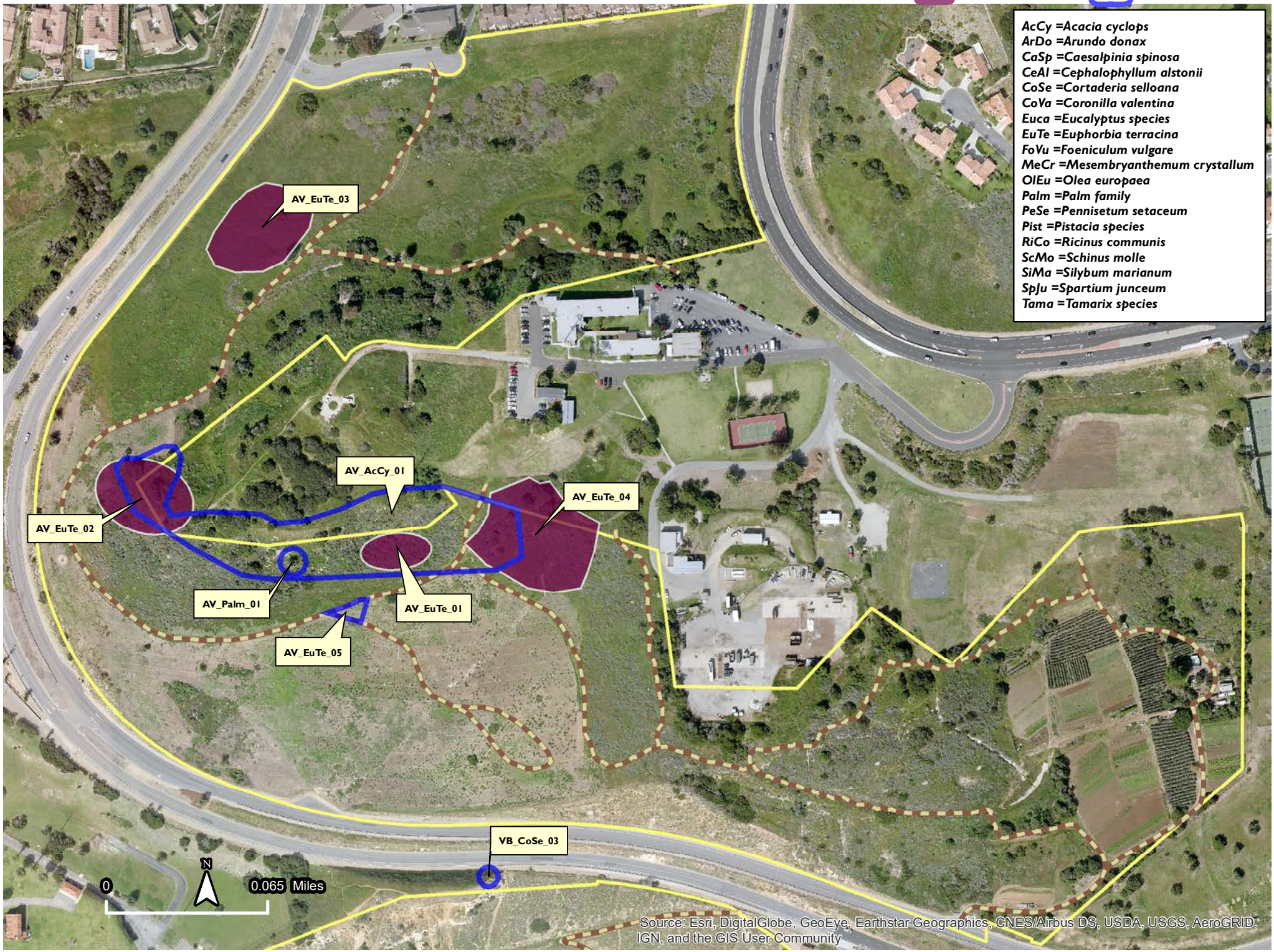
2017 TERPP Former TERPP

TERPP Sites: *ABALONE COVE*

2017 TERPP Former TERPP

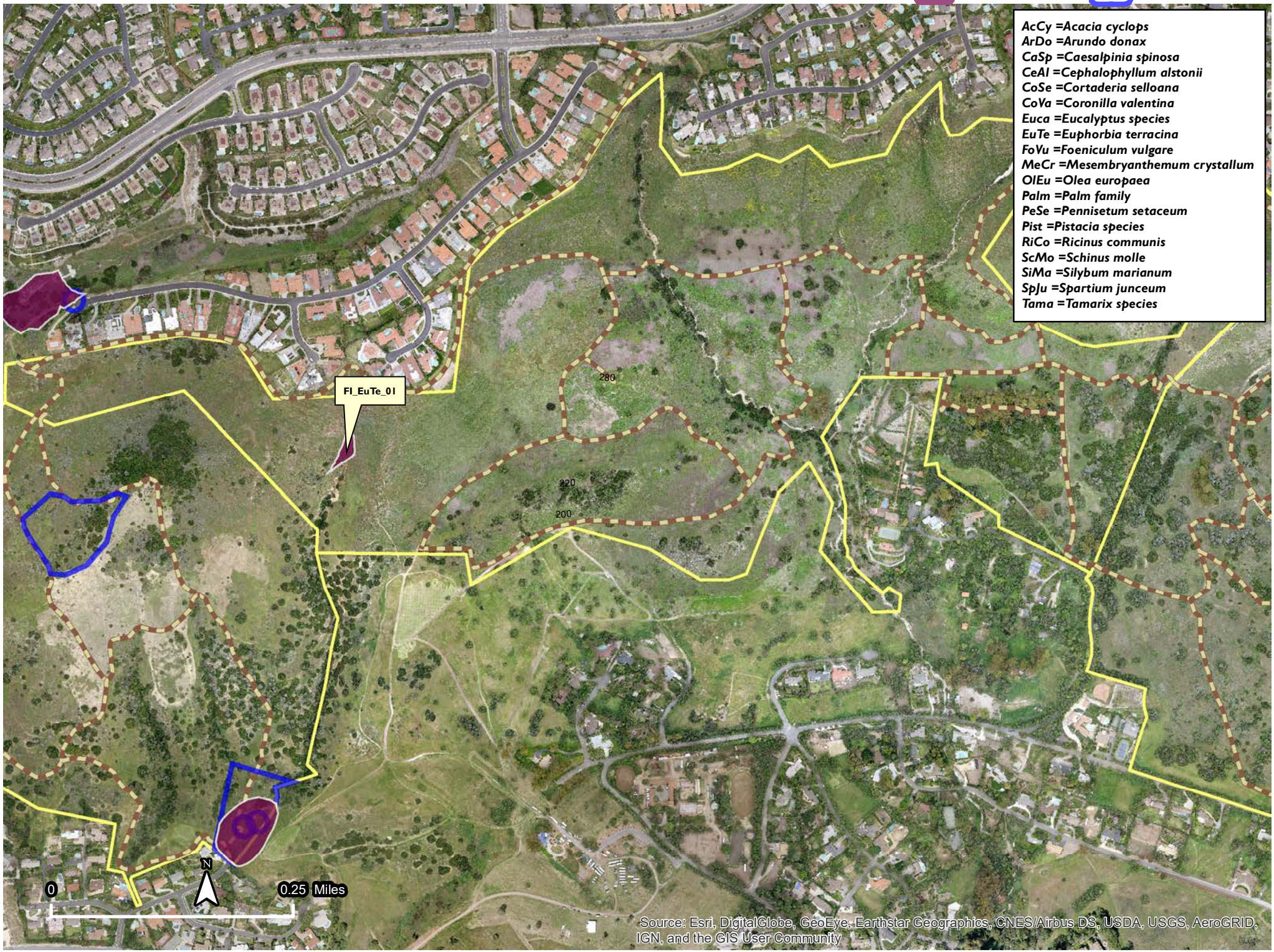


TERPP Sites: *ALTA VICENTE*



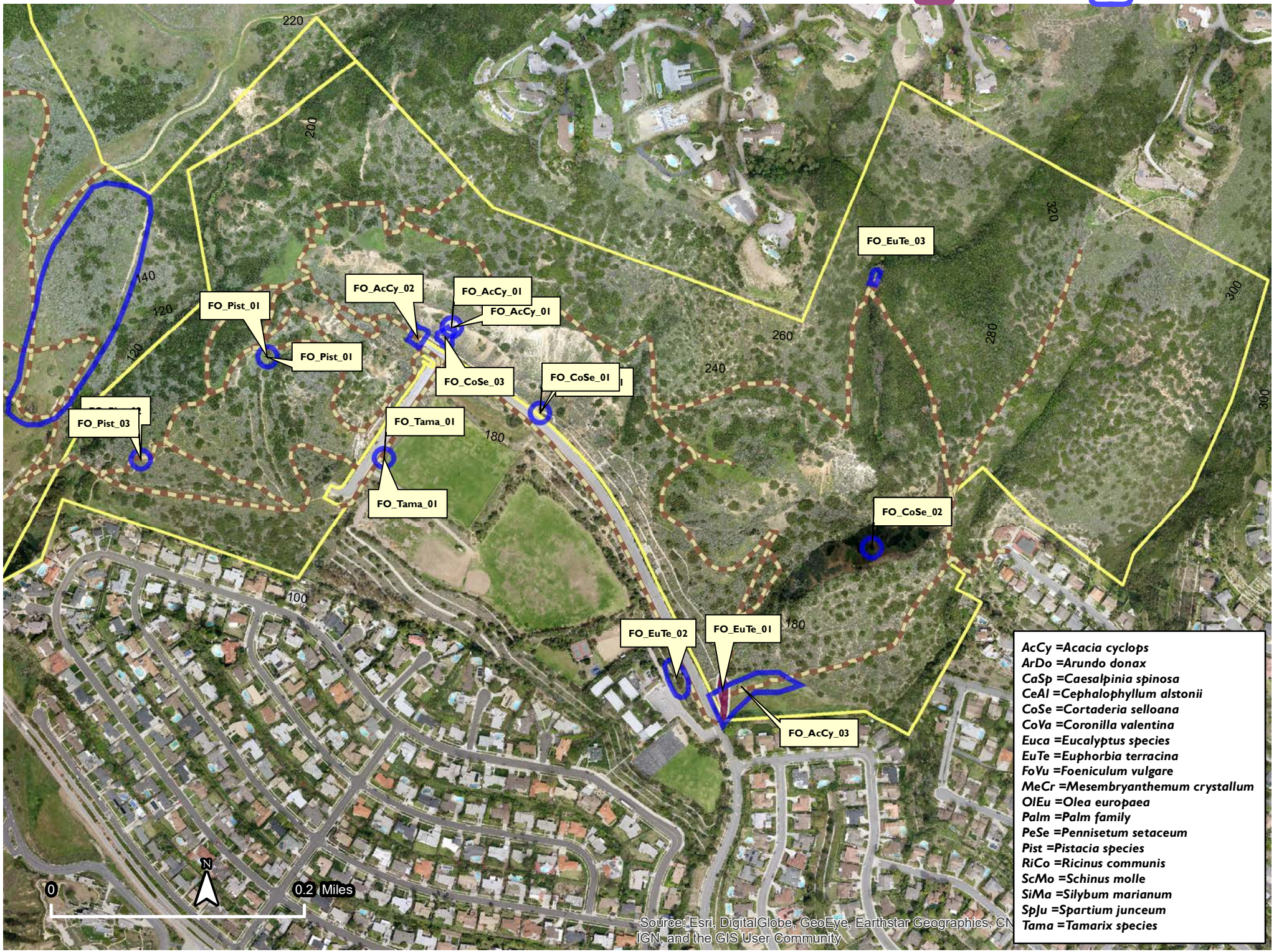
TERPP Sites: *FILIORUM*

2017 TERPP Former TERPP



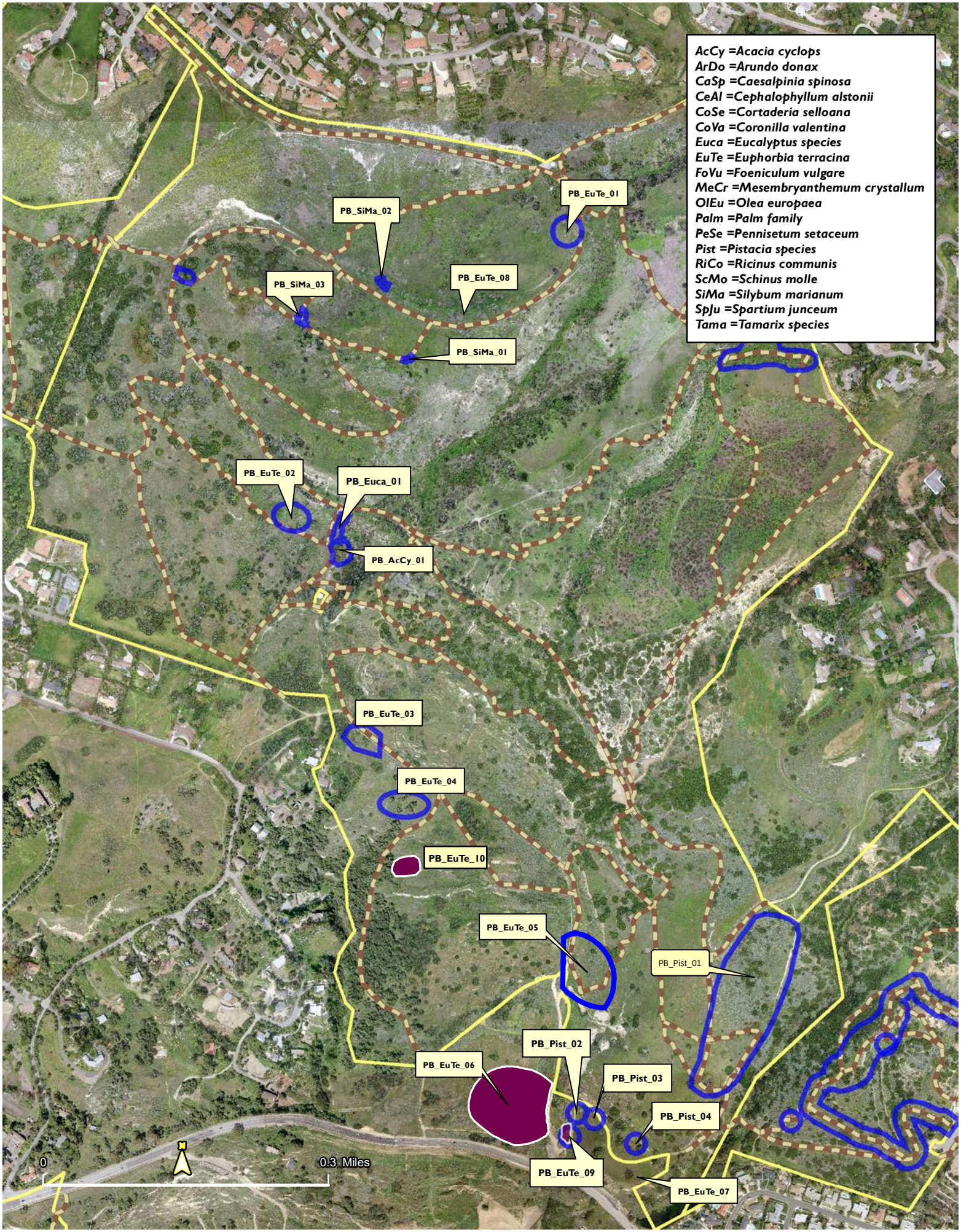
TERPP Sites: ***FORRESTAL***

2017 TERPP Former TERPP



TERPP Sites: *PORTUGUESE BEND*

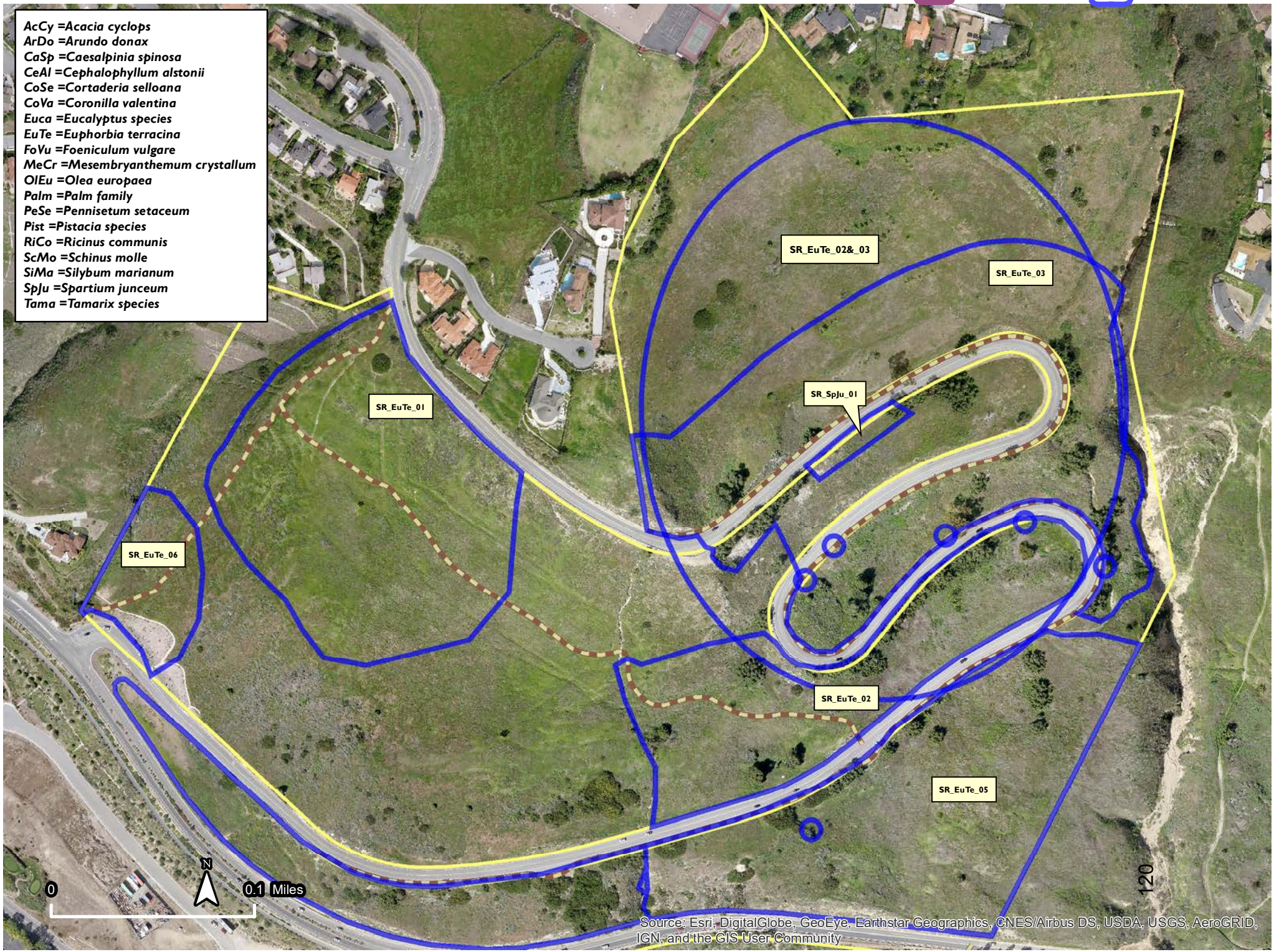
2017 TERPP Former TERPP



TERPP Sites: *SAN RAMON*

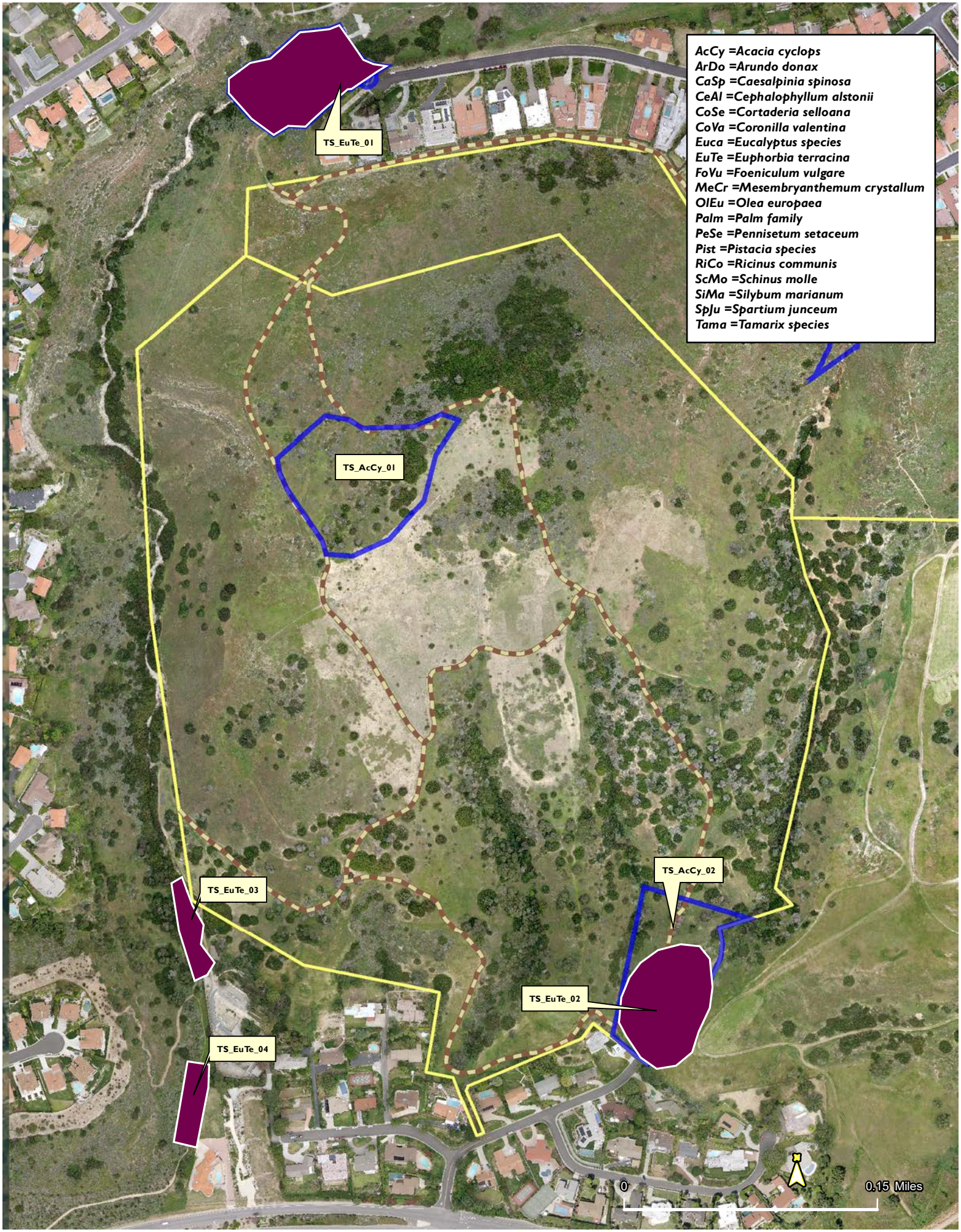
2017 TERPP Former TERPP

AcCy =Acacia cyclops
ArDo =Arundo donax
CaSp =Caesalpinia spinosa
CeAl =Cephalophyllum alstonii
CoSe =Cortaderia selloana
CoVa =Coronilla valentina
Euca =Eucalyptus species
EuTe =Euphorbia terracina
FoVu =Foeniculum vulgare
MeCr =Mesembryanthemum crystallum
OlEu =Olea europaea
Palm =Palm family
PeSe =Pennisetum setaceum
Pist =Pistacia species
RiCo =Ricinus communis
ScMo =Schinus molle
SiMa =Silybum marianum
SpJu =Spartium junceum
Tama =Tamarix species



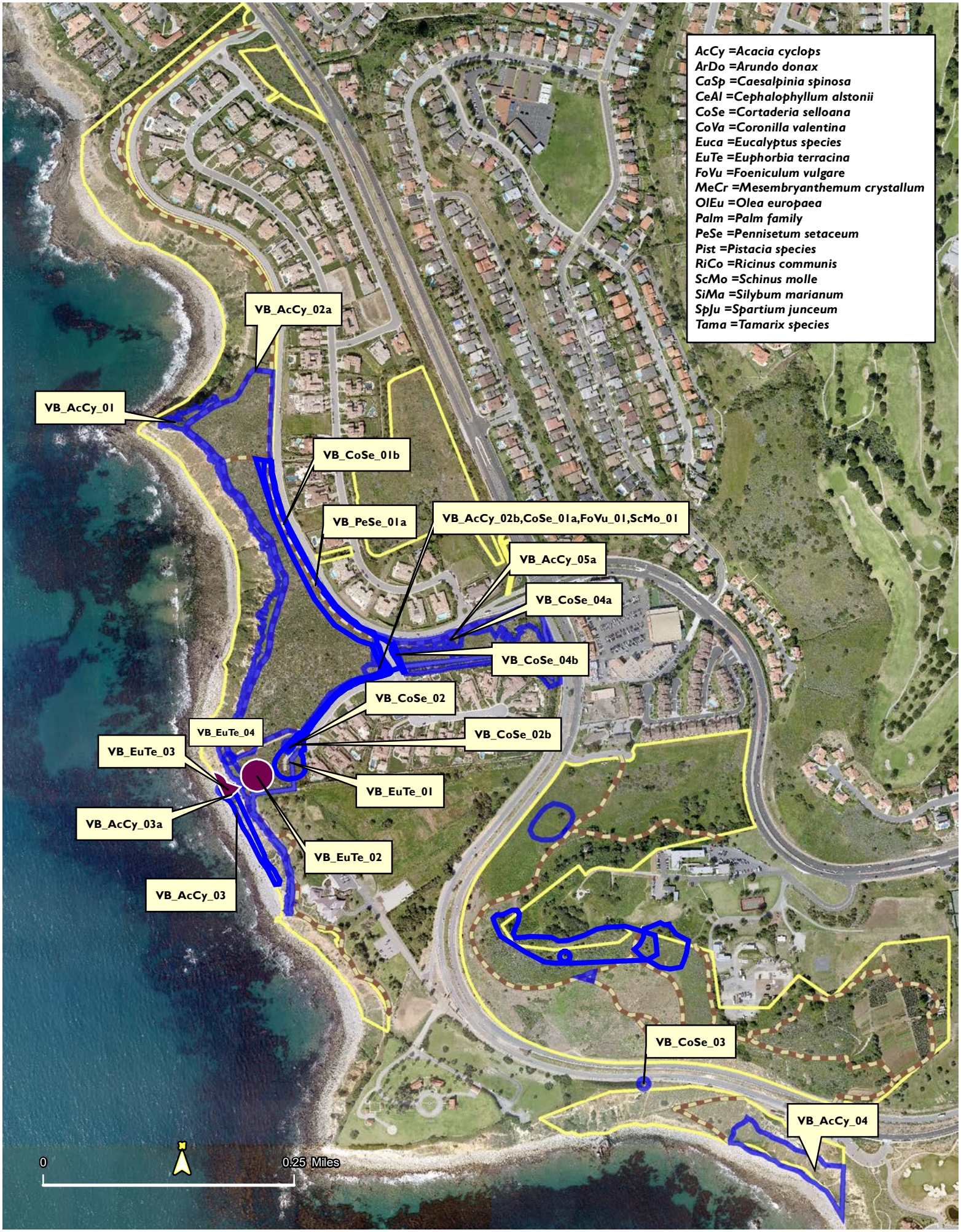
TERPP Sites: ***THREE SISTERS***

2017 TERPP Former TERPP



TERPP Sites: *VICENTE BLUFFS*

2017 TERPP Former TERPP



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 2017, 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 2017 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 (Table 1).

Table 1. 2017 Science Fair Results for high school students in PVPLC research program

Student	Award	Project Title
Kelly Tran	N/A	Flowering period and size of *Acmispon glaber*.
John Szeiff	N/A	Flowering period and size of *Acmispon glaber*.
Austin Nash	1st Place Animal Sciences Palso Verdes Peninsula Science and Engineering Fair	Mammalian behavioral ecology in southern California habitat fragments.

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. 2). 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 2. 2017 Collegiate research conducted

Student	Project Title	Academic Institution
Steven Moody	Shallow subsurface geophysical imaging of the Portuguese Bend landslide.	California Polytechnic State University Pomona

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 they built a nest, incubated eggs, and successfully fledged three chicks. Monitoring work in 2017 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.

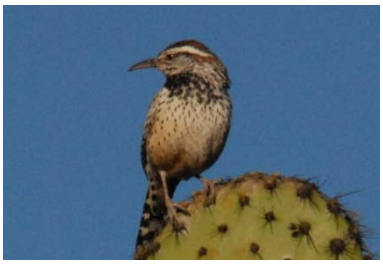
The 2017 Wildlife Tracking Program took place in the fall, beginning with training the volunteers for tracking wild coyotes, red fox, and gray fox in the Preserve. Once volunteers were confident in identifying tracks and scat of a particular species, they individually conducted regular surveys along 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. The wildlife cameras also yielded several videos of the rarely observed gray fox in the Forrestal Reserve.

Coastal Cactus Wren

(*Campylorhynchus brunneicapillus*)

Citizen Science Monitoring

2017



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Surveyed by:

Mike and Tana Bell, Ann Dalkey, Joe Hale, Dan Loether, Connie Lao, Donna McLaughlin, Rod Jenson, Jess Morton, Liane O'Donnell, Jim Rassler, Joan Krause, Elisabeth Ryan, Gary and Rosanna Scimeca, Ben Smith, Josh Weinik, and Lowell Wedemeyer.

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 2017.

				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**	**13**	**7**	**54**	**X**	**X**	**-**	**regular**
Alta Vicente	AV4	13	2	15	X	-	-	occasional
Alta Vicente	AV5	13	4	31	-	X	-	occasional
Alta Vicente	AV7	12	2	17	-	X	-	occasional
Forrestal	FO7	9	1	11	-	-	-	rare
Ocean Trails	OT8	14	3	21	-	X	X	occasional
Ocean Trails	OT9	14	4	29	X	X	-	occasional
Ocean Trails	OT10	14	3	21	X	X	-	occasional
Ocean Trails	**OT11**	**14**	**5**	**29**	**X**	**X**	**X**	**periodic**
Ocean Trails	**OT12**	**14**	**2**	**36**	**X**	**X**	**X**	**periodic**
Ocean Trails	OT13	14	1	14	-	-	X	occasional
Ocean Trails	OT15	11	1	9	-	-	-	rare
Portuguese Bend	P1	4	1	25	-	-	-	rare
Portuguese Bend	P2	8	1	13	-	-	-	rare
Three Sisters	TS2	36	1	3	-	-	-	rare

Green rows indicate the high likelihood of cactus wren breeding within associated cactus patch.

Reserve Specific Results:

Alta Vicente

Alta Vicente reserve was surveyed each month of the 2017 survey period (March through July). A total of 13 surveys were conducted. CAWR were detected within four cactus patches (AV2, AV4, AV5, and AV7)(Table 1). Cactus patches AV4, AV5, and AV7 received an inhabitance rating of "occasional" based on inhabitance criteria (Table 1). These results indicate that CAWRs activity within these transects includes behaviors associated with relatively short-term inhabitance such as foraging and dispersal. This finding also indicates a lack of nesting within A4, AV5, and AV7. Cactus patch AV2 received an inhabitance rating of "regular" based on inhabitance criteria (Table 1 and 2). These results indicate that CAWR activity within this transect includes behaviors associated with long-term inhabitance such as nesting and territorial defense. This finding also suggests high quality habitat within AV2. Five cactus patches (AV1, AV3, AV6, AV8, and AV9) were not found to be inhabited by CAWR, which suggests the presence of inhabitance-inhibiting factors (i.e. poor habitat quality, high predation pressure, and/or disturbance).

Filiorum

Filiorum reserve was surveyed during only one month (April) of the 2017 survey period (March through July). Most trails within Filiorum were impassible during much of the survey period due to rain closures, unsafe trail conditions, and high cover by invasive non-native plant species (*Brassica nigra*). One survey was conducted, which did not yield a cactus wren observation across any cactus patches (FI1-7). The interpretation of these results is limited due to the lack of completed surveys, but may in very narrow terms describe the presence of inhabitance-inhibiting factors (i.e. poor habitat quality, high predation pressure, and/or disturbance).

Forrestal Reserve

Forrestal reserve was surveyed each month during the 2017 survey period (March through July), resulting in a total of 11 completed surveys. CAWR were detected within one cactus patch (FO7), which received an inhabitance rating of "rare" based on inhabitance criteria (Table 1). This result indicates that CAWR activity within this transect includes behaviors associated with short-term inhabitance such as foraging and dispersal. Five cactus patches (FO1-6) were not found to be inhabited by CAWR. A lack of CAWR observations with these cactus patches suggests the presence of inhabitance-inhibiting factors (i.e. poor habitat quality, high predation pressure, and/or disturbance).

Ocean Trails

Ocean Trails Section A

Ocean Trails Section A was surveyed four months (March through June) out of the 2017 survey period (March through July). Eight surveys were conducted. No cactus wren were detected within cactus patches of Ocean Trails Section A. This finding suggests the presence of inhabitance excluding factors (i.e. poor habitat quality, high predation pressure, and/or disturbance).

Ocean Trails Section B

Ocean Trails Reserve was surveyed each month of the 2017 survey period (March through July). A total of 14 surveys were conducted. Cactus wrens were detected within seven cactus patches (OT8, OT9, OT10, OT11, OT12, OT13 and OT15). Cactus patches OT9, OT11, and OT12 received a rating of "periodic" based on inhabitance criteria (Table 1). These results indicate that CAWR activity within this transect to include behaviors associated with long-term inhabitance such as nesting and territorial

defense. This finding also suggests high quality habitat within these transects. Cactus patches OT8, OT10, and OT13 received a rating of "occasional" based on inhabitance criteria (Table 1 and 2). Despite low observation rates (<25%), other inhabitance criteria (multiple cactus wren, multiple month, and/or nest observations) were associated with these transects indicating repeated use by multiple cactus wren individuals including the investment of nest building (Table 1). Breeding is not expected to occur within these transects, although it is likely that breeding is occurring in higher ranked cactus patches (OT9, OT11, and OT12) nearby.

Portuguese Bend

Portuguese Bend Section A

Portuguese Bend reserve was surveyed one month (March) of the 2017 survey period (March through July). One survey was conducted, which did not yield a cactus wren observation across any cactus patches (PB5 – PB8) within Portuguese Bend Reserve Section A.

Portuguese Bend Section C

Portuguese Bend Section C was surveyed two months (March and June) of the 2017 survey period (March through July). A total of four surveys were conducted. No cactus wren were observed across any cactus patches (PB3 and PB4).

Portuguese Bend Section D

Portuguese Bend Section D was surveyed three months (April, May, and June) of the 2017 survey period (March through July), resulting in a total of five surveys. CAWR were detected within two cactus patches (P1 and P2). Cactus Patches P1 and P2 received a rating of "rare" based on inhabitance criteria (Table 1 and 2). Low observation rates (≤25%) and lack of any additional inhabitance descriptors indicates low CAWR occupation at these patches.

San Ramon

San Ramon Reserve was surveyed two months (March and April) of the 2017 survey period (March through July), resulting in a total four surveys. No CAWR were detected across any cactus patches (SR1) within San Ramon Reserve.

Three Sisters

Three Sisters Reserve was surveyed three months (March – June) of the 2017 survey period (March through July), resulting in a total of 36 surveys. Two CAWR observations were made, one within cactus patch TS2 and the other in the vicinity of cactus patches TS7, TS8, and TS9. The high density of cactus patches in Three Sisters makes it challenging to definitely associate an exclusively audial observation with a particular patch. Cactus patch TS2 was given a rating of "rare" based on inhabitance criteria (Table 1 and 2). These observations indicate a low level of CAWR inhabitance within the Three Sisters Reserve.

DISCUSSION

Results of the 2017 Cactus Wren Survey Project (project) describe varying levels of CAWR inhabitance across the seven reserves studied (Table 1). The project specifically identified several cactus patches of high habitat use that received inhabitance ratings of "periodic" and "regular" with observation rates between 29% and 54% (Table 1). These high-use patches were also associated with multiple month, multiple CAWR, and nest observations which further described the level of inhabitance and active breeding potential at each site. Alta Vicente and Ocean Trails were the only reserves to be considered breeding sites within the PVNP in 2017. Both reserves were also indicated by the 2016 survey as likely supporting CAWR breeding, with confirmed breeding at Alta Vicente and a nest observed in Ocean Trails along Gnatcatcher Trail (adjacent to cactus patches OT 11 and OT12). Despite continued CAWR breeding at Alta Vicente and Ocean Trails in 2017, inhabitance levels fell from 2016. In Alta Vicente observation rates were reduced by nearly half, from 100% in 2016 to 54% in 2017. Ocean Trails saw a similar, although less dramatic change in observation rate from 50% recorded along Gnatcatcher Trail to 29% and 36% at adjacent cactus patches OT11 and OT12. Reductions in observed CAWR inhabitance was not exclusive to potential breeding areas as moderately ranked habitat areas saw equally drastic reductions. Several sites occupied in 2016 did not produce a CAWR observation during the 2017 survey. San Ramon reserve was one such location that did not have a cactus wren observation in 2017, yet was considered a likely area for CAWR breeding in 2016. Other former breeding areas, such as Three Sisters and Filiorum reserves, had reduced CAWR inhabitance levels in 2017.

Low observations of CAWR within formerly occupied and previous breeding sites is not uncommon across the southern California cactus wren management area. Regional monitoring projects have noted areas of "unoccupied suitable habitat" or those with adequate cactus cover to support long term CAWR inhabitance. (Merkel 2014). This lack of occupation has been explained in some management areas as biennial occupation (abandonment and return to a site every other year). Indeed, it appears that biennial occupation may be occurring on a small scale within adjacent reserves Ocean Trails and San Ramon where trade-offs in CAWR inhabitance were observed, particularly due to the close proximity of cactus patches within these reserves. Therefore, while it is possible that biennial occupation is occurring between Ocean Trails Reserve and San Ramon Reserve, it does not appear to be occurring across PVNP as a whole. The reduction of CAWR observations across most (six of seven) reserves surveyed suggests that an expansive impact of presence inhabitance-inhibiting factors, rather than a location-specific phenomenon such as biennial occupation.

Of the many potential drivers of decreased CAWR observations, only impacts due to changes in weather, more specifically rainfall, would likely equate to such a broad-reaching decrease. Intense winter weather, such as high rainfall and cold temperatures, can have damaging effects to CAWR nesting success and abundance by lowering available insect populations and promoting habitat-altering vegetation growth which would further reduce foraging potential. The 2017 survey did not include the monitoring of insect populations or vegetation dynamics of habitat areas, however, the increase in non-native plant cover (namely *Brassica nigra*) can be easily observed using annual photo point data of each reserve studied (Appendix B). The density and magnitude of the *Brassica nigra* infestation was so great that several trails of the survey route were impassable until cleared by mechanical equipment. 2017 saw a significant environmental shift from previous years in the form of heavy rainfall, which undoubtedly contributed to the influx *Brassica nigra* in previously bare areas. The large-scale reduction in CAWR observations during the 2017 is likely due to the large-scale impact of significantly higher rainfall, which

lead to *Brassica nigra* encroachment and a loss of necessary habitat characteristics (i.e. the reduction of bare ground) for CAWR.

Vegetation encroachment also appears to be occurring within the PVNP in the form of "overtopping" or encroachment by native shrubs on cactus plants. This was observed in (Preston 2012) as another factor effecting CAWR inhabitance and breeding success. The non-native tree, *Acacia cyclops* and the native shrub, *Rhus integrifolia* were commonly observed overtopping stands of cactus during the 2017 survey, thereby decreasing habitat quality at overtopped cactus patches. It seems apparent that changes in vegetation are acting as inhabitance-inhibiting factors, though further study is required to determine the severity of overtopping's effect on CAWR inhabitance within the PVNP. Vegetative dynamics of cactus patches were not collected in the 2017 survey, making it difficult to statistically link the loss of bare ground or increased in non-native/native plant cover to declines in CAWR inhabitance. Despite this challenge, the synthesis of studies provides insight into the potential changes to CAWR habitat quality as a result the loss of bare ground and "overtop" encroachment by invasive non-native species such as Brassica nigra and expanding cover by native plants. The results of these studies may then inform future CAWR monitoring with the PVNP.

FUTURE STUDY

Recommended additions for the 2018 survey include the following:

1) Survey degree of vegetation encroachment on cactus patches by both native and non-native species to examine effects on CAWR nesting potential.

2) Survey degree of vegetation encroachment on bare ground by both native and non-native species to examine effects on CAWR foraging potential.

3) Examine Ocean Trails Reserve and San Ramon Reserve for potential biennial occupation.

4) Consider monitoring of insect populations to clarify the relationship between insect populations, vegetation encroachment, and CAWR foraging potential.

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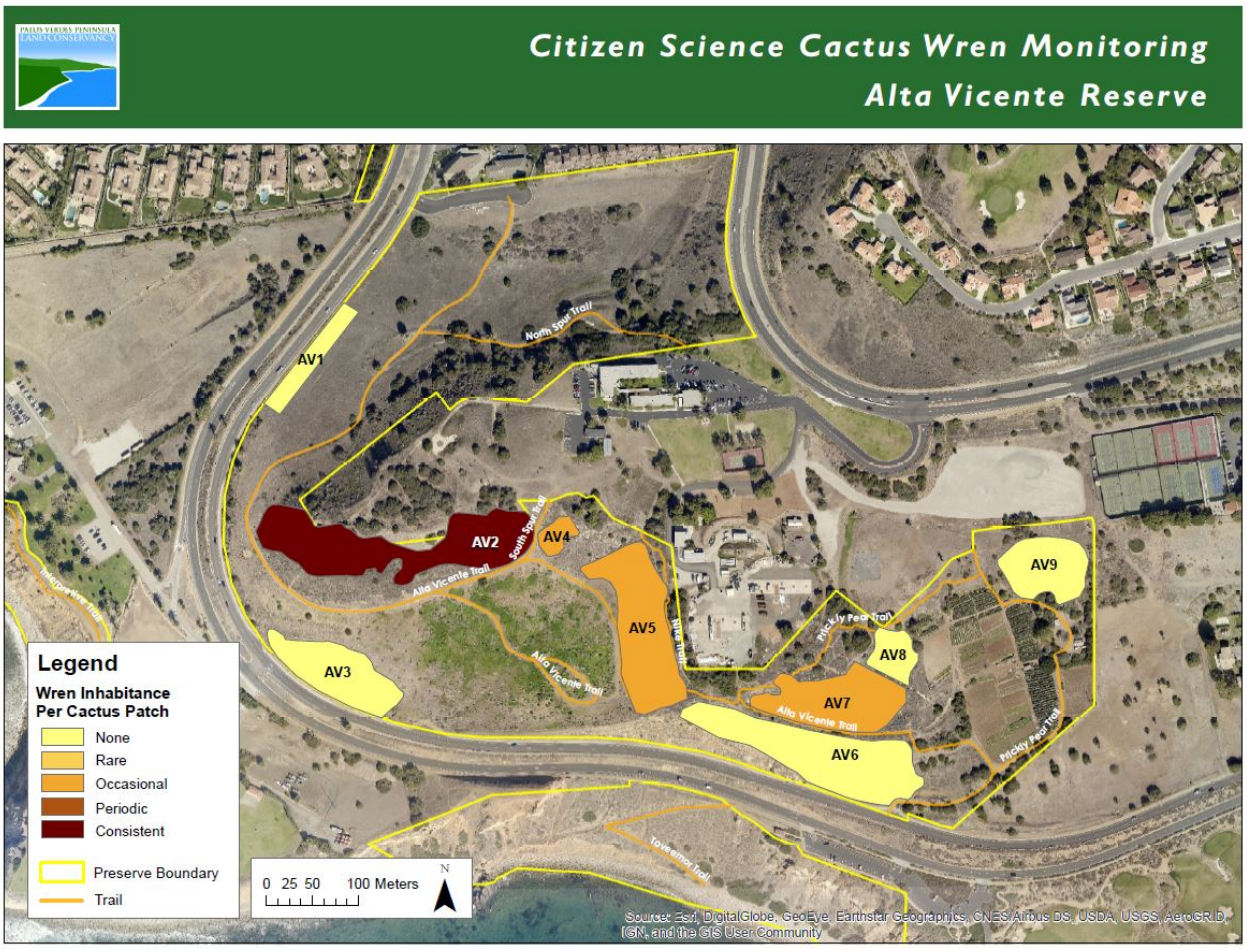
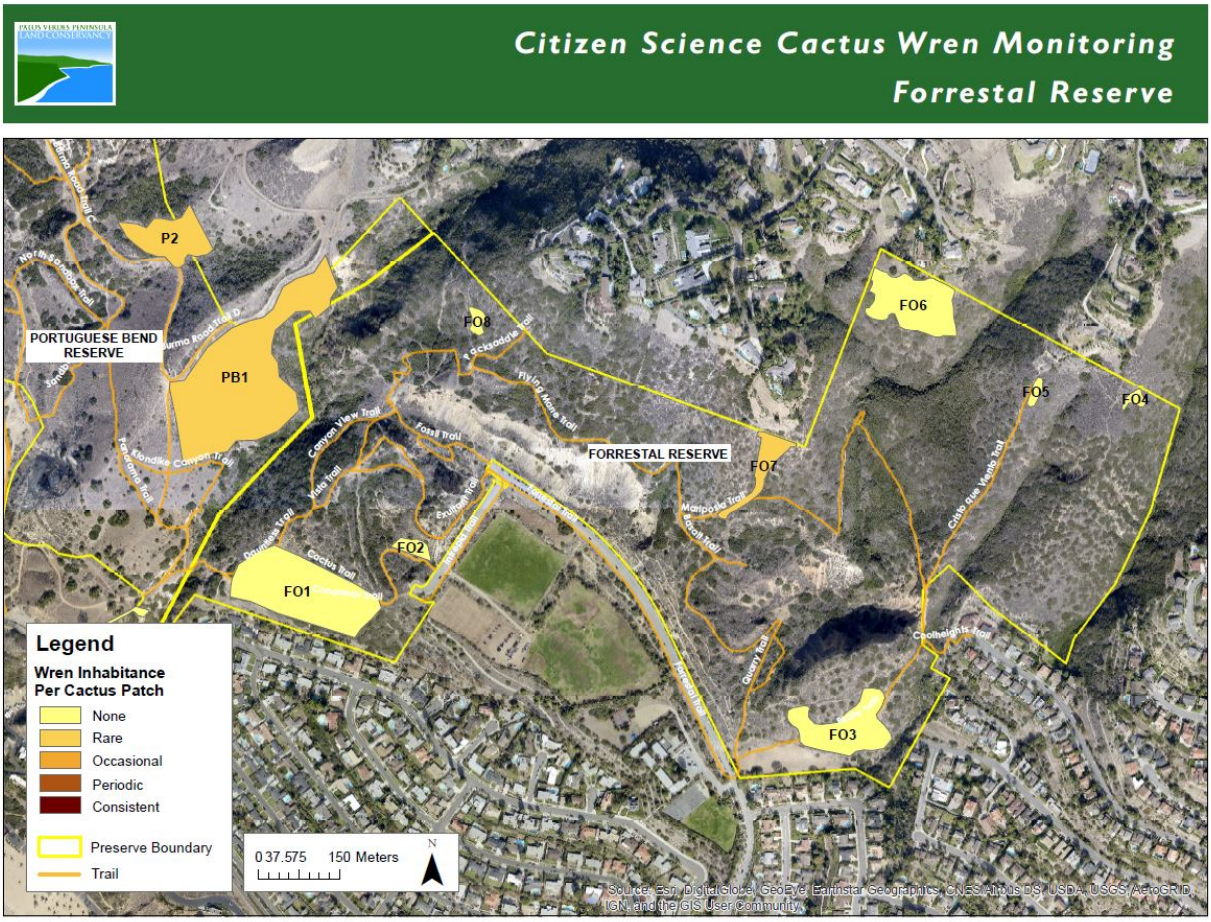
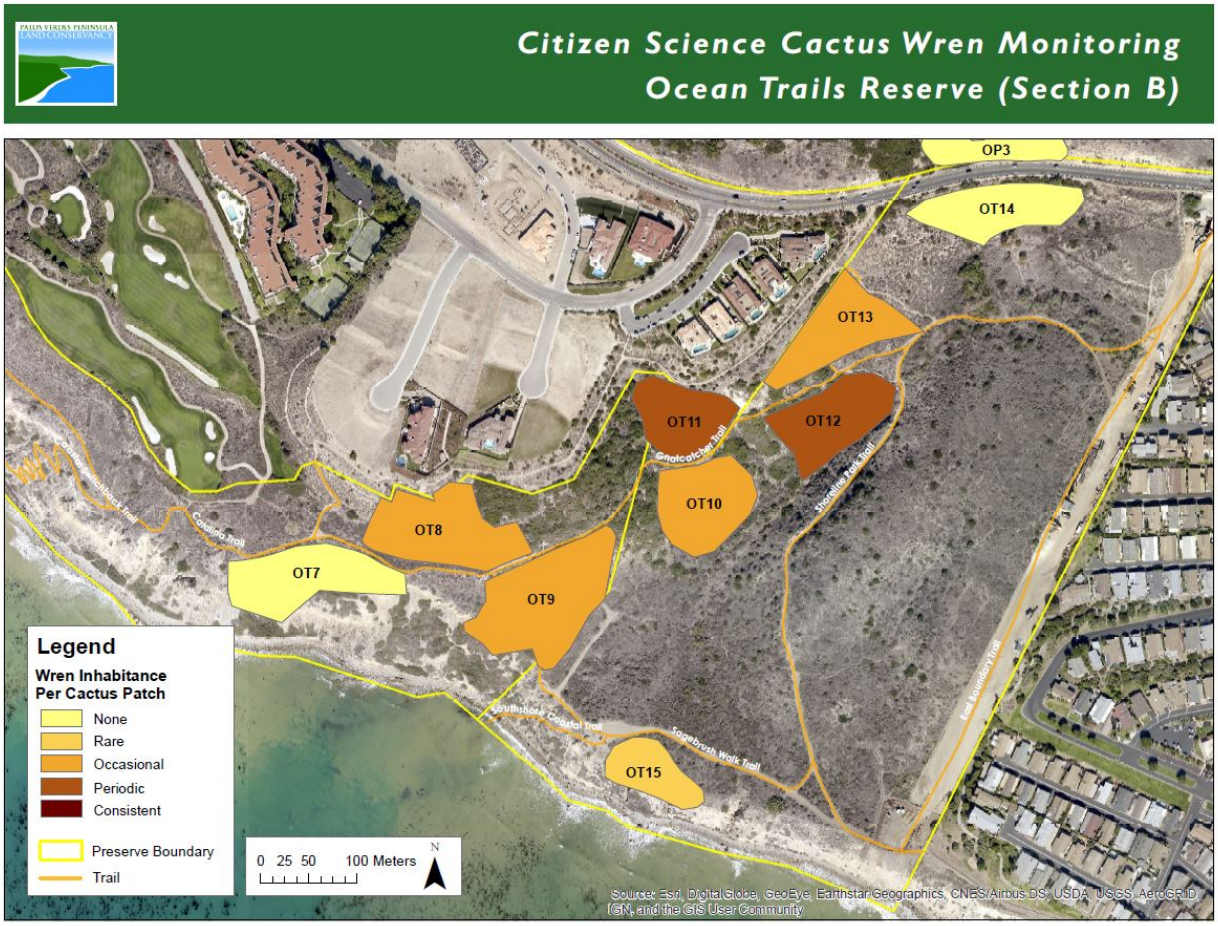
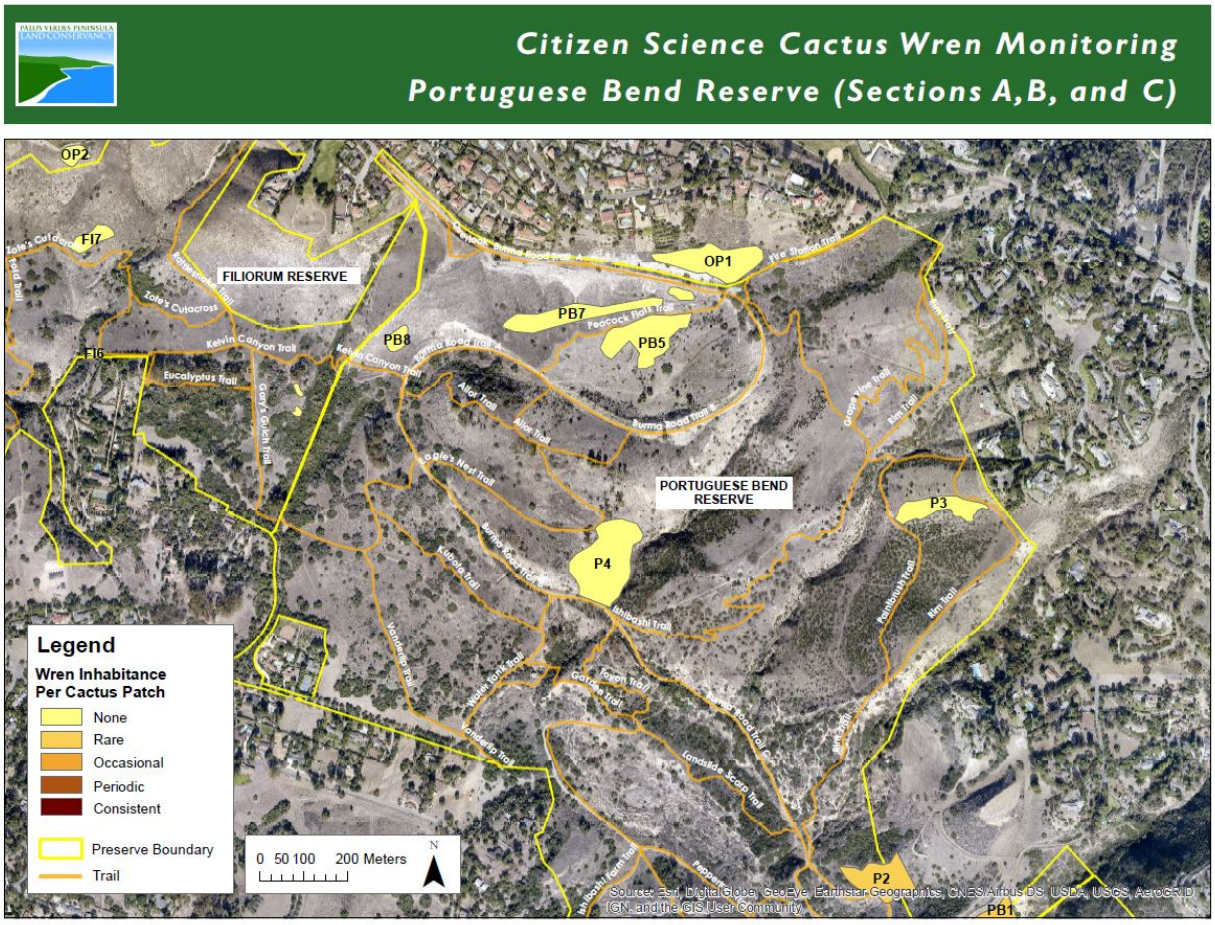
APPENDIX A

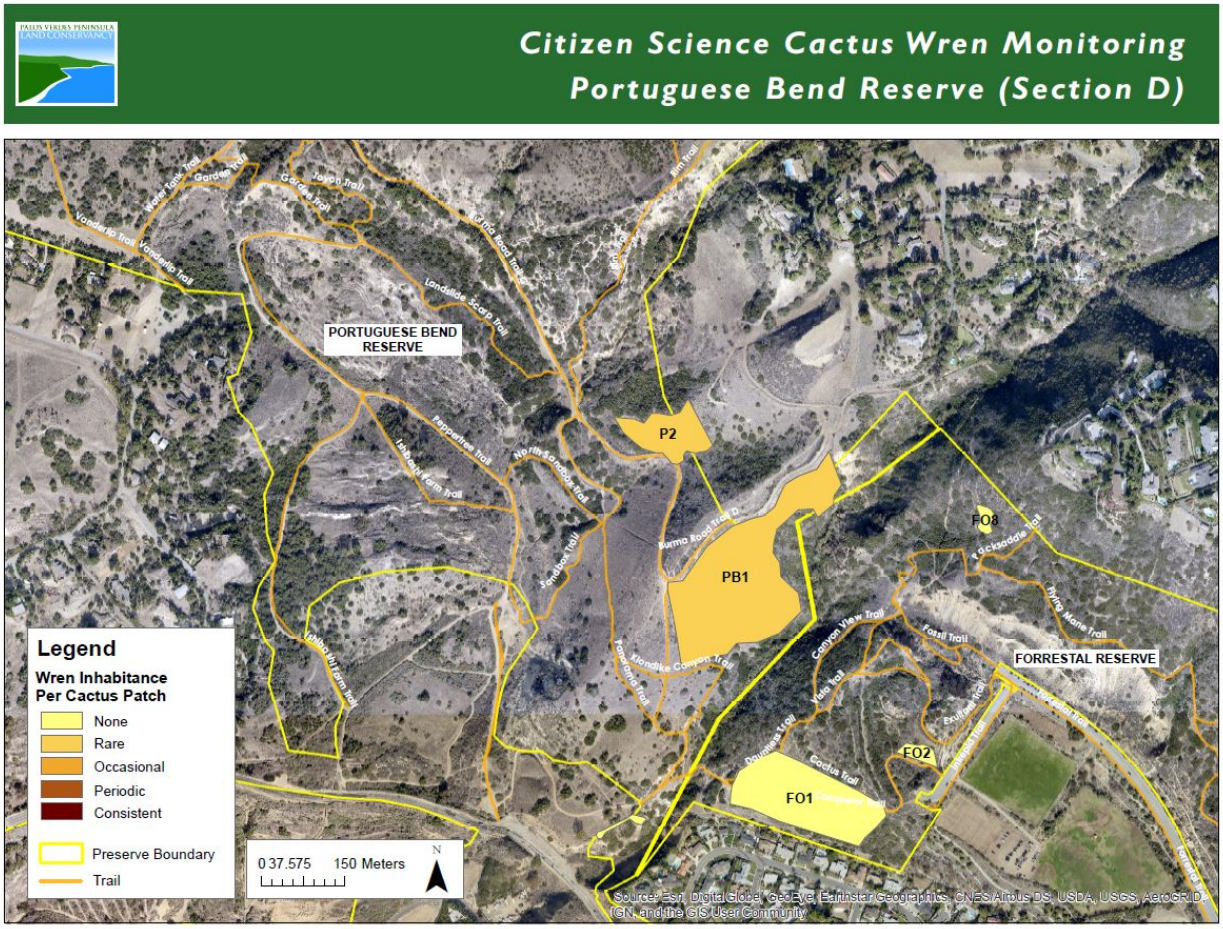
Mappped results of cactus inhabitance per catus patch survyed.

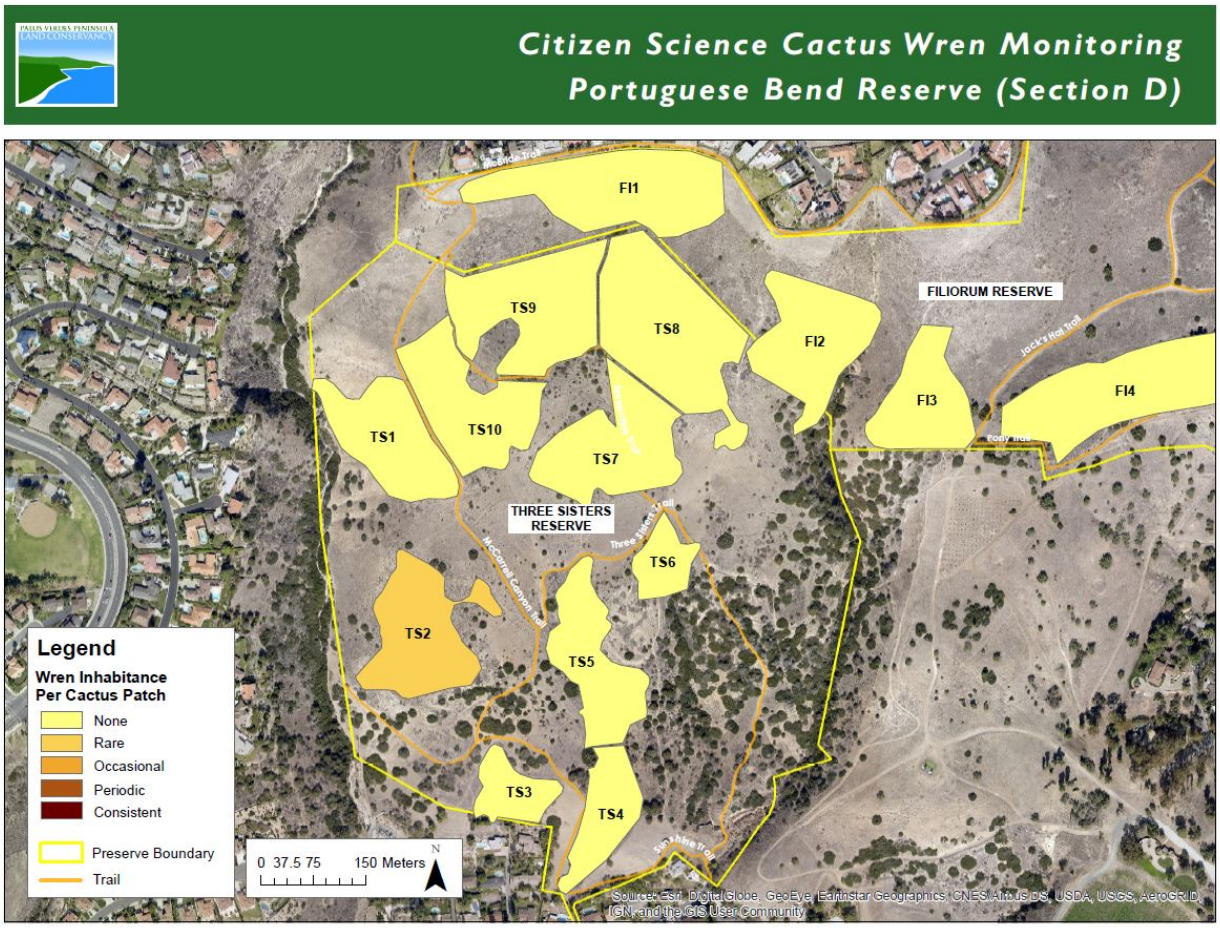



Citizen Science Cactus Wren Monitoring
Forrestal Reserve
PORTUGUESE BEND RESERVE
FORRESTAL RESERVE
P2
PB1
FO1
FO2
FO3
FO4
FO5
FO6
FO7
FO8
Legend
Wren Inhabitance Per Cactus Patch
None
Rare
Occasional
Periodic
Consistent
Preserve Boundary
Trail
0 37.575 150 Meters
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Citizen Science Cactus Wren Monitoring
Ocean Trails Reserve (Section B)
OP3
OT14
OT13
OT11
OT12
OT10
OT8
OT7
OT9
OT15
Gnatcatcher Trail
Coastal Trail
Sagebrush Walk Trail
Legend
Wren Inhabitance
Per Cactus Patch
None
Rare
Occasional
Periodic
Consistent
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


Citizen Science Cactus Wren Monitoring
Portuguese Bend Reserve (Sections A,B, and C)
OP2
FI7
FILIORUM RESERVE
OP1
PB7
PB5
PB8
FI6
PORTUGUESE BEND RESERVE
P3
P4
P2
PB1
Legend
Wren Inhabitance Per Cactus Patch
None
Rare
Occasional
Periodic
Consistent
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
Portuguese Bend Reserve (Section D)
PORTUGUESE BEND RESERVE
P2
PB1
FO8
FO2
FO1
FORRESTAL RESERVE
Legend
Wren Inhabitance Per Cactus Patch
None
Rare
Occasional
Periodic
Consistent
Preserve Boundary
Trail
0 37.575 150 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
Portuguese Bend Reserve (Section D)
FI1
TS9
TS8
FI2
FILIORUM RESERVE
FI3
FI4
TS1
TS10
TS7
THREE SISTERS RESERVE
TS6
TS2
TS5
TS3
TS4
Legend
Wren Inhabitance Per Cactus Patch
None
Rare
Occasional
Periodic
Consistent
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

APPENDIX B

Photopoint comparison (2015 vs 2017) of cactus wren habitat.

Three Sisters Reserve

2015

2017

Portuguese Bend Reserve

2014

2017

Monitoring Wild Canids in the Palos Verdes Nature Preserve

INTRODUCTION

Three species of wild canid inhabit the Palos Verdes Nature Preserve (PVNP): coyote (*Canis latrans*), gray fox (*Urocyon cinereoargeneus*), and red fox (*Vulpes vulpes*). These canids serve as top predators within PVNP. The Palos Verdes Peninsula Land Conservancy (PVPLC) has monitored wild canid presence within the PVNP since 2006 in accordance with the Rancho Palos Verdes Natural Community Conservation Plan (NCCP). This agreement provisions PVPLC to describe biological data on wildlife movements of predators. The Citizen Science Wildlife Tracking Program is currently engaged in performing this monitoring task.

METHODS

Study Area: The study area was within five reserves of the Palos Verdes Nature Preserve (Figure 4 and 5) in Rancho Palos Verdes, CA.

Survey Period: November 2016 - March 2017

Data Collection: Volunteers walked predetermined trail routes documenting scat or tracks of wild canids. A photo was taken of each observation and the location was noted on field data sheets (Figure 1).

Data Analysis: Track and scat observations were collectively mapped to spatially describe the movement of wild canids within the PVNP.

Figure 1. Completed field sheet for the Forrestal Reserve.

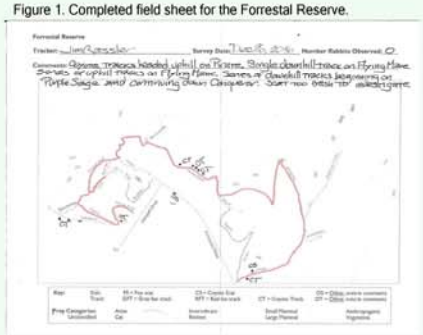


Figure 2. Track photo.

Figure 3. Scat photo.

RESULTS

1) Field surveys identified the presence of all 3 wild canid species known to exist within the Palos Verdes Nature Preserve.

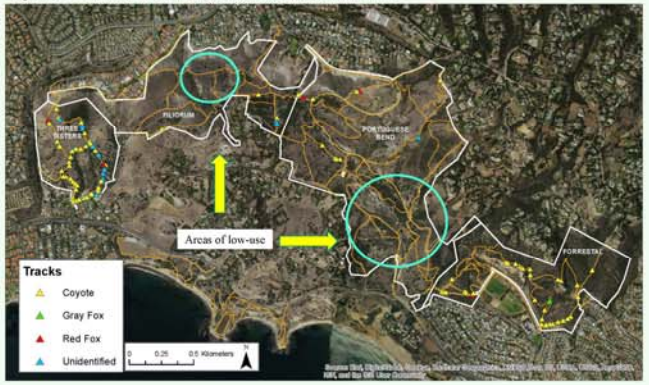
2) The majority of scat and track observations were coyote.

3) Three areas of intensive use by wild canids were found within Three Sisters, Portuguese Bend, and Forrestal reserves.

4) Areas of low-use or near exclusion may exist between observed high-use areas.

Figure 4. Locations of wild canid scats detected across the PVNP.

Figure 5. Location of wild canid tracks detected across the PVNP.



Project Coordination by Josh Weinik, Stewardship Associate PVPLC
Contact Information: jweinik@pvplc.org (310) 541 - 7613

CONCLUSIONS

1) Coyotes were observed to be the most abundant wild canid within the Palos Verdes Nature Preserve.

2) Habitat areas of the PVNP support varying intensities of wild canid activity. This may potentially describe differing levels of inhabitance factors known to affect canid occupancy such as habitat quality, prey abundance, and disturbance pressure.

3) High-use areas may generally depict den locations.

FUTURE STUDY

Future study will evaluate the validity of observed high/low-use areas as well as work towards better understanding wild canid movement across the PVNP. **Trail cameras** will be used to identify individual coyote movement and describe the presence or absence of territorial use of observed high-use areas. This work may also improve our understanding of wild canid presence within low-use areas and supplement current research methods in the case that environmental factors such as substrate composition or trailside vegetation impede track and scat detection. The development of a **relative abundance index** (# of scat/kilometer surveyed/week) will be created to track yearly fluctuations of wild canid populations.

Figure 6. Installation of a trail camera.

Figure 7. Trail camera capture of a coyote.

CITIZEN SCIENTISTS

Bethany Bax (AmeriCorps), Mike Bell, Tana Bell, Peter Cameron, Joseph Garcia, Linda Howat, Rebecca Heisey, Alex Kovary, Joan Krause, Connie Lao, Donna McLaughlin, Jim Rassler, Ben Smith, Wes Wyberg (AmeriCorps), and the Casil family.

Mammalian Behavioral Ecology in Southern California Habitat Fragments

by Austin Nash (Peninsula High)

Statement of Problem

This project assessed the likelihood and possible consequences of human-wildlife conflict in habitat fragments within a suburban matrix. The effects of human presence on the mesopredator release hypothesis and the behavioral ecology of nine mammal species were also analyzed, focused on *Canis latrans, Procyon lotor*, and *Felis catus*.

Introduction

The Palos Verdes Peninsula is a suburban matrix, with habitat fragments of varying quality lying within suburban development. This landscape poses two main issues in terms of wildlife management. Firstly, the proximity of human development to wildlife habitat leads to human-wildlife conflict. On the Palos Verdes Peninsula, coyotes are the only large mammalian predator that has not been extirpated. Coyotes have shifted activity towards nocturnality in urban areas and have shown to avoid areas most associated with human activity. Coyote occurrence has even been shown to be positively correlated to urban proximity. These abilities have lead to confrontations between the coyote and humans. Coyotes have been shown to forage in human areas at night while resting in chaparral during the day in Southern California. However, the canyon fragments in Palos Verdes experience the greatest human traffic during the day, and coyotes may be exhibiting an altered behavior to reduce conflict.

Additionally, these habitat fragments do not ecologically function identically to larger habitat areas, creating a novel set of pressures for the wildlife species still persisting. As these natural places become smaller and more isolated from one another, the quality of habitat for certain species is reduced and for others has been shown to increase. *P. lotor*, *Mephitis mephitis,* and *F. catus*, have been shown to positively benefit from fragmentation, while predators such as *C. latrans* have reduced occurrence as fragments become smaller and more isolated. As fragmentation negatively affects large mammal predators and positively affects mesopredators, fragments are areas where a mesopredator release could occur. In another Southern California study, a high presence of larger mammal predators, especially *C. latrans*, occurred with a low occurrence of raccoons and feral cats.

Materials and Methods

Trail cameras, trail camera security boxes, security cables, memory cards, batteries, T-stakes, and tree straps were used in the field. The two canyons that were studied were Margate Canyon (control) and Agua Amarga Canyon (human presence). Cameras were installed in two pairs per canyon, with a creekbed and trail camera along the same perpendicular axis to the canyon's length, for a total of 8 camera installations. The cameras were in place from 5-3-17 to 11-18-17 for a total time of 6 months and 16 days. A capture is when one animal is present in a video, and multiple individuals in the same video count as multiple captures. Chi-Square analysis was used to determine if differences in captures between location types were significant.

Results

	Procyon lotor	Felis catus	Neotoma fuscipes	Sylvilagus audubonii	Mephitis mephitis	Didelphis virginiana	Sciurus niger	Canis latrans	Vulpes vulpes	Total Captures	% Total
Control Trail Night	176	55	33	4	19	16	0	0	4	307	47
Control Creekbed Night	80	43	45	2	12	8	0	2	1	193	30
Control Trail Day	3	12	0	26	0	0	17	1	0	59	9
Control Creekbed Day	1	41	0	5	0	0	2	0	0	49	8
Impacted Creekbed Night	2	19	0	0	0	0	0	1	0	22	3
Impacted Trail Night	7	1	0	2	1	0	0	4	0	15	2
Impacted Trail Day	0	1	0	3	0	0	3	0	0	7	1
Impacted Creekbed Day	0	0	0	1	0	0	0	0	0	1	0.2
Total Captures	269	172	78	43	32	24	22	8	5	653	
% Total	41	26	12	7	5	4	3	1	1		

Table 1. All captures sorted by species and location type

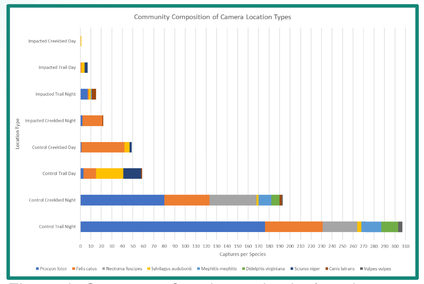


Figure 1. Captures of each species by location type

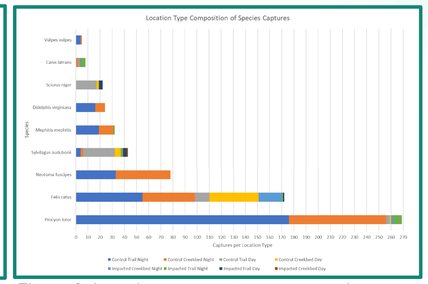


Figure 2. Location type captures per species

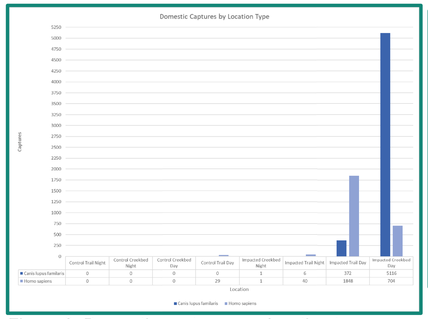


Figure 3. Domestic captures per location type

Figure 4. Daytime capture of *C. latrans* along trail in control canyon

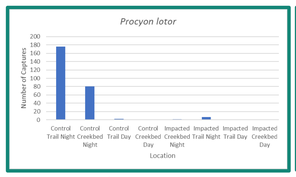


Figure 5. *P. lotor* captures by location type

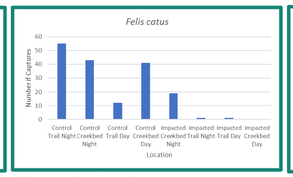


Figure 6. *F. catus* captures by location type

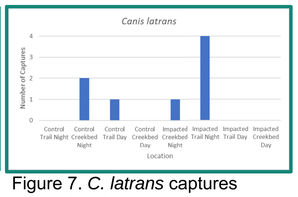


Figure 7. *C. latrans* captures by location type

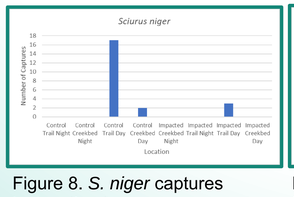


Figure 8. *S. niger* captures by location type

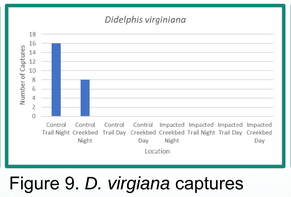


Figure 9. *D. virgiana* captures by location type

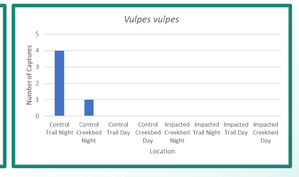


Figure 10. *V. vulpes* captures by location type

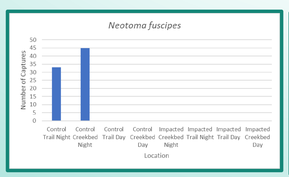


Figure 11. *N. fuscipes* captures by location type

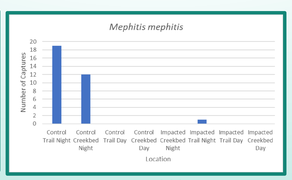


Figure 12. *M. mephitis* captures by location type

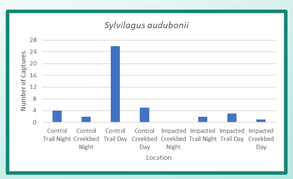


Figure 13. *S. audubonii* captures by location type

All graphs, tables, and photos produced by author.

Special Acknowledgements to Dr. Theodore Stankowich, Rita Collins, Julie Muñoz, Thomas Jankowski and Josh Weinik for support.

Discussion

This study has shown that other factors within habitat fragments can create a significant effect on mammalian behavioral ecology. There was a significant difference in the number of captures between the control and impacted canyon, suggesting a reduction of animal movement due to human presence. This trend has been shown to exist globally and is a possible exclusionary factor for larger mammalian predators such as cougars and bobcats. Species richness was reduced in the impacted canyon, which is a trend observed in previous literature, and warrants the conservation of fragments where human activity is restricted. Species that were only present in the control canyon were *Didelphis virgiana*, *Neatoma fuscipes*, and *Vulpes vulpes*. As these mammals vary greatly in mass, body size most likely is not a strong contributing factor to the absence of a mammal species in a fragment with human presence. *Mephitis mephitis, D. virgiana*, and *N. fuscipes* were the only species observed solely at night. These behaviors do not show change from natural patterns. *P. lotor* and *C. latrans* captures were recorded during the day only in the control canyon, suggesting that human presence may shift activity of mammals toward nocturnality, which is supported by previous literature and aligns with literature that observed coyotes primarily rest in chaparral fragments during the day. The coyotes that were captured on video in this study exhibited no observable fear of the cameras, even staring directly into the camera during the day without postural changes, in one instance. This conflicts with previous literature showing that coyotes are wary of camera installations. However, the aforementioned literature involved coyotes living within an unfragmented landscape and increased fragmentation may lead to a reduction in coyote wariness of camera installations. Furthermore, if conflict does occur in these fragments, it is unlikely to end in serious human injury. This is due to 98% of wildlife captures representing either *P. lotor* or a species of smaller body size. These species present little to no danger to humans, and since 99% of human activity was recorded during the day, conflict is likely of little consequence.

Future Management Implications

This study has demonstrated that factors within fragments are ecologically significant and should be taken into account when managing wildlife within a fragmented landscape. The presence of humans and domestic dogs was shown to reduce species richness, and thus conservation plans should incorporate areas where human presence is limited. As human development continues, further research into coyote conflict is warranted as they have shown reduced wariness to manmade structures within fragments and have been able to successfully adapt to living within urban and suburban habitat matrices. As habitat continues to be fragmented, further research is required as significant differences in behavioral ecology of mammals have occurred in fragmented landscapes.

APPENDIX F

VOLUNTEER PROGRAMS

1. 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, 2017 to December 31, 2017.

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:

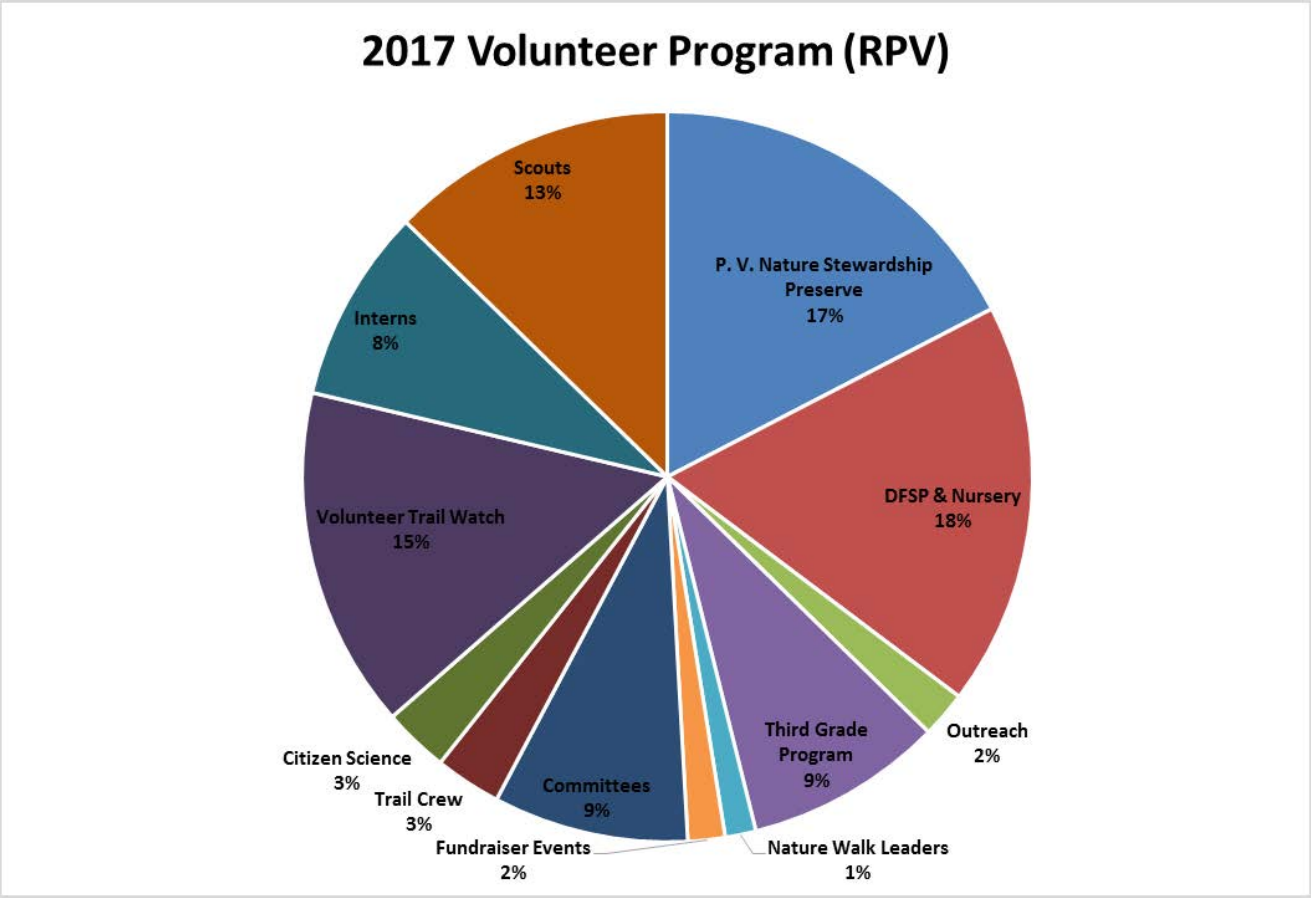
- Committees and Advisory Boards
- Special Events and Office Assistance
- Education Docents and Nature Walk Leaders
- Interns

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 2017, volunteers provided a grand total of **18,977.51** hours 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 $28.46 per hour (based on Dollar Value of a Volunteer Hour, by State: 2016, Independent Sector), thus generating a total of $540,099.935

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 1,640 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 259 hours in 2017. Former PVPLC Board of Directors member Anke Raue coordinates 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 2017, 30 interns dedicated a total of 1630.25 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 HERO Club chapters 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 2017:

- 13,082.51 hours of outdoor stewardship volunteer time
- Grant from REI Inc. to support volunteer programs, youth engagement, and restoration initiatives

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.

A detailed account of volunteer days and group events are listed below. Events are listed chronologically by Preserve with the Palos Verdes Nature Preserve (PVNP) further separated by Reserve.

3.1.1 Palos Verdes Nature Preserve

Abalone Cove Reserve

Date	Activity
1-Apr	Rapid Response
15-Apr	Rapid Response
14-July	Rapid Response
15-July	Rapid Response
25-Aug	Rapid Response
26-Aug	Rapid Response

Agua Amarga Reserve

Date	Activity
6-Aug	Weed removal
9-Sept	Weed removal
29-Oct	Weed removal and watering
4-Nov	Volunteer planting; installed 60 coastal sage scrub plants

Alta Vicente Reserve

Date	Activity
28-Jan	Plant 360 plants and remove crystalline iceplant
11-Mar	USC Upward Bound: Widespread mustard removal in phases 2 and 3
15-Apr	Mustard, cheeseweed, and grass removal from Phase 3
6-May	Weeding Phase 3: bristly ox tongue, dandelion, cheeseweed, mustard, castor bean
24-Jun	Bristly ox-tongue removal around native plants
8-July	Rapid Response-Trail Crew
15-Jul	Removing Invasive weeds in phase 3 by cul-de-sac in coastal sage scrub habitat (1/4 acre weeds removed)
19-Aug	Remove bristly ox-tongue in 1/2 acre plot in Phase 3
30-Aug	PV Realtors: Weeding Phase 3 and cleaning up plants
9-Sept	Trail Crew
16-Sep	Weed over half of Phase 3 and remove Acacia
18-Nov	750 plants installed via Erik Lilligren, weed removal by cul-de-sac
15-Dec	Plant 300 native species in Phase 4 butterfly zone with REI and staff
16-Dec	Rapid Response and Phase 4 planting –over 400 plants

Portuguese Bend Reserve

Date	Activity
6-Jan	Rapid Response
3-Feb	Rapid Response
10-Feb	Rapid Response
11-Feb	Rapid Response
24-Feb	Rapid Response
3-Mar	Rapid Response
4-Mar	Remove invasive mustard from Phases 4 and 5
1-Apr	Weeding Phase 5 focusing on mustard removal
10-Mar	Rapid Response
14-Apr	Rapid Response
21-Apr	Rapid Response
28-Apr	Rapid Response
5-May	Rapid Response
12-May	Rapid Response
13-May	Removing mustard from Phases 5 and 3
26-May	Rapid Response
2-June	Rapid Response
10-June	Mustard removal in restoration site
16-June	Rapid Response
23-June	Rapid Response
30-June	Rapid Response
8-July	Mustard and bristly ox-tongue removal Phases 3 and 4
5-Aug	Weed bristly ox tongue and tocalote Phase 3
18-Aug	Rapid Response and Marymount California Volunteer Day: Phase 3 weed removal

2-Sep	Removing mustard from Phase 5
6-Oct	Removing weeds and sowing grass, CSS, and wildflower seed in lower west Phase 3
2-Dec	Seeded Eriogonum in Phase 3 and weeded tocalote

Filiorum Reserve

Date	**Activity**
25-Feb	Rapid Response-Trail Crew
17-Mar	Rapid Response
7-Apr	Rapid Response
29-Apr	Rapid Response
27-May	Rapid Response
28-July	Rapid Response
29-July	Rapid Response
2-Dec	Rapid Response

Forrestal Reserve

Date	**Activity**
14-Jan	Rapid Response
28-Jan	Rapid Response
4-Mar	Rapid Response
24-Mar	Rapid Response
31-Mar	Rapid Response
17-June	Rapid Response
22-July	Rapid Response
4-Aug	Rapid Response
5-Aug	Rapid Response
23-Dec	Rapid Response

3.1.2 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 3393.5 volunteer hours were contributed to nursery efforts in 2017.

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 2017, four workshops were held which trained **48** leaders at White Point Preserve on April 8,th May 7,th June 3rd and September 9th.

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 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 2017, scout projects accumulated 2411.61 hours of volunteer service.

3.4 Trail Crew Program

In 2017, the volunteer Trail Crew contributed a total of 557.25 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

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.

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 14	49	Abalone Cove	Rock Stairs on Sea Dahlia
February 11	48	PVPLC office	Introductory Course
March 11	33	Forrestal	
April 8	37	Filiorum	
May 13	21	Abalone Cove	Repairing the stairs
June 10	6	Portuguese Bend	Repair the Vanderlip Trail
July 8	35	Alta Vicente	Pruning overgrowth and debris
July 12	13.5	Alta Vicente	Enhancing steps on North Spur trail
Aug 19	36	Filiorum	Trail clearing and improvement of Zotes Cutacross
Sept 9	27	Alta Vicente	Brush and Clear AV trail, Remove tarmac
Oct 14	24	Three Sisters	Sunshine and Barkentine retaining wall and tread repair
Nov 18	25	Filiorum	Ford Trail tread repair and rock retaining wall
Dec 9	28	Abalone Cove	Sea Dahlia grade dips and rock check dams

3.5 Volunteer Trail Watch Program

The mission of the Palos Verdes Nature Preserve Volunteer Trail Patrol 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. Volunteers dedicated 2868.65 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

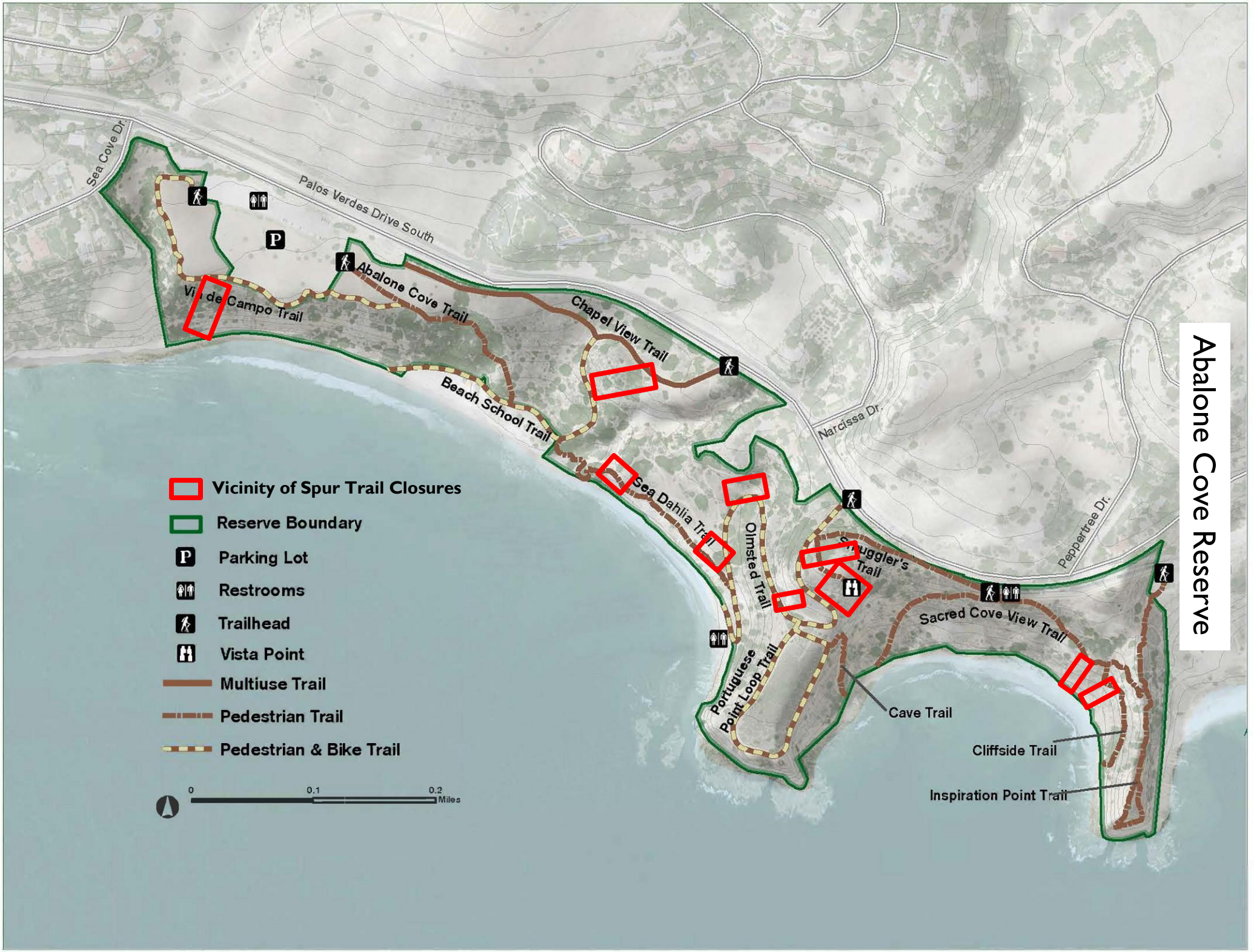
Volunteers help the PVPLC monitor wildlife on the Preserve in order to document populations and their response to restoration efforts. Citizen Science volunteers contributed 550 hours to documenting the behavior of cactus wrens and the evidence of mammalian populations like coyotes and foxes through tracking efforts.

4. GRANTS SUPPORTING VOLUNTEER ENGAGEMENT

In 2017, the Conservancy received a grant from REI for $10,000 to help with volunteer efforts to build trails and restore habitat.

APPENDIX G

2017 UNAUTHORIZED TRAIL CLOSURES


Abalone Cove Reserve
Sea Cove Dr.
Palos Verdes Drive South
Vista de Campo Trail
Abalone Cove Trail
Chapel View Trail
Beach School Trail
Narcissa Dr.
Sea Dahlia Trail
Olmsted Trail
Smuggler's Trail
Peppertree Dr.
Sacred Cove View Trail
Portuguese Point Loop Trail
Cave Trail
Cliffside Trail
Inspiration Point Trail
Vicinity of Spur Trail Closures
Reserve Boundary
Parking Lot
Restrooms
Trailhead
Vista Point
Multiuse Trail
Pedestrian Trail
Pedestrian & Bike Trail
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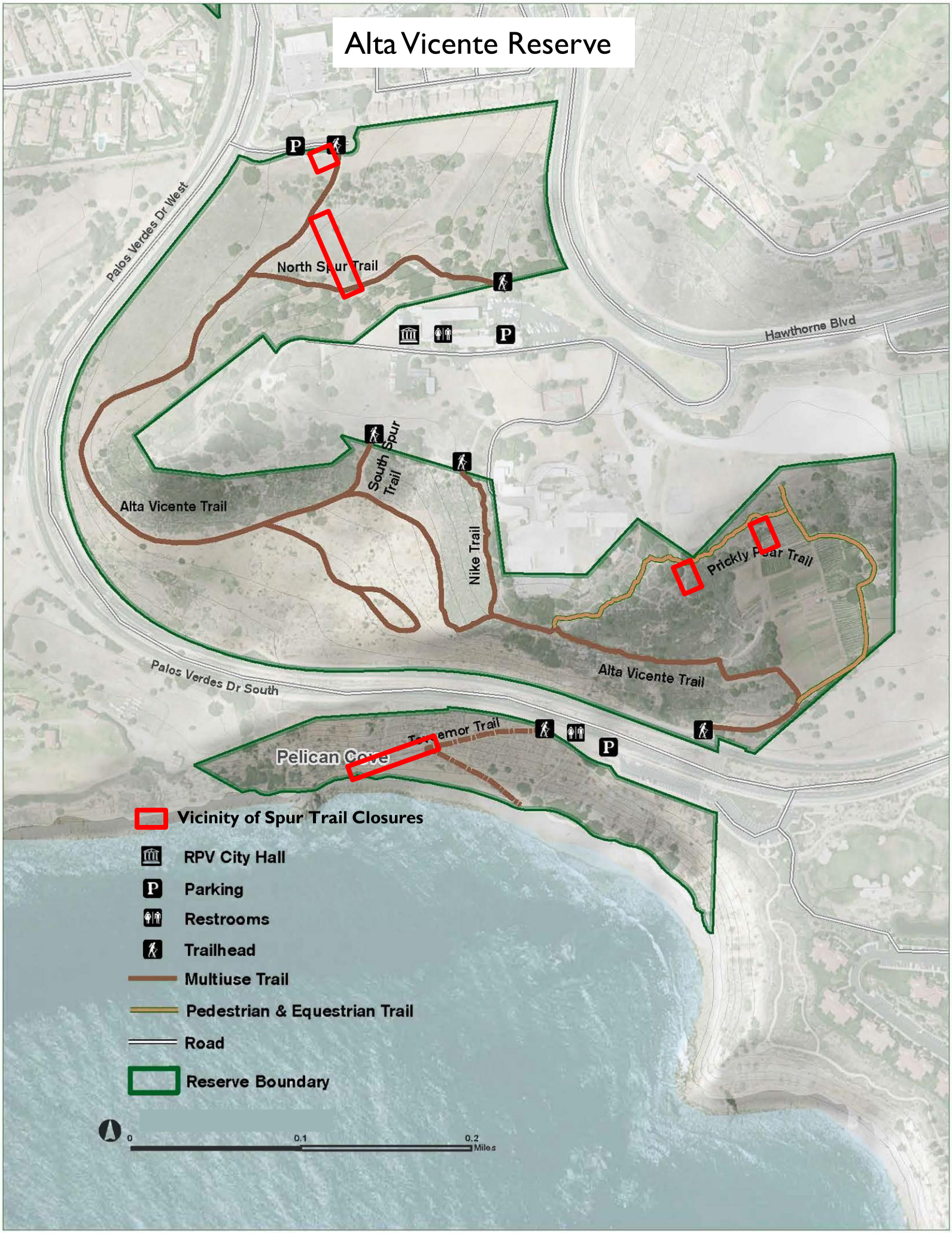
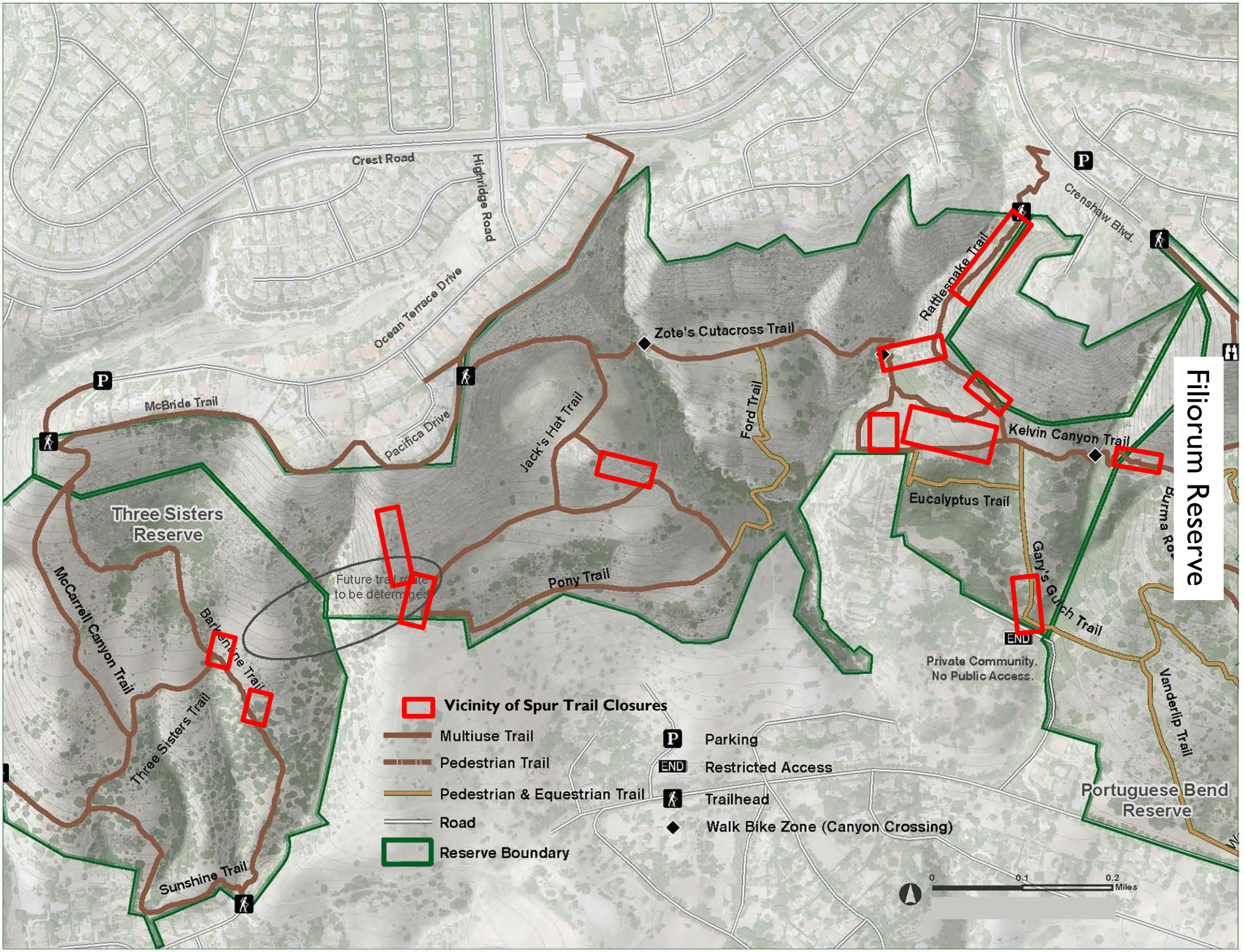
Miles


Alta Vicente Reserve
Palos Verdes Dr West
North Spur Trail
Hawthorne Blvd
South Spur Trail
Alta Vicente Trail
Nike Trail
Prickly Pear Trail
Palos Verdes Dr South
Alta Vicente Trail
Pelican Cove
Vicinity of Spur Trail Closures
RPV City Hall
Parking
Restrooms
Trailhead
Multiuse Trail
Pedestrian & Equestrian Trail
Road
Reserve Boundary
0
0.1
0.2
Miles


Filiorum Reserve
Crest Road
Highridge Road
Ocean Terrace Drive
Pacifica Drive
McBride Trail
Zote's Cutacross Trail
Jack's Hat Trail
Ford Trail
Rattlesnake Trail
Crenshaw Blvd.
Kelvin Canyon Trail
Eucalyptus Trail
Gary's Gulch Trail
Pony Trail
Future trail route to be determined
Three Sisters Reserve
McCarrell Canyon Trail
Three Sisters Trail
Sunshine Trail
Private Community. No Public Access.
Vanderlip Trail
Portuguese Bend Reserve
END
Vicinity of Spur Trail Closures
Multiuse Trail
Pedestrian Trail
Pedestrian & Equestrian Trail
Road
Reserve Boundary
Parking
Restricted Access
Trailhead
Walk Bike Zone (Canyon Crossing)
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0.1
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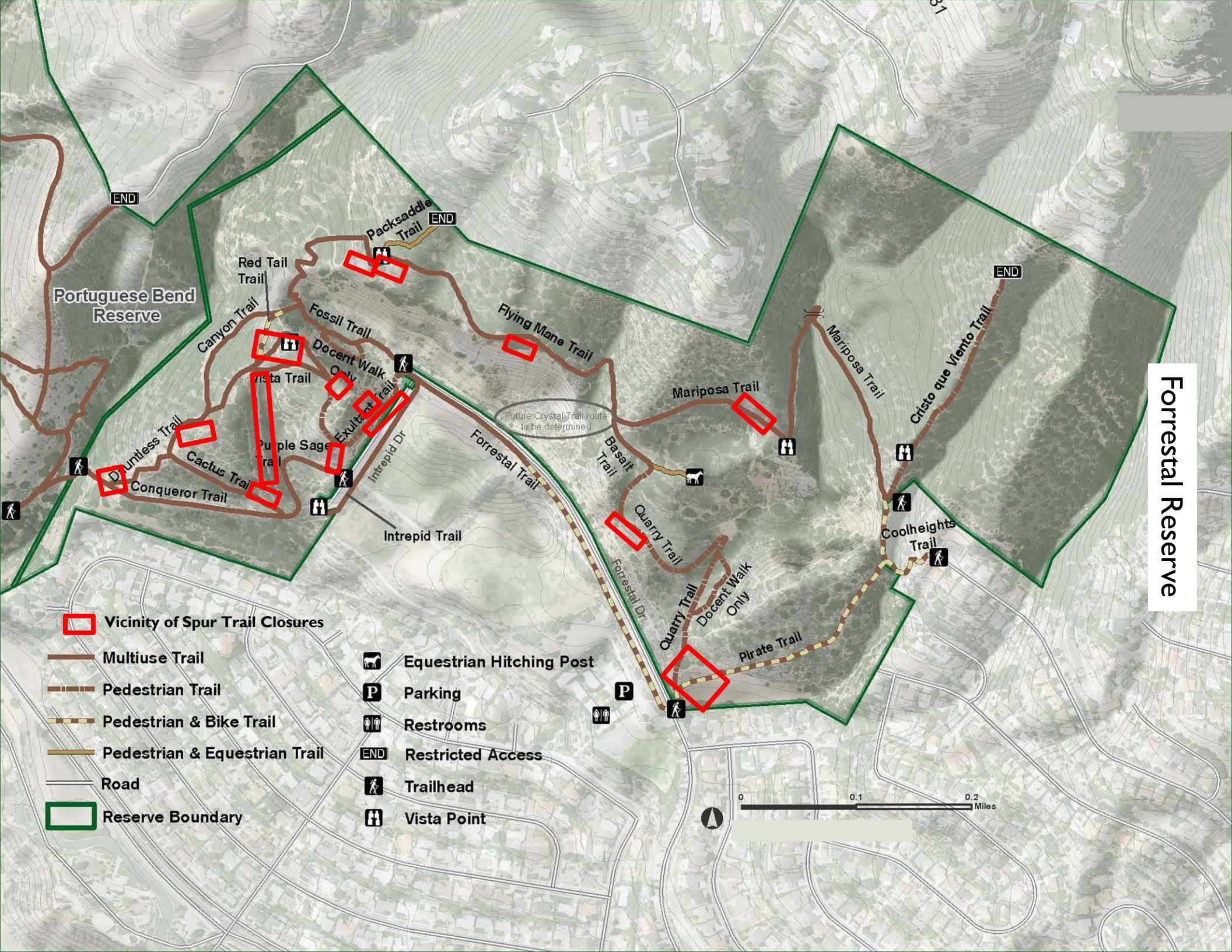
Miles


Portuguese Bend Reserve
Forrestal Reserve
END
Packsaddle Trail
Red Tail Trail
Canyon Trail
Fossil Trail
Docent Walk Only
Vista Trail
Flying Mane Trail
Future Crystal Trail route to be determined
Mariposa Trail
Cristo que Viento Trail
Dauntless Trail
Cactus Trail
Conqueror Trail
Purple Sage Trail
Exulte Trail
Intrepid Dr
Intrepid Trail
Forrestal Trail
Basalt Trail
Quarry Trail
Forrestal Dr
Docent Walk Only
Coolheights Trail
Pirate Trail
Vicinity of Spur 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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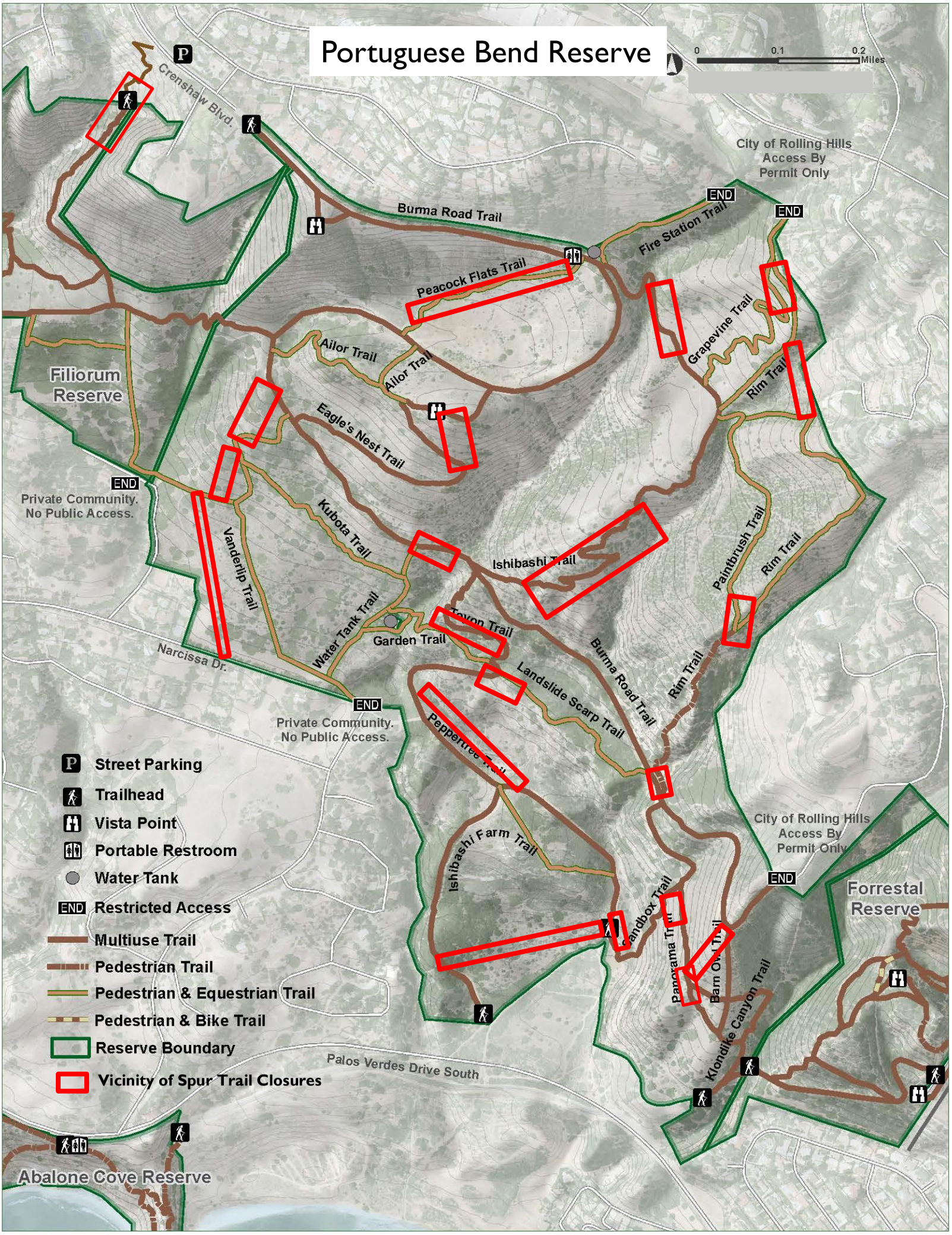
Miles


Portuguese Bend Reserve
0
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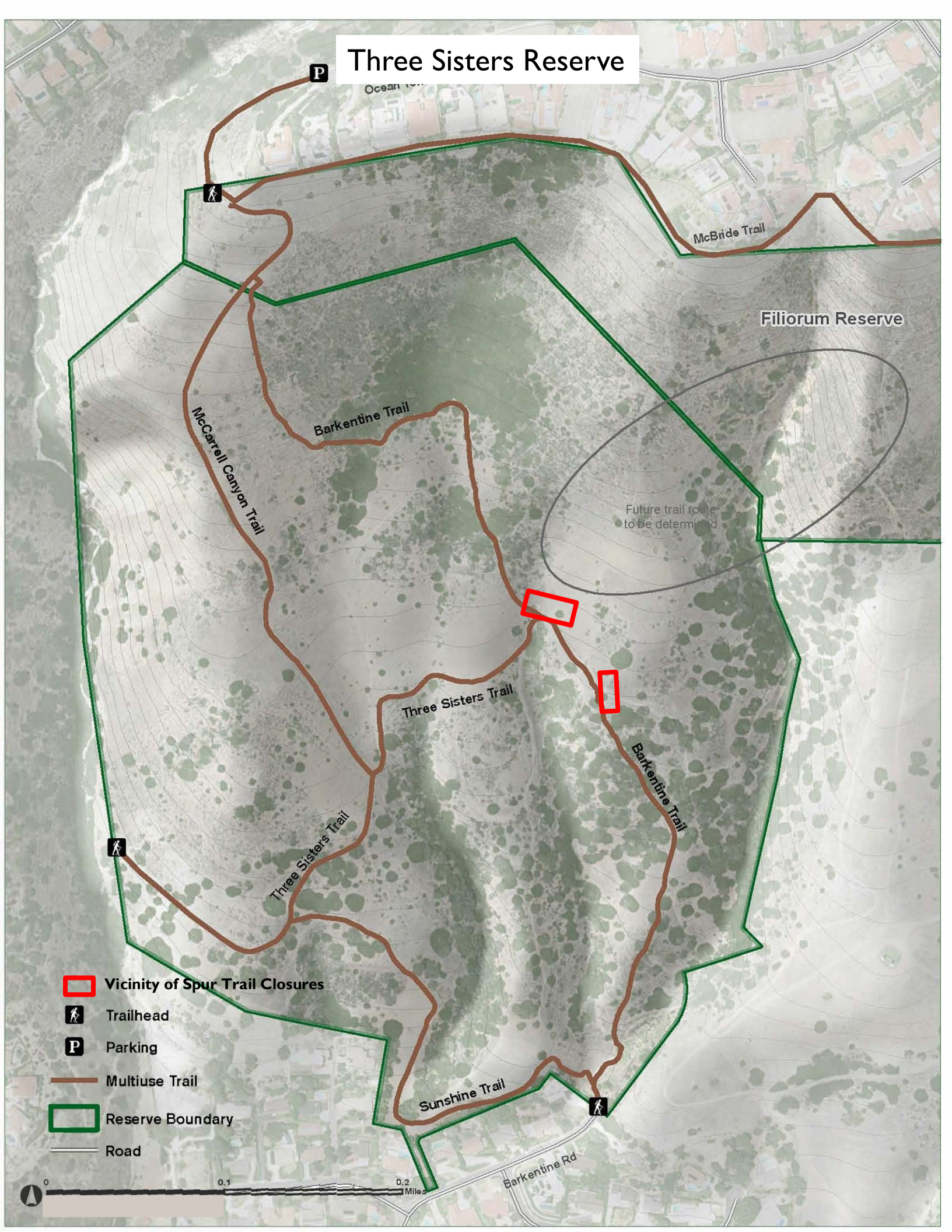
0.2
Miles
Crenshaw Blvd.
City of Rolling Hills
Access By
Permit Only
Burma Road Trail
Fire Station Trail
END
Peacock Flats Trail
Grapevine Trail
Rim Trail
Ailor Trail
Filiorum
Reserve
Eagle's Nest Trail
Private Community.
No Public Access.
Kubota Trail
Vanderlip Trail
Ishibashi Trail
Paintbrush Trail
Water Tank Trail
Garden Trail
Narcissa Dr.
Landslide Scarp 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
Street Parking
Trailhead
Vista Point
Portable Restroom
Water Tank
Restricted Access
Multiuse Trail
Pedestrian Trail
Pedestrian & Equestrian Trail
Pedestrian & Bike Trail
Reserve Boundary
Vicinity of Spur Trail Closures


Three Sisters Reserve
McBride Trail
Filiorum Reserve
Future trail route to be determined
Barkentine Trail
McCarrell Canyon Trail
Three Sisters Trail
Barkentine Trail
Three Sisters Trail
Sunshine Trail
Barkentine Rd
Vicinity of Spur Trail Closures
Trailhead
Parking
Multiuse Trail
Reserve Boundary
Road
0
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Miles

APPENDIX H

FUTURE TRAIL PROJECTS LIST

2018 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
	Abalone Cove Trail	Spur Trail Closures	Low – Ongoing
	Beach School Trail	Spur Trail Closures	Low – Ongoing
	Sacred Cove View Trail	Spur Trail Closures	Medium
	Sacred Cove View Trail	Repair trail erosion damage	Medium
	Via del Campo Trail	Spur Trail Closures	Low – Ongoing
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
	McBride Trail	Maintain spur trail closures	Low
Forrestal			

	Crystal Trail	Develop trail alignment per PTP	Low
	Quarry Trail	Spur trail closure	Medium - ongoing
	Cool Overlook	Spur trail closure	Medium - ongoing
	Dauntless Trail	Spur trail closure (upper section) and repair trail erosion (lower section)	Medium
	Vista Trail	Spur trail closure	Medium - ongoing
	Exultant Trail	Maintain spur trail closure	Medium - ongoing
	Cristo que Viento Trail	Spur trail closure	Low
	Flying Mane Trail	Maintain spur trail closure	Medium - ongoing
	Pirate Trail	Maintain post and cable repair and check dams	Medium - ongoing
Portuguese Bend			
	Ishibashi Trail	Maintain spur trail closures and remove embankments	Medium - ongoing
	Ishibashi Trail	Evaluate measures to improve user safety	Medium
	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	Medium -- Ongoing
	Panorama Trail	Maintain spur trail and eyebrow closures	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			

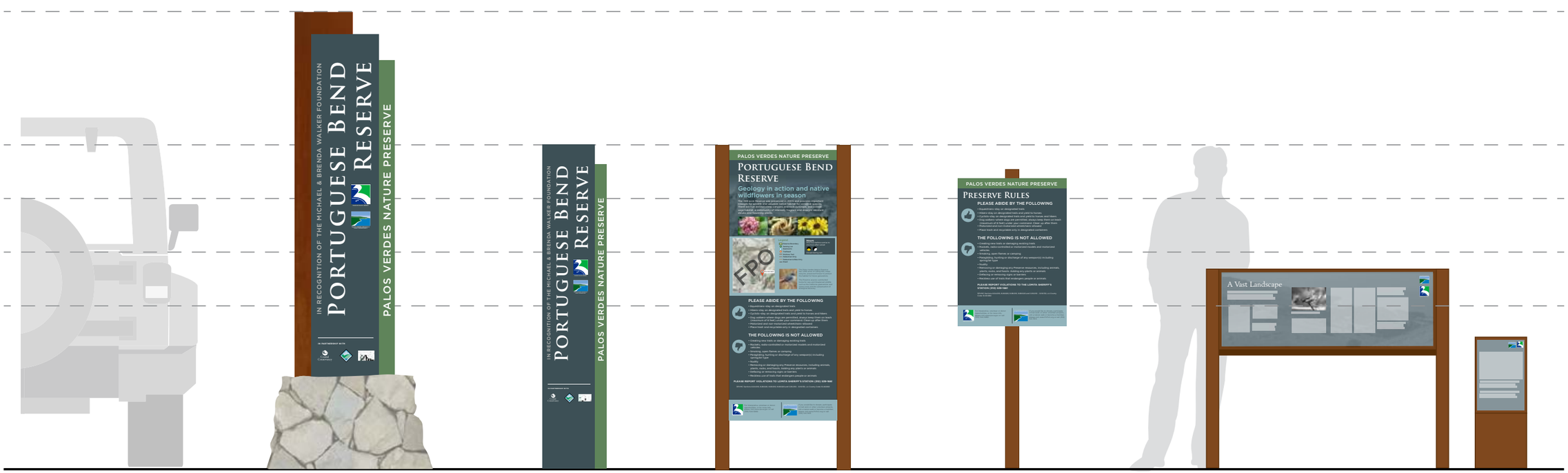
Last Updated 06/22/2018

APPENDIX I

PVNP SIGNAGE DESIGNS

Family of Sign Types

8′-6″
6′-0″
5′-0″
4′-0″
3′-0″



10 - Primary ID | 15 - Secondary ID | 20 - Orientation Panel | 22 - Single Reg Panel | 25 - Primary Interp. 26 - Secondary Interp.

ELEVATION

SCALE: 1/2" = 1'-0"

APPENDIX J

HABITAT IMPACTS

There were no new impacts to habitat throughout the NCCP/HCP sub-area or Palos Verdes Nature Preserve that occurred in 2017.

APPENDIX K

CITY OF RPV
2017 NIGHT HIKE ACTIVITY

2017 Preserve Night Hikes and Activities

1/6/17 Sierra Club hike*
2/20/17 Sierra Club hike
3/6/17 Sierra Club hike
10/16/17 Sierra Club hike
10/23/17 Sierra Club hike
10/30/17 Sierra Club hike
11/6/17 Sierra Club hike
11/13/17 Sierra Club hike
11/20/17 Sierra Club hike
11/27/17 Sierra Club hike
12/4/17 Sierra Club hike
12/18/17 Sierra Club hike

*Night hikes may include a maximum of 30 participants per hike. Night hikes averaged 15 participants per hike in 2017.