

El Moro Elfin Forest

Final Biological Assessment Report



Prepared for:

Los Osos-Morro Bay Chapter of Small Wilderness Preservation Area
San Luis Obispo County, California

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March 2019

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List of Terms and Acronyms

10(a)1(a) Permit: Permit required by the U.S. Fish and Wildlife Service to conduct scientific research on a federally-listed species or activities to enhance a listed species' propagation or survival; also referred to as a Recovery Permit.

Cal-IPC: California Invasive Plant Council

CCC: California Conservation Corps

CDFW: California Department of Fish and Wildlife

County: Refers to the agency of the County of San Luis Obispo

Estuary: Refers to the Morro Bay Estuary in San Luis Obispo County

Forest: Refers to the El Moro Elfin Forest in San Luis Obispo County

GIS: Refers to Geographic Information System software

GPS: Global Positioning System

MSS: Morro shoulderband snail (*Helminthoglypta walkeriana*)

Non-native: Species introduced to California any time after European contact and as a direct or indirect result of human activity

Recovery Permit: See 10(a)(1)(A) Permit

SWAP: Refers specifically to the Los Osos – Morro Bay Chapter of Small Wilderness Area Preservation

USFWS: United States Fish and Wildlife Service

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1.0 INTRODUCTION

This biological assessment report was prepared by Terra Verde Environmental Consulting, LLC (Terra Verde) for the San Luis Obispo County Parks and Recreation Department (County Parks) and the Los Osos-Morro Bay Chapter of Small Wilderness Area Preservation (SWAP) to review the health of the El Moro Elfin Forest Natural Area (Forest) and provide specific recommendations for future management of the Forest. The Forest is an approximately 90-acre natural area located on the northern edge of the community of Los Osos in San Luis Obispo County, California (see Appendix A – Figure 1: Site Location Map). The Forest is bounded by a residential neighborhood on the south, South Bay Boulevard on the east, and the Morro Bay Estuary (Estuary) on the west and north. It is situated at the western end of the Los Osos Valley, immediately south of where Los Osos Creek flows into the Estuary. Ownership of the Forest is divided between County Parks, the California Parks and Recreation Department (CA State Parks), and the California State Lands Commission (see Appendix A – Figure 1).

In 1985, the Los Osos-Morro Bay Chapter of SWAP, a volunteer organization, was formed in order to protect the area now known as the El Moro Elfin Forest. SWAP assisted County Parks in acquiring the land by working with the property owner, providing community awareness, and raising funds for acquisition through contributions and grants. In 1994, after County Parks acquired the Forest, SWAP signed an Adopt-A-Park agreement with County Parks to help provide community education regarding this unique resource and to assist with Forest maintenance. To further assist the County, SWAP prepared an initial draft of the Elfin Forest Resource Management Plan in the mid-1990's. The final Management Plan, completed in 1997, serves as a framework for how the County protects and manages the Forest.

Following completion of the Management Plan, County Parks and SWAP implemented various management and improvement projects in the Forest, including some restoration projects. Although these individual projects included native revegetation projects within the Forest, the overall direct benefit to the Forest's sensitive resources – including the federally endangered Morro shoulderband snail (*Helminthoglypta walkeriana*; MSS) – was not clear. Thus, County Parks hired Morro Group, Inc. (Morro Group; now SWCA) to prepare the Elfin Forest Recovery Action Plan (Morro Group, 2003). This plan documented the 2003 baseline conditions and provided recommendations for removing invasive plant populations and restoring disturbed areas within the Forest. The Recovery Action Plan focused on improving habitat quantity and quality for MSS, as well as enhancing native habitats and existing populations of special-status plant species. The 2003 plan was used by County Parks to prioritize focused restoration and enhancement projects and guide the overall management of the Forest for the past 15 years.

This biological assessment is intended to serve as an update to the 2003 Recovery Action Plan, with specific focus on assessing the current health of the Forest and assessing management issues that were not a concern in 2003 (e.g., invasion by feral pigs, dilapidated fencing, etc.). In particular, the primary objectives of this report include:

- Provide a 2018 update to the native habitat baseline conditions by mapping plants, wildlife, and plant communities;
- compare 2018 conditions to 2003 conditions and identify areas of change;
- identify and map locations of invasive and non-native plants and animals;

- identify and map potential erosion concerns;
- document potential impacts to native habitat as a result of overuse and/or non-native wildlife activity;
- assess management concerns pertaining to human-wildlife interactions and public outreach; and
- provide recommendations regarding the ongoing management of the Forest.

The recommendations made in this report are based on direct observations made during a series of field surveys completed in June, July, and August, 2018; information documented in past reports; personal communication with local residents and SWAP members who live near and volunteer in the Forest; and a literature review of publicly-available information on the resources and potential threats identified in the Forest.

1.1 Management and Survey History

1.1.1 Resource Management Plan

The 1997 Management Plan (SWAP, 1997) provides a detailed description of existing conditions within the Forest at the time, including biological and cultural resources, existing trails and infrastructure, and known uses of the Forest. In addition, it established a framework for future management and project planning within the Forest, with an emphasis that all plans for the Forest must be in keeping with its size, scale, and status as an ecological reserve. Several proposed projects were identified in the 1997 Management Plan, which were aimed at increasing public awareness of Forest resources and improving accessibility within the Forest.

Many of these original proposed improvement projects have been implemented by County Parks or are being implemented on an ongoing basis in the Forest. Most notably, a wooden boardwalk was constructed in 1999 with assistance from the California Conservation Corps (CCC). This boardwalk provides pedestrian and disabled access from 16th Street to a roughly one-mile wooden boardwalk loop through the Forest, with two scenic overlooks known as Bush Lupine Point and Siena's View (formerly Mayhem Point) (see Appendix A – Figure 2: Infrastructure and Overview Map). In addition to creating pedestrian, wheelchair, and stroller access to the Forest, the boardwalk was intended to reduce the amount of off-trail access. Regular, ongoing efforts in the Forest are focused on eradication of invasive weed species, as well as general maintenance of the boardwalk and sand trails. These efforts are accomplished through regular volunteer work parties such as SWAP's Weed Warriors. These efforts are implemented by volunteers and, occasionally, with the help of hired CCC crews.

The 1997 Management Plan is now outdated and several of the projects originally proposed are no longer a priority and are not recommended for future implementation. For reference, a list of the projects proposed in that plan, as well as a summary of implementation status, is included in Appendix B – 1997 Resource Management Plan Project Summary.

1.1.2 Recovery Action Plan

The Recovery Action Plan prepared by Morro Group (2003) included documentation of baseline conditions and identification of priority-ranked recovery actions to be implemented in a phased approach. Recovery actions included removal of invasive plant species and the enhancement,

restoration, and protection of habitat within the Forest, which focused on protecting native habitats and special-status species, such as MSS. In particular, 10 recovery areas were identified and ranked in order of priority for implementation of enhancement and restoration projects, which would occur in three phases:

- (1) Invasive species eradication, initial seed collection, and plant propagation
- (2) Seeding and planting in suitable, target restoration areas; continue seed collection and plant propagation
- (3) Maintenance and monitoring

Details regarding the 2003 baseline conditions and current status of each of the 10 priority recovery areas, as well as information pertaining to other restoration efforts implemented in the Forest, are included in Appendix C – Restoration History Summary Table.

1.1.3 Other Biological Surveys and Assessments

Numerous focused and general biological surveys have been completed within the Forest as a result of specific proposed projects. The first biological surveys were conducted by V.L. Holland in 1995 (Holland and Dreher, 1999) to determine the potential impacts associated with the proposed boardwalk project, which was built in 1999 (as noted in Section 1.1). Additional biological surveys have been conducted in support of various projects proposed by County Parks, including several boardwalk extensions, as well as scientific studies initiated by professors and graduate students at California Polytechnic State University, San Luis Obispo (Cal Poly). These various studies have included inventories of the diverse plants, lichens, fungi, arthropods, birds, mammals, and reptiles that inhabit the Forest.

SWAP published a pocket guide to the Plants and Animals of the Elfin Forest in 2005 (SWAP, 2005). This guide includes 28 mammals, 10 reptiles, 4 amphibians, 187 birds, 130 invertebrates, 56 lichens, 36 mushrooms, and more than 200 species of vascular plants that have been documented in the Forest. These species lists have been updated periodically since 2005, including a focused botanical inventory update that was completed in 2013 by botany expert Dr. David J. Keil. Updated lists are available on SWAP's website (SWAP, 2018).

1.2 Purpose and Goals

The Forest supports a unique natural ecosystem and serves a diverse community of local residents, tourists, and research entities. The purpose of this biological assessment is to review and document the overall health of the Forest. This report provides an updated inventory of biological resources present in the Forest, including the current status and extent of known vegetation communities, and special-status and invasive botanical and wildlife species populations. This updated information was compared to data collected as part of the 2003 Recovery Action Plan. In addition, this report reviews specific management concerns identified by SWAP, including items such as erosion, overuse, human-wildlife interactions, and aging infrastructure (e.g., signs, fencing, etc.). In addition to summarizing the current status and condition of biological resources in the Forest, Section 3.0 includes a comparison of conditions documented in 2003 and 2018, for the purpose of documenting change in the Forest. Section 4.0 includes a series of management recommendations that may be implemented by the appropriate local agency or entity.

2.0 SURVEY METHODOLOGY

Terra Verde biologists completed a series of field surveys in June, July, and August 2018 to document the 2018 baseline conditions of the Forest. In addition to field surveys, the assessment included information compiled from past reports (SWAP, 1997; Land Conservancy, 1998; Holland and Dreher, 1999; Sarafian, 2000; Morro Group, 2003), historical aerial imagery, and personal communication with volunteers who access and volunteer in the Forest on a regular basis. In particular, current members of SWAP spent time with Terra Verde biologists in the Forest to share information about historical conditions, past restoration efforts, and ongoing maintenance activities, as well as the locations of past observations of wild boar (*Sus scrofa*), coyote (*Canis latrans*), and invasive plants. Table 2 below includes a summary of field surveys completed in the Forest in 2018.

Table 1. Field Survey Summary		
Date	Survey Type	Surveyors
06/26/18	Reconnaissance survey, preliminary vegetation community mapping, identify key management concerns	Brooke Langle, Kristen Nelson <i>SWAP Members:</i> Jan DiLeo, David Bowlus, Skip Rotstein, Dean Thompson
07/13/18	Botanical and wildlife inventory, vegetation community mapping, sensitive and invasive species mapping, identify erosion features	Rhett Blanton Kristen Nelson
07/19/18	Botanical inventory, vegetation community mapping, sensitive and invasive species mapping	Rhett Blanton, Kristen Nelson <i>SWAP Members:</i> David Bowlus, Skip Rotstein
07/26/18	Botanical and wildlife inventory, vegetation community mapping, sensitive and invasive species mapping, identify erosion features	Rhett Blanton Kristen Nelson
08/01/18	Botanical inventory, vegetation community mapping, sensitive and invasive species mapping	Kristen Nelson
08/08/18	Botanical inventory, vegetation community mapping, sensitive and invasive species mapping	Brooke Langle Kristen Nelson Peter Sarafian ¹

¹ Mr. Sarafian is a former SWAP Board Member, a current member of SWAP, and a long-time volunteer in the Forest; Mr. Sarafian also holds a 10(a)1(a) recovery permit for the federally endangered Morro shoulderband snail (*Helminthoglypta walkeriana*), conducts monitoring in support of weed abatement activities, and is licensed to administer herbicide to invasive weed populations.

Field surveys focused on documenting updated baseline conditions, identifying potential management concerns and/or threats to the health of the Forest, and identifying recommended management strategies that can be implemented by SWAP in coordination with County Parks

and CA State Parks. The 2018 assessment included mapping the current boundaries of vegetation communities; documenting the overall health of the Forest and each community; and identifying and mapping invasive species infestations, erosion concerns, evidence of invasive wildlife activity, and impacts associated with overuse. In addition, the current condition and functionality of fencing and signage was assessed. As suggested in the 2003 report, habitat mapping was completed using a combination of field and desktop methods, similar to what was previously done (Morro Group, 2003).

High resolution aerial imagery of the Forest is available online for several years between 1937 and 2017 (SWAP, 2018). These high-resolution images were used, along with maps provided in past reports and historical aerial imagery available through Google Earth (2018), to inform surveys and complete a comparative analysis of change in cover over time. Past data collected by Morro Group using Global Positioning System (GPS) and/or Geographic Information Systems (GIS) software was also made available, which was used to make direct comparisons between habitat boundaries documented in 2003 and 2018, by overlaying 2003 and 2018 data in GIS.

Field surveys included an inventory of all detected botanical and wildlife species, including indirect wildlife observations (e.g., tracks, scat, vocalization, etc.). Botanical species identifications and taxonomic nomenclature followed *The Jepson Manual: Vascular Plants of California*, 2nd edition (Baldwin et al., 2012), as well as taxonomic updates provided in the Jepson eFlora (Jepson Flora Project, 2018). Vegetation communities were mapped and classified according to classifications used in previous reports, as well as descriptions used in the second edition of *A Manual of California Vegetation* (MCV) classification system (Sawyer et al., 2009).

As previously noted, extensive inventories of vascular plants, wildlife, fungi, and lichens have been compiled for the Forest, which have been prepared by local experts over many years. These lists were used to inform the 2018 surveys, which focused on identification and mapping of special-status and invasive species occurrences, as well as incidental observations of new species observations and confirmations of ‘unconfirmed’ species included on the list of Vascular Plants of the Elfin Forest (SWAP, 2018). A list of all wildlife species observations and new botanical species observations (i.e., species not currently included on the list of Vascular Plants of the Elfin Forest [SWAP, 2018]) is included in Appendix D – 2018 Wildlife Observations and Botanical Species Additions.

3.0 RESULTS

In 2018, a total of 76 acres of habitat were mapped within the terrestrial areas of the Forest and along the edge of the Estuary. Remaining acreage of the Forest extends out into the salt marsh and mudflats of the Estuary, which are intermittently inundated during high tide. Five special-status botanical species and nine invasive weeds were documented, all of which were previously known to occur in the Forest. Similarly, four special-status and three non-native wildlife species were observed, all of which were known to occur in the Forest prior to the 2018 surveys (see Appendix D).

Vegetation communities observed in the Forest include coast live oak (*Quercus agrifolia*) woodland, maritime chaparral, coastal dune scrub, riparian woodland, brackish marsh, and limited areas of ice plant mat (see Appendix A – Figure 3: 2018 Vegetation Communities Map).

Mudflats and salt marsh habitat that surround the western and northern edges of the Forest were not mapped. The current boundaries of vegetation communities were mapped in the field and on the desktop using GPS and GIS software, with the aid of current and historical aerial imagery. Table 3 below provides a comparison of the acreage of each community mapped in 2018 and 2003 (Morro Group, 2003). In addition, a visual comparison of mapped community boundaries from 2003 and 2018 is illustrated in Appendix A – Figure 4: Vegetation Communities Comparison Map.

Table 2. Vegetation Communities of the Elfin Forest			
Mapped Feature	2018 Acreage	2003 Acreage¹	Acreage Difference (2018 – 2003)
Oak Woodland	25.46	27.8	-2.34
Maritime Chaparral	36.15	25.9	+10.25
Coastal Dune Scrub	6.84	15.6	-8.76
Riparian Woodland	3.19	--	N/A
Brackish Marsh	4.12	--	N/A
Ice Plant Mat	0.16	--	N/A
Total	75.92	69.3	--

¹2003 acreage from the Recovery Action Plan (Morro Group, 2003); acreage was not reported for riparian woodland, brackish marsh, or ice plant mat.

²See Appendix A – Figure 4 for an illustration of approximate areas of change between 2003 and 2018 community boundaries.

The current extent and condition of each vegetation community is discussed in Section 3.1 below.

3.1 Vegetation Communities

This section includes a summary of the extent and overall health of each vegetation community identified and mapped in the Forest, including discussions regarding the specific impacts and threats to each community.

3.1.1 Coast Live Oak Woodland

The coast live oak woodland of the Forest is a unique community that supports trees that are up to several hundred years old, but often only reach heights of 4 to 15 feet (Holland and Dreher, 1999; SWAP, 2018). These gnarled, multi-trunked trees are often referred to as pygmy oaks, and were once recognized as a distinct variety of coast live oak. The form and stature of these trees has been attributed to the unusually harsh environmental conditions of the Forest, including salt spray and strong winds blowing off the Estuary and nutrient-poor soil (Holland and Dreher, 1999; SWAP, 2018). However, the results of preliminary studies conducted by researchers at California Polytechnic State University in Pomona indicate that soil nutrient content is not likely a limiting resource for the pygmy oaks (Bobich, unpublished). In 2018, just over 25 acres of coast live oak woodland were mapped in the Forest (34 percent of mapped communities), which is approximately 2 acres less than what was mapped in 2003. During both assessments, the edge of oak canopy was mapped using a combination of direct field observations and available aerial imagery. For areas where there was a difference in the extent of mapped oak canopy, historical aerial photographs were closely inspected to determine whether loss or expansion of canopy

area was apparent. There was no apparent loss in oak canopy observed, and no dead oak trees were observed in the field. As such, it is unlikely that the difference in acreage mapped in 2003 compared to 2018 is a result of loss of oak canopy during this time period; rather, it is expected that minor differences in the quality of aerial imagery and mapping methods resulted in slightly different boundaries. In particular, it is possible that areas mapped as riparian woodland in 2018 were included as oak woodland in 2003.

Areas of oak woodland within the Forest are stable and healthy, forming a closed canopy and supporting a diverse understory. The northern and western boundaries of this community transition sharply into a narrow band of riparian woodland that borders the salt marsh at the edge of the Estuary. The inland edges of oak woodland form a wide, patchy, transitional habitat with areas of maritime chaparral, particularly in the northern half of the Forest. This transitional zone is mapped as an oak-manzanita complex or mosaic of several communities in some past references (SWAP, 1997; Holland and Dreher, 1999). The understory of oak woodlands within the Forest are variably dense to open, with poison oak (*Toxicodendron diversilobum*), bracken fern (*Pteridium aquilinum*), Santa Barbara sedge (*Carex barbarae*), and California blackberry (*Rubus ursinus*) occurring most commonly.

Most oak groves and individual trees exhibited healthy, vigorous new growth. In addition to new leaves and branches, young acorns were observed developing on trees throughout the Forest (see Appendix E – Representative Site Photographs, Photo 2). However, limited areas of crown dieback (observed as portions of the canopy that were partially or completely defoliated) were noted in the field (see Appendix E – Photo 3), which may be attributable to natural, long-term cycles, pest infestation (e.g., California oak moth), or stress resulting from prolonged drought conditions, and ultimately, climate change. Other factors may include competition for water from invasive species such as African asparagus fern (*Asparagus asparagoides*), or reduced water infiltration resulting from soil compaction, as well as natural aging. A focused assessment of tree health would be necessary to quantify the rates of dieback and new growth and determine whether normal or atypical factors are affecting the oaks of the Forest.

Impacts due to intrusion and overuse were mostly limited to areas where elevated canopies of taller trees exist in close proximity to established trails. Evidence of intrusion included a reduced duff/leaf layer covering the ground and occasional trash, most of which appeared to be very old. Many areas of oak woodland are infested with invasive weed species, particularly along the boundary between oak woodland and riparian woodland, where significant incursions of cape ivy (*Delairea odorata*) were documented. Recent and past evidence of wild boar was also documented, primarily along the outer edge of oak woodland habitat, near the edge of riparian woodland. In addition, two notable erosion features were observed within oak woodland habitat, in the northeast and southwest corners of the Forest. These erosion features are discussed in greater detail in Section 3.7 below.

3.1.2 Maritime Chaparral

Maritime chaparral is a unique habitat type dominated by one or more species of manzanita (*Arctostaphylos* spp.) or California-lilac (*Ceanothus* spp.) that are adapted to coastal areas with cool, foggy summers and well-drained soils. Maritime chaparral accounts for nearly half of the vegetation cover in the Forest (47 percent). The northern portions of this community support

dense cover of shrubs up to 12 feet high, dominated by the federally threatened Morro manzanita (*Arctostaphylos morroensis*), with buckbrush (*Ceanothus cuneatus*) and chamise (*Adenostoma fascicularis*) occurring as common co-dominants (see Appendix E – Photo 4). Occasional individuals of coast live oak also occur in this habitat, as well as fuchsia-flowered gooseberry (*Ribes speciosum*), black sage (*Salvia mellifera*), and California sagebrush (*Artemisia californica*). In the southern half of the Forest, Morro manzanita becomes an infrequent component of the chaparral community, where buckbrush and chamise dominate the cover.

The band of shrub-dominated habitat located between the southern boundary of the Forest and the southern half of the boardwalk loop is a transitional area, forming a patchy mosaic of dense to open coastal dune scrub and early- to mid-successional chaparral habitat (see Appendix E – Photo 5). Approximately 36 acres of maritime chaparral were mapped in 2018, which is 10.25 acres more than what was mapped in 2003. This change in cover is mirrored by a reduction of nearly 9 acres of coastal scrub habitat mapped in 2018 compared to 2003 (refer to Table 3). Almost all of the mapping differences in these two communities occur in the band of transitional habitat along the southern Forest boundary, and particularly near the southwestern corner, north of 11th and 12th Streets.

This change in cover may be attributed to a natural succession from open scrub to dense chaparral as a result of efforts to rehabilitate historically impacted areas. In particular, construction of the boardwalk and installation of extensive fencing bordering the sand and boardwalk trails in the southern half of the Forest likely reduced the amount of off-trail access and disturbance in these communities, thus allowing for establishment of more slow-growing species and, ultimately, succession toward chaparral. Areas of maritime chaparral are healthy and stable in the Forest, with the exception of transitional areas that are naturally succeeding from scrub to chaparral along the southern and western boundaries of the Forest.

Observed impacts to chaparral resulting from off-trail access were limited, and mostly concentrated along the southern boundary of the Forest. Few occurrences of narrowleaf iceplant (*Conicosia pugioniformis*) were observed in openings within chaparral habitat, and past evidence of wild boar was documented through the understory of chaparral in a few areas in the northern portion of the Forest (see Appendix E – Photo 6), where chaparral and oak woodland intergrade.

3.1.3 Coastal Dune Scrub

Coastal scrub habitat currently accounts for 6.8 acres (9 percent) of the vegetation cover in the Forest, which is approximately 9 acres less than what was mapped in 2003. As discussed above, this change in cover is likely attributable to the natural succession of open scrub to dense chaparral as a result of reduced anthropogenic disturbance in these communities. This community varies from areas of open dune scrub with low cover (> 50 percent exposed sand) dominated by wedge leaved horkelia (*Horkelia cuneata* var. *cuneata*), seacliff wild buckwheat (*Eriogonum parvifolium*), desert croton (*Croton californicus*), and deerweed (*Acmispon glaber*) to more dense coastal scrub dominated by black sage, mock heather (*Ericameria ericoides*), and sticky monkeyflower (*Diplacus [=Mimulus] aurantiacus*), with occasional occurrences of coyote brush (*Baccharis pilularis*) (see Appendix E – Photos 7 and 8).

Large areas of coastal scrub were significantly impacted historically. Significant efforts have been made to restore these areas through establishment of native plantings, seeding, and installation

of fencing which has reduced off-trail access. Historically impacted areas currently support healthy, established target communities. These areas are mostly all still fenced off with a combination of plastic green fencing and symbolic fencing to prevent trampling of plants and soil disturbance in restored habitats. Though natural succession to a denser chaparral community may eventually reduce the overall cover of this community in the Forest, restored areas of coastal scrub are currently stable. This community is healthy in the Forest, with some areas of notable anthropogenic disturbance, primarily along the southern boundary. In addition, occasional occurrences of narrowleaf iceplant (see Appendix E – Photo 9) and veldt grass (*Ehrharta* sp.) were documented, as well as various escaped ornamental species along the boundary of the Forest with private residences to the south (see Appendix E – Photo 10).

3.1.4 Riparian Woodland

A narrow band of riparian woodland borders the Estuary-edge of the Forest, which is supported by several freshwater springs that surface on the steep slopes bordering the northern and western exposures of the Forest. California wax myrtle (*Morella californica*) and arroyo willow (*Salix lasiolepis*) dominate the overstory (see Appendix E – Photo 11) with dense thickets of California blackberry and poison oak forming an often impenetrable wall in the understory. Giant wild rye (*Elymus condensatus*), bracken fern, and Santa Barbara sedge are also common along the edges of this community. In addition, black cottonwood (*Populus trichocarpa*), blue elderberry (*Sambucus nigra* subsp. *caerulea*), and western dogwood (*Cornus sericea* subsp. *occidentalis*) occur in limited patches on the western Forest boundary, all of which are new observations in the Forest (see Appendix E – Photos 12 and 13).

Nearly 3.25 acres of riparian woodland were mapped in 2018; however, this community was not included in the vegetation community mapping efforts in 2003. This community is well-protected from anthropogenic incursion, but substantial infestations of cape ivy were observed throughout this community. In addition to the difficulty of accessing many infestation areas, patches of cape ivy are often entangled with poison oak thickets, making management and eradication extremely difficult. Evidence of remnant trails, foraging, and scat from wild boar were also observed in some areas of riparian woodland.

3.1.5 Brackish Marsh

Bordering the Estuary-side of the riparian woodland is a band of brackish marsh approximately 10 to 50 feet wide, which receives freshwater influences from Los Osos Creek and the natural springs along the northern and western slopes of the Forest, and salt water influence during high tide in the Estuary (see Appendix E – Photos 11 and 14). This community is dominated by several species of bulrush (*Bolboschoenus maritimus* subsp. *paludosus*, *Schoenoplectus* spp.), with occasional occurrences of southwestern spiny rush (*Juncus acutus* subsp. *leopoldii*) and common reed (*Phragmites australis*). Southwestern spiny rush has a California Rare Plant Rank (CRPR) of 1B.1 (California Native Plant Society [CNPS], 2018). Just over four acres of brackish marsh were mapped in 2018; however, this community was not included in vegetation community mapping completed in 2003. This community is well-protected from anthropogenic incursion, and no significant infestations of invasive weeds were observed in this community. However, significant impacts from migration and foraging of wild boars were apparent throughout this community.

3.1.6 Ice Plant Mat

Species of iceplant (*Carpobrotus* spp.) are highly invasive in coastal habitats, generally forming dense, monotypic mats that prevent other plants from establishing or surviving (see Appendix E – Photo 15). Limited areas of ice plant mat, totaling approximately 0.19 acre, were documented in two locations at the edge of the Forest: in a narrow band adjacent to South Bay Boulevard, near the bridge over Los Osos Creek; and surrounding the 14th Street trailhead. Iceplant is not tolerant of shade and is unlikely to invade the oak woodland that borders the patch along South Bay Boulevard; however, there is high potential for iceplant to invade coastal scrub and the edges of chaparral habitat along the southern Forest boundary.

3.2 Invasive Species

3.2.1 Invasive Plants

The accumulated knowledge about invasive weed infestations in the Forest currently exists in varied formats and locations, and is therefore difficult to track and, in some cases, is no longer available. The 2018 surveys included mapping of incidental encounters of invasive weeds in the Forest; this included specific efforts to visit locations of previously mapped infestations, where possible, to verify the current status. The species of primary management concern in the Forest are listed in Table 4 below, along with the primary management considerations and current status.

Table 3. Summary of Invasive Weeds of the Elfin Forest		
Species	Management Considerations	Current Status in the Forest
Century plant <i>Agave americana</i>	Readily propagates asexually; high potential for eradication if addressed	Limited occurrences in the Forest; incidental hand-pulling when encountered
African asparagus fern <i>Asparagus asparagoides</i>	Readily propagates asexually; significant negative ecological impacts when established ¹	Currently well-established and highly invasive in several plant communities; herbicide-treated regularly, where accessible
Freeway iceplant <i>Carpobrotus edulis</i>	High potential for invasion in scrub communities, transitional habitat, and disturbed areas; significant negative ecological impacts when established ¹	Currently established in limited areas at the Forest edge; not currently treated ²
Narrowleaf iceplant <i>Conicosia pugioniformis</i>	Readily propagates asexually; moderate potential for eradication if addressed	Numerous isolated occurrences in the Forest; incidental hand-pulling when encountered
Cape ivy <i>Delairea odorata</i>	Readily propagates asexually; significant negative ecological impacts when established ¹	Currently well-established and highly invasive in oak and riparian woodlands; herbicide treated regularly, where accessible

Table 3. Summary of Invasive Weeds of the Elfin Forest		
Species	Management Considerations	Current Status in the Forest
Veldt grass <i>Ehrharta calycina</i> , <i>E. erecta</i>	Prolific seed production; abundant in surrounding areas and high potential for invasion in scrub communities, transitional habitat, and disturbed areas; significant negative ecological impacts when established ¹	Scattered occurrences near the southern and eastern boundaries of the Forest; hand-pulled and herbicide-treated regularly
Fennel <i>Foeniculum vulgare</i>	Moderate potential for invasion in scrub communities, transitional habitat, and disturbed areas; high potential for eradication if addressed	Limited occurrences at Forest margins; not currently treated
English ivy <i>Hedera helix</i>	Moderate potential for further invasion of oak/riparian woodlands; moderate potential for eradication if addressed, but co-exists with poison oak; significant negative ecological impacts when established ¹	Currently known from one isolated location in the Forest; opportunistically treated with herbicide
Myoporum <i>Myoporum laetum</i>	Moderate potential for invasion of oak and riparian woodlands and scrub; high potential for eradication if addressed	A single individual is known, which was previously pruned/cut back
New Zealand spinach <i>Tetragonia tetragonoides</i>	New observation in the Forest (2018); high potential for eradication if addressed	Currently known from one isolated location in the Forest; not currently treated

¹Cal-IPC, 2018

²San Luis Obispo County Public Works department is slated to remove much of the ice plant adjacent to South Bay Boulevard in association with repair/maintenance of stormwater control structures in this area

The negative ecological impacts of the species listed in Table 4 are well documented (Cal-IPC, 2018). Preventing new infestations and controlling existing populations is a primary management concern for the Forest. In order to simplify and consolidate future tracking of invasive weed populations in the Forest, all available information regarding the primary species of concern was compiled and is summarized in Appendix F – Invasive Species Tracking Table. In addition, location data for infestations observed in 2018 is shown on Figure 5: 2018 Invasive Species and Erosion Features Map in Appendix A, and specific recommendations regarding the continued management of invasive weeds are included in Section 4.2.1.

In addition to the species of primary concern listed above, several other non-native and invasive species have been previously documented by volunteers. These additional species do not seem to present a significant threat in the Forest; however, these species and past occurrence locations should be tracked for weed abatement needs in the future. In particular, the slope along South Bay Boulevard is at continual high risk of infestation from seeds and propagules blown or brought in by wind and vehicle traffic along the public road. The locations of these additional species were documented and made available by SWAP volunteer Peter Sarafian, and include the following:

- Black mustard (*Brassica nigra*); edge of South Bay Boulevard

- Wall barley (*Hordeum murinum*); edge of South Bay Boulevard
- Goldentop grass (*Lamarckia aurea*); edge of South Bay Boulevard
- Italian thistle (*Carduus pycnocephalus*); end of 10th Street, Celestial Meadow
- Maltese star-thistle (*Centaurea melitensis*); edge of South Bay Boulevard
- Prickly pear (*Opuntia littoralis*); 16th Street trailhead
- Rattail sixweeks grass (*Festuca myuros*); scattered throughout Forest
- Red brome (*Bromus madritensis* subsp. *rubens*); edge of South Bay Boulevard, 11th-17th Street trailheads
- Redstem filaree (*Erodium cicutarium*); edge of South Bay Boulevard
- Ripgut grass (*Bromus diandrus*); edge of South Bay Boulevard, Klopfer Grove, 11th-17th Street trailheads
- Saharan mustard (*Brassica tournefortii*); edge of South Bay Boulevard
- Slender wild oat (*Avena barbata*); edge of South Bay Boulevard
- Wild oat (*Avena fatua*); edge of South Bay Boulevard

Significant infestations of cape ivy were observed in the narrow band of riparian woodland that borders the northern and western edges of the Forest (see Appendix E – Photo 16). In addition, several areas of past and current infestation by various invasive species are located at the edges of the Forest where natural habitats abut anthropogenic areas, including the residential neighborhood along the southern boundary and South Bay Boulevard along the eastern boundary. African asparagus fern has also been documented extensively in many of the oak groves throughout the Forest. Though very few areas of live individuals were observed during the 2018 surveys, desiccated root masses of African asparagus fern were observed in many areas of the Forest, either partially exposed from under the soil surface or lying on top of the soil (see Appendix E – Photo 17). Although the root mass of this species is substantial, and there is potential for it to re-sprout in areas where above-ground growth has been previously removed or treated with herbicide, desiccated root masses of this species were not mapped as current weed infestations.

Similarly, piles of cape ivy that had been removed from oak limbs by hand and herbicide-treated were observed in several areas. These piles mostly appeared to be dead and desiccated, but there is some potential that some stems may re-sprout (see Appendix E – Photo 18). However, treated piles of cape ivy were not mapped as current weed infestations during the 2018 surveys.

3.2.2 Invasive Wildlife

Use of the Forest by non-native wildlife appears to be limited to three species: wild boar, brown garden snail (*Cornu aspersum*, formerly *Helix aspersa*), and Argentine ant (*Linepithema humile*). Non-native bird species that are common in residential areas, such as starlings (*Sturnus vulgaris*), may use the Forest on occasion. In addition, domestic cats (*Felis catus*) have been occasionally observed hunting native wildlife in the Forest. These species have the potential to negatively impact native and special-status wildlife species that occur in the Forest and disrupt natural ecological processes.

Wild Boar

Wild boar is likely the single biggest threat to the health and stability of the Forest, and should be managed using a proactive and coordinated approach. Evidence of wild boar was found to be most prevalent along the Estuary margin, which has resulted in reduced habitat quality for native flora and fauna. The impacts associated with wild boars foraging in these areas reduce the functional value of the marsh and critical edge habitats by inhibiting vegetation establishment. Well-established boar trails are apparent through the marsh habitat along the entire northern and western boundaries of the Forest (see Appendix E – Photos 19 and 20), which are likely used regularly by boars foraging along the Estuary margin. According to the U.S. Department of Agriculture (2016), wild boars directly impact wildlife by preying on the nests, eggs, and young of ground nesting birds and reptiles. They also actively hunt and consume small mammals, reptiles, amphibians, and insects. Of particular concern, wild boar has been documented as negatively impacting oak woodlands through rooting of seedlings and consumption of acorns (Sweitzer and Van Vuren, 2006). In the Forest interior, observations of tracks, scat, and rooting from wild boars through oak woodland and maritime chaparral habitat were mostly remnant; however, fresh scat was observed in the outer edge of the oak woodland that borders the western edge of the Forest. Specific recommendations for the management of wild boar are included in Section 4.2.2.

Argentine Ant

During the 2018 survey efforts, a variety of ant species were observed throughout open, sandy areas of the Forest including the invasive Argentine ant. Behavioral studies conducted between the Argentine ant and eight ant species native to California suggest that Argentine ants are more likely than native ants to act aggressively and native ants tend to retreat more frequently when competing for food resources (Human and Gordon, 1999). This behavior may help Argentine ants to displace native ant species in invaded areas. Additionally, there is evidence that Argentine ants eat other insects, including their larvae (Human and Gordon, 1997).

Based on 2018 observations, the population of Argentine ants in the Forest seems to be well-established in open, sandy areas, concentrated in the southern half of the Forest (see Appendix E – Photo 21). If Argentine ants are displacing native harvester ants (*Pogonomyrmex* spp.) in the Forest, this may have detrimental effects on the local population of Blainville's horned lizard (*Phrynosoma blainvillii*), a California Department of Fish and Wildlife (CDFW) species of special concern, which preferentially feeds on harvester ants. Further, studies have shown a negative correlation between the presence of Argentine ants and a decline in Blainville's horned lizard (Suarez et al., 2000; Suarez and Case, 2002). However, no studies have been conducted to quantify the population size or interactions of various ant species and Blainville's horned lizard in the Forest; thus, the actual impacts are unknown.

Brown Garden Snail

Several shells of brown garden snails were observed in coastal scrub and oak woodland habitats throughout the Forest, most prominently in the area south of the boardwalk (see Appendix E – Photo 22). No live garden snails were noted during the survey. According to the U.S. Fish and Wildlife Service (USFWS), brown garden snail may pose a threat to native snails, such as the federally endangered Morro shoulderband snail (MSS), primarily through competition for habitat

(USFWS, 1998). However, the current population density of MSS and brown garden snail in the Forest is not known and, thus, the level of impacts has not been assessed.

3.3 Use and Overuse of the Forest

The Forest is used by a diverse group of local residents, tourists, youth education and docent-led naturalist groups, and researchers. Historically, a lack of formal trails resulted in a network of informal sand trails that meandered through intact habitats and resulted in significant impacts to these areas, particularly in the shrub-dominated communities that abut residential areas along the southern edge of the Forest. Construction of the boardwalk in 1999 created a formalized trail system and included the installation of informational signage at trailheads and trail intersections. Subsequent installation of fencing in specific areas substantially reduced the frequency of off-trail access into areas of intact habitat. Further, several restoration projects were undertaken over the past two decades, which served to re-establish native vegetation in previously impacted areas and further discourage off-trail access. The reduction in off-trail access is evident in a review of historical aerial imagery from the 1980's through 2018, and was also anecdotally confirmed by SWAP volunteers who frequent the Forest. Designated sand trails have largely been reduced to a handful of well-established connectors between the southern half of the boardwalk loop and the 11th to 17th Street trailheads, as well as a few trails along the eastern boundary of the Forest. In addition, one well-established sand trail remains that is not an officially designated trail; this trail extends north from the northeast corner of the boardwalk loop into the Klopfer Grove near the northeast corner of the Forest.

The boardwalk is a popular walking and jogging loop for individuals, families with children, and dog owners. A few observations of potential overuse and/or unauthorized use were directly observed during surveys and reported by SWAP members. These observations included some areas of continued off-trail access and tree climbing. It has also been reported that dogs being walked on the boardwalk regularly exit the boardwalk and walk through the adjacent native habitat. In addition, a small succulent garden was documented at the edge of the Forest adjacent to South Bay Boulevard; this garden is maintained by a local resident as a memorial site. Overall, potential impacts associated with these common uses of the Forest appear to be limited, which are described in further detail in the following paragraphs.

Tree Climbing in Rose's Grove

According to observations made by SWAP volunteers, the formal boardwalk access into Rose's Grove is a popular spot where groups gather and sit, and children often climb on the low branches of the pygmy oak trees (see Appendix E – Photo 23). Climbing on the lower limbs of oak trees likely reduces the lichen community that may otherwise persist on the surface of old, untouched bark and may also cause additional stress to lower limbs. This impact appears to be largely limited to the one grove of trees where the boardwalk extends under the oak canopy (i.e., Rose's Grove).

Pedestrian Access into Klopfer Grove

The sand trail that extends north from the boardwalk into the area of oak woodland known as the Klopfer Grove on the northern Forest boundary is a well-established, but unofficial trail. Regular pedestrian access into the Klopfer Grove is apparent by the persistence of narrow trails that meander through the leaf litter (see Appendix E – Photo 24). Relatively easy pedestrian access is possible for several hundred feet west of the entry point from the sand trail, before

dense, low-growing vegetation chokes out the trail. Remnant game trails exist in the dense brush west and north of this point, but pedestrian access mostly terminates when the vegetation becomes too dense and low to easily walk. This area of oak woodland is likely one of the most heavily used due to the established trail access that leads to it.

Off-trail Access South of Bush Lupine Point

The oak grove immediately south of the boardwalk at Bush Lupine Point also attracts pedestrian access, as evidenced by a clear trail through the understory. This informal trail cuts through the oak grove and leads to the top of the steep, west-facing slope south of Bush Lupine Point. This area offers unobstructed views of the Estuary and has historically been a popular, informal view point. However, off-trail access to this slope has resulted in significant impacts to vegetation and destabilization of the soil. As such, this area has always been a priority restoration area for the County and SWAP. In addition, limited evidence of continued off-trail access was also observed along the southern Forest boundary, in the vicinity of private residences and established trailheads.

Succulent Garden Memorial

As noted above, a planted succulent garden memorial was observed near the northeastern corner of the Forest, immediately adjacent to South Bay Boulevard (see Appendix E – Photo 25). The garden is about five feet across and consists of ornamental species planted in a small circle, bordered by imported rock and bricks. This garden should be monitored to ensure ornamental species do not escape and become established in the Forest. Recommendations are included in Section 4.2.3 for limiting the amount of unauthorized activity in the Forest.

3.4 Fencing

Three types of fencing are common throughout the Forest: split-rail wood fencing, green plastic fencing, and symbolic cable fencing. The primary goal of fencing is to restrict pedestrian access along unauthorized trails and into intact habitat areas, to prevent new impacts to native vegetation and allow previously impacted areas to re-vegetate.

Split-rail Wood Fencing

Wood fencing borders several sand trails near the southern Forest boundary, particularly along the interface with the adjacent residential neighborhood (see Appendix E – Photo 26). It is in good, functioning condition, effectively delineating authorized access areas without impeding wildlife passage.

Green Plastic Fencing

The green plastic fencing used throughout the Forest is about four feet tall and is reinforced with smooth wire strung across the top and t-posts spaced approximately four to six feet apart (see Appendix E – Photo 27). This type of fencing is employed as a significant visual and physical barrier to off-trail access in specific areas where targeted restoration efforts have been implemented. Approximately 2,900 linear feet (0.55 mile) of plastic fencing was mapped in 2018, mostly in the southern half of the Forest. In many areas, dense scrub and chaparral vegetation has grown through and around the plastic fencing (see Appendix E – Photo 28), which is now partially entangled in new growth. Installation of this type of fencing began in 2003 with the specific

intended purpose of temporarily reducing the intensity and frequency of access in specific areas targeted for restoration. The original plan was to leave this fencing in place for up to three years.

A proposal to remove some of the green fencing was prepared in 2011 (Meyer, 2011). Some of the original green fencing has been removed, and some new sections have been added and/or repaired by volunteers. Recommendations are made in Section 4.2.4 that address removal and replacement of green fencing, based on an assessment of the functionality, visual impacts, and biological concerns associated with this type of fencing in different areas of the Forest.

Symbolic Fencing

The symbolic cable fencing consists of a single strand of black cable strung approximately two feet above the ground between short metal posts (see Appendix E – Photo 29). This fencing has been employed along most of the boardwalk loop and in several areas along sand trails and is intended to serve as a symbolic visual barrier to discourage off-trail access in a less aesthetically impactful way than the green plastic fencing. Along sand trails, this type of fencing is effective at clearly delineating access boundaries and reducing off-trail pedestrian access.

3.5 Restoration

Over the years, restoration efforts implemented by County Parks and SWAP within the Forest have consisted of:

- Invasive species removal throughout the Forest;
- enhancing degraded scrub and chaparral habitat directly north and south of the southern half of the boardwalk;
- fencing or blocking areas of the Forest where sensitive habitat (such as oak groves or manzanita) are being heavily impacted by human use; and
- fencing and/or closing-off spur or redundant trails to allow natural regeneration of native habitat.

See Appendix C for a summary of all restoration activities completed to date in the Forest, and the current status of revegetation in these areas. In addition to these efforts undertaken by SWAP and County Parks, the Land Conservancy of San Luis Obispo County implemented a focused restoration effort along the slope adjacent to South Bay Boulevard (see Appendix E – Photo 31) sometime around 2000 to 2002 (Land Conservancy, 1998). At the time, this area was reportedly heavily inundated with veldt grass (*Ehrharta calycina*). The Land Conservancy received grant funding to clear the area of invasive weeds, plant it with native species, and complete two years of maintenance and monitoring.

Ongoing weed abatement is accomplished through organized volunteer work parties such as SWAP's Weed Warriors, efforts by individual volunteers that conduct periodic invasive plant removal, and the occasional hiring of the CCC to remove invasive plants. Invasive plant removal and other ground-disturbing maintenance is coordinated with a USFWS-approved MSS monitor. The monitor is present to ensure no MSS are impacted by the weed abatement activities. Routine maintenance of established trails includes trimming woody shrubs that become overgrown along the boardwalk. Trimmed vegetation is often piled in strategic locations to discourage the use of remnant volunteer trails that have been formally abandoned. No other active restoration or

habitat enhancement activities are currently occurring in the Forest. Recommendations regarding the implementation of targeted restoration efforts are made in Section 4.2.5.

3.6 Interactions with Wildlife

Based on information provided by SWAP, negative human-wildlife interactions in the Forest are rare and predominantly limited to encounters between coyotes and people walking in the Forest with dogs during the pupping season. No coyote attacks on humans or dogs have been reported. Coyote sightings are common in residential areas of Los Osos, and coyotes are known to breed in the northern portion of the Forest. Interactions between coyotes and the public are likely more frequent during the pupping season as a result of both den protection and food stress associated with caring for large litters. Both den-protective behaviors and food stress are increased in the spring when pups are born and into early summer when pups begin to leave the den.

Ensuring that the public is aware of the potential for coyote sightings in the Forest and how to respond if a coyote is sighted is critical to minimize the incidence of negative interactions and manage public fears. Specific recommendations for managing human interactions with coyotes in the Forest are offered in Section 4.2.6

3.7 Erosion and Sedimentation

Four erosion features were observed during field surveys, which are described in detail below. Erosion in the Forest may result in unwanted impacts to native habitats, loss of soil and sedimentation into the Estuary, deposition of eroded sand onto streets and public access areas, and, in one case, potentially unsafe or unstable conditions if left unattended. In an attempt to address these concerns, numerous temporary erosion control methods have been employed throughout the Forest, including monofilament fiber rolls, silt fencing, sand bags, and imported rock and concrete chunks used as slope protection. In most cases, these controls are degraded and no longer functioning. The remnants of degraded monofilament erosion controls are unsightly and present a significant risk to wildlife due to the potential for entrapment and inadvertent ingestion. Four primary areas of erosion concern were documented and recorded using a hand-held GPS unit (see Appendix A – Figure 5). These features are described in detail below.

Feature 1: Concrete-lined swale near South Bay Boulevard

A concrete-lined drainage swale along the eastern edge of the Forest conveys surface flows from South Bay Boulevard to the southern bank of the Los Osos Creek mouth, immediately west of the bridge over Los Osos Creek. The upper portion of the concrete-lined swale has filled in with sand and become overgrown with iceplant, which obstructs flow through the swale (see Appendix E – Photos 32 and 33). As a result, storm water runoff has incised several areas adjacent to the swale before discharging at an energy dissipation structure near the southern bank of Los Osos Creek. Soil erosion into Los Osos Creek was apparent downslope of the dissipation structure, which consists of several broken slabs of concrete that have been undermined by localized erosion. If left as-is, this degraded swale will continue to deposit eroded material into Los Osos Creek and the Estuary during rain events.

Feature 2: Erosion on the Orchid Trail and Nearby Sand Trails

Two trails along the eastern edge of the Forest have sections of moderately steep grades that have been rutted into narrow gullies that are now lower in elevation than the immediately surrounding area. Consequently, storm water runoff is concentrated along the trails, resulting in soil erosion. Wood timbers have been installed perpendicular to the trail in these areas to direct runoff away from the middle of the trail and prevent soil from sloughing down the slope (see Appendix E – Photo 34). At some locations, a small amount of concrete rubble has also been placed at the downslope edge of the timbers (see Appendix E – Photo 35). It appears storm water from these trails discharges into areas of upland vegetation and does not result in direct sedimentation into any water body. However, continued erosion of these trails may lead to unsafe walking conditions, soil loss, and eventual sedimentation into the Estuary.

Feature 3: Eroded, Unstable Slope South of Bush Lupine Point

The steep, west-facing slope south of Bush Lupine Point has historically been a popular area for off-trail pedestrian access and use as an informal vista point. As a result, dune scrub and chaparral habitat has been substantially impacted in this area, which has led to slope de-stabilization and erosion. At the bottom of the slope, wooden grade control structures have been installed to prevent further soil sloughing and erosion, but continued access has prevented re-vegetation and stabilization of this slope. Significant barriers have been constructed that block the primary access points from the top of the slope, primarily in the form of green plastic fencing. Additionally, jute netting has been installed over some areas of exposed soil, but it is no longer functioning properly (see Appendix E – Photo 36).

Feature 4: Deep Rutting along Informal Trail west of the of 11th Street Trailhead

Approximately 150 feet west of the 11th Street trailhead, an informal trail has been established that slopes downhill off a gravel driveway into dense oak woodland. Due to the slope of this area, concentrated pedestrian access along a single track has caused rutting along a narrow path. Over time, the initial rutting has caused surface flows to become concentrated along the rutted track, resulting in a substantial gully, soil loss, and downslope sedimentation. A substantial quantity of broken concrete chunks has been placed in the gully (see Appendix E – Photo 37), with the intention of maintaining access to the oak woodland to complete herbicide treatments on significant infestations of cape ivy in this area. Further downslope, several additional temporary erosion controls were observed, including wood timbers for grade control, a dilapidated silt fence, and degraded monofilament fiber rolls. A remnant section of chain-link fence was also observed partially lying down in the oak understory. Due to existing topography and drainage patterns, it is likely that storm water will continue to concentrate along the informal trail and undermine the concrete slope protection if left as-is.

Specific recommendations for stabilizing each of these erosion features with more permanent, long-term approaches are included in Section 4.2.7 below.

3.8 Additional Observations and Considerations

3.8.1 Special-status Plants

Five special-status plants were observed during the 2018 surveys, all of which were previously known to occur in the Forest: Morro manzanita, sand almond (*Prunus fasciculata* var. *punctata*), suffrutescent wallflower (*Erysimum suffrutescens*), Michael's rein orchid (*Piperia michaelii*), and southwestern spiny rush (*Juncus acutus* subsp. *leopoldii*). Incidental observations of these species during the 2018 surveys were recorded using a GPS unit (see Appendix A – Figure 6: Sensitive Resources Map). In addition, the total number of observed individuals for each species was recorded or estimated.

Morro Manzanita

As noted above, Morro manzanita is listed as threatened on the federal Endangered Species Act, and is listed by CNPS with a CRPR 1B.1 rank (CNPS, 2018). In 2018, it was estimated that more than 500 individual Morro manzanitas currently exist in the Forest. Protection of this population is important for the continued survival of this species, which is only known to occur on stabilized dunes around the communities of Morro Bay and Los Osos, and south into Montaña de Oro State Park. Most of the manzanitas that occur in the Forest are associated with maritime chaparral habitat (see Appendix E – Photo 8), though occasional individuals were found in more open scrub habitats, and also at the immediate edge of oak woodland. One small patch of dead Morro manzanitas was observed in an approximately 20-foot by 25-foot area immediately south of Bush Lupine Point, all of which appeared to be young at the time of death (see Appendix A – Figure 6). Based on available information, it was determined that this localized mortality of young plants was likely associated with an unsuccessful restoration attempt.

Sand Almond

Sand almond occurs in sandy soils along the coast from Lompoc to Morro Bay, and is listed by CNPS with a CRPR 4.3 rank. Only a few individuals of sand almond were recorded in GIS data provided by Morro Group from the 2003 surveys. In 2018, more than 150 individuals were estimated in open scrub and transitional chaparral habitats south of the southern half of the boardwalk loop. Most commonly, sand almond was observed occupying edge habitats between chaparral and scrub communities (see Appendix E – Photo 39), where they were protected, but not completely shaded by large chaparral shrubs. It is possible that the increase in observed individuals between 2003 and 2018 is a result of an increase in preferred edge habitat in areas where scrub and successional chaparral habitat intergrade.

Suffrutescent Wallflower

Suffrutescent wallflower occurs in stabilized sand dunes and coastal scrub along the central and southern California coast, and is listed by CNPS with a CRPR 4.2 rank. Only five individuals of this species were observed in 2018; however, more individuals may be present and more readily detected during their flowering period, earlier in the spring. Suffrutescent wallflower was found in open to moderately dense scrub habitat south of the southern half of the boardwalk loop.

Michael's Rein Orchid

Michael's rein orchid occurs in dry habitats in association with various scrub and woodland communities in coastal mountains and the Sierra Nevada foothills, primarily from Point Reyes to Santa Barbara. It is listed by CNPS with a CRPR 4.2 rank. During the 2018 surveys, it was only observed in one location, within the ice plant mat adjacent to South Bay Boulevard. However, the surveys occurred after this species was mostly senesced for the year (see Appendix E – Photo 40), and more localities are known in the Forest. The small population observed adjacent to South Bay Boulevard may benefit from appropriately-timed management and removal of the ice plant, which may allow the seed bank to more readily germinate and reach maturity.

Southwestern Spiny Rush

Southwestern spiny rush occurs in salt marshes and alkaline seeps along the coast and in limited inland areas of central and southern California. It is listed by CNPS with a CRPR 4.2 rank. This species was only observed along the edge of the Forest in association with brackish marsh habitat. This population is healthy and secure from anthropogenic impacts but may be impacted by wild boar.

3.8.2 Special-status Wildlife

Numerous special-status wildlife species are known or have potential to occur in the Forest, either as long-term or migratory residents. In 2018, direct and indirect observations of four special-status wildlife species were documented, all of which are known to occur in the Forest: MSS, Blainville's horned lizard, great blue heron (*Ardea herodias*), and monarch butterfly (*Danaus plexippus*). Great blue heron and monarch butterfly likely migrate and forage through the area, but no rookeries (great blue heron) or overwintering sites (monarch butterfly) are known in the Forest.

MSS is listed as endangered on the federal Endangered Species Act and has been historically documented throughout the southern half of the Forest. Incidental observations of desiccated MSS shells were documented during the 2018 surveys (see Appendix E – Photo 41) but quantifying the population size was beyond the scope of these surveys.

Blainville's horned lizard is considered a California Species of Special Concern by CDFW. A single adult individual was observed on open sand in chaparral habitat in the center of the boardwalk loop during the 2018 surveys (see Appendix E – Photo 42). The preferred food source of Blainville's horned lizard is native harvester ants, although they will also consume small invertebrates such as spiders, beetles, termites, flies, honeybees, moth larvae, and grasshoppers (Nafis, 2018). The extent of the Blainville's horned lizard population in the Forest is not currently known.

3.8.3 Climate Change

The extent and nature of the effects of climate change on native habitats, ecosystems, and individual species is just beginning to be characterized and understood at the landscape scale (Murphy and Weiss, 1992; Hayhoe et al., 2004; Brotons et al., 2013; Harrison et al., 2015). Interacting factors such as fire suppression practices and fire history further complicate our ability to predict and quantify the impacts of climate change on natural ecosystems at the local

level (Brotons et al., 2013). Though available research and predictive models provide important information about likely changes that can be anticipated, the specific effects on small, isolated wilderness areas such as the Elfin Forest are yet to be seen, and are likely to be highly site-specific. Anticipated effects of climate change include drought stress resulting from altered weather and precipitation patterns, increased risk of catastrophic fire, individual species loss, shifts in community assemblages, and associated reduction in habitat stability due to changes in the composition of flora and fauna at micro and macro trophic levels (Murphy and Weiss, 1992; Hayhoe et al., 2004; Castro et al., 2010; Brotons et al., 2013; Harrison et al., 2015).

Of these, catastrophic fire is likely one of the most significant potential threats to the Forest. Fire suppression practices alter natural fire cycles and may result in significant accumulation of leaf litter and woody debris that can fuel highly destructive wildland fires (Brotons et al., 2013). In particular, maritime chaparral is a fire-adapted community that depends on natural fire cycles for regeneration. One to three fires every 100 years is reported to be a natural fire interval in California chaparral communities (U.S. Forest Service, 2016). However, according to the California Department of Forestry and Fire Protection (CalFire), there is no recorded fire history for the Forest, which includes available data back to 1878 (CalFire, 2017).

Drought may also have significant effects on the health and long-term stability of the Forest. Preliminary research in Santa Barbara County is beginning to show significant shifts in local climatic patterns that are resulting in an increased percent of annual precipitation occurring in extreme storm events, and a decreased percent of annual precipitation occurring in small or 'normal' rain events (Mayes, 2018). This trend may result in a long-term reduction of water available for absorption in the soil due to high runoff rates and reduced infiltration associated with extreme events, compared to small or normal events. Drought-stressed plants may further add to the risk of catastrophic wildfire.

Recent advances in drone technology present significant opportunities for conducting climate change research at the landscape scale using high resolution aerial imagery. Information such as thermal signature and leaf reflectance that can be recorded using specialized drone-mounted cameras can be used to document and track the health and productivity of an entire community over time. The size, scale, and habitat diversity of the Forest make it an excellent candidate for conducting this type of monitoring, which may be used to inform management decisions in the Forest and, at a larger scale, make predictions about the effects of climate change in coastal Mediterranean ecosystems. Specific recommendations regarding the management and consolidation of data collected in the Forest, as well as opportunities for increasing the amount of academic research in the Forest are offered in Sections 4.2.8 and 4.2.9.

4.0 MANAGEMENT RECOMMENDATIONS

4.1 Management Objectives

The approximately 90-acre Elfin Forest supports a uniquely diverse assemblage of species and habitats that once covered most of Los Osos. Management of the Forest is focused on balancing the primary goal of preserving and protecting the Forest as a wilderness area while providing designated public access and education regarding this County- and state-owned natural area. As such, management recommendations provided here are offered with careful consideration of these primary objectives. Some recommendations are provided that may be implemented by a volunteer work force, and others would require engineering, expert/specialist assessment, and/or project-specific funding. The primary management considerations identified during the 2018 assessment include:

- Controlling and eradicating invasive species
- Discouraging off-trail access and unauthorized activities in the Forest
- Stabilizing significant erosion features
- Engaging and informing the public about the sensitivity and unique diversity of the Forest in order to encourage responsible use and appreciation of the Forest
- Maintaining organized and up-to-date data and records regarding Forest resources, projects, and maintenance activities

The following sections include a series of specific management recommendations that may be implemented as time and resources allow. Specific recommendations are also summarized in Appendix G – 2018 Recommendations Summary Table.

4.2 Specific Management Recommendations

4.2.1 Invasive Weed Control

Due to the known presence of MSS in the Forest, control of invasive weeds is permitted only with oversight by a USFWS-approved biologist holding a 10(a)(1)(A) Endangered Species Recovery Permit for MSS. SWAP has historically and is currently coordinating with one such biologist, Peter Sarafian, who volunteers to provide oversight and monitoring for monthly weed abatement efforts organized by SWAP. In addition, Mr. Sarafian is licensed and authorized to apply herbicide treatments, which he completes independently on a regular basis in the Forest. To date, weed abatement efforts in the Forest have been largely successful at reducing the abundance and distribution of invasive weed populations, as well as limiting new infestations. Such success is likely attributable to the dedicated efforts of volunteers on a regular, ongoing basis. However, reliance on a limited number of USFWS-approved monitors for weed abatement activities is not sustainable and presents a significant risk of such efforts being interrupted or halted suddenly for an unknown length of time.

In addition, current knowledge of existing and past weed infestations in the Forest exists in dispersed locations and formats, including past reports, GIS files, old maps, and working knowledge of the volunteers and locals that spend significant time in the Forest. This body of information should be consolidated in a format that allows for easy tracking over time.

Based on these considerations, the following recommendations are made regarding invasive weed control in the Forest:

- Pursue efforts to identify new biologists to become trained and permitted as USFWS-approved MSS biologists; consider reaching out to the County, college professors/lecturers at Cal Poly and Cuesta College, or other local entities to identify interested parties, such as graduate students or local biologists.
- Continue organizing monthly volunteer events to control and remove target weed species from the Forest, as permitted with oversight from a permitted MSS biologist.
- Establish a consistent monitoring schedule to track and document weed infestations and other potential concerns; this can be completed in conjunction with a photo monitoring program, as recommended in Section 4.2.8. A survey should be completed at least every two years to update and inventory the extent of invasive weed populations in the Forest.
- Employ the use of pre-printed maps and monitoring forms to use in tracking the location and status of weeds in the Forest; consider creating and using a gridded map for easy and accurate mapping of weed infestations and related treatments.
- Consider establishing a paid or unpaid internship position for someone to manage, track, and update all data pertaining to known weed infestations and removal efforts.
- Whenever possible, do not leave piles of hand-pulled invasive weeds in the Forest, particularly for vining and rhizomatous species that readily re-sprout from asexual propagules. If possible, bag and remove all pulled and treated weeds from the Forest.

Appendix F includes a table summarizing all available information about the location, extent, and current status of weed infestations in the Forest. This table may be updated and modified as needed to facilitate data tracking.

4.2.2 Invasive Wildlife Control

Wild Boar

As noted previously, wild boar is likely the single biggest threat to the Forest, and impacts should be addressed using a proactive and coordinated effort. Dense vegetation along the Estuary-edge of the Forest coupled with limited access, tidal fluctuations, and sensitive habitat types make installation of wild boar exclusion fencing infeasible and not recommended. Efforts to reduce use of the Forest by wild boars may involve multiple, coordinated strategies, and should be coordinated with CDFW. It is also recommended that any efforts employed should also be coordinated with adjacent landowners in the Los Osos Valley in order to improve the success and effectiveness of any efforts.

Argentine Ant

Available methods for controlling non-native ant populations are limited to few chemical or poison control options. Though success has been reported with the use of poison bait stations in vineyard and agricultural settings, this method poses a risk of inadvertently poisoning native and special-status species in natural ecosystems. Unintended poisoning of MSS and Blainville's horned lizard are of particular concern in the Forest. Any plans to deploy poison bait stations in the Forest would require careful planning and monitoring, as well as approval from the County, CA State Parks, USFWS, and CDFW. The residential areas bordering the Forest will likely act as a

continuing source of Argentine ants entering the Forest, thus, a long-term management plan may need to be developed to address this concern. As such, current recommendations regarding the management of Argentine ants include:

- Identify interested researchers and potential granting agencies to study and document the populations of native and non-native ants in the Forest, as well as species that are ecologically linked to ant populations, such as Blainville's horned lizard.
- Solicit and encourage use of the Forest for academic research by regional experts and local students.
- Develop a long-term management plan for control of Argentine ants.

Brown Garden Snail

As with Argentine ant, available methods for controlling invasive snails are limited and largely ineffective or inappropriate in native ecosystems. The extent of impacts associated with brown gardens snail in the Forest are not apparent and have not been documented. Any efforts to encourage researchers and regional experts to study the Forest ecosystem may include an emphasis on studying the population density of native and non-native snails, and interactions between brown garden snail and MSS. Due to the federal listing status of MSS, it is possible that federal grant funding may be available to conduct such research.

4.2.3 Managing Overuse and Off-trail Access

Public outreach is a significant component of the successful protection, management, and restoration of public lands. Effective outreach may occur in several formats, including organized public hikes and events led by trained docents, up-to-date informational signage placed at high visibility locations, and printed brochures and trail guides. Recommendations offered here emphasize the use of public outreach and informational signage to minimize the occurrence of unauthorized activities in the Forest. Existing signs in the Forest include informational entry signs at each entry point into the Forest, interpretive displays along the boardwalk loop and overlooks, and specific County signs that indicate Forest rules. Many of these signs were installed in the early 2000's; some are now out of date, others are degraded and overgrown by vegetation, and others have numerous "new" postings which reduce the visibility and functionality of these signs (see Appendix E – Photos 43, 44, and 45). In addition, modernization of the area's interpretive information could help increase public engagement and awareness regarding resources of the Forest.

As such, it is recommended that a cohesive Fence and Sign Plan be developed for the Forest, which should provide a detailed implementation plan for replacing dilapidated temporary fencing with updated, modernized informational and interpretive signs. The following is a list of recommendations that should be included in the Fence and Sign Plan:

Recommendations for Updating and Modernizing Signs

- Update existing informational signs at trailheads and throughout the Forest to focus on specific management concerns, rules, public hikes, and how to get involved. Emphasize the use of simple, positive language, such as 'Thank you for helping us protect the unique diversity of the Elfin Forest'.

- Update and modernize existing interpretive signs throughout the Forest to focus relevant interest topics such as restoration efforts, unique local ecology, special-status species, cultural history, and potential impacts associated with off-trail access. Individual signs should be designed to address only one or two topics with simple, accessible information and emphasize the use of simple, positive language, such as ‘You can help us protect this unique resource by using designated trails.
- Develop a cohesive, modernized look for all signs to be used in the Forest.
- Remove and, if needed, replace interpretive and informational signs that have become overgrown with vegetation.
- Place new signs and, as needed, relocate existing signs to be in high visibility locations. For example, the ‘dogs on leash’ sign at 11th Street is partially hidden by overgrown vegetation and is placed off to the side where it may not be seen (see Appendix E – Photo 45). Existing interpretive signs may be modified in-place with updated information that is cohesive with all new information.
- As needed, update existing pamphlets to include information about new projects, vista points, and interest points in the Forest. Pamphlet boxes that include brochures with maps should be located near information signage at every trailhead.
- Specific topics that may be emphasized on interpretive signs include: the role and diversity of lichen and fungal communities that occur in the Forest (suggested placement: outside Rose’s Grove), the role of cryptobiotic soil crusts in preventing erosion (suggested placement: near common off-trail access area), the unique ecology of pygmy oak trees, special-status species photos and life history information, the effects of sedimentation into the Estuary (suggested placement: at the Butterfly Hill Scenic Overlook), the significance of the Estuary as critical feeding grounds for migratory birds, and the cultural history of the area. These topics can include information about the importance of enjoying the Forest from established trails. Additional topics may be included.
- Update the existing native plant interpretive walk. This may be accomplished by planting and maintaining a diversity of large individuals of dominant dune scrub and chaparral species in appropriate locations in immediate proximity to the boardwalk, along with informational signs about the plants, or numbered signs that correspond to information in a trail guide pamphlet (i.e., update existing interpretive walk and pamphlet information). Signs and vegetation associated with the existing interpretive walk are dilapidated and, in some cases, no longer exist. Establishing new planting locations for the interpretive walk may also be strategically selected to block popular off-trail access areas (e.g., unauthorized trail into oak grove south of Bush Lupine Point). The use of highly aromatic species such as black sage, California sagebrush, and wedge leaved horkelia would further provide interactive educational opportunities for the visually impaired.
- Reference the style and type of signs used by various public agencies to designate other public lands. For example, the City of San Luis Obispo has interpretive signs posted at most City Open Space trailheads that have a cohesive appearance. The Bureau of Land Management (BLM) undertook an effort to modernize their signage in 2015; examples of their new signage and branding, including large interpretive panels, can be found at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd500317.pdf (BLM, 2015).

In addition to these general recommendations, the following location-specific recommendations are offered, which address concerns associated with specific locations in the Forest.

Butterfly Hill (located South of Bush Lupine Point):

- Since this area is a popular, informal vista point, it is recommended that infrastructure at this location be modified to formalize it and encourage responsible use.
- Consider installing an elevated bench or viewing platform to encourage the use of this location as a vista point, without the need to encroach on intact vegetation down the slope.
- Install interpretive signs about the cultural significance of the area, and the ecological importance of the Morro Bay Estuary. To further discourage off-trail access, an interpretive sign at this location might discuss the negative effects of sedimentation into the Estuary and the importance of restoration efforts being implemented.

Rose's Grove:

- Update the existing interpretive sign near the entrance to Rose's Grove with one that focuses on the unique ecology of the pygmy oak trees and the organisms that depend on them. An informational panel about the diversity of lichens that can grow on the shaded lower limbs of these multi-trunked trees should be included, along with a reminder about the potential impacts of climbing on the limbs.

Recommendations for Fencing Modifications

Green plastic fencing installed throughout the Forest was initially intended to serve as a temporary deterrent to off-trail access within historically impacted and recently restored habitats. This effort was an important component of restoration and habitat rehabilitation activities being implemented, particularly in the southern half of the Forest, in the early 2000's. Most of the fencing has now been in place for 10 to 15 years, and is becoming degraded, overgrown, and occasionally vandalized. Often, dilapidated sections of green fencing are repaired or replaced with more green fencing, in an effort to maintain it instead of removing or replacing it with more permanent infrastructure.

Due to the degraded condition, limited functionality, potential for wildlife entrapment, and aesthetic impact associated with this type of fencing, it is recommended that all green fencing be removed and, where appropriate, replaced with more permanent options. This activity should occur in a phased approach in coordination with efforts to update and replace signage throughout the Forest, as discussed above.

The following specific recommendations are made regarding the removal of green fencing:

- At Bush Lupine Point, replace all green fencing with updated, strategically-placed signs about the importance of native habitat restoration efforts and reducing sedimentation into the Estuary. This will be most effective if completed at the same time or immediately following the completion of restoration efforts along the slope south of Bush Lupine Point (see Section 4.2.5 below). Fence removal will also facilitate access to restoration areas for installation, maintenance, and monitoring by volunteers. Also see Section 4.2.4 for specific recommendations about the removal of green fencing in the Forest.

- At the Butterfly Hill Scenic Overlook, replace green fencing with an aesthetically favorable, split-rail wood fence, similar to the one used elsewhere in the Forest. Consider installing the new fence slightly west of the existing fence, just downslope of the crest of the hill. This placement would allow for a less obstructed view.
- It may be beneficial to replace green fencing with split-rail fencing (similar to the one used elsewhere in the Forest) in areas where the boardwalk is bordered by low-density dune scrub habitat between Bush Lupine Point and the 14th Street connector trail, so as to maintain a significant visual and physical barrier between the walkway and open habitat in this area.
- All removal and replacement of green fencing should occur in a phased approach and in coordination with efforts to install informational signs about the original purpose of the fencing, and ongoing efforts to limit off-trail access.
- Begin removal in areas where green fencing is no longer functional, including all areas where it is overgrown with well-established vegetation (e.g. along the sand trail from 11th Street) and areas where fencing is not even visible from established trails (e.g., remnant short sections associated with past restoration efforts).
- Fencing and support posts should be carefully removed to limit damage to intact vegetation and soil disturbance to the maximum extent feasible. This may require cutting fencing into small sections and untangling overgrown vegetation.
- Use temporary signs to inform the public of planned efforts to remove green fencing and install new infrastructure; such signs may include information about why fencing is being removed, how people can help and volunteer, and when to expect changes.

In high visibility areas, post new, permanent signs at trail edges to identify restored and active restoration areas as a reminder for pedestrians to remain on established trails.

No modifications to wood or symbolic fencing are recommended at this time. If new symbolic cable fencing is installed or replaced in areas adjacent to the boardwalk at any point in the future, consider elevating the height of the cable to increase visibility.

4.2.5 Habitat Restoration and Monitoring

Past restoration efforts in the Forest have been very successful and included a variety of methods including seeding and planting native species, invasive species removal, and excluding access to certain areas to allow for the natural regeneration of native habitats. Targeted restoration efforts are recommended here to address impacts and erosion concerns associated with off-trail access south of Bush Lupine Point. In particular, recommendations for stabilizing the impacted slope south of Bush Lupine Point include the following:

- Establish moderate- to high-density container-stock plantings of scrub and chaparral species along the slopes and terraces south of Bush Lupine Point. To the extent feasible, container stock should be grown from seed and/or cuttings collected in the Forest. Any container stock obtained from other sources should be locally-sourced from coastal San Luis Obispo County. Seeding and planting should occur in the late fall or early winter.
- Additional plantings should be placed within the informal trail that extends into the oak grove on the south side of the boardwalk, just east of Bush Lupine Point. Blocking this trail

will discourage access into the oak grove and, ultimately, to the unstable slope on the south side of the grove.

- In areas of exposed sand between container stock plantings, apply seed of native scrub and chaparral species collected in the Forest. Seed should be gently raked into the soil and, if appropriate, covered with natural fiber erosion control blankets.
- At the base of container stock plantings and over seeded areas, apply a thick layer of weed-free wood mulch to protect seed from predation, retain moisture at the soil surface, and protect the soil surface from wind and water erosion. To the extent possible, mulch should be sourced from woody debris of native species collected in the Forest during trail maintenance.
- Limited additional plantings may be installed at specific locations to block and revegetate historical informal trails and other areas where off-trail access is apparent.
- Restoration activities should take place in the fall or winter, following the first significant rains of the season.
- All seed and cuttings collected from the Forest should be collected in a manner that does not negatively impact existing communities or individual species. In general, no more than 10 percent of the available seed or living canopy of an individual plant or localized population should be harvested in one growing season.
- Supplemental watering of container stock plantings may be necessary during the first year. If infrastructure is not available to establish drip irrigation, hand-watering may be necessary. Supplemental watering should be used only as needed during the first two years, to help plants establish healthy root systems.
- Establish a monitoring program to be implemented on a regular basis to ensure maintenance needs are identified and addressed in a timely manner. At a minimum, monthly monitoring should occur for the first growing season, followed by quarterly monitoring until plants are established.

4.2.6 Managing Wildlife Interactions with the Public

To reduce the potential for negative interactions between humans and coyotes or any other wildlife in the Forest, the following recommendations are made:

- Maintain existing informational signs about the presence of coyotes in the Forest, and the elevated likelihood for sightings and interactions in the spring and late summer.
- As appropriate, post or mail public notices about the importance of keeping all trash and food scraps, including domestic animal food items, in lidded and secured containers, especially in neighborhoods bordering the Forest.
- Inform the public of necessary actions to take if a coyote is encountered, such as making loud noises, waving the arms, and carrying a stick or other implement that may be used for defense if approached by a coyote.

4.2.7 Erosion Control

Specific management recommendations offered below emphasize stabilization of existing erosion features and reducing the potential for sedimentation in the Estuary. Specific recommendations are made for each of the four major erosion features identified in the Forest, as well as minor erosion concerns associated with trailheads and general guidance on the use of

temporary erosion control methods. Since the Elfin Forest contains federally endangered species (i.e., MSS and Morro manzanita), the following projects must be coordinated through USFWS.

General Erosion Control Recommendations

- All monofilament netting should be removed from the Forest and properly disposed of. If fiber rolls are deployed for temporary erosion control in the Forest, only burlap-wrapped fiber rolls should be used (see Appendix H – BMP Reference Guides).
- In addition, degraded silt fencing and sand bags should be removed from the Forest. These products are not recommended for use in the Forest, as they are vulnerable to degradation and contribute to debris in the Forest understory and potentially within the Estuary.
- As necessary, mulch berms may be used as a natural substitute for silt fencing, where temporary sediment controls are needed. Once the subject area is adequately stabilized, mulch can be spread in remaining bare soil areas.
- If sediment control is needed at trailheads, a wooden curb or low retaining wall should be constructed in place of sand bags.

Feature 1: Concrete-lined swale near South Bay Boulevard

- In coordination with CA State Parks and/or the County Public Works Department, it is recommended that ice plant and accumulated sand be removed from the concrete-lined swale to restore normal flow through the channel. Iceplant and soil removal would likely require ongoing maintenance.
- Deeply incised voids that are undermining the concrete channel should be filled with non-erodible fill such as appropriately-sized rock, followed by slope recontouring to direct runoff into the swale.
- Undermined concrete slabs at the down slope end of the swale should be removed and replaced with an appropriately-sized and engineered energy dissipation structure (i.e., rock slope protection underlain with filter fabric). Repairs should be properly engineered and will require discretionary permits through the appropriate resource agencies, as well as coordination with CA State Parks and the County Public Works Department.
- County Parks should contact County Public Works to discuss the timing of replacing the bridge over Los Osos Creek at this location as they may address this issue during that project. Interim measures as noted above are needed to prevent sedimentation to the Estuary.

Feature 2: Erosion on the Orchid Trail and Nearby Sand Trails

- Additional grade control structures should be added to steep sections of formal sand trails. In areas where significant drops have been created between existing steps, additional steps should be added to prevent further soil loss and rutting.
- Use guidance from current trail-building literature (see Appendix I – Trail-building Reference Guides) to increase the effectiveness of grade control structures and reduce overall soil loss along the eroding trails. Specific improvements to grade control structures may include:

- Out-slope trail treads in wide trail areas at a two to five percent grade and utilize appropriately-sized, shaped, and quantities of rock as backfill to slow runoff and allow water passage at the downslope side.
- Extend grade controls or steps to the maximum width of the trail where trail elevations are lower and constricted by adjacent slopes. These structures may be keyed-in to adjacent slopes and backfilled with sufficient quantities of rock to allow storm water to infiltrate rather than incise around the structure.
- Extend grade control structures below the trail tread surface and appropriately secure with weather-resistant materials installed through the structure.
- Avoid the use of small concrete rubble laid on the ground surface, as this material tends to become easily displaced.
- Install water bars upslope of steep trail sections to direct runoff away from the trail.
- Consider removing or relocating a trail, if appropriate, to reduce erosion concerns.

Feature 3: Eroded, Unstable Slope South of Bush Lupine Point

Specific recommendations for the restoration of this area are included in Section 4.2.5, and recommendations for the use of public outreach and updated, appropriate signage as a means of deterring off-trail access are included in Section 4.2.3. Further, the following recommendations are made for stabilization of this area:

- Prior to stabilizing the area with container stock plantings, native seed, and mulch, remove dilapidated jute netting from the slope, and recontour the soil surface in preparation of planting.
- In coordination with restoration efforts, use various public outreach avenues to inform the public of the efforts and the importance of re-establishing native vegetation on the unstable slope. Outreach efforts may include temporary and permanent signs installed at nearby trailheads, trail intersections, and at Bush Lupine Point; docent-led walks and hikes; stationing volunteers at Bush Lupine Point to interact with the public, answer questions, and prevent off-trail access; mailers or pamphlets; and encouraging the public to volunteer in the restoration effort.

Feature 4: Deep Rutting along Informal Trail west of the 11th Street Trailhead

- To discourage further gully erosion, appropriately-sized rock underlain with filter fabric should be installed in the gully. The rock would aid in armoring native soils by creating a protected “rock swale” to convey storm water runoff.
- Extend the rock-lined swale upslope of the current extent of the gully to prevent further head-cutting.
- Additionally, check dams constructed of non-erodible material should be installed immediately upslope of the gully to slow runoff velocity.
- Crescent-shaped check dams may be constructed of non-erodible material downslope of the rock swale to capture any sediment mobilized through the swale.
- If it is desirable to discontinue use of this informal trail, the margins of the rock swale should be planted with native species such as California blackberry and, if possible, poison oak, to block the trail and further promote soil stabilization.
- Consider removing or relocating a trail, if appropriate, to reduce erosion concerns.

4.2.8 Data Management and Routine Monitoring

The working knowledge of SWAP members and Forest volunteers about the location and status of weed infestations, ongoing projects, public access concerns, and other management considerations should be consolidated in a single location that can be easily tracked and updated. The following recommendations are made to aid in the management of Forest data:

- Consider hiring a paid or unpaid intern that will be responsible for carrying out specific duties, such as organizing all existing data about weed infestations, weed abatement efforts, ongoing projects, etc. This position may also be used for the development of plans, such as a new resource management plan, fence and sign plan, etc.
- Create a digital tracking table that includes all available information about past, ongoing, and planned restoration and maintenance projects in the Forest. This table should be updated on a regular basis. A template and initial draft is included in Appendix C, which can be used and modified by SWAP.
- Create a digital tracking table that includes all available information about invasive weed infestations and special-status species populations in the Forest. At a minimum, it is recommended that surveys be completed by a qualified individual at least every other year to inventory and update existing information about weed infestations, special-status species populations, and known management concerns (e.g., erosion features). A template and initial draft is included in Appendix F, which can be used and modified by SWAP and/or the County.
- Establish a routine monitoring program to track the overall status of restoration projects and community health in the Forest, and track weed infestations. Updated surveys should be completed by a qualified individual approximately every other year in the spring. A sample form is included in Appendix J – Sample Habitat Monitoring Form.
- As part of routine monitoring, it is recommended that a repeatable photo monitoring program using permanent photo monitoring points be implemented. To help initiate this effort, 15 photo monitoring points with a total of 28 photographs were established during the 2018 assessment. Permanent photo monitoring points are shown on Figure 7: Routine Monitoring Map in Appendix A, and photographs taken at established points in 2018 are included in Appendix K – Routine Monitoring Photographs. Taking photos from the same location and aspect on an annual basis will allow SWAP to track changes in habitat composition over time.
- Figure 7 also includes a gridded overlay over the entire Forest, which can be used with general monitoring observation forms to accurately and easily track the locations of any concerns observed by volunteers.
- Pre-printed monitoring forms and gridded maps of the Forest with labeled photo monitoring points should be provided to monitors to facilitate consistency in monitoring data.

4.2.9 Update Management Plan and Encourage Forest Research

For more than 20 years, the members of SWAP have successfully engaged with the local community to recruit a dedicated body of volunteers that protect the resources of the Forest, while demonstrating and encouraging responsible use by all members of the local community. Most of these volunteers are residents of the immediately adjacent neighborhood and

collectively possess an unrecorded body of knowledge that is invaluable to the future health and management of the Forest. Ensuring the continued successful management of the Forest will require engaging with and recruiting new dedicated volunteers on an ongoing basis. In addition, it is recommended that an updated Resource Management Plan be developed to guide the ongoing management of the Forest, based on current conditions and updated management considerations.

The unique diversity of the Forest ecosystem provides an excellent setting for conducting research on rare and endangered species, climate change, tree health and rates of crown dieback, interactions between native and non-native species, as well as testing grounds for invasive species eradication techniques. As such, the following recommendations are made to foster volunteerism and research in the Forest:

- Develop an updated Resource Management Plan for the Forest. The plan should outline management priorities, including efforts to encourage use of the Forest by research groups.
- Identify specific research projects that would be beneficial for increasing current knowledge of the ecology of the Forest and seek grant funding that may support such projects.
- Contact college professors and lecturers at Cal Poly, Cuesta College, and other regional universities, as well as local agencies and non-profit groups (e.g., California Native Plant Society) to identify potential new sources of volunteers and interested research entities that may carry out specific research projects in the Forest.

5.0 CONCLUSION

The results of the 2018 assessment included identification of several management considerations that may be implemented by County Parks, CA State Parks, and/or SWAP to improve public engagement with and awareness of Forest resources, foster responsible use, enhance areas of impacted habitat and erosion concerns, and ensure successful management of Forest for the foreseeable future. When SWAP signed their first Adopt-A-Park agreement with County Parks in 1995, maintenance concerns were initially focused on addressing significant habitat impacts and invasive weed infestations that resulted from the unregulated historical use of the area for various recreational activities. More than two decades of work by County Parks and SWAP volunteers have resulted in the successful restoration and enhancement of native habitats throughout the Forest.

Though management and control of weed infestations will be an ongoing effort in the Forest, many invasive species have been brought under control. With the successes of the last two decades of work by County Parks and SWAP volunteers, management efforts can now shift from an emphasis on responding to past degradation to proactively engaging the community to be involved and use the Forest responsibly while also encouraging use of the Forest for professional and academic research projects.

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APPENDIX A – REPORT FIGURES

Figure 1: Site Location Map

Figure 2: Infrastructure and Overview Map

Figure 3: 2018 Vegetation Communities Map

Figure 4: Vegetation Communities Comparison Map

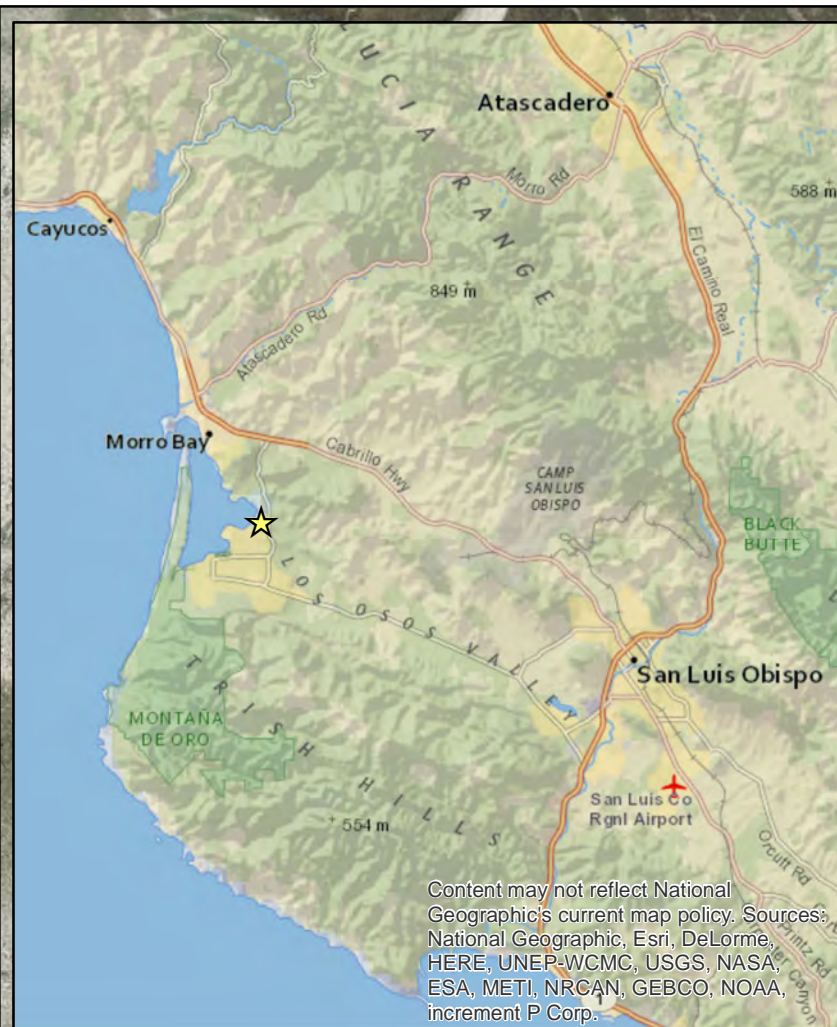
Figure 5: 2018 Invasive Species and Erosion Features Map

Figure 6: Sensitive Resources Map

Figure 7: Routine Monitoring Map



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24 Sep 2018



El Moro Elfin Forest 2018 Biological Assessment
Figure 1: Site Location Map

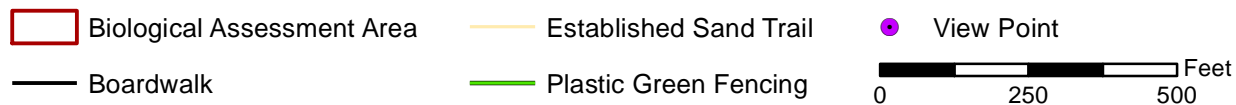


24 Sep 2018

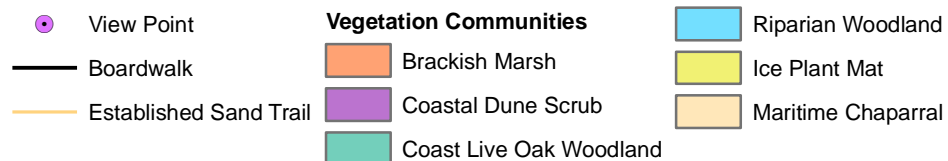
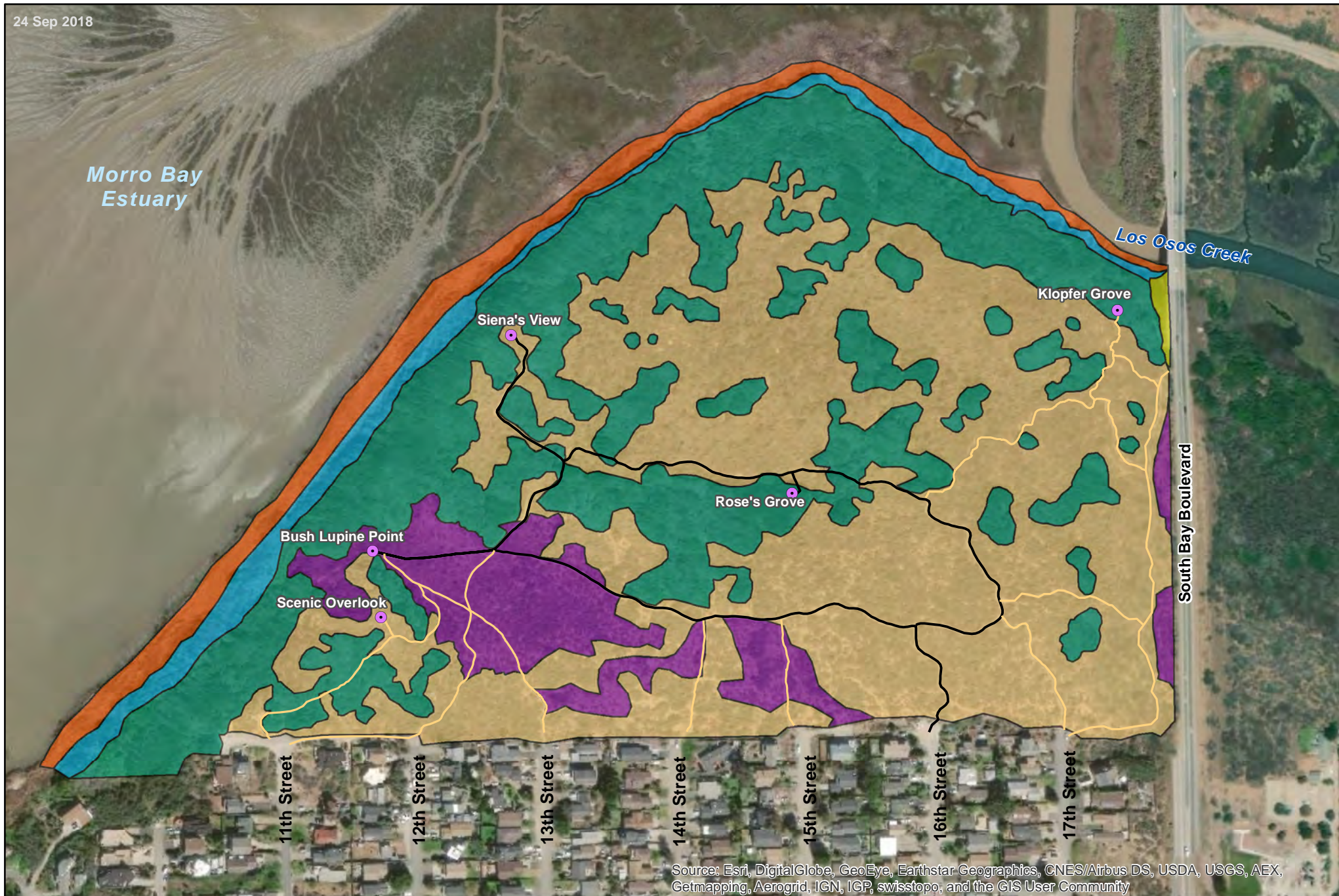


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

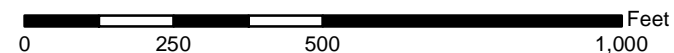
El Moro Elfin Forest 2018 Biological Assessment
Figure 2: Infrastructure and Overview Map

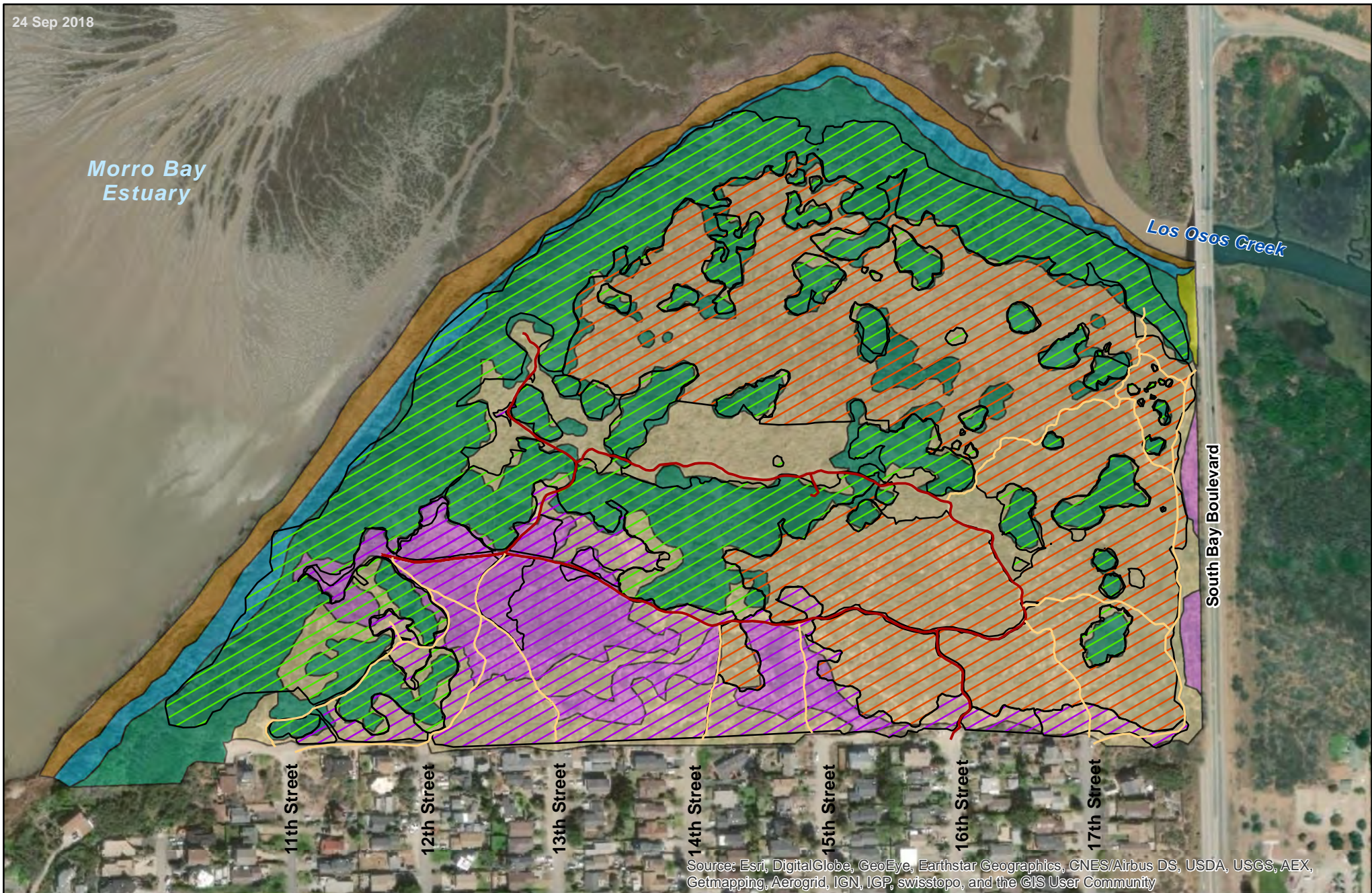


24 Sep 2018

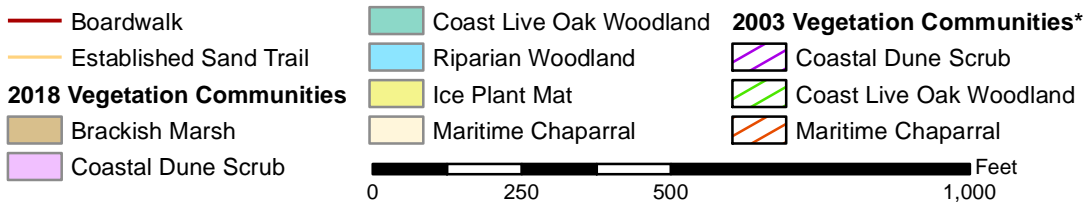


El Moro Elfin Forest 2018 Biological Assessment
Figure 3: 2018 Vegetation Communities Map





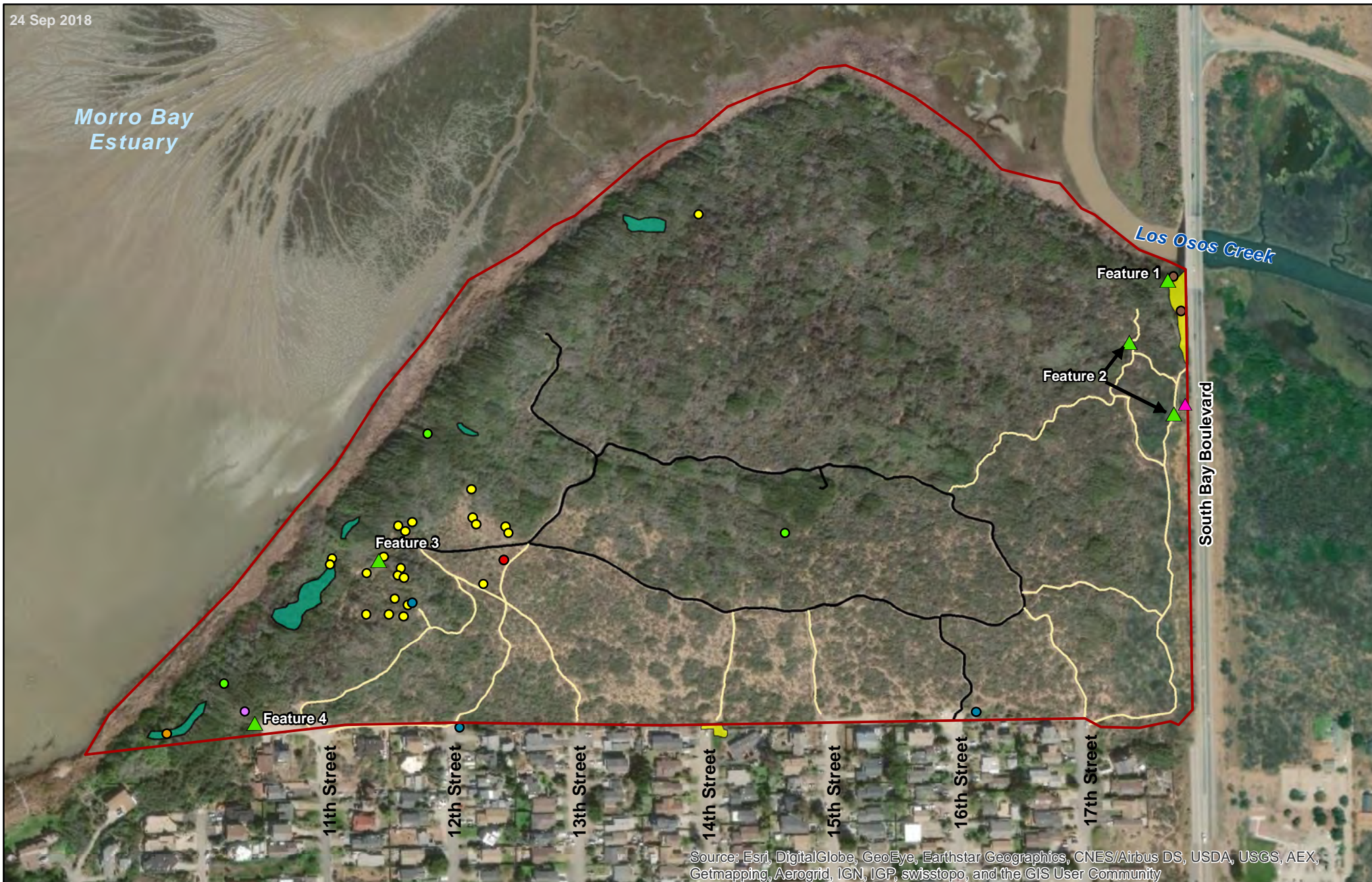
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



El Moro Elfin Forest 2018 Biological Assessment
Figure 4: Vegetation Communities Comparison Map

*2003 data provided by SWCA (formerly Morro Group, Inc.); areas with no cross-hatching were not mapped in the provided data.





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

El Moro Elfin Forest 2018 Biological Assessment
Figure 5: 2018 Invasive Species and Erosion Features Map



Morro Bay Estuary

Los Osos Creek

South Bay Boulevard

11th Street

12th Street

13th Street

14th Street

15th Street

16th Street

17th Street

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

El Moro Elfin Forest 2018 Biological Assessment
Figure 6: Sensitive Resources Map

Approximate Forest Boundary

Boardwalk

Established Sand Trail

Special-status Species Observations

Dune Almond

Michael's Rein Orchid

Morro Manzanita - Isolated Occurrence

Southwestern Spiny Rush

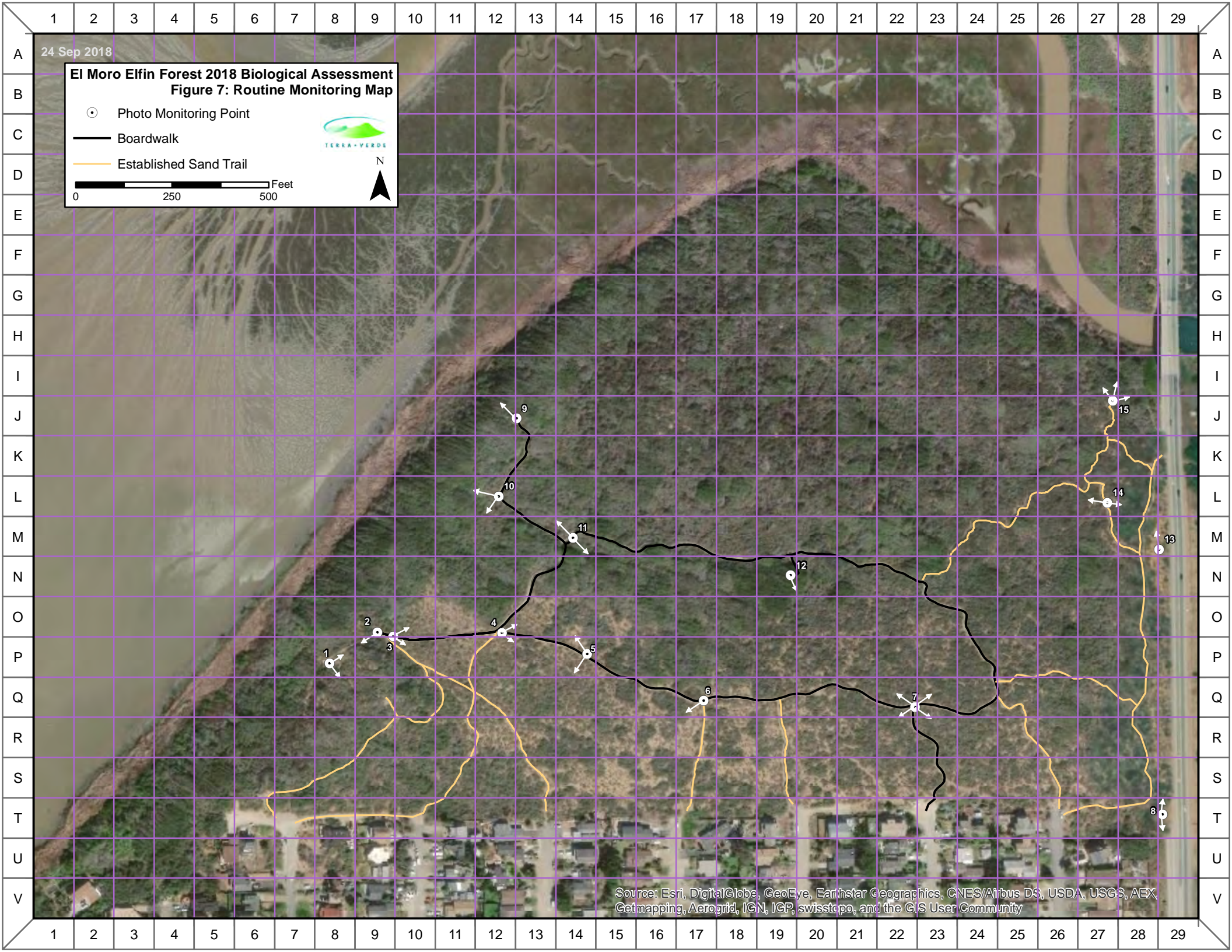
Suffrutescent Wallflower

Blainville's Horned Lizard

Approx. Extent of Morro Manzanita Population

0 250 500 1,000 Feet





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**APPENDIX B –
1997 RESOURCE MANAGEMENT PLAN PROJECT SUMMARY**



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Appendix B - 1997 Resource Management Plan Project Summary

Proposed Project ¹	Description ¹	Status
1. Post Informational Signage at Street Ends (11 th through 17 th St.)	<ul style="list-style-type: none"> - Present information on appropriate use, consistent with County ordinance - Include trail maps/pamphlets 	Complete
		Complete
2. Establish Buffer Between Residences and Elfin Forest	<ul style="list-style-type: none"> - Install split-rail fencing along former 80-foot-wide Santa Paula Avenue and Forest to discourage short-cut trails - Revegetate former Santa Paula Avenue with native plantings - Develop plan for non-motorized east-west access along Santa Paula Avenue for bikes and pedestrians 	Partially complete
		Partially complete
		Plan status unknown; not implemented
3. Establish Designated Parking	<ul style="list-style-type: none"> - Place bike racks at entrance trails - Establish handicapped parking at 16th Street - Establish vehicle parking at intersections of Santa Paula Avenue and 11th-17th Streets - Post signs prohibiting overnight camping and restricted parking hours - Develop environmental interpretive area with parking, benches, interpretive signs, restrooms, trash cans, and visual screening - Evaluate the potential for pedestrian access from South Bay Boulevard - Provide safe access for school field trips and planned group activities 	Partially complete
		Complete
		Complete
		Complete
		Not implemented
		No formal access here currently
		Complete/ongoing
4. Improve Established Trails	<ul style="list-style-type: none"> - Control erosion; bank stabilization and replanting are a priority at Bush Lupine Point - Place rail fence within 'Ghost Hall' grove of oaks to limit access and soil compaction - Place exclosures around oak and manzanita seedlings in Celestial Meadow - Limit access to 'Woodrat Hall' (now Rose's Grove) by requiring special use permit - Establish low wooden rail fencing to discourage off-trail access and shortcuts, as necessary - Groom trails, as necessary 	Complete/ongoing effort
		Not implemented
		This area is now mature chaparral
		Unknown
		Complete, some areas
		Complete/ongoing effort

Proposed Project ¹	Description ¹	Status
5. Establish 'Universal Access' to the Forest	<ul style="list-style-type: none"> - Establish looped universal access with turnouts (boardwalk) wide enough for two wheelchairs - Establish an alternative touch/smell/hear trail along the boardwalk 	Complete
		Not implemented
6/7. Place Benches and Overlooks Along Improved Access (Boardwalk)	<ul style="list-style-type: none"> - Use natural-looking materials with low visual impact; select locations for benches on the basis of scenic value and appropriate rest spots - Build observation decks with railings at Bush Lupine Point and Mayhem Point (now Siena's View) 	Complete
		Complete
8. Develop a Self-guided Nature Walk and Trail Guide	<ul style="list-style-type: none"> - Write self-guided pamphlet providing information associated with trail markers - Use directional signs to provide location information - Use information signs to identify resources 	Complete
		Complete
		Complete
9. Post Notices About County Dog Leash Ordinance	<ul style="list-style-type: none"> - Post signs to remind owners about leash requirement and to clean up after pets - Develop plan for disposal of dog waste - Post signs on trails leading into CA State Park property stating that dogs are not allowed 	Complete
		Complete
		Not implemented
10. Establish Agreement with MB State Parks for Docent Walks	<ul style="list-style-type: none"> - Establish an agreement to cover liability so that docents can lead walks through the entire Forest 	Complete

¹Project numbering, trail names, and location names (e.g., Ghost Hall, Celestial Meadow) come from the Resource Management Plan (SWAP, 1997), pg. 13 through 17.

**APPENDIX C –
RESTORATION HISTORY SUMMARY TABLE**



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Site ID ¹	Habitat Type(s)	2003 Baseline Condition ²	Restoration Actions Implemented	2018 Status
Prioritized Recovery Areas Identified by Morro Group (2003)				
1A	Coastal dune scrub, oak woodland	HI, HP, SS, HU, PV	(1) Green plastic fencing installed around Bush Lupine Point and unnamed overlook south of there (2) Both green plastic and symbolic fencing installed along sand trail from 11th Street (3) Erosion control blankets and wood boards installed on steep slope south of Bush Lupine Point (4) Targeted weed abatement	Slope south of Bush Lupine Point is unstable and lacking vegetation from historical off-trail access and subsequent slope de-stabilization and erosion
1B	Coastal dune scrub	HI, HP, HU, PV	(1) Green plastic fencing installed around Siena's View overlook (2) Symbolic fencing and signs installed along boardwalk leading to Siena's View (3) Targeted weed abatement	This area is largely revegetated with a mix of coastal dune scrub, chaparral, and oak woodland species
1C	Coastal dune scrub	MI, HP, SS HU, PV	(1) Symbolic fencing installed and strategic brush-piling used to discourage off-boardwalk travel (2) Restricted use of Rose's Grove for group activities by requiring a special use permit (3) Targeted weed abatement	This area is substantially revegetated with dense chaparral and coastal dune scrub species; evidence of off-boardwalk access is very limited
1D	Coastal dune scrub	HI, SS, PV	(1) Green plastic fencing installed along trails and around target rehabilitation areas to discourage off-trail access (2) Symbolic fencing installed along sand trails from 15th and 16th Street trailheads to discourage off-trail access (3) Targeted weed abatement efforts, particularly along the southern Forest boundary between the 15th and 16th Street trailheads	This area is substantially revegetated with chaparral and coastal dune scrub species; evidence of off-trail access is limited; weed observations were limited primarily to escaped ornamental species adjacent to private residences
2A	Oak woodland, maritime chaparral	HI, SS, HU, MP	(1) Combination of split-rail wood fence, green plastic fence, and symbolic fence installed along 11th and 12th Street sand trails (2) Erosion controls installed west of 11th Street trailhead, including piled concrete chunks, microfilament fiber rolls, and silt fence (3) Chain-link fence installed at southwestern Forest boundary (4) Targeted weed abatement efforts, particularly in the oak understory west of 11th Street	Significant infestations of cape ivy and English ivy persist within the oak woodland and riparian woodland communities west of the 11th Street trailhead; substantial gully erosion present on informal trail west of 11th Street trailhead; degraded fiber rolls, silt fence and chain-link fence remain
2B	Coastal dune scrub, oak woodland	MI, HP, HU, PV	(1) Green plastic fencing and symbolic fencing installed along boardwalk to allow for natural/passive habitat rehabilitation (2) Targeted weed abatement	This area is substantially revegetated with chaparral and coastal dune scrub species; evidence of off-trail access is limited; weed observations were limited to infrequent occurrences of narrowleaf iceplant
3A	Coastal dune scrub, maritime chaparral	MP, SS, HU, PV	(1) Green plastic fencing installed along some trails and around target rehabilitation areas to discourage off-trail access (2) Symbolic fencing installed along sand trails from 13th and 14th Street trailheads to discourage off-trail access (3) Targeted weed abatement	This area is substantially revegetated with chaparral and coastal dune scrub species; evidence of off-trail access is limited; weed observations were limited primarily to escaped ornamental species adjacent to private residences
3B	Coastal dune scrub, oak woodland	MI, SS, MP, PV	(1) Symbolic fencing installed along sand trails from 16th and 17th Street trailheads to discourage off-trail access (2) Targeted weed abatement	This area is substantially revegetated with chaparral and coastal dune scrub species; evidence of off-trail access is limited; weed observations were limited primarily to escaped ornamental species adjacent to private residences

Site ID ¹	Habitat Type(s)	2003 Baseline Condition ²	Restoration Actions Implemented	2018 Status
Prioritized Recovery Areas Identified by Morro Group (2003)				
3C	Oak woodland, maritime chaparral	MI, HP, SS, PV	(1) Targeted weed abatement	Access to this area is limited to few sand trails, mostly through dense chaparral; off-trail access is rare and weed infestations are infrequent, mostly in oak understory
3D	Coastal dune scrub, maritime chaparral	Not assessed	(1) Targeted weed abatement	This area is substantially revegetated with chaparral and coastal dune scrub species; off-trail access is rare and weed infestations are infrequent; a planted succulent garden bordered by large rocks is present near the northern end of this slope
Other Restored Areas				
South Bay Blvd.	Coastal dune scrub	Coincides with Site 3D above	(1) Around 2000-2003, area was restored by Land Conservancy of San Luis Obispo County; veldt grass and other weeds were removed, coastal scrub species were planted and monitored for 2 years (2) Regular/ongoing weed abatement	This area is substantially revegetated with chaparral and coastal dune scrub species; off-trail access is rare and weed infestations are infrequent; a planted succulent garden bordered by large rocks is present near the northern end of this slope
East of Bush Lupine Point	Coastal dune scrub	Revegetated prior to 2003 (no specific baseline data available)	(1) Prior to 2003, triangular area between boardwalk and existing sand trails was restored with native coastal dune scrub species (2) Targeted weed abatement	This area is substantially revegetated with coastal dune scrub species; evidence of off-trail access is limited; weed observations were limited to infrequent occurrences of narrowleaf ice plant
¹ Refer to Morro Group Recovery Action Plan (2003) for site ID locations. ² Baseline Condition Rating Factors Used in 2003 Assessment (Table 2 in Morro Group, 2003): HI - heavily infested with invasive species MI - moderately infested with invasive species HP - high potential for recovery MP - moderate potential for recovery SS - sensitive species present HU - high use area PV - potential vector for spread of exotics				

**APPENDIX D –
2018 WILDLIFE OBSERVATIONS AND BOTANICAL SPECIES ADDITIONS**



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El Moro Elfin Forest - 2018 Biological Assessment Report
List of Wildlife Species Observed on August 13, 19, and 26, 2018

Order	Scientific Name	Common Name	Listing Status*
Birds	<i>Aphelocoma californica</i>	California scrub jay	--
	<i>Ardea herodias</i>	Great blue heron	Special Animal (rookery)
	<i>Baeolophus inornatus</i>	Oak titmouse	--
	<i>Callipepla californica</i>	California quail	--
	<i>Calypte anna</i>	Anna's hummingbird	--
	<i>Carpodacus mexicanus</i>	House finch	--
	<i>Cathartes aura</i>	Turkey vulture	--
	<i>Chamaea fasciata</i>	Wrentit	--
	<i>Colaptes auratus</i>	Northern flicker	--
	<i>Corvus brachyrhynchos</i>	American crow	--
	<i>Egretta thula</i>	Snowy egret	--
	<i>Euphagus cyanocephalus</i>	Brewer's blackbird	--
	<i>Geothlypis trichas</i>	Common yellowthroat	--
	<i>Hirundo rustica</i>	Barn swallow	--
	<i>Junco hyemalis</i>	Dark-eyed junco	--
	<i>Larus occidentalis</i>	Western gull	--
	<i>Melanerpes formicivorus</i>	Acorn woodpecker	--
	<i>Melospiza melodia</i>	Song sparrow	--
	<i>Melospiza crissalis</i>	California towhee	--
	<i>Numenius americanus</i>	Long-billed curlew	--
	<i>Petrochelidon pyrrhonota</i>	American cliff swallow	--
	<i>Pipilo maculatus</i>	Spotted towhee	--
	<i>Psaltiriparus minimus</i>	Bushtit	--
	<i>Sayornis nigricans</i>	Black phoebe	--
	<i>Toxostoma redivivum</i>	California thrasher	--
	<i>Tyto alba</i>	Barn owl	--
	<i>Vireo huttoni</i>	Hutton's vireo	--
Mammals	<i>Canis latrans</i>	Coyote	--
	<i>Lynx rufus</i>	Bobcat	--
	<i>Neotoma</i> spp.	Woodrat (houses)	<i>Neotoma fuscipes</i> is CSC
	<i>Odocoileus hemionus columbianus</i>	Columbian black-tailed deer	--
	<i>Procyon lotor</i>	Raccoon	--
	<i>Spermophilus beecheyi</i>	California ground squirrel	--
	<i>Sus scrofa</i>	Wild boar	Non-native invasive
	<i>Sylvilagus audubonii</i>	Audubon's cottontail	--
	<i>Thomomys bottae</i>	Botta's pocket gopher	--
Reptiles	<i>Phrynosoma blainvillii</i>	Blainville's horned lizard	CSC
	<i>Sceloporus occidentalis</i>	Coast Range fence lizard	--



*El Moro Elfin Forest
Biological Assessment Report*

Order	Scientific Name	Common Name	Listing Status*
Invertebrates	<i>Apis mellifera</i>	Western honey bee	Non-native
	<i>Cornu aspersum</i>	Brown garden snail	Non-native
	<i>Danaus plexippus</i>	Monarch butterfly	Special Animal
	<i>Helminthoglypta walkeriana</i>	Morro shoulderband snail	FE
	<i>Pieris rapae</i>	Cabbage white butterfly	--

*CSC = CDFW California Species of Special Concern; FE = Federal Endangered

El Moro Elfin Forest 2018 Biological Assessment
List of New Botanical Species Identified in the Forest

Scientific Name / Common Name	Form	Bloom / Color	Habitat	Origin / Invasive Status ¹	Location in Forest
<i>Atriplex prostrata</i> Fat-hen	Herb	Apr-Oct; Green	Brackish marsh	Naturalized	Few individuals at edge of Los Osos Creek, west of bridge
<i>Cornus sericea</i> subsp. <i>occidentalis</i> Western dogwood	Tree/Shrub	May-Jul; White	Riparian woodland	Native	Few individuals in riparian woodland SW of Bush Lupine Point
<i>Galium californicum</i> California bedstraw	Herb (occ. ± woody)	Mar-Jul; Yellow	Oak woodland	Native	Scattered occurrences throughout oak woodland
<i>Hedera helix</i> * English ivy	Vine	Aug-Nov; Cream	Oak woodland	Naturalized, Cal-IPC High	Single dense patch west of 11 th Street trailhead
<i>Myoporum laetum</i> Myoporum/Ngaio tree	Tree/Shrub	Feb-Apr; White	Oak woodland, scrub	Naturalized, Cal-IPC Mod	Single individual west of 11 th Street trailhead
<i>Polypogon monspeliensis</i> Rabbitfoot grass	Grass	Apr-Aug; White	Disturbed areas	Naturalized, Cal-IPC Lim	Few individuals at edge of Los Osos Creek, west of bridge
<i>Populus trichocarpa</i> Black cottonwood	Tree	Feb-Apr; White	Riparian woodland	Native	Few individuals in riparian woodland SW of Bush Lupine Point
<i>Sambucus nigra</i> subsp. <i>caerulea</i> Blue elderberry	Tree/Shrub	Mar-Sep; Cream	Oak / riparian woodland	Native	Few individuals in oak grove N. of 17 th Street trailhead and in riparian woodland SW of Bush Lupine Point
<i>Tetragonia tetragonoides</i> New Zealand spinach	Herb	Apr-Sep; Yellow	Marsh edges	Naturalized, Cal-IPC Lim	Few individuals at edge of Los Osos Creek, west of bridge

¹**Origin / Listing Status:** Indicates whether a species is native or naturalized in California; for naturalized species that are included on the California Invasive Plant Council (Cal-IPC) Invasive Plant Inventory (Cal-IPC, 2017) are indicated above with the listing rank. Cal-IPC rankings included on this list are defined as:

- **Limited (Lim):** invasive but with minor statewide ecological impacts, or insufficient information to justify a higher score.
- **Moderate (Mod):** substantial and apparent, but generally not severe ecological impacts on physical processes, plant and animal communities, and vegetation structure.
- **High:** severe ecological impacts on physical processes, plant and animal communities, and vegetation structure.

*This species is currently listed on the list of Vascular Plants of the Elfin Forest (SWAP, 2018) as unconfirmed; this ID was confirmed in 2018.

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APPENDIX E – REPRESENTATIVE SITE PHOTOGRAPHS



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Photo 1. Fully accessible boardwalk loop through an area of oak woodland (07-26-18).



Photo 2. Young acorn growth on healthy oak tree in the Klopfer Grove (08-08-18).



Photo 3. View north from Bush Lupine Point of canopy dieback in oak woodland (08-08-18).



Photo 4. Maritime chaparral with oak woodland in the background (07-13-18).



Photo 5. Transitional habitat with a mix of scrub and chaparral species (07-13-18).



Photo 6. Remnant game trail through dense chaparral in the northern portion of the Forest (07-26-18).



Photo 7. Open coastal dune scrub dominated by low-density subshrubs (08-01-18).



Photo 8. Dense coastal scrub dominated by larger shrubs such as sagebrush and black sage (08-01-18).



Photo 9. Individual narrowleaf iceplant growing in coastal scrub habitat (07-13-18).



Photo 10. View east along southern Forest edge where ornamentals often invade native habitat (08-28-18).



Photo 11. Brackish marsh (foreground) and riparian woodland bordering northern Forest edge (07-26-18).



Photo 12. Western dogwood in flower in riparian woodland at western Forest boundary (08-01-18).



Photo 13. Black cottonwood (background) and blue elderberry (foreground) on western edge (08-01-18).



Photo 14. View west across northern Forest edge at the Los Osos Creek mouth (07-19-18).



Photo 15. Monotypic mat of iceplant adjacent to the Los Osos Creek mouth (07-26-18).



Photo 16. Significant cape ivy infestation in the northern part of the Forest (07-26-18).



Photo 17. Desiccated root mass of African asparagus fern exposed on the soil surface (08-08-18).



Photo 18. Pile of pulled and herbicide-treated cape ivy with resprouting evident (07-19-18).



Photo 19. Wild boar trail evident through the brackish marsh on the northern Forest edge (07-26-18).



Photo 20. Evidence of wild boar foraging in brackish marsh habitat (05-25-18).



Photo 21. Argentine ant hill in open scrub habitat (07-1-18).



Photo 22. Desiccated garden snail shell in coastal dune scrub opening (07-26-18).



Photo 23. Low limbs of multi-trunked trees in Rose's Grove, accessible by boardwalk (08-08-18).



Photo 24. Klopfer Grove with apparent, meandering pedestrian trails (08-08-18).



Photo 25. Planted succulent garden adjacent to South Bay Boulevard (07-13-18).



Photo 26. Split-rail wooden fence along the southern Forest boundary (07-13-18).



Photo 27. Green plastic fencing, supported by t-posts and smooth wire strung across the top (07-13-18).



Photo 28. Green fencing that is overgrown with mature vegetation near 11th Street trailhead (07-13-18).



Photo 29. Symbolic fencing along the Orchid Trail at the eastern edge of the Forest (08-08-18).



Photo 30. Historically restored coastal dune scrub habitat east of Bush Lupine Point (08-01-18).



Photo 31. Scrub habitat that was restored by The Land Conservancy along South Bay Boulevard (07-13-18).



Photo 32. Upper limits of the concrete drainage swale, filled in with sand and iceplant (07-13-18).



Photo 33. Outlet of the concrete drainage swale near the northeastern corner of the Forest (07-13-18).



Photo 34. Wooden grade control structures employed on sand trails; Orchid Trail shown here (07-13-18).



Photo 35. Grade control structures and concrete chunks on steep slope south of the Klopfer Grove (07-13-18).



Photo 36. Unstable slope with jute net and fencing installed around Bush Lupine Point (07-13-18).



Photo 37. Deeply incised gully lined with large concrete chunks, west of 11th Street trailhead (07-19-18).



Photo 38. Morro manzanita dominating the maritime chaparral in the northern half of the Forest (07-26-18).



Photo 39. Sand almond growing at the edge of transitional chaparral and scrub habitat (08-01-18).



Photo 40. Michael's rein orchid growing through dense iceplant near South Bay Boulevard (08-08-18).



Photo 41. Desiccated shells of Morro shoulderband snail in open scrub habitat (07-26-18).



Photo 42. Individual Blainville's horned lizard sunning in open sand within chaparral habitat (07-26-18).



Photo 43. Overgrown informational sign adjacent to the boardwalk, south of Siena's View (06-26-18).



Photo 44. Degraded informational sign at Bush Lupine Point (07-26-18).



Photo 45. Overgrown information sign at the 11th Street trailhead (08-28-18).



Photo 46. Dilapidated fencing south of Bush Lupine Point (08-01-18).



Photo 47. California quail perched in maritime chaparral habitat (07-26-18).



Photo 48. Banded wren perched in coast live oak near the riparian woodland fringe in the north (07-26-18).

**APPENDIX F –
INVASIVE SPECIES TRACKING TABLE**



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Invasive Weeds Summary Table					
Species	Location Description(s)	Coordinates*	Data Source	Quantity/Area	2018 Update/ Status
Century plant <i>Agave americana</i>	Just west of unnamed overlook, south of Bush Lupine Point	35.33269 / -120.83022	2018 surveys	One small individual	N/A
	Surrounding 16th Street trailhead	35.33180 / -120.82534	Peter Sarafian	Several large and small individuals	Still present
African asparagus fern <i>Asparagus asparagoides</i>	West of 11th Street trailhead, in oak woodland	35.33214 / -120.83189	2018 surveys	Localized patch	N/A
	Approx. 300 feet north of Bush Lupine Point in oak woodland	35.33390 / -120.83005	2018 surveys	Localized patch	N/A
	Oak grove at approximate center of boardwalk loop	35.33313 / -120.82693	2018 surveys	Localized patch	N/A
	Oak grove south of Bush Lupine Point	35.333 / -120.830*	Peter Sarafian	Abundant	Only desiccated root masses present in 2018
	Oak grove north of 11th Street trailhead	35.332 / -120.831*	Peter Sarafian	Abundant	Only desiccated root masses present in 2018
	Northwest of 11th Street trailhead, on north side of sand trail	35.332376 / -120.830498	2003 data	Patch of 80+ individuals	Unknown, not verified in 2018
	Northwest of 11th Street trailhead, on north side of sand trail	35.332277 / -120.830433	2003 data	Patch of 50-79 individuals	Not present/ detected in 2018
	Oak grove south of Bush Lupine Point	35.332625 / -120.830131	2003 data	Patch of 80+ individuals	Only desiccated root masses present in 2018
	Oak grove south of Bush Lupine Point	35.332753 / -120.830093	2003 data	Patch of 50-79 individuals	Only desiccated root masses present in 2018
	Oak grove north of 17th Street trailhead	35.332610 / -120.824000	2003 data	Patch of 25-49 individuals	Only desiccated root masses present in 2018
	Oak grove north of 17th Street trailhead	35.332429 / -120.824078	2003 data	Patch of 25-49 individuals	Only desiccated root masses present in 2018
	Oak grove north of 17th Street trailhead	35.332433 / -120.824274	2003 data	Patch of < 25 individuals	Only desiccated root masses present in 2018

Species	Location Description(s)	Coordinates*	Data Source	Quantity/Area	2018 Update/ Status
Freeway iceplant <i>Carpobrotus edulis</i>	Edge of South Bay Boulevard, west of the bridge	35.33472 / -120.82342	2018 surveys	Dense mat covering 0.16 acre	N/A
	14th Street trailhead	35.33174 / -120.82760	2018 surveys	Dense mat covering 0.03 acre	N/A
	North end of 10th Street (just outside Forest)	35.33128 / -120.83216	2018 surveys	Localized patch	N/A
Tocalote <i>Centaurea melitensis</i>	North of the boardwalk at the Celestial Meadow	35.333714 / -120.827142	2003 data	<25 individuals dispersed in large area	Not present/ detected in 2018
Narrowleaf iceplant <i>Conicosia pugioniformis</i>	Several occurrences in open scrub habitat in the vicinity of Bush Lupine Point	35.33259 / -120.83030	2018 surveys	Generally one to few small plants at each location	N/A
		35.33261 / -120.83043	2018 surveys		N/A
		35.33261 / -120.83061	2018 surveys		N/A
		35.33271 / -120.83037	2018 surveys		N/A
		35.33267 / -120.83025	2018 surveys		N/A
		35.33302 / -120.83091	2018 surveys		N/A
		35.33297 / -120.83092	2018 surveys		N/A
		35.33302 / -120.83046	2018 surveys		N/A
		35.33291 / -120.83062	2018 surveys		N/A
		35.33294 / -120.83032	2018 surveys		N/A
		35.33289 / -120.83034	2018 surveys		N/A
		35.33287 / -120.83028	2018 surveys		N/A
		35.33324 / -120.83031	2018 surveys		N/A
		35.33321 / -120.83027	2018 surveys		N/A
		35.33327 / -120.83020	2018 surveys		N/A
		35.33281 / -120.82959	2018 surveys		N/A
		35.33349 / -120.82968	2018 surveys		N/A
		35.33329 / -120.82967	2018 surveys		N/A
		35.33324 / -120.82964	2018 surveys		N/A
		35.33322 / -120.82938	2018 surveys		N/A

Species	Location Description(s)	Coordinates*	Data Source	Quantity/Area	2018 Update/ Status
Narrowleaf iceplant <i>Conicosia pugioniformis</i> (cont.)	Several occurrences in open scrub habitat in the vicinity of Bush Lupine Point	35.33317 / -120.82937	2018 surveys	Generally one to few small plants at each location	N/A
		35.333975 / -120.827926	2003 data		Unknown, not verified in 2018
		35.333986 / -120.827755	2003 data		Unknown, not verified in 2018
		35.334062 / -120.827762	2003 data		Unknown, not verified in 2018
		35.334110 / -120.827677	2003 data		Unknown, not verified in 2018
		35.334158 / -120.827733	2003 data		Unknown, not verified in 2018
		35.334214 / -120.827666	2003 data		Unknown, not verified in 2018
		35.331814 / -120.823873	2003 data		Not present/ detected in 2018
		35.331953 / -120.824116	2003 data		Not present/ detected in 2018
		35.331811 / -120.823858	2003 data		Not present/ detected in 2018
	Dense oak woodland near the northern edge of the Forest	35.33544 / -120.82763	2018 surveys	10-15 individuals	N/A
	Oak grove south of Bush Lupine Point	35.332733 / -120.830146	2003 data	Patch of 50-79 individuals	Not present/ detected in 2018
	Open scrub southwest of Bush Lupine Point	35.333041 / -120.830419	2003 data	Patch of < 25 individuals	Still present
	Edge of chaparral northeast of Bush Lupine Point	35.333370 / -120.829616	2003 data	Patch of < 25 individuals	Still present
	Edge of chaparral northeast of Bush Lupine Point	35.333492 / -120.829652	2003 data	Patch of < 25 individuals	Still present
	Open scrub east of Bush Lupine Point, along boardwalk	35.333052 / -120.829266	2003 data	Patch of < 25 individuals	Not present/ detected in 2018

Species	Location Description(s)	Coordinates*	Data Source	Quantity/Area	2018 Update/ Status
Narrowleaf iceplant <i>Conicosia pugioniformis</i> (cont.)	Open scrub east of Bush Lupine Point, along boardwalk	35.333124 / -120.829059	2003 data	Patch of < 25 individuals	Not present/ detected in 2018
	Chaparral east of Bush Lupine Point, along boardwalk	35.333078 / -120.828715	2003 data	Patch of < 25 individuals	Not present/ detected in 2018
	Chaparral between the boardwalk and the Klopfer Grove	35.334678 / -120.826266	2003 data	Patch of 25-49 individuals	Unknown, not verified in 2018
	Chaparral between the boardwalk and the Klopfer Grove	35.334663 / -120.825166	2003 data	Patch of < 25 individuals	Unknown, not verified in 2018
	Klopfer Grove near the established sand trail entrance	35.334964 / -120.824390	2003 data	Patch of 25-49 individuals	Unknown, not verified in 2018
	Oak grove north of 17th Street trailhead	35.332274 / -120.824224	2003 data	Patch of < 25 individuals	Not present/ detected in 2018
	Chaparral between the boardwalk and the Klopfer Grove	35.334377 / -120.827007	2003 data	Unknown	Unknown, not verified in 2018
	Oak woodland northeast of Siena's View	35.335161 / -120.827956	2003 data	Unknown	Unknown, not verified in 2018
Cape ivy <i>Delairea odorata</i>	West end of the oak grove in the center of the boardwalk loop	35.33328 / -120.8274	Peter Sarafian	Unknown	Not present/ detected in 2018
	East end of the oak grove in the center of the boardwalk loop	35.33322 / -120.8273	Peter Sarafian	Unknown	Not present/ detected in 2018
	Oak grove northeast of Celestial Meadow	35.33453 / -120.8261	Peter Sarafian	Abundant	Unknown, not verified in 2018
	Oak grove northeast of Celestial Meadow	35.33492 / -120.8265	Peter Sarafian	Unknown	Unknown, not verified in 2018
	Oak grove northeast of Celestial Meadow	35.33514 / -120.8263	Peter Sarafian	Unknown	Unknown, not verified in 2018
	Oak grove northeast of Celestial Meadow	35.33519 / -120.8261	Peter Sarafian	Unknown	Unknown, not verified in 2018
	Oak grove northeast of Celestial Meadow	35.33542 / -120.8261	Peter Sarafian	Unknown	Unknown, not verified in 2018

Species	Location Description(s)	Coordinates*	Data Source	Quantity/Area	2018 Update/ Status
Cape ivy <i>Delairea odorata</i> (cont.)	Oak grove northeast of Celestial Meadow	35.33506 / -120.8257	Peter Sarafian	Unknown	Unknown, not verified in 2018
	South of trail entrance into Klopfer Grove	35.33436 / -120.8242	Peter Sarafian	Unknown	Unknown, not verified in 2018
	West of 11th Street trailhead, in oak woodland	35.33183 / -120.83223	2018 surveys	Abundant, approx. 0.09 acre	N/A
	Oak woodland southwest of Bush Lupine Point, along riparian woodland edge	35.33262 / -120.83128	2018 surveys	Abundant, approx. 0.23 acre	N/A
	Oak woodland due west of Bush Lupine Point	35.33326 / -120.83075	2018 surveys	Abundant, approx. 0.02 acre	N/A
	Oak woodland midway between Bush Lupine Point and Siena's View	35.33392 / -120.82970	2018 surveys	Abundant, approx. 0.02 acre	N/A
	Oak woodland northeast of Siena's View	35.33537 / -120.82808	2018 surveys	Abundant, approx. 0.09 acre	N/A
	Just north of 11th Street trailhead	35.332092 / -120.831077	2003 data	Patch of 50-79 individuals	Not present/ detected in 2018
	North of the boardwalk, just east of the intersection with spur to Siena's View	35.333790 / -120.828158	2003 data	Patch of < 25 individuals	Not present/ detected in 2018
	Oak woodland between the boardwalk and the Klopfer Grove	35.334783 / -120.826079	2003 data	Patch of < 25 individuals	Unknown, not verified in 2018
Veldt grass <i>Ehrharta calycina</i> , <i>E. erecta</i>	North end of 10th Street (just outside the Forest)	35.33128 / -120.83216	Peter Sarafian	Scattered individuals	Still present
	Edge of South Bay Boulevard	35.332 / -120.823*	Peter Sarafian	Scattered individuals	Still present
	Just south of boardwalk, approx. 250 east of Bush Lupine Point	35.33298 / -120.82940	2018 surveys	Single individual (already set seed)	N/A
	Just west of 11th Street trailhead	35.331949 / -120.831459	2003 data	Patch of 50-79 individuals	Not present/ detected in 2018

Species	Location Description(s)	Coordinates*	Data Source	Quantity/Area	2018 Update/ Status
Veldt grass <i>Ehrharta calycina</i> , <i>E. erecta</i> (cont.)	Just west of 11th Street trailhead	35.331894 / -120.831191	2003 data	Patch of 80+ individuals	Not present/ detected in 2018
	Oak grove south of Bush Lupine Point	35.332668 / -120.830117	2003 data	Patch of 80+ individuals	Not present/ detected in 2018
	Along the southern Forest boundary between 15th and 16th Streets	35.331874 / -120.825937	2003 data	<25 individuals dispersed in large area	Not present/ detected in 2018
	Southeast corner of the Forest, adjacent to private residence	35.331779 / -120.823648	2003 data	Patch of 25-49 individuals	Not present/ detected in 2018
Fennel <i>Foeniculum vulgare</i>	Under and adjacent to South Bay Boulevard bridge over Los Osos Creek	35.33464 / -120.82340	Peter Sarafian	Scattered individuals	Still present
	North end of 10th Street (just outside the Forest)	35.33128 / -120.83216	2018 surveys	Scattered individuals	N/A
English ivy <i>Hedera helix</i>	West of 11th Street trailhead, in oak woodland at the edge of private property	35.33179 / -120.83240	2018 surveys	Dense patch	N/A
Myoporum <i>Myoporum laetum</i>	West of 11th Street trailhead, in oak woodland	35.33194 / -120.83171	2018 surveys	One small individual, previously pruned	N/A
New Zealand spinach <i>Tetragonia tetragonoides</i>	West of South Bay Boulevard bridge over Los Osos Creek	35.33502 / -120.82381	2018 surveys	Few individuals in small patch	N/A

*Coordinates with asterisk are approximate, based on description of location; others are precise, based on GPS data

**APPENDIX G –
2018 RECOMMENDATIONS SUMMARY TABLE**



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2018 Management Recommendations Summary

Document Section	Recommended Actions*	Recommended Implementation Timeline
4.2.1 Invasive Weed Control	Pursue efforts to identify new biologists to become trained and permitted as USFWS-approved MSS biologists; consider reaching out to the County, college professors/ lecturers at Cal Poly and Cuesta College, or other local entities to identify interested parties, such as graduate students or local biologists.	Engage interested parties in logging training hours for MSS surveys under the supervision of currently permitted biologists as soon as feasible
	Continue organizing monthly volunteer events to control and remove target weed species from the Forest, as permitted with oversight from a permitted MSS biologist.	Current and ongoing activity
	Establish a consistent monitoring schedule to track and document weed infestations and other potential concerns; a survey should be completed at least every two years to update and inventory the extent of invasive weed populations in the Forest.	At least every other year
	Employ the use of pre-printed maps and monitoring forms to use in tracking the location and status of weeds in the Forest; consider creating and using a gridded map for easy and accurate mapping of weed infestations and related treatments.	For use with all monitoring/ survey efforts
	Consider establishing a paid or unpaid internship position for someone to manage, track, and update all data pertaining to known weed infestations and removal efforts.	Engage interested parties as soon as feasible, when time and resources allow
	Whenever possible, do not leave piles of hand-pulled invasive weeds in the Forest, particularly for vining and rhizomatous species that readily re-sprout from asexual propagules. If possible, bag and remove all pulled and treated weeds from the Forest.	During all weed abatement activities
4.2.2 Invasive Wildlife Control	Coordinate with CDFW to identify, plan, and fund appropriate boar eradication efforts. As feasible, any efforts should also be coordinated with adjacent landowners in the Los Osos Valley.	Reach out to CDFW as soon as feasible
	Identify interested researchers and potential granting agencies to study and document the populations of native and non-native invertebrates (ants and snails) in the Forest, as well as species that are ecologically linked to these invertebrate populations, such as Blainville's horned lizard and MSS.	As time and resources allow
	Solicit and encourage use of the Forest for academic research by regional experts and local students.	As time and resources allow

4.2.2 Invasive Wildlife Control (cont.)	Identify grant funding sources to support research in the Forest; due to the federal listing status of MSS, it is possible that federal grant funding may be available to conduct research on this species.	As time and resources allow
	Develop a long-term management plan for control of invasive wildlife species, including wild boar, argentine ants, and brown garden snail.	As time and resources allow
4.2.3 Managing Overuse and Off-trail Access (Updating and Modernizing Signs)	Develop a cohesive Fence and Sign Plan for the Forest, which should provide a detailed implementation plan for replacing dilapidated temporary fencing with updated, modernized informational and interpretive signs.	As time and resources allow
	Update existing informational signs at trailheads and throughout the Forest to focus on specific management concerns, rules, public hikes, and how to get involved. Emphasize the use of simple, positive language, such as 'Thank you for helping us protect the unique diversity of the Elfin Forest'.	When signs are updated in the Forest and/or the Fence and Sign Plan is developed
	Update and modernize existing interpretive signs throughout the Forest to focus relevant interest topics such as restoration efforts, unique local ecology, special-status species, cultural history, and potential impacts associated with off-trail access. Individual signs should be designed to address only one or two topics with simple, accessible information and emphasize the use of simple, positive language, such as 'You can help us protect this unique resource by using designated trails'.	When signs are updated in the Forest and/or the Fence and Sign Plan is developed
	Develop a cohesive, modernized look for all signs to be used in the Forest.	When signs are updated in the Forest and/or the Fence and Sign Plan is developed
	Remove and, if needed, replace interpretive and informational signs that have become overgrown with vegetation.	When signs are updated in the Forest and/or the Fence and Sign Plan is developed
	Place new signs and, as needed, relocate existing signs to be in high visibility locations. Existing interpretive signs may be modified in-place with updated information that is cohesive with all new information.	When signs are updated in the Forest and/or the Fence and Sign Plan is developed
	As needed, update existing pamphlets to include information about new projects, vista points, and interest points in the Forest. Pamphlet boxes that include brochures with maps should be located near information signage at every trailhead.	As time and resources allow

4.2.3 Managing Overuse and Off-trail Access (Updating and Modernizing Signs) (cont.)	Specific topics that may be emphasized on interpretive signs include: the role and diversity of lichen and fungal communities that occur in the Forest (suggested placement: outside Rose's Grove), the role of cryptobiotic soil crusts in preventing erosion (suggested placement: near common off-trail access area), the unique ecology of pygmy oak trees, special-status species photos and life history information, the effects of sedimentation into the Estuary (suggested placement: at the Butterfly Hill Scenic Overlook), the significance of the Estuary as critical feeding grounds for migratory birds, and the cultural history of the area. These topics can include information about the importance of enjoying the Forest from established trails. Additional topics may be included.	When signs are updated in the Forest and/or the Fence and Sign Plan is developed
	Update the existing native plant interpretive walk. This may be accomplished by planting and maintaining a diversity of large individuals of dominant dune scrub and chaparral species in immediate proximity to the boardwalk, along with informational signs about the plants, or numbered signs that correspond to information in a trail guide pamphlet (i.e., update existing interpretive walk and pamphlet information). Signs and vegetation associated with the existing interpretive walk are dilapidated and, in some cases, no longer exist. Establishing new planting locations for the interpretive walk may also be strategically selected to block popular off-trail access areas (e.g., unauthorized trail into oak grove south of Bush Lupine Point). . The use of highly aromatic species such as black sage, California sagebrush, and wedge leaved horkelia would further provide interactive educational opportunities for the visually impaired.	As time and resources allow
	Reference the style and type of signs used by various public agencies to designate other public lands. For example, the City of San Luis Obispo has interpretive signs posted at most City Open Space trailheads that have a cohesive appearance. The Bureau of Land Management (BLM) undertook an effort to modernize their signage in 2015; examples of their new signage and branding, including large interpretive panels, can be found at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd500317.pdf (BLM, 2015)	When signs are updated in the Forest and/or the Fence and Sign Plan is developed
	Formalize the informal vista point/overlook at the top of Butterfly Hill to encourage responsible use and discourage off-trail access.	As time and resources allow
	Consider installing an elevated bench or viewing platform to encourage the use of this location as a vista point, without the need to encroach on intact vegetation down the slope.	As time and resources allow

4.2.3 Managing Overuse and Off-trail Access (Updating and Modernizing Signs) (cont.)	At or near Butterfly Hill, install interpretive sign(s) about the cultural significance of the area, and the ecological importance of the Morro Bay Estuary. To further discourage off-trail access, an interpretive sign at this location might discuss the negative effects of sedimentation into the Estuary and the importance of restoration efforts being implemented.	As time and resources allow
	Update the existing interpretive sign near the entrance to Rose's Grove with one that focuses on the unique ecology of the pygmy oak trees and the organisms that depend on them. An informational panel about the diversity of lichens that can grow on the shaded lower limbs of these multi-trunked trees should be included, along with a reminder about the potential impacts of climbing on the limbs.	When signs are updated in the Forest and/or the Fence and Sign Plan is developed
4.2.3 Managing Overuse and Off-trail Access (Fencing Modifications)	At Bush Lupine Point, replace all green fencing with updated, strategically-placed signs about the importance of native habitat restoration efforts and reducing sedimentation into the Estuary. This will be most effective if completed at the same time or immediately following the completion of restoration efforts along the slope south of Bush Lupine Point (see Section 4.2.5 below). Fence removal will also facilitate access to restoration areas for installation, maintenance, and monitoring by volunteers. Also see Section 4.2.4 for specific recommendations about the removal of green fencing in the Forest.	As time and resources allow
	At the Butterfly Hill Scenic Overlook, replace green fencing with an aesthetically favorable, split-rail wood fence, similar to the one used elsewhere in the Forest. Consider installing the new fence slightly west of the existing fence, just downslope of the crest of the hill. This placement would allow for a less obstructed view.	As time and resources allow
	It may be beneficial to replace green fencing with split-rail fencing (similar to the one used elsewhere in the Forest) in areas where the boardwalk is bordered by low-density dune scrub habitat between Bush Lupine Point and the 14th Street connector trail, so as to maintain a significant visual and physical barrier between the walkway and open habitat in this area.	As time and resources allow
	All removal and replacement of green fencing should occur in a phased approach and in coordination with efforts to install informational signs about the original purpose of the fencing, and ongoing efforts to limit off-trail access.	As time and resources allow
	Begin removal in areas where green fencing is no longer functional, including all areas where it is overgrown with well-established vegetation (e.g. along the sand trail from 11th Street) and areas where fencing is not even visible from established trails (e.g., remnant short sections associated with past restoration efforts).	As soon as feasible

4.2.3 Managing Overuse and Off-trail Access (Fencing Modifications) (cont.)	Fencing and support posts should be carefully removed to limit damage to intact vegetation and soil disturbance to the maximum extent feasible. This may require cutting fencing into small sections and untangling overgrown vegetation.	At the time of fence removal
	Use temporary signs to inform the public of planned efforts to remove green fencing and install new infrastructure; such signs may include information about why fencing is being removed, how people can help and volunteer, and when to expect changes.	At the time of fence removal
	In high visibility areas, post new, permanent signs at trail edges to identify restored and active restoration areas as a reminder for pedestrians to remain on established trails.	At the time of fence removal
4.2.5 Habitat Restoration and Monitoring	Establish moderate- to high-density container-stock plantings of scrub and chaparral species along the slopes and terraces south of Bush Lupine Point. To the extent feasible, container stock should be grown from seed and/or cuttings collected in the Forest. Any container stock obtained from other sources should be locally-sourced from coastal San Luis Obispo County. Seeding and planting should occur in the late fall or early winter.	As soon as feasible
	Additional plantings should be placed within the informal trail that extends into the oak grove on the south side of the boardwalk, just east of Bush Lupine Point. Blocking this trail will discourage access into the oak grove and, ultimately, to the unstable slope on the south side of the grove.	As soon as feasible
	In areas of exposed sand between container stock plantings, apply seed of native scrub and chaparral species collected in the Forest. Seed should be gently raked into the soil and, if appropriate, covered with natural fiber erosion control blankets.	At the time of planting/ restoration
	At the base of container stock plantings and over seeded areas, apply a thick layer of weed-free wood mulch to protect seed from predation, retain moisture at the soil surface, and protect the soil surface from wind and water erosion. To the extent possible, mulch should be sourced from woody debris collected in the Forest during trail maintenance and, if applicable, trail establishment along the Santa Paula Avenue right-of-way.	At the time of planting/ restoration
	Limited additional plantings may be installed at specific locations to block and revegetate historical informal trails and other areas where off-trail access is apparent.	At the time of planting/ restoration
	Restoration activities should take place in the fall or winter, following the first significant rains of the season.	At the time of planting/ restoration

4.2.5 Habitat Restoration and Monitoring (cont.)	All seed and cuttings collected from the Forest should be collected in a manner that does not negatively impact existing communities or individual species. In general, no more than 10 percent of the available seed or living canopy of an individual plant or localized population should be harvested in one growing season.	At the time of seed collection
	Supplemental watering of container stock plantings may be necessary during the first year. If infrastructure is not available to establish drip irrigation, hand-watering may be necessary. Supplemental watering should be used only as needed during the first two years, to help plants establish healthy root systems.	Following initial planting/ restoration
	Establish a monitoring program to be implemented on a regular basis to ensure maintenance needs are identified and addressed in a timely manner. At a minimum, monthly monitoring should occur for the first growing season, followed by quarterly monitoring until plants are established.	Following initial planting/ restoration
4.2.6 Managing Wildlife Interactions with the Public	Maintain existing information signs about the presence of coyotes in the Forest, and the elevated likelihood for sightings and interactions in the spring and late summer.	As soon as feasible
	As appropriate, post or mail public notices about the importance of keeping all trash and food scraps, including domestic animal food items, in lidded and secured containers, especially in neighborhoods bordering the Forest.	As time and resources allow
	Inform the public of necessary actions to take if a coyote is encountered, such as making loud noises, waving the arms, and carrying a stick or other implement that may be used for defense if approached by a coyote.	As soon as feasible
4.2.7 Erosion Control (General Recommendations)	All monofilament netting should be removed from the Forest and properly disposed of. If fiber rolls are deployed for temporary erosion control in the Forest, only burlap-wrapped fiber rolls should be used (ref new appendix of good and bad materials).	As soon as feasible
	In addition, degraded silt fencing and sand bags should be removed from the Forest. These products are not recommended for use in the Forest, as they are vulnerable to degradation and contribute to debris in the Forest understory and potentially within the Estuary.	As soon as feasible
	As necessary, mulch berms may be used as a natural substitute for silt fencing, where temporary sediment controls are needed. Once the subject area is adequately stabilized, mulch can be spread in remaining bare soil areas.	As time and resources allow
	If sediment control is needed at trailheads, a wooden curb or low retaining wall should be constructed in place of sand bags.	As time and resources allow

4.2.7 Erosion Control (Erosion Feature 1 - Concrete-lined Swale)	In coordination with CA State Parks and/or the County Public Works Department, it is recommended that ice plant and accumulated sand be removed from the concrete-lined swale to restore normal flow through the channel. Iceplant and soil removal would likely require ongoing maintenance.	As soon as feasible
	Deeply incised voids that are undermining the concrete channel should be filled with non-erodible fill such as appropriately-sized rock, followed by slope recontouring to direct runoff into the swale.	As soon as feasible
	Undermined concrete slabs at the down slope end of the swale should be removed and replaced with an appropriately-sized and engineered energy dissipation structure (i.e., rock slope protection underlain with filter fabric). Repairs should be properly engineered and will require discretionary permits through the appropriate resource agencies, as well as coordination with CA State Parks and the County Public Works Department.	As soon as feasible
	County Parks should contact County Public Works to discuss the timing of replacing the bridge over Los Osos Creek at this location as they may address this issue during that project. Interim measures as noted above are needed to prevent sedimentation to the Estuary.	As soon as feasible

4.2.7 Erosion Control (Erosion Feature 2 - Erosion on the Orchid Trail)	Additional grade control structures should be added to steep sections of formal sand trails. In areas where significant drops have been created between existing steps, additional steps should be added to prevent further soil loss and rutting.	As time and resources allow
	<p>Use guidance from current trail-building literature to increase the effectiveness of grade control structures and reduce overall soil loss along the eroding trails. Specific improvements to grade control structures may include:</p> <ul style="list-style-type: none"> - Out-slope trail treads in wide trail areas at a two to five percent grade and utilize appropriately-sized, shaped, and quantities of rock as backfill to slow runoff and allow water passage at the downslope side. - Extend grade controls or steps to the maximum width of the trail where trail elevations are lower and constricted by adjacent slopes. These structures may be keyed-in to adjacent slopes and backfilled with sufficient quantities of rock to allow storm water to infiltrate rather than incise around the structure. - Extend grade control structures below the trail tread surface and appropriately secure with weather-resistant materials installed through the structure. - Avoid the use of small concrete rubble laid on the ground surface, as this material tends to become easily displaced. - Install water bars upslope of steep trail sections to direct runoff away from the trail. - Consider removing or relocating a trail, if appropriate, to reduce erosion concerns. 	As time and resources allow

4.2.7 Erosion Control (Erosion Feature 3 - Bush Lupine Point)	Prior to stabilizing the area with container stock plantings, native seed, and mulch, remove dilapidated jute netting from the slope, and recontour the soil surface in preparation of planting.	As time and resources allow
	In coordination with restoration efforts, use various public outreach avenues to inform the public of the efforts and the importance of re-establishing native vegetation on the unstable slope. Outreach efforts may include temporary and permanent signs installed at nearby trailheads, trail intersections, and at Bush Lupine Point; docent-led walks and hikes; stationing volunteers at Bush Lupine Point to interact with the public, answer questions, and prevent off-trail access; mailers or pamphlets; and encouraging the public to volunteer in the restoration effort.	As time and resources allow
4.2.7 Erosion Control (Erosion Feature 4 - West of 11th Street Trailhead)	To discourage further gully erosion, appropriately-sized rock underlain with filter fabric should be installed in the gully. The rock would aid in armoring native soils by creating a protected “rock swale” to convey storm water runoff.	As time and resources allow
	Extend the rock-lined swale upslope of the current extent of the gully to prevent further head-cutting.	As time and resources allow
	Additionally, check dams constructed of non-erodible material should be installed immediately upslope of the gully to slow runoff velocity.	As time and resources allow
	Crescent-shaped check dams may be constructed of non-erodible material downslope of the rock swale to capture any sediment mobilized through the swale.	As time and resources allow
	If it is desirable to discontinue use of this informal trail, the margins of the rock swale should be planted with native species such as California blackberry and, if possible, poison oak, to block the trail and further promote soil stabilization.	As time and resources allow
	Consider removing or relocating a trail, if appropriate, to reduce erosion concerns.	As time and resources allow
4.2.8 Data Management and Routine Monitoring	Consider hiring a paid or unpaid intern that will be responsible for carrying out specific duties, such as organizing all existing data about weed infestations, weed abatement efforts, ongoing projects, etc. This position may also be used for the development of plans, such as a new resource management plan, fence and sign plan, etc.	As time and resources allow
	Create a digital tracking table that includes all available information about past, ongoing, and planned restoration and maintenance projects in the Forest. This table should be updated on a regular basis. A template and initial draft is included in Appendix C, which can be used and modified by SWAP.	Update and/or modify provided template at least every two years

4.2.8 Data Management and Routine Monitoring (cont.)	Create a digital tracking table that includes all available information about invasive weed infestations and special-status species populations in the Forest. At a minimum, it is recommended that surveys be completed by a qualified individual at least every other year to inventory and update existing information about weed infestations, special-status species populations, and known management concerns (e.g., erosion features). A template and initial draft is included in Appendix F, which can be used and modified by SWAP and/or the County.	Update and/or modify provided template at least every two years
	Establish a routine monitoring program to track the overall status of restoration projects and community health in the Forest, and track weed infestations. Updated surveys should be completed by a qualified individual approximately every other year in the spring. A sample form is included in Appendix G – Sample Habitat Monitoring Form.	At least every other year
	As part of routine monitoring, it is recommended that a repeatable photo monitoring program using permanent photo monitoring points be implemented. To help initiate this effort, 15 photo monitoring points with a total of 28 photographs were established during the 2018 assessment. Permanent photo monitoring points are shown on Figure 7: Routine Monitoring Map, and photographs taken at established points are included in Appendix H – Routine Monitoring Photographs. Taking photos from the same location and aspect on an annual basis will allow SWAP to track changes in habitat composition over time.	At least every other year
	Figure 7 also includes a gridded overlay over the entire Forest, which can be used with general monitoring observation forms to accurately and easily track the locations of any concerns observed by volunteers.	Use/update as applicable
	Pre-printed monitoring forms and gridded maps of the Forest with labeled photo monitoring points should be provided to monitors to facilitate consistency in monitoring data.	Use/update as applicable

4.2.9 Update Management Plan and Encourage Forest Research	Develop an updated Resource Management Plan for the Forest. The plan should outline management priorities, including efforts to encourage use of the Forest by research groups.	As time and resources allow
	Identify specific research projects that would be beneficial for increasing current knowledge of the ecology of the Forest, and seek grant funding that may support such projects.	As time and resources allow
	Contact college professors and lecturers at Cal Poly, Cuesta College, and other regional universities, as well as local agencies and non-profit groups (e.g., California Native Plant Society) to identify potential new sources of volunteers and interested research entities that may carry out specific research projects in the Forest.	As time and resources allow

*Many recommended actions will require coordination with USFWS due to the known presence of the federally-listed Morro shoulderband snail (*Helminthoglypta walkeriana*) and Morro manzanita (*Arctostaphylos morroensis*) in the Forest.

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APPENDIX H – LIST OF BMP REFERENCE GUIDES



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List of Reference Guides:

1) Key Concepts of Sustainable Erosion Control Technical Guide

CalTrans, November 2010; available online at:

http://www.dot.ca.gov/hq/LandArch/16_la_design/guidance/ec_toolbox/Erosion_Control_Technical_Guide_v2.pdf

2) Construction Site Best Management Practices (BMP) Manual

CalTrans, May 2017; available online at:

<http://www.dot.ca.gov/hq/construc/stormwater/CSBMP-May-2017-Final.pdf>

3) Stormwater Quality Handbooks, Project Planning and Design Guide

CalTrans, July 2017; available online at:

http://www.dot.ca.gov/design/hsd/ppdg/PPDG-Final_2017-07.pdf

4) Product Data Sheet: Rice Straw Wattle, 8 Inch Burlap

Earth Saver Products, July 2018; available online at:

https://docs.wixstatic.com/ugd/c80b9f_b9a6797df7b54abb8a41b82aa773646f.pdf

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**APPENDIX I –
LIST OF TRAIL-BUILDING REFERENCE GUIDES**



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List of Reference Guides:

1) Trail Construction and Maintenance Notebook

USDA, July 2007; available online at:

<https://www.fs.fed.us/t-d/pubs/pdfpubs/pdf07232806/pdf07232806dpi72.pdf>

2) Trails Management Manual

Maricopa County Parks and Recreation Department, May 2018; available online at:

https://www.maricopacountyparks.net/assets/1/6/2018_Trails_Management_Training_Manual_Update.pdf

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**APPENDIX J –
SAMPLE HABITAT MONITORING FORM**

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Surveyor(s): _____ Date: _____

Invasive Species Observations

Species	Count/Density	Grid ID	Location Description
<i>Ex.: Narrowleaf iceplant / Conicosia</i>	<i>5 individuals in localized patch</i>	<i>K12</i>	<i>Approx. 100 feet north of boardwalk, near boundary with K13 grid square</i>

Photo Monitoring:

Point 1: View NE _____ View SE _____

Point 2: View SW _____

Point 3: View NE _____ View SE _____

Point 4: View NE _____ View SE _____

Point 5: View NW _____ View SW _____

Point 6: View SW _____

Point 7: View NE _____ View NW _____ View SE _____ View SW _____

Point 8: View N _____ View S _____

Point 9: View NW _____

Point 10: View SW _____ View W _____

Point 11: View NW _____ View SE _____

Point 12: View SE _____

Point 13: View N _____

Point 14: View E _____ View W _____

Point 15: View NE _____ View N _____ View NW _____

Other observations (designate location on map and/or with coordinates, as needed):

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**APPENDIX K –
ROUTINE MONITORING PHOTOGRAPHS**



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Photo Point 1 - view northeast



Photo Point 1 - view southeast



Photo Point 2 - view southwest



Photo Point 3 - view northeast



Photo Point 3 - view southeast



Photo Point 4 - view northeast



Photo Point 4 - view southeast



Photo Point 5 - view northwest



Photo Point 5 - view southwest



Photo Point 6 - view southwest



Photo Point 7 - view northwest



Photo Point 7 - view northeast



Photo Point 7 - view southeast

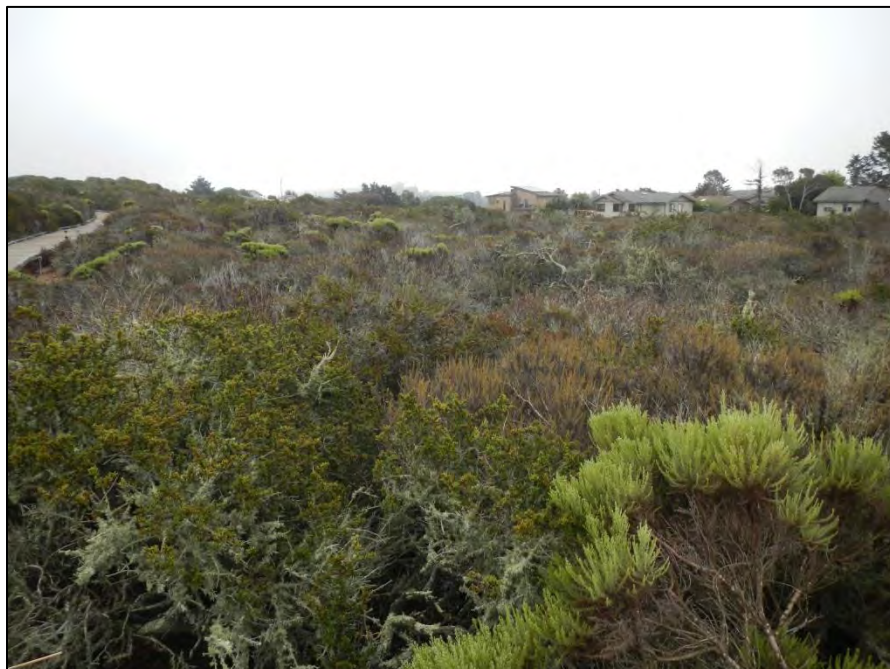


Photo Point 7 - view southwest



Photo Point 8 - view north



Photo Point 8 - view south



Photo Point 9 - view northwest



Photo Point 10 - view southwest



Photo Point 10 - view west



Photo Point 11 - view northwest



Photo Point 11 - view southeast



Photo Point 12 - view southeast



Photo Point 13 - view north



Photo Point 14 - view east



Photo Point 13 - view west



Photo Point 15 - view northeast



Photo Point 15 - view north



Photo Point 15 - view northwest