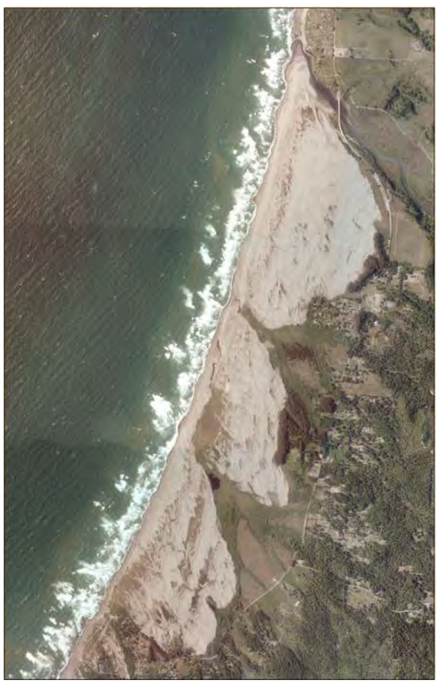
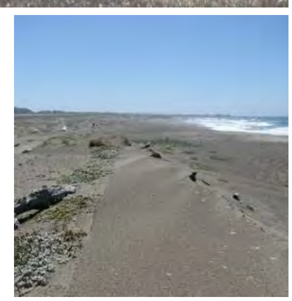
DRAFT

INITIAL STUDY
MITIGATED NEGATIVE DECLARATION

INGLENOOK FEN – TEN MILE DUNES NATURAL PRESERVE
MACKERRICHER STATE PARK
DUNE REHABILITATION PROJECT



July 30, 2012

State of California
California State Parks

MITIGATED NEGATIVE DECLARATION

PROJECT: **MACKERRICHER STATE PARK DUNE REHABILITATION PROJECT**

LEAD AGENCY: California State Parks

AVAILABILITY OF DOCUMENTS: The Initial Study for this Mitigated Negative Declaration is available for review at:

- Mendocino District Headquarters
  California State Parks
  Russian Gulch State Park
  12301 North Highway 1
  Mendocino, California 95460

- Mendocino County Library, Fort Bragg Branch
  499 Laurel Street
  Fort Bragg, California 95437

- Northern Service Center
  California State Parks
  One Capital Mall, Suite 410
  Sacramento, California 95814

- California State Parks Internet Site
  http://www.parks.ca.gov/default.asp?page_id=980

PROJECT DESCRIPTION:

California State Parks (CSP) proposes to restore ecosystem processes that are crucial to the viability of endangered species and their habitats in the Inglenook Fen-Ten Mile Dunes Natural Preserve (Preserve) by removing up to 2.7 miles (4.3 km) of asphalt road and portions of the underlying rock base in foredune habitat, removing two culverts and restoring the stream channel, and treating approximately 60 acres (24.3 hectares) of European beachgrass and other nonnative weeds. Mitigation measures are incorporated to assure that restoration and enhancements would not result in significant adverse effects.

A copy of the Initial Study is incorporated into this Mitigated Negative Declaration. Questions or comments regarding this Initial Study/Mitigated Negative Declaration may be addressed to:

Renee Pasquinelli, Senior Environmental Scientist
California State Parks
Mendocino District
12301 North Highway 1 – Box 1
Mendocino, CA 95460

Submissions must be in writing and postmarked or received by fax or e-mail no later than August 31, 2012. The original of any faxed document must be received by regular mail within ten (10) working days following the deadline for comments, along with proof of successful fax transmission. Email or fax submissions must include full name and address. All comments will be included in the final environmental document for this project and become part of the public record.

Pursuant to Section 21082.1 of the California Environmental Quality Act, the California State Parks (CSP) has independently reviewed and analyzed the Initial Study and Negative Declaration for the proposed project and finds that these documents reflect the independent judgment of CSP.

Burko — 7-31-12

Liz Burko
District Superintendent
Date

For Renee Pasquinelli — 07/31/12

Renee Pasquinelli
Environmental Coordinator
Date

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CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION AND REGULATORY GUIDANCE

The Initial Study/Mitigated Negative Declaration (IS/MND) has been prepared by California State Parks (CSP) to evaluate the potential environmental effects of the proposed Dune Rehabilitation Project at MacKerricher State Park, Mendocino County, California. This document has been prepared in accordance with the California Environmental Quality Act (CEQA), Public Resources Code §21000 *et seq*., and the State CEQA Guidelines, California Code of Regulations (CCR) §15000 *et seq*.

An Initial Study is conducted by a lead agency to determine if a project may have a significant effect on the environment [CEQA Guidelines §15063(a)]. If there is substantial evidence that a project may have a significant effect on the environment, an Environmental Impact Report (EIR) must be prepared, in accordance with CEQA Guidelines §15064(a). However, if the lead agency determines that revisions in the project plans or proposals made by or agreed to by the applicant mitigate the potentially significant effects to a less-than-significant level, a Mitigated Negative Declaration may be prepared instead of an EIR [CEQA Guidelines §15070(b)]. The lead agency prepares a written statement describing the reasons a proposed project would not have a significant effect on the environment and, therefore, why an EIR need not be prepared. This IS/MND conforms to the content requirements under CEQA Guidelines §15071.

1.2 LEAD AGENCY

The lead agency is the public agency with primary approval authority over the proposed project. In accordance with CEQA Guidelines §15051(b)(1), "the lead agency will normally be an agency with general governmental powers, such as a city or county, rather than an agency with a single or limited purpose." The lead agency for the proposed project is CSP. The contact person for the lead agency regarding specific project information is:

Renee Pasquinelli, Senior Environmental Scientist
Email: rpasquinelli@parks.ca.gov

Questions or comments regarding this Initial Study/Mitigated Negative Declaration should be submitted to:

Renee Pasquinelli, Senior Environmental Scientist
California State Parks
Mendocino District
12301 North Highway 1 – Box 1
Mendocino, CA 95460
Fax : (707) 937-2953
Email: rpasquinelli@parks.ca.gov

Submissions must be in writing and postmarked or received by fax or email no later than August 31, 2012. The originals of any faxed document must be received by regular mail within ten (10) working days following the deadline for comments, along with proof of successful fax transmission. Email or fax submissions must include full name and address. All comments will be included in the final environmental document for this project and become part of the public record.

1.3 PURPOSE AND DOCUMENT ORGANIZATION

The purpose of this document is to evaluate the potential environmental effects of the proposed Dune Rehabilitation Project at MacKerricher State Park. Mitigation measures have been incorporated into the project to either eliminate any potentially significant impacts or reduce them to a less-than-significant level.

This document is organized as follows:

- Chapter 1 - Introduction.
  This chapter provides an introduction to the project and describes the purpose and organization of this document.

- Chapter 2 - Project Description.
  This chapter describes the reasons for the project, scope of the project, project objectives, and project requirements.

- Chapter 3 - Environmental Setting, Impacts, and Mitigation Measures.
  This chapter identifies the significance of potential environmental impacts, explains the environmental setting for each environmental issue, and evaluates the potential impacts identified in the CEQA Environmental (Initial Study) Checklist. Mitigation measures are incorporated, where appropriate, to reduce potentially significant impacts to a less than significant level.

- Chapter 4 - Mandatory Findings of Significance.
  This chapter identifies and summarizes the overall significance of any potential impacts to natural and cultural resources, cumulative impacts, and impact to humans, as identified in the Initial Study.

- Chapter 5 - Summary of Mitigation Measures.
  This chapter summarizes the mitigation measures incorporated into the project as a result of the Initial Study.

- Chapter 6 - References.
  This chapter identifies the references and sources used in the preparation of this IS/MND.

- Chapter 7 - Report Preparation
  This chapter provides a list of those involved in the preparation of this document.

1.4 SUMMARY OF FINDINGS

Chapter 3 of this document contains the Environmental (Initial Study) Checklist that identifies the potential environmental impacts (by environmental issue) and a brief discussion of each impact resulting from implementation of the proposed project.

Based on the IS and supporting environmental analysis provided in this document, the proposed MacKerricher Dune Rehabilitation Project would result in less than significant impacts for the following issues: aesthetics, agricultural and forest resources, air quality, biological resources, cultural resources, greenhouse gas emissions, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation/traffic, and utilities and service systems.

In accordance with §15064(f) of the CEQA Guidelines, a MND shall be prepared if the proposed project would not have a significant effect on the environment after the inclusion of mitigation measures in the project. Based on the available project information and the environmental analysis presented in this document, there is no substantial evidence that, after the incorporation of mitigation measures, the proposed project would have a significant effect on the environment.

CHAPTER 2
PROJECT DESCRIPTION

2.1 INTRODUCTION

This Initial Study/Mitigated Negative Declaration (IS/MND) has been prepared by California State Parks(CSP) to evaluate the potential environmental effects of the proposed MacKerricher State Park Dune Rehabilitation Project within the Inglenook Fen – Ten Mile Dunes Natural Preserve (Preserve), MacKerricher State Park, located near the unincorporated town of Cleone, Mendocino County, California. The proposed project restores natural ecosystem processes that are critical to recovery of coastal dune habitat, which supports threatened and endangered species, by removing a paved road and underlying rock ballast, culverts, and nonnative plants.

2.2 PROJECT LOCATION

This project would be implemented completely within the boundaries of the 1,285-acre Inglenook Fen -Ten Mile Dunes Natural Preserve in MacKerricher State Park, Mendocino County, California. The project area is west of Highway 1 and stretches from the northern boundary at the Ten Mile River to the southern boundary at Ward Avenue.

2.3 BACKGROUND AND NEED FOR THE PROJECT

The mission of California State Parks is to *"provide for the health, inspiration, and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation."* In 1995, the fen complex and dunes of MacKerricher State Park were classified as the Inglenook Fen - Ten Mile Dunes Natural Preserve to recognize the regional and statewide significance of its outstanding natural values.

The foundation for State Parks' management approach for all units is based on the unit classification statutes as defined in the Public Resources Code (PRC § 5019.50 - 5019.80). PRC Section 5019.71 specifies that the "*purpose of natural preserves shall be to preserve such features as rare or endangered plant and animal species and their supporting ecosystem, representative examples of plant and animal communities existing in California prior to the impact of civilization, geologic features illustrative of geologic processes, significant fossil occurrences or representative or unique bio-geographical patterns."*

Coastal strand and dunes are prominent, naturally dynamic habitats within the Preserve, with the native species, including those listed as endangered, being adapted to the movement of sand and water. The Preserve supports a coastal dune ecosystem that includes extensive areas of wetlands and dune habitat with well-preserved relatively natural dynamic features, and some areas with significantly impaired ecological structure and dynamics. One of the most altered zones of the dunes is the foredune (frontal or seaward dune zone), which has been affected by:

- past construction of a linear haul road and road bed along the naturally dynamic foredune zone;
- past construction of two culverts under the haul road draining wetlands (fens) at artificially stabilized locations, forming artificially incised (downcut) channels, controlling the outlets of extensive wetlands within the Preserve, and modifying their dynamics;
- extensive establishment of European beachgrass that strongly modifies both the

foredune structure and the hydrology of the wetland outlets.

Beach shoreline retreat at the Preserve is not perfectly parallel with the haul road. Differential retreat and growth of the beach has eroded the haul road extensively at the south end, but partly buried it with dune sand at the north end. The culverts are degraded, but continue to stabilize artificial locations and stream morphology affecting the drainage of the large fen of the Preserve.

European beachgrass, a nonnative, invasive plant, has displaced native dune plants and rendered large areas of the dunes unsuitable for many native plant and animal species. European beachgrass alters natural dune processes by forming dense, tall vegetation capable of trapping windblown sand within a relatively narrow zone landward of the beach, and regenerating rapidly after burial by sand. This process results in foredunes of high vegetation density, steepness and elevation immediately behind the beach, compared with broad, mounded semi-open foredune zones formed by native prostrate dune vegetation. European beachgrass also modifies sand deposition patterns around the outlets (mouths seaward of culverts) of the wetlands, affecting the hydrology of the wetlands. Segments of the elevated road berm and European beachgrass occur parallel to the beach, displacing nesting habitat for western snowy plovers (listed as Federally Threatened) and creating an access barrier for fledglings to forage.

The partially eroded haul road and culvert system will continue to impair fen wetland hydrology if no action is taken. The culverts are located behind relatively wide (past or current European beachgrass-influenced) foredunes that temporarily protect them from direct storm wave erosion. Partial storm wave erosion of the rusted metal culverts would result in hazardous and esthetically unacceptable conditions, and may result in persistent artificial influence of wetland outlet hydrology. Partial storm wave erosion of the haul road results in formation of a steep cliff-like dune scarp with an asphalt-armored top that impedes establishment of native dune vegetation (root zone restriction, inhibition of colonization). Active removal of the haul road, culverts, and beachgrass would accelerate recovery of the dune and wetland complex within the Preserve, particularly the critical outlets of the fen wetland systems. The proposed project would remove unnatural features to restore native habitats and to preserve “endangered plant and animal species and their supporting ecosystem”.

2.4 PROJECT OBJECTIVES

The MacKerricher State Park General Plan (1995) identifies restoration of natural vegetation and geologic processes, preservation and protection of sensitive species and critical habitat, and eradication of European beachgrass (*Ammophila arenaria*) as important objectives for management of the coastal dunes. Additionally, the General Plan recognizes maintenance of natural processes at river and creek mouths as a resource management objective for coastal strand habitat areas.

The primary objective of the project is to restore natural processes in a 1285-acre dune ecosystem of statewide significance within a Natural Preserve. Artificial structures that impede naturally dynamic sand and water movement would be eliminated from the preserve by the removal of a 2.7 mile (4.3 km) segment of road and two culverts. Approximately 250 acres of nesting habitat for the federally listed western snowy plover and 60 acres (24.3 ha) of native dune vegetation, including portions that can support habitat for the federally listed Howell's spineflower and Menzies' wallflower, would be opened up as a result of the removal of the road and European beachgrass.

2.5 PROJECT DESCRIPTION

CSP proposes to restore ecosystem processes that are crucial to the viability of endangered species and their habitats in the Inglenook Fen-Ten Mile Dunes Natural Preserve (Preserve) through the implementation of project activities designed to remove unnatural elements and avoid impacts to sensitive cultural sites.

The following summarizes the proposed work:

- Remove three segments of abandoned asphalt roadway and underlying rock base totaling 2.7 miles (4.3 km). Some portions of the road will remain intact to protect sensitive resources.
- Remove two approximately 5-foot diameter (1.5 meter) culverts and associated fill materials to restore the stream bed, bank, and channel to a natural condition and reestablish native plant vegetation.
- Remove approximately 38 acres (15.4 ha) of previously treated European beachgrass using hand labor and approximately 15 acres (6.07 ha) of previously untreated European beachgrass through a long-term program of hand removal and native plant reestablishment.
- Remove other non-native plants, including trees and shrubs through a long-term program that includes reestablishing native dune forest in an approximate 7 acre (2.8 ha) area of back dunes.
- Reestablish federally and state-listed threatened and endangered species and other native plants into suitable habitat by direct seeding, transplanting, or installation of cuttings.
- Remove iceplant in select areas to increase habitat for the federally listed Howell's spineflower.

2.6 PROJECT IMPLEMENTATION

<u>Road and Culvert Removal</u>

CSP proposes to remove sections of a remnant haul road totaling approximately 2.7 miles (4.3 km) in length. The Ten Mile Dunes haul road proposed for removal begins 0.81 miles (1.3 km) north of the Preserve's southern boundary near Ward Avenue and continues north to the Ten

Mile River and estuary at the Preserve's northern boundary. The road runs roughly parallel to the coastal strand and crosses two creeks: Fen Creek to the south and Inglenook Creek to the north. Due to erosion and washouts, some sections of the road are isolated and non-contiguous to the rest of the road.

At the southern end of the Preserve and north of the Ward Avenue access, the road has been completely washed out and no longer exists as a roadway. Heavy equipment necessary for the removal of the road cannot negotiate the existing footpath from the bluffs to the beach. The narrow path is also a popular access point for recreationists. Vehicle traffic on the beach or through the adjacent dune system in this area would cause negative impacts to federally listed plant and wildlife species. South of Fen Creek the road becomes severely eroded and is broken into two disconnected portions. However, the road is intact in the northern portion of the Preserve, although some segments are covered in loose sand. Vehicle access is available to this area from a gated road located near the Ten Mile River Bridge. Due to these conditions, all vehicle and equipment access to the work site would be from the north near the Ten Mile River Bridge, making use of the existing roadway to drive equipment as far south as possible. Where the roadway ends, a temporary ramp made of natural rock material may be used to move vehicles from the road berm edge to wet sand on the beach below in order to reach stranded remnants of the old haul road at the southern end of the Preserve. Road removal work will begin at the southern portion of the Preserve, with vehicles returning to the road where it is still intact to haul out materials as the project progresses northward.

Based on site analysis by project engineers and data from ground-penetrating radar, CSP estimates that the total volume of materials to be removed is approximately 25,000 cubic yards (19,114 cubic meters). Materials removed during the project may be temporarily stockpiled within the project area on areas selected to avoid sensitive resources. Materials such as concrete, asphalt, road base and metal culverts would be recycled or reused if possible. A portion of the road materials would be available to the contractor for salvage. The remainder may be hauled approximately 20 miles (32 km) south to the old quarry site on CSP property at Big River to be used for future park projects, or hauled to other local sites for potential use by others. If equipment operates 5 days per week, CSP estimates that removal of the road and the hauling of materials from the stockpile area to disposal sites will take approximately 45 working days, or 9 weeks. Delivery of a portion of those materials to the Big River quarry site would take approximately 21 working days, or 4 weeks.

To facilitate road removal, the road is divided into three segments, or portions (Table 2.6–01: Ten Mile Dunes Haul Road Removal Portions and Culverts).

The three sections proposed for removal are: Portion 1, the southernmost remnant beginning 0.81 miles (1.3 km) north of the Preserve's southern boundary near Ward Avenue; Portion 2, beginning 0.59 miles (0.95 km) south of Fen Creek; and Portion 3, beginning 0.41 miles (0.66 km) south of Fen Creek and continuing largely intact to the Preserve boundary to the northeast (See Appendix A.1 - Dune Rehabilitation Project Overview Map). Two culverts will be removed along Portion 3 at Fen Creek and Inglenook Creek. In general, the project proposes to remove the entire length of the haul road including remnant asphalt surface and underlying road base within the Preserve's dune system, except where removal would harm sensitive resources.

Portion 1

Portion 1 stretches about 720 feet (220 m) in length above the coastal strand. It is disconnected from the existing haul road to the north and south. The portion sits atop foredunes, and annual high winter tides further undercut the portion. Segments of the remaining asphalt are unstable and perched above an actively changing beach/coastal strand. Asphalt segments that have broken off lean against the coastal side of the elevated road berm and are carried to sea by high waves during storm events (Figure 2.6–01).

Access to Portion 1 would require that project equipment and vehicles travel across wet sand below the high tide line to approach from the coastal side. CSP staff will conduct daily project area surveys for sensitive species prior to allowing vehicle access on the beach.

Figure 2.6–01: Portion 1-Vertical Position

Figure 2.6–02: Portion 2-Horizontal Position

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Portion 2

Portion 2 is a 262-feet (80 m) segment above the coastal strand approximately 200 feet (61 m) NNE (up the coast) from Portion 1. This portion is also isolated from other road portions without access by the existing haul road. Portion 2 sits atop foredunes and annual high winter tides further undercut it. Large segments of asphalt are leaning against the coastal side of the remnant road berm (Figure 2.6–02).

Access to Portion 2 will require project equipment and vehicles to travel across wet sand below the high tide line to approach from the coastal side. Similar to requirements for Portion 1, CSP staff will conduct daily project area surveys for sensitive species prior to allowing vehicle access on the beach.

Portion 3

The largest portion of road to be removed is Portion 3. A little under 2.5 miles (4 km), it extends from approximately 755 feet (230 m) NNE (up the coast) from Portion 2 to the northern end of the haul road at the Preserve boundary. The haul road then continues on adjacent private property, where it will not be treated as part of this project. The road in Portion 3 angles slightly back from the coastal strand, and crosses Fen Creek and Inglenook Creek. This portion can be accessed from the existing haul road in its entirety and is mostly intact with the road base still in place. In numerous places, windblown sand has covered the road to a depth of several feet.

Treatment of Portion 3 will include sand removal from the road surface to facilitate vehicle and equipment access as well as asphalt and road base removal using heavy equipment, except in those areas identified to avoid sensitive resources. Approximately 6000 cubic yards (4587 cubic meters) of sand would be removed and temporarily stockpiled in approved locations adjacent to the road berm. Equipment will operate on the existing roadway to remove asphalt and road base. As asphalt and road base are removed by sections, the stockpiled sand, with associated plant materials and native seed, will be moved back to replace the former road.

Fen Creek is currently channeled to flow beneath the haul road through a culvert. Where Inglenook Creek passes under the haul road, concrete riprap is visible below the western side of the road. Inglenook Creek may be passing through an unseen culvert below the riprap or simply seeping through the structure and partially blocked culvert. Channel restoration for both creeks would include excavating the fill material and pulling out culvert structures to return the channel to a more natural state, and allowing natural processes to establish the channel configurations. Native vegetation will become reestablished where suitable through natural regeneration, or through a combination of natural regeneration augmented with the installation of cuttings and/or direct seeding. All non-ballast materials and structures will be transported offsite for disposal and reused or recycled if possible.

Table 2.6 – 01: **Ten Mile Dune Haul Road Removal Portions and Culverts**

Ten Mile Dunes Haul Road /Culvert crossing to be removed	Approx. Length feet (meters)	Portion End Point	Latitude and Longitude (in decimal degrees)		UTM Zone 10 NAD 83 EAST	UTM Zone 10 NAD 83 NORTH	Township, Range, Section, ¼ section
Portion 1	720 (220)	South	39.512818	-123.781958	0432780	4373979	19N, 17W ,17, NW
		North	39.514672	-123.781059	0432859	4374184	
Portion 2	260 (80)	South	39.515150	-123.780890	0432874	4374237	19N, 17W ,17, NW
		North	39.515801	-123.780572	0432902	4374309	
Portion 3	13,120 (4000)	South	39.517699	-123.779697	0432979	4374519	19N, 17W, 05 & 08, SE–NE
		North	39.548977	-123.765650	0434216	4377980	20N, 17W, 33, SW
Crossings							
Fen Creek	300 (91)		39.523030	-123.776220	0433283	4375108	19N, 17W, 08, SW
Inglenook Creek	400 (122)	North	39.530260	-123.772961	0433570	4375908	19N, 17W, 08, NW
		South	39.529826	-123.773108	0433557	4375860	

European Beachgrass Removal

The establishment of European beachgrass in dune ecosystems drastically impacts native habitats by altering the natural topography and outcompeting native plants, often to the point of exclusion (see discussion under 3. IV Biological Resources, Flora, Other (Non Special Status) Natural Communities) In the Preserve, European beachgrass occupies the habitat of the federally and state listed Howell's spineflower (*Chorizanthe howellii*) and Menzies' wallflower (*Erysimum menziesii* spp*. menziesii*) and at least four other plants of limited distribution recognized within the California Rare Plant Rank list (formerly CNPS list) (*Abronia umbellata* ssp. *breviflora*, *Gilia millefoliata*, *Collinsia corymbosa*, and *Oenothera wolfii*).

The removal of European beachgrass has been an ongoing integrated pest management project in the Preserve since approximately 2000. A 2-acre (0.8 ha) patch north of Inglenook Creek and a 3.5-acre (1.4 ha) patch south of Fen Creek were pulled by hand from 2001-2004. In September 2006 an 80-acre (32.4 ha) prescribed burn was conducted to reduce the European beachgrass thatch and promote new, green shoots for herbicide treatment the following year. Since 2007 different areas of European beachgrass have been treated and retreated with glyphosate and imazapyr herbicides.

For the proposed project, European beachgrass throughout the Preserve will be removed with hand labor. Primary treatment areas include 15 acres of European beachgrass that have not previously been treated and 38 acres of European beachgrass that will be retreated to gain optimal control. Since 2007, the original cover of 95 acres of European beachgrass has been reduced by approximately 60%; the retreatment areas are contained within the remaining 40%. A secondary treatment area consists of 7 acres (2.8 ha) of European beachgrass growing within an eastern area of the Preserve. Removal of beachgrass in this secondary area will be undertaken through a long-term program that first includes the reestablishment of native trees (pines) to regenerate former areas of dune forest.

(Primary) New Treatment Areas – Approximately 15 acres (6.9 ha) of European beachgrass that was not previously treated (pulled, burned, or herbicide application) will be removed using hand labor to reduce the cover and spread in dune habitat. All work will follow avoidance measures for rare plants and animals (See Standard Project Requirements – Biological Requirements).

(Primary) Retreatment Areas – Approximately 38 acres (15.4 ha) of European beachgrass growing within an area of approximately 95 acres (38.4 ha) will be pulled in the same manner as the New Treatment Areas described above. In retreated areas, the total cover of European beachgrass has been reduced by approximately 60% since treatment in 2007, thus 40%, or 38 acres (15.4 ha) of the original 95 acres (38.4 ha) of European beachgrass currently remain and will be removed. All work will follow avoidance measures for rare plants and animals (See Standard Project Requirements, Biological Requirements).

Secondary Treatment Area –A 7 acre (2.8 ha) area of steep dunes primarily covered in European beachgrass occupies the eastern portion of the Preserve west of Beal Lane and Ocean View Drive. Other plants occurring here are Scotch broom (*Cytisus scoparius*), lupine

(*Lupinus littoralis*), Douglas-fir (*Pseudotsuga menziesii*), shore pine (*Pinus contorta* ssp. *contorta.*), Monterey pine (*Pinus radiata*), bishop pine (*Pinus muricata*), scattered eucalyptus saplings (*Eucalyptus globulus*) and pampas grass (*Cortaderia jubata*) (Figure 2.6–03). Immediately to the east of this area is a stand of willow and conifers.

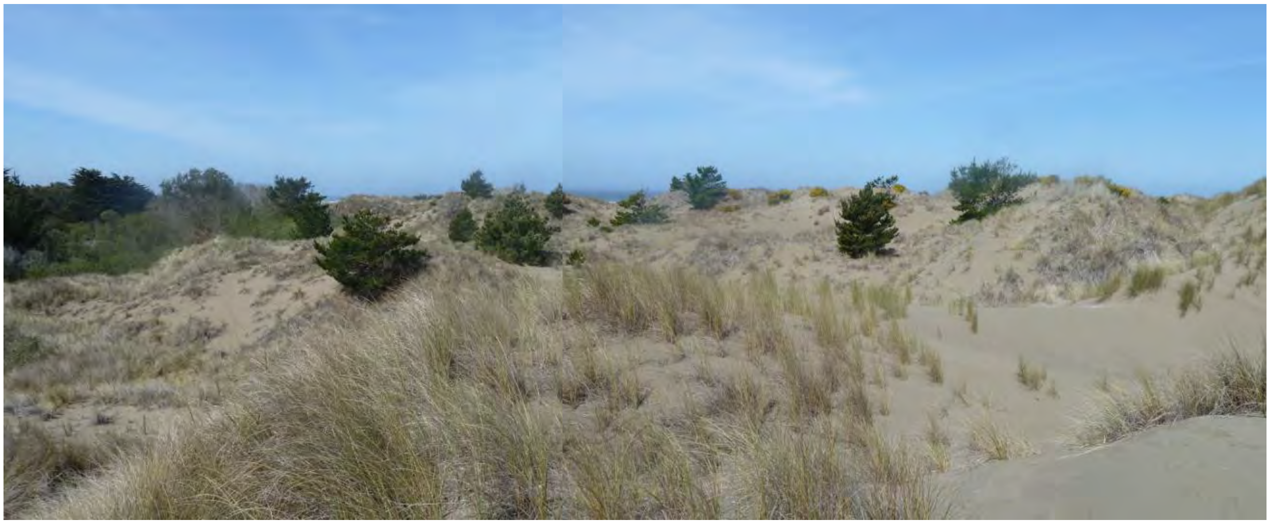

Figure 2.6–03: Photograph of Secondary Treatment Area

While wind-transport of sand is a natural process in a dune environment, sand becomes deposited and its movement halted on the eastern fringes of dunes where conifers are established. This type of dune is called a precipitation ridge, and is a typical feature of mobile dunes that migrate into forests. The removal of wooded areas backing the eastern edge of the Ten Mile Dunes has provided an uninterrupted path for wind-carried sand and the landward expansion of the dunes in the Preserve (Barry & Schlinger 1977). Thus, the management objective for the 7 acre secondary treatment area is to facilitate re-initiation of native pine forest succession in dunes at the landward margins of the dunes in selected areas, where appropriate. This would entail partial stabilization of dune scrub landward of the proposed dune forest succession zone. Once the forest canopy reaches elevations exceeding the dunes upwind, the forest canopy would interact with any future mobile dunes by precipitating a steep, slow-moving dune slipface from northwestern winds moving across the dunes, thus allowing sand to deposit on the sheltered dune slipface. This dune would migrate only very slowly landward compared with unvegetated, convex mobile dunes.. This approach will provide a vegetative buffer for the wetland to the east, affording it more protection and creating an environment that likely resembles pre-European landscape influences. Dune forest succession would also promote recovery of dune forest plant and insect species diversity that has been lost (reduced to small dune forest remnants) during the 20th century. It will also incidentally provide a dune migration buffer for the residences neighboring the eastern edge of the sand dunes. Native tree establishment will be further encouraged in this area by protecting those that do occur and potentially transplanting seedlings of native trees where appropriate.

European beachgrass, Monterey pine, broom, and eucalyptus growing in the 7 acre area will still be removed, but as a secondary priority and slowly over time once the native trees are well established. The woody plants will be cut and either left in place to provide structure for sand entrapment and native seed establishment, or burned on-site. Broom will be pulled with a weed wrench. Eucalyptus in the area will be pulled where possible or otherwise cut low to the ground. Follow-up treatment to eliminate eucalyptus sprouts will involve using hand tools to cut newly emerged sprouts at the point of attachment before they reach 2 feet in height. Hand pulling will also be used to remove broom, Monterey pine, and eucalyptus seedlings until eradication is successful.

Where other sensitive resource sites occur throughout the Preserve, including within the 7 acre area, ground disturbance will be avoided. Monterey pines may be girdled and left to provide wildlife habitat. Species that resprout will be cut at ground surface and sprouts removed by hand until growth reserves in the roots are exhausted.

Temporary Closures During Implementation

Prior to actual project implementation, preparatory actions would be taken in all park areas in which visitor access or recreation may be constrained or restricted due to project activities. Project information and area closure notices would be issued by the Mendocino District State Parks Superintendent and published in local newspapers, as well as posted on the CSP website. During work activities, appropriate signs and notices would be provided at main access areas to alert park visitors to potential vehicle traffic or temporary road and area closures. Educational or safety-related information would be posted, and staging areas and travel corridors would be flagged and signed to insure visitor safety. These actions would also be applied to any use of the M1 road to the Big River quarry.

2.7 PROJECT REQUIREMENTS

BIOLOGICAL PROJECT REQUIREMENTS

BIO–1a. Standard Project Requirement: Plants	a) All personnel engaged in restoration activities with the potential to harm special status plants will be instructed by a CSP-approved biological monitor in the identification of such special status plants and how to avoid them. b) Special status plant stands have been surveyed and mapped. Prior to work in these areas, special status plant boundaries will be identified in the field at the beginning of the work day and instruction on how to operate in these areas to avoid plants will be given to workers. c) Project work in new areas will commence only after seasonally-appropriate special status plant surveys are completed.

BIOLOGICAL PROJECT REQUIREMENTS (continued)

BIO–1b. Specific Project Requirement: Plants	a) Sand will not be stored in designated "Sand Storage Exclusion Zones" (also known as Sensitive Resource Areas) nor will project activities occur in these mapped areas east and west of the haul road. A CSP-approved biological monitor will flag these areas prior to the start of project activities. b) Stored sand will not be piled higher than the adjacent foredunes to prevent excessive sand movement. c) Excavated sand on top of the road will be moved to the nearest site outside of the "Sand Storage Exclusion Zones," and where feasible, sand storage will primarily occur on the west side of the haul road and secondarily on the east side. d) Care will be given to ensure that root systems of special status plants are not dislodged where invasive plants are hand-pulled. e) The small patches of *Horkelia marinensis* and *Oenothera wolfii* occurring within the 50 ft (15 m) road buffer will be flagged before construction and avoided. f) To maintain genetic integrity, only plant stock collected within the Ten Mile Dunes Natural Preserve will be used for revegetation in the project area.

BIOLOGICAL PROJECT REQUIREMENTS (continued)

BIO–2a. Standard Project Requirement: Vegetation Communities	a) All personnel engaged in restoration activities with the potential to harm special status natural communities will be instructed by a CSP-approved biological monitor in the identification of such special status natural communities and how to avoid them. b) Special status natural communities have been surveyed and mapped. Prior to work in these areas, special status natural community boundaries will be identified in the field and flagged where appropriate at the beginning of the work day and instruction on how to operate in these areas will be given to workers by a CSP-approved biological monitor.
BIO–2b. Specific Project Requirement: Vegetation Communities	a) Sand will not be stored in the designated "Sand Storage Exclusion Zones" nor will project activities occur in these mapped areas east and west of the haul road. A CSP-approved biological monitor will flag these prior to the start of project activities. b) Excavated sand on top of the road will be moved to the nearest site outside of the "Sand Storage Exclusion Zones", and where feasible, sand storage will primarily occur on the west side of the haul road and secondarily on the east side. c) Stored sand will not be piled higher than the adjacent foredunes to prevent excessive sand movement. Piled sand will be routinely monitored and silt fencing will be installed if it is determined that sand piles become mobile.

BIOLOGICAL PROJECT REQUIREMENTS (continued)

BIO–3a. Standard Project Requirement: Wetlands	a) Integration of Standard Project Requirement HAZ–1 will prevent impacts to water quality from possible pollutants (fuels, vehicle fluids) released from vehicles, and heavy equipment during the project.
BIO–3b. Specific Project Requirement: Wetlands	a) All fill from road berm that is currently within the creek channel will be removed from the creek bed and channel unless it is otherwise part of the engineering plans that reestablish native topography.

BIOLOGICAL PROJECT REQUIREMENTS (continued)

BIO–4. Specific Project Requirement: Invertebrates	a) A CSP-approved biological monitor will conduct a visual survey of project areas immediately before ground-disturbing project activities are to begin, relocating any globose dune beetle or Ten Mile shoulderband snail found into adjacent, suitable habitat. b) Sand storage areas will be visually surveyed for globose dune beetle and Ten Mile shoulderband snail by a CSP-approved biological monitor before sand is placed in the area. Any individuals found will be relocated into adjacent, suitable, undisturbed habitat areas. c) Project personnel will be instructed by a CSP-approved biological monitor regarding the identification and life history of Ten Mile shoulderband snail, and instruction on the appropriate protocol to follow in the event that an individual resembling this species is found in the areas where project work is being conducted.

BIOLOGICAL PROJECT REQUIREMENTS (continued)

BIO–5 Project Requirement Amphibians and Reptiles	a) Project personnel will be instructed by a CSP-approved biological monitor regarding the life history and habitat requirements of amphibians and reptiles, and instruction in the appropriate protocol to follow in the event that an amphibian or reptile is found on site. b) A CSP-approved biological monitor will be on site during all activities to ensure there are no impacts to amphibians or reptiles. c) Immediately prior to the start of work each morning a CSP-approved biological monitor will conduct a visual inspection of the project zone where activities will take place. d) If reptiles or amphibians are found, start of work at that project location will be delayed until the individuals are captured and relocated upstream or into suitable protected habitat by CSP-approved personnel.
BIO–6a. Standard Project Requirements: Fish	a) Streams and riparian zones will not be used as equipment staging or refueling areas. Equipment will be stored, serviced, and fueled away from streams and riparian areas. Heavy equipment will be cleaned (e.g., power washed, steamed) off-site prior to being used below the ordinary high water mark.
BIO–6b. Specific Project Requirements: Fish	a) At Fen Creek and Inglenook Creek, stream flow will be diverted following specifications detailed in the Water Diversion Plan submitted with the Streambed Alteration Agreement for the project. Where flow is sufficient to be intercepted, a small diversion dam will be built upstream and stream flow piped around the worksite and discharged into the stream below the worksite. If the stream is flowing at a slow rate and cannot be captured and diverted, filter structures will be installed downstream to filter turbid discharge from the work site. b) Erosion control measures will include slash packing and willow sprigging with native vegetation where appropriate for road crossings and culvert removal areas at Fen Creek and Inglenook Creek.

BIOLOGICAL PROJECT REQUIREMENTS (continued)

BIO–6c. Specific Project Requirements: Fish. Tidewater goby	a) Under the direction of USFWS-permitted personnel, qualified staff will conduct pre-project surveys for Tidewater goby presence in Fen Creek and Inglenook Creek, at and downstream from the project area, within 30 days prior to project activity. The USFWS Recovery Plan for tidewater goby identifies July 1 to October 31 as the season of highest abundance for the species in general. b) As a precaution, avoidance measures recommended by the USFWS will be implemented to prevent potential impacts to tidewater goby and habitat. In the event that tidewater goby is detected in either Fen Creek or Inglenook Creek, Technical Assistance will be requested from USFWS.
BIO–7a. Standard Project Requirements: Birds	a) Additional project requirements will be incorporated with permit conditions in compliance with California Endangered Species Act (CESA), California Fish and Game Code §3503, 3503.5 and 3511, as well as the United States Endangered Species Act of 1973and Migratory Bird Treaty Act of 1918 unless exceptions are authorized through permitting and/or technical assistance from the DFG, USFWS, or other appropriate authority. b) Prior to project activities a CSP-approved biological monitor will survey project areas and surrounding suitable habitats for nesting birds. If breeding is discovered, avoidance measures as detailed below will be implemented to minimize disturbance.

BIOLOGICAL PROJECT REQUIREMENTS (continued)

BIO–7b Specific Project Requirement: Birds. Nesting Raptors and Migratory Birds	a) If possible, noise-generating project activities will not occur during the raptor and migratory bird breeding season (February 1 – September 15). b) If project-related activities must be scheduled during the breeding season, then focused surveys for nesting migratory bird and raptor species will be conducted by a CSP-approved biologist before project activities occur in these months to identify active nests. c) Surveys for active raptor nests will be conducted within a 500-foot (152 m) radius of the project area 10 days prior to the beginning of project work at each site. If nesting raptors are found, no project activities will occur within a 500-foot (152 m) radius of the nest until the young have fledged and the young will no longer be impacted by project activities (as determined by a CSP-approved biologist) and there is no evidence of a second attempt at nesting. d) Surveys for active migratory bird nests will be conducted within a 100-foot (30.5 m) radius of the project area 10 days prior to the beginning of project work at each work site. If active nests are located, then no project activities will occur within a 100-foot (30.5 m) radius of the nest location until the young have fledged and the young will no longer be impacted by project activities (as determined by a CSP-approved biologist).
BIO–7c. Specific Project Requirement: Birds. Wintering burrowing owl	a) Surveys for burrowing owls and active owl burrows will be conducted within a 164 ft. (50 m) radius of the project area prior to the beginning of project activities b) No disturbance will occur within 164 ft. (50 m) of occupied burrows during the nonbreeding season of September 1 through January 31

BIO–7d. Specific Project Requirement: Birds. Western Snowy Plover	a) When practicable, project activities will occur during the non-breeding season, from September 15 - March 15. b) Each day, prior to the start of project work, all areas within 1000 feet (300 meters) of project activities will be surveyed for the presence of snowy plovers. The first survey will be conducted the day before the start of the project. Surveys will follow the general survey methods described in the Mendocino District's Recovery Permit. c) If plovers are *not* seen in the survey area, the project facilitators will be given direction to proceed, with the condition that a plover surveyor be present to monitor the project while it is ongoing. d) If plovers are seen within 660 feet (200 meters) of the project area, activities in that area will be cancelled until the next day, and another survey will be conducted. e) If birds are seen on the second survey, but no nest is found, the project will proceed with a plover surveyor in attendance for monitoring. f) Plover surveyors will be responsible for directing project facilitators to stop or modify activities if plovers exhibit disturbance behavior that is related to the project activity. g) If at any time a nest is located within 330 feet (100 meters) of the project, project work in that area will be canceled until the end of the breeding season, or until further monitoring activities document that the nest is no longer active. h) Vehicle use will be minimized to the extent practicable. Vehicles will operate on the haul road instead of the beach whenever practicable. A corridor will be delineated and clearly marked by a qualified monitor to provide vehicle access from the haul road to the beach; only approved corridors will be used for this purpose. Vehicles operating on the beach will be accompanied by a qualified monitor, and remain on wetted sand whenever possible. i) Project work, including operation of vehicles, will occur no earlier than ½ hour after sunrise and conclude at least ½ hour before sunset. j) Coastal strand habitat will not be used as equipment staging or refueling areas. Equipment will be

	stored, serviced, and fueled away from coastal strand and dune areas. Heavy equipment will be cleaned (e.g., power washed, steamed) off-site prior to being used below the ordinary high water mark. k) CSP may consult with USFWS and request technical assistance for site-specific avoidance or mitigation measures. Any such changes will be amended into the Mitigated Negative Declaration if necessary.
BIO–8. Standard Project Requirements: Marine Mammals	a) Additional project requirements will be incorporated with permit conditions in compliance with California Endangered Species Act (CESA), and California Fish and Game Code §4500, and the United States Endangered Species Act of 1973. b) In the event a marine mammal hauls out onto the coastal strand, project activities will be minimized to the extent practicable within 820 feet (250 meters). c) Travel along the wet sands below the tide-line will cease within 330 feet (100 meters) of the marine mammal until it has returned to the ocean. d) Project activity will be minimized to the extent practicable until the marine mammal has departed the area.

CULTURAL RESOURCES PROJECT REQUIREMENTS

CULT–1. Standard Project Requirement: Prior to project implementation	a) A CSP-qualified Archaeologist will consult with the contractor and project manager to identify all cultural resources that must be protected. b) A CSP-qualified Archaeologist will flag and/or fence all cultural resources with a buffer of 25 meters for avoidance during project activities. The fencing will be removed after the project has been completed. c) Prior to any earthmoving activities, a CSP-qualified Archaeologist will approve all subsurface work, including the operation of heavy equipment within 82 feet (25 meters) of the identified sensitive resource area. d) A CSP-qualified Archaeologist will train project personnel in cultural resource identification and protection procedures. e) Any locations where ground disturbing activities are proposed for the removal of invasive plant species or for planting of native plants will require additional archaeological review. This will include archival research and possible field investigations to identify previously undocumented archaeological resources in specified treatment areas.

CULTURAL RESOURCES PROJECT REQUIREMENTS (continued)

CULT–2. Specific Project Requirements: Prior to project implementation	a) A CSP-qualified Archaeologist familiar with the project will provide the project manager a site-specific avoidance plan with associated maps developed for this project. These documents will illustrate the extent of permissible project work at each culturally sensitive area and will be based on the extent of the archaeological constituents, the location of the resource in relation to the area of direct impact, and the level of proposed ground disruptions at each location. Due to the sensitivity of the archaeological resources and associated confidentiality issues, the avoidance plan and maps will not be provided in this public document; but rather, to the project manager and other appropriate project personnel when completed. b) A CSP-qualified Archaeologist familiar with the project will review and authorize all vehicle and equipment staging and material storage sites except those staging/storage locations situated on the currently paved surface of the Haul Road or those locations outside of the park. c) All excess sand generated from clearing of the haul road can be disposed of in the Preserve; however, disposal locations will not be allowed within the boundaries (with a 25 meter buffer) of archaeological sites. Additionally, prior to disposal of the excess sand, locations selected for this activity will need clearance from a CSP-qualified Archaeologist.
CULT–3. Specific Project Requirements: General Avoidance	a) Foot traffic through archaeological sites is prohibited unless approved by a CSP-qualified Archaeologist. Additionally, this equipment will be restricted to the hardened footprint of the former haul road. If circumstances dictate the need to deviate from the road footprint, these areas will require prior clearance from the CSP-approved Archaeologist reviewing the project. b) Vehicle access and equipment staging will not be allowed in known archaeological site locations. c) No plant eradication activities will be allowed within the boundary of archaeological deposits. This will include a 25 meter buffer around the site. d) Plant revegetation efforts within the boundary of archaeological sites, including a 25 meter buffer will be limited to seed broadcasting only. e) All introduced materials (ballast, road base, asphalt, etc.) associated with the removal of the haul road will be disposed of outside of the Preserve and the greater MacKerricher State Park.

CULT–4. Specific Project Requirements: Documented Archaeological Site Avoidance **This Section Is not to be available to the public.**	
CULT–5. Standard Project Requirement: Monitoring	a) A CSP qualified Archaeologist will monitor all ground disturbing phases of this project at his/her discretion (refer to Specific Project Requirements related to monitoring). **i.** The project manager will notify the CSP Northern Service Center or District Cultural Resource Section a minimum of three weeks prior to the start of ground–disturbing work to schedule archaeological monitoring, unless other arrangements are made in advance.
CULT–6. Specific Project Requirements: Monitoring	a) Currently, a CSP-qualified Archaeologist will be present to monitor for all ground disturbing activities related to this project. These activities include but are not limited to road removal, culvert restoration, invasive plant removal, and revegetation efforts. In some instances, archaeological monitoring may not be warranted; however, this will be determined at the discretion of the CSP Archaeologist responsible for the review of this project.

CULTURAL RESOURCES PROJECT REQUIREMENTS (continued)

CULT -7. Specific Project Requirements for Inadvertent Finds	a) If previously undocumented archaeological resources are encountered during removal of the haul road material (asphalt, road base, and ballast), all work will cease at this location. Work can resume 25 meters past the find (point of discovery). If during resumed removal of the haul road evidence suggest the archaeological deposit is still present, than the same protocol described above will be implemented. This will be continued until evidence of the site is no longer present. This find will be appropriately documented, photographed, and mapped.
CULT–7. Standard Project Requirement: Undocumented Discovery	a) A CSP-qualified Archaeologist will record historic fabric or features discovered during the project (a photograph and/or drawing showing any new material must be prepared or recovered and archived). b) If a CSP-qualified Archaeological Monitor discovers previously undocumented cultural resources during project activities, work within 82 feet (25 meters) of the find will be temporarily halted until the Archaeologist designs and implements appropriate treatments in accordance with the Secretary of the Interior's Standards and Guidelines for archaeological resource protection. i. The project manager working with the Archaeologist will modify the project to ensure that project activities will avoid cultural resources upon review and approval of a CSP-qualified Archaeologist. ii. If ground disturbing activities uncover intact cultural features (including but not limited to dark soil containing shellfish, bone, flaked stone, groundstone, or deposits of historic ash), when a CSP-qualified Archaeologist is not on-site, the project manager will contact the CSP State Representative immediately and will temporarily halt or divert work within the immediate vicinity of the find until a CSP-qualified Archaeologist evaluates the find and determines the appropriate treatment and disposition of the cultural resource.

CULTURAL RESOURCES PROJECT REQUIREMENTS (continued)

CULT–8 Standard Project Requirement: Human Remains	a) In the event that human remains are discovered, work will cease immediately in the area of the find and the project manager/site supervisor will notify the appropriate CSP personnel. Any human remains and/or funerary objects will be left in place or returned to the point of discovery and covered with soil. The CSP Sector Superintendent (or authorized representative) will notify the County Coroner, in accordance with §7050.5 of the California Health and Safety Code, and the Native American Heritage Commission (or Tribal Representative). If a Native American monitor is on-site at the time of the discovery, the monitor will be responsible for notifying the appropriate Native American authorities. b) The local County Coroner will make the determination of whether the human bone is of Native American origin. c) If the Coroner determines the remains represent Native American interment, the NAHC in Sacramento and/or tribe will be consulted to identify the most likely descendants and appropriate disposition of the remains. Work will not resume in the area of the find until proper disposition is complete (PRC §5097.98). No human remains or funerary objects will be cleaned, photographed, analyzed, or removed from the site prior to determination. d) If it is determined the find indicates a sacred or religious site, the site will be avoided to the maximum extent practicable. Formal consultation with the State Historic Preservation Office and review by the Native American Heritage Commission/Tribal Cultural representatives will occur as necessary to define additional site mitigation or future restrictions.

GEOLOGY PROJECT REQUIREMENTS

GEO–1. Stand Project Requirements: Best Management Practices	a) Best Management Practices (see pertinent sections of Appendix E.1 - Best Management Practices) will be used in all project areas to control sand/soil movement and surface water runoff during excavation and removal of the road remnants and culverts. If excavation and removal of remnant road materials take place during winter months, temporary erosion control measures will be used to protect and "winterize" any soils stockpiled offsite.

GREENHOUSE GAS AND AIR QUALITY PROJECT REQUIREMENTS

GHG & AIR–1. Standard Project Requirement: Ozone-Related Emissions	a) CSP and its contractor(s) will maintain all construction equipment in good mechanical condition, according to manufacturer's specifications. Construction equipment exhaust emissions will not exceed Bay Area Air Quality Management District (BAAQMD) Regulation IV – Rule 400 – Visible Emissions limitations (Cal EPA 2007b). b) All off-road and portable diesel-powered equipment, including but not limited to bulldozers, graders, cranes, loaders, scrapers, backhoes, generator sets, compressors, auxiliary power units, will be fueled with California Air Resources Control Board (CARB)-certified motor vehicle diesel fuel. c) Idling time for all diesel-powered equipment will be limited to five minutes, except as necessary to maintain a continuous workflow or for safety considerations. d) The use of diesel construction equipment meeting the CARB's 1996 or newer certification standard for off-road heavy-duty diesel engines will be maximized to the extent feasible e) Electric and/or gasoline-powered equipment, or equipment using alternative fuels, such as compressed natural gas (CNG), liquefied natural gas (LNG), propane, or biodiesel, will be substituted for diesel-powered equipment, when available.

GREENHOUSE GAS AND AIR QUALITY PROJECT REQUIREMENTS (continued)

GHG & AIR–2. Standard Project Requirement: Particulate Matter Fugitive Dust Emissions	a) Ground-disturbing activities will be suspended when sustained winds exceed 25 miles per hour (40 kilometers per hour), instantaneous gusts exceed 35 miles per hour (56 kilometers per hour), or dust from project activities might obscure driver visibility on public roads. b) As necessary, disturbed areas of the site will be covered (tarped) or watered depending on the conditions, using water trucks and/or sprinkler systems, to prevent airborne dust from leaving the site. c) If available, reclaimed (non-potable) water will be used. d) Any dirt stockpiles will be covered (tarped) or watered daily, as necessary to prevent dispersion of windblown dust e) All trucks hauling dirt, sand, soil, or other loose materials on public roads will be covered or will maintain at least two feet (0.6 meters) of freeboard (minimum vertical distance between top of load and top of trailer), in accordance with California Vehicle Code Section 23114. f) Project requirements will also be implemented during holidays, weekend periods, or times when work is temporarily suspended, as necessary to control site conditions generating fugitive dust. Contact information for the project manager as well as the Mendocino County Air Quality District will be made available to the public to ensure compliance with applicable regulations.

HAZARDS AND HAZARDOUS MATERIALS PROJECT REQUIREMENTS

HAZ–1. Standard Project Requirements: Spill Prevention	a) All equipment will be inspected for leaks immediately prior to the start of the project, and regularly inspected thereafter until equipment is removed from park premises. b) No maintenance or fueling activities will be allowed within 200 feet (61 m) of any body of water. c) Fuel transfer will be done over an impervious surface. Portable containment equipment will be used during fueling. d) A Spill Prevention, Control, and Countermeasure Plan (SPCC Plan) will be prepared prior to the start of the project and an appropriate spill kit maintained onsite throughout the duration of the project. The SPCC Plan will include a map delineating project staging or storage areas and areas where refueling, lubrication, and maintenance of equipment may occur. In the event of a spill or release of any chemical on or adjacent to the project site, the contractor or equipment operator will immediately notify appropriate CSP staff and implement the Mendocino District Hazardous Spill Response Procedures. Appropriate agencies will be notified in the event of significant spillage. e) Other than emergency repairs, all equipment cleaning and repair will occur outside of the Natural Preserve at designated authorized sites. All contaminated liquids and materials and other hazardous compounds will be disposed of at a designated authorized site. f) When not in use, hazardous materials will be stored in a locked storage area. Materials will be transported to the work site in spill proof containers and will be secured in the vehicle so as to prevent spillage.
HAZ–2. Standard Project Requirements: Hazardous Substances Health and Safety	a) CSP will include, in any contract documents or in internal work plan documents, health and safety specifications regarding management of potential hazardous incidents. The specifications will include methods for safe handling, collection, and proper disposal of any contaminated soil and refuse uncovered during the excavation procedures; discuss the proper personal protection during project activities; the use of an exclusion zone if necessary to prevent exposure to the public; and the proper disposal procedures for any hazardous substances encountered. b) Project information and area closure notices will be issued by the Mendocino District State Parks superintendent and published in local newspapers as well as posted on the CSP website.

HAZ–3. Standard Project Requirements: Fire Management	a) A fire safety plan will be in place prior to the start of any project activities, including identified fire suppression equipment and completion of any required employee training. b) Spark arrestors or turbo-charging (which eliminates sparks in exhaust) and fire extinguishers will be required for all heavy equipment. c) Project work crews will be required to park vehicles away from flammable material, such as dry grass and brush. At the end of each workday, heavy equipment will be parked at a designated staging area located on asphalt or bare sand to reduce the chance of fire. d) Implementation of the SPCC Plan during all phases of the project will insure the proper use, storage, and disposal of any flammable materials used during the project. e) CSP staff will be required to have a CSP two-way communications radio on site, which will allow direct contact with the Northern Communications dispatch center, to facilitate the rapid dispatch of control crews and equipment in case of a fire. Fire suppression equipment will also be available within the park.

HYDROLOGY AND WATER QUALITY PROJECT REQUIREMENTS

HYDRO–1. Standard Project Requirements: Best Management Practices	a) Any additional requirements identified through the permitting processes will be incorporated into the project design and specifications, and implemented as part of the project scope to avoid potential natural resource impacts. b) State Parks will adopt best management practices (refer to GEO–1) and use materials, methods, and techniques to implement erosion and sedimentation control and to otherwise stabilize slopes and barren soil surfaces, as described in Appendix E.1 - Best Management Practices. c) Integration of Standard Project Requirement HAZ–1 will prevent impacts to water quality from possible pollutants (fuels, vehicle fluids) released from vehicles, and heavy equipment during the project.

LAND USE AND PLANNING PROJECT REQUIREMENTS

LAND–1. Standard Project Requirement:	a) Conditions and requirements identified through the Coastal Development Permit process will be incorporated into the project design and specifications, and implemented as part of the project scope to avoid potential natural resource impacts.

NOISE PROJECT REQUIREMENTS

NOISE–1. Standard Project Requirements: NOISE	a) Project activities will be limited to daylight hours, Monday - Friday. If work during weekends or holidays is required, no work will occur on those days before 7:30 am or after 8 p.m. b) Internal combustion engines used for any purpose at the job site will be equipped with a muffler of a type recommended by the manufacturer. Equipment and trucks used for project activities will utilize the best available noise control techniques (e.g., engine enclosures, acoustically-attenuating shields or shrouds, intake silencers, ducts, etc.) whenever feasible and necessary. c) Stationary noise sources and staging areas will be located as far from sensitive receptors as possible

2.8 VISITATION TO MACKERRICHER STATE PARK

MacKerricher State Park is open year round to visitors for picnicking, hiking, jogging, bicycling, wildlife viewing, swimming, fishing, equestrian use, camping and other recreational activities. The Preserve is available for light day-use activity, although with specific regulations to protect resource values.

According to the most recent Statistical Report from the California State Park System, visitation from July 2009 through June 2010 at MacKerricher State Park was 633,502 day-use visitors and 76,105 campers.

Most visitor activity is concentrated around popular areas such as Pudding Creek Beach, Laguna Point boardwalk, Lake Cleone, campgrounds and visitor center, and the old haul road trail between the trestle at Pudding Creek and Ward Avenue. The proposed project would not affect visitor use at any of these locations.

The Coastal Trail, which also includes the designated equestrian trail through the Park, runs along the shoreline on the beach and would not be permanently affected by the project.

The proposed project would temporarily exclude day-use visitors from areas within the Preserve where work is being conducted.

2.9 CONSISTENCY WITH LOCAL PLANS AND POLICIES

All project components would be implemented within the boundaries of MacKerricher State Park and would be consistent with the CSP mission and management directives aimed at protecting natural and cultural resources while providing for public recreational opportunities. This project would not conflict with local plans or land-use policies for the immediate area or for adjacent landowners, nor for the County of Mendocino Local Coastal Plan.

The proposed Dune Rehabilitation Project is consistent with the following resource management objectives stated in the MacKerricher State Park General Plan (June 2005):

- Restore natural vegetation and geologic processes to dune systems wherever possible.
- Preserve and protect sensitive species and critical habitat.
- Maintain natural processes at river and creek mouths.

The proposed Dune Rehabilitation Project is consistent with the following goals and tasks outlined in the Final Draft Ten Mile Dunes Management Plan (2007):

- Restore and protect the natural dynamic processes in the Preserve.
- Remove the haul road surface, base and other materials introduced to construct the road prism along its entire length through the Preserve.
- Improve and sustain the hydrological integrity of the Inglenook Fen, stream corridors, and other wetlands in the Preserve.
- Remove culverts at all stream crossings (along haul road) in the Preserve.
- Protect and restore all native vegetation types and plant communities within the Preserve.

- Develop and implement habitat restoration plans, including invasive plant removals, for ecologically damaged vegetation types and plant communities.
- Protect and enhance populations and habitats of federally endangered plant species.
- Increase and enhance potential habitat for federally listed plants in the Preserve.
- Eradicate all European beachgrass from the Preserve.
- Protect and perpetuate western snowy plovers and their foraging and nesting habitat.
- Improve plover habitat through eradication of European beachgrass.

2.10 DISCRETIONARY APPROVALS

CSP has approval authority for implementation of the proposed project. The project will require discretionary approval from the California Department of Fish and Game for a Streambed Alteration Agreement (SAA). CSP will file an application for the SAA once the Notice of Determination has been filed for this project. CSP will also file an application for a Clean Water Act (CWA) Section 404 Permit with the US Army Corps of Engineers, and an application for CWA Section 401 the NCRWQCB. NOAA Fisheries will be consulted as part of the Section 404 permitting process. The US Fish and Wildlife Service and California Department of Fish and Game will review the planned project sites with regard to potential impacts to western snowy plover, listed plant species, and their respective habitats. Any permits required related to the listed species will be obtained in consultation with these agencies. As the project lies within the coastal zone, the project will require discretionary approval from the Mendocino County Planning and Building Services Department or California Coastal Commission through the Coastal Permit process. Discretionary approval from the Mendocino County Air Quality District will be sought through an application for a 207.27 permit.

2.11 RELATED PROJECTS

Glass Beach Coastal Headlands Restoration Project – With funding from an internal Coastal Impact Assistance Program (CIAP) grant, CSP is removing approximately five acres (2.02 ha) of non-native, invasive plants, and restoring approximately one acre (0.4 ha) of eroded areas impacted by volunteer trails. The Glass Beach Headlands is a 30+ acre (12 ha) parcel located at the southern end of MacKerricher State Park, approximately 5 miles south of the Dune Rehabilitation project area, that supports the only known population of Point Reyes *Blennosperma* that occurs north of Point Reyes. Natural resource staff began hand removal of non-native plants, as well as collecting seeds of native plants.

Eradication of European beachgrass – The removal of European beachgrass has been an ongoing integrated pest management project in the Preserve since approximately 2000. A 2-acre (0.8 ha) patch north of Inglenook Creek and a 3.5-acre (1.4 ha) patch south of Fen Creek were pulled by hand from 2001-2004. In September 2006 an 80-acre (32.4 ha) prescribed burn was conducted to reduce the European beachgrass thatch and promote new, green shoots for herbicide treatment the following year. Since 2007 different areas of European beachgrass have been treated and retreated with glyphosate and imazapyr herbicides.

Eradication of Iceplant – The removal of iceplant has been an on-going integrated pest management project at MacKerricher State Park since approximately 1995. Patches of iceplant have been removed by hand near the parking area at Lake Cleone and east of the haul road to Ward Avenue. With federal funding through Section 6 of the Endangered Species Act, iceplant was removed in 2005 and 2006 from test plots south of Ward Avenue to assess the potential for reestablishment by *Chorizanthe howellii* (Howell's spineflower). The trials showed that spineflower successfully recolonizes sites where iceplant is removed adjacent to existing spineflower populations. Additional funding is currently available from the passage of Proposition 84 to continue iceplant removal at the park.

CHAPTER 3
ENVIRONMENTAL CHECKLIST

PROJECT INFORMATION

1. Project Title: MacKerricher State Park Dune Rehabilitation Project

2. Lead Agency Name & Address: California State Parks

3. Contact Person & Phone Number: Renee Pasquinelli: (707)937-5721

4. Project Location: Inglenook Fen - Ten Mile Dunes Natural Preserve, MacKerricher State Park

5. Project Sponsor Name & Address: California State Parks
   Mendocino District
   12301 N. Highway 1, Box 1
   Mendocino, CA 95460

6. General Plan Designation: Natural Preserve

7. Zoning: Open Space (OS) (Mendocino County General Plan Coastal Element Nov. 5, 1985, Revised March 11, 1991)

8. Description of Project:

CSP proposes to restore ecosystem processes that are crucial to the viability of endangered species and their habitats in the Inglenook Fen-Ten Mile Dunes Natural Preserve (Preserve) through the implementation of project activities designed to remove unnatural elements and avoid impacts to sensitive cultural sites.

The following summarizes the proposed work:

- Remove three segments of abandoned asphalt roadway and underlying rock base totaling 2.7 miles (4.3 km). Some portions of the road will remain intact to protect sensitive resources.
- Remove two approximately 5-foot diameter (1.5 meter) culverts and associated fill materials to restore the stream bed, bank, and channel to a natural condition and reestablish native plant vegetation.
- Remove approximately 38 acres (15.4 ha) of previously treated European beachgrass using hand labor and approximately 15 acres (6.07 ha) of previously untreated European beachgrass through a long-term program of hand removal and native plant reestablishment.
- Remove other non-native plants, including trees and shrubs through a long-term program that includes reestablishing native dune forest in an approximate 7 acre (2.8 ha) area of back dunes.
- Reestablish federally and state-listed threatened and endangered species and other native plants into suitable habitat by direct seeding, transplanting, or installation of cuttings.
- Remove iceplant in select areas to increase habitat for the federally listed Howell's spineflower.

9. Surrounding Land Uses & Setting: Refer to Chapter 3 of this document (Section IX, Land Use Planning)

10. Approval Required from Other Public Agencies: Refer to Chapter 2, Section 2.9

1. ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact", as indicated by the checklist on the following pages.

☐	Aesthetics	☐	Agricultural Resources	☐	Air Quality
☐	Biological Resources	☐	Cultural Resources	☐	Geology/Soils
☐	Hazards & Hazardous Materials	☐	Hydrology/Water Quality	☐	Land Use/Planning
☐	Mineral Resources	☐	Noise	☐	Population/Housing
☐	Public Services	☐	Recreation	☐	Transportation/Traffic
☐	Utilities/Service Systems	☐	Mandatory Findings of Significance	☒	None

DETERMINATION

On the basis of this initial evaluation:

I find that the proposed project **COULD NOT** have a significant effect on the environment and a **NEGATIVE DECLARATION** will be prepared. ☐

I find that, although the original scope of the proposed project **COULD** have had a significant effect on the environment, there **WILL NOT** be a significant effect because revisions/mitigations to the project have been made by or agreed to by the applicant. A **MITIGATED NEGATIVE DECLARATION** will be prepared. ☒

I find that the proposed project **MAY** have a significant effect on the environment and an **ENVIRONMENTAL IMPACT REPORT** or its functional equivalent will be prepared. ☐

I find that the proposed project **MAY** have a "potentially significant impact" or "potentially significant unless mitigated impact" on the environment. However, at least one impact has been adequately analyzed in an earlier document, pursuant to applicable legal standards, and has been addressed by mitigation measures based on the earlier analysis, as described in the report's attachments. An **ENVIRONMENTAL IMPACT REPORT** is required, but it must analyze only the impacts not sufficiently addressed in previous documents. ☐

I find that, although the proposed project could have had a significant effect on the environment, because all potentially significant effects have been adequately analyzed in an earlier EIR or Negative Declaration, pursuant to applicable standards, and have been avoided or mitigated, pursuant to an earlier EIR, including revisions or mitigation measures that are imposed upon the proposed project, all impacts have been avoided or mitigated to a less-than-significant level and no further action is required. ☐

______________________________________ ________________________

Renée Pasquinelli — Date
Environmental Coordinator

EVALUATION OF ENVIRONMENTAL IMPACTS

1. A brief explanation is required for all answers, except "No Impact", that are adequately supported by the information sources cited. A "No Impact" answer is adequately supported if the referenced information sources show that the impact does not apply to the project being evaluated (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on general or project-specific factors (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2. All answers must consider the whole of the project-related effects, both direct and indirect, including off-site, cumulative, construction, and operational impacts.

3. Once the lead agency has determined that a particular physical impact may occur, the checklist answers must indicate whether that impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate when there is sufficient evidence that a substantial or potentially substantial adverse change may occur in any of the physical conditions within the area affected by the project that cannot be mitigated below a level of significance. If there are one or more "Potentially Significant Impact" entries, an Environmental Impact Report (EIR) is required.

4. A "Mitigated Negative Declaration" (Negative Declaration: Less Than Significant with Mitigation Incorporated) applies where the incorporation of mitigation measures, prior to declaration of project approval, has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact with Mitigation." The lead agency must describe the mitigation measures and briefly explain how they reduce the effect to a less than significant level.

5. Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR (including a General Plan) or Negative Declaration [CCR, Guidelines for the Implementation of CEQA, § 15063(c)(3)(D)]. References to an earlier analysis should:

   a) Identify the earlier analysis and state where it is available for review.

   b) Indicate which effects from the environmental checklist were adequately analyzed in the earlier document, pursuant to applicable legal standards, and whether these effects were adequately addressed by mitigation measures included in that analysis.

   c) Describe the mitigation measures in this document that were incorporated or refined from the earlier document and indicate to what extent they address site-specific conditions for this project.

6. Lead agencies are encouraged to incorporate references to information sources for potential impacts into the checklist or appendix (e.g., general plans, zoning ordinances, biological assessments). Reference to a previously prepared or outside document should include an indication of the page or pages where the statement is substantiated.

7. A source list should be appended to this document. Sources used or individuals contacted should be listed in the source list and cited in the discussion.

8. Explanation(s) of each issue should identify:
   a) the criteria or threshold, if any, used to evaluate the significance of the impact addressed by each question **and**
   b) the mitigation measures, if any, prescribed to reduce the impact below the level of significance.

ENVIRONMENTAL ISSUES

I. AESTHETICS.

ENVIRONMENTAL SETTING

MacKerricher State Park is one of California's largest and finest coastal parks. It contains many varied natural communities including extensive dunes, unique wetland habitats, and a relatively undisturbed marine environment typical of the northern California coast. Important scientific resources in the Park range from several sensitive and rare plant and animal species to Inglenook Fen, the only coastal fen in California. In addition, MacKerricher's cultural resources chronicle Native American activities in the area dating back more than 2,000 years.

The Inglenook Fen-Ten Mile Dunes Natural Preserve is located in the northern portion of MacKerricher State Park. The Preserve is bordered by the Ten Mile River and estuary to the north, with State Highway 1, a National Scenic Byway, and rural residential properties forming the eastern boundary. To the south lie the more developed recreational areas of MacKerricher State Park and the adjacent community of Cleone. The western edge of the Preserve is shared with the Pacific Ocean, providing an uninterrupted vista of the sea and sky. Above the beach, remnants of an old haul road bisect the foredunes of the Preserve from north to south, with some sections of asphalt intact while other areas are severely eroded or washed away entirely.

Between highway and ocean an extensive dune system covers more than 1,200 acres, one of the major scenic attractions and prominent features of the Park. The sweeping vista of undulating dunes formed at the ocean's edge and sculpted by relentless wind is a visual opportunity found in few other places in the state. Hidden among the ridges and swales are pockets of life where highly specialized plants take hold in the shifting sands, including the unique flora of the Inglenook Fen, a relic plant community from the last ice age. In spring and summer, low mats of vegetation carpet the dunes with delicate and colorful blooms. Meandering tracks of insects, birds, small mammals and larger predators provide further proof that this harsh environment supports a rich diversity of life. European beachgrass, an introduced and non-native plant species, has invaded much of the dune system, altering dune formation and crowding out native plant and animal species within the Preserve.

Several perennial creeks flow from upland areas across the dunes to the ocean. Inglenook Creek and Fen Creek support plant and animal communities that wouldn't be found in the dune system otherwise. Willow and other riparian plants line the creek banks, creating a green ribbon of life in sharp contrast with the pale sand of the surrounding dunes. Small birds move through the thickets of these riparian corridors and fill the air with their calls and song. The creeks rise and fall with the seasons, sometimes rushing towards the sea after a winter storm to carve a new path across the sand. At other times the streams flow quietly to the beach, where summer sand bars build up to block their flow, creating small lagoons for resting and foraging shorebirds, wading birds and waterfowl.

For those seeking a different kind of park experience, the Preserve offers the chance to explore a rare and unique landscape along California's coast. Other than the remnant road and occasional wooden post from old fence lines, few signs of modern life are apparent. A four-mile (6.4 km) expanse of sandy beach runs along the western edge of the Preserve. Opportunities to enjoy the ocean, beach and dunes in solitude attract visitors to this relatively undisturbed and more remote area of MacKerricher State Park. Conditions change rapidly along the shore but the rewards are great for those visitors with a sense of adventure. Here, time is marked by the seasons and tides in an ever-changing and dynamic environment of blowing wind, shifting sands and crashing surf. Wildlife abounds both onshore and offshore. Shorebirds follow retreating waves to forage for sand-dwelling invertebrates while osprey and brown pelicans dive for fish beyond the breakers. Curious harbor seals surface to inspect the scene then disappear beneath the blue-green water. The ever-present gulls circle and call overhead. Depending on the season, visitors may view whale spouts and fishing boats on the horizon, or an advancing wall of fog moving inland to envelop the landscape in mist.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

DISCUSSION

a) The proposed project would temporarily affect the scenic qualities of the dunes at the immediate project site. Construction equipment, materials and crew activities have the potential to disrupt visitors' enjoyment of the natural landscape for the duration of the project. However, upon completion this project would benefit the aesthetic environment of the dunes by removing a degraded and unsightly remnant road, eliminating invasive beachgrass, and returning the dune habitat to a more natural condition. With the barrier of the road removed and elimination of non-native beachgrass, natural dune processes would return and native plant communities would become reestablished, resulting in an improved aesthetic experience. Due to the temporary nature of the work, the project would have a less than significant impact.

b) Highway 1 is a designated National Scenic Byway, but is not an officially designated State Scenic Highway in this portion of Mendocino County. Highway 1 runs adjacent to some portions of the Inglenook Fen-Ten Mile Dunes Preserve on its eastern boundary, but the majority of the project site would not be visible from the highway, including vegetation work in the backdune area. The project proposes to remove the remnant haul road and restore natural processes to the dune ecosystem. The proposed project would not damage any scenic resources or historic buildings within a state scenic highway and would therefore have no impact.

c) As with any construction project, there would be some temporary decrease in the visual appeal of the area immediately affected by the work being performed. The presence of construction vehicles and other support equipment and associated emissions and noise may make it difficult for visitors to appreciate and experience the visual character and quality of the project site and the surrounding landscape. However, the duration of the work would be limited, the immediate project area would be temporarily closed to visitors, thus limiting exposure to unsightly construction activity, and visual impacts would be overshadowed by the aesthetic improvements and protection of the resource that would be the end result. There would be no permanent or long-term degradation of the visual character of the site or its surroundings as a result of this project. Therefore, the impact from this project would be less than significant.

d) Lighting is not an element of this project and no new light sources would be introduced into the landscape. All construction work would be limited to daylight hours, eliminating the need for work lights. The proposed project would have no impact.

II. AGRICULTURAL AND FOREST RESOURCES.

ENVIRONMENTAL SETTING

The proposed project is located in the Inglenook Fen-Ten Mile Dunes Natural Preserve within the northern section of MacKerricher State Park. The land within MacKerricher State Park is zoned open space. None of the land within or immediately adjacent to MacKerricher SP is zoned as forest land or timberland production. The proposed project area contains no land zoned for agriculture or in agricultural use, forest land or timberland production. None of the land within MacKerricher SP is zoned for agricultural use, enrolled under the Williamson Act (California Land Conservation Act of 1965), or included in any of the Important Farmland categories, as delineated by the California Department of Conservation, under the Farmland Mapping and Monitoring Program (FMMP). Private property located on the east side of Highway 1 at the junction of Little Valley Road is enrolled under a Williamson Act contract. The project site and the Preserve property boundary are not contiguous with this land.

WOULD THE PROJECT*:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code §4526), or timberland zoned Timberland Production (as defined by government Code § 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

* In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997), prepared by the California Department of Conservation as an optional model for use in assessing impacts on agricultural and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and the forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.

DISCUSSION

a) As noted in the Environmental Setting above, MacKerricher SP does not support any agricultural operations. All work proposed as part of this project in the Inglenook Fen -Ten Mile Dunes Natural Preserve would be confined within park boundaries. No land adjoining the park is zoned as agricultural land or used for agricultural purposes, as defined by the United States Department of Agriculture land inventory and monitoring criteria (modified for California). The Dune Rehabilitation Project would not cause the conversion of any prime, unique or important farmlands to non-agricultural use.

b) This project would have no effect on any category of California Farmland and would not conflict with any existing zoning for agricultural use or Williamson Act contract. Private property located east of the Preserve boundary is enrolled under a Williamson Act contract, but the project site is located entirely within the boundaries of MacKerricher State Park at least 0.3 miles (0.5 km) from this property and would present no conflicts with its zoning or use. Therefore, no impact would result.

c) This project would not conflict with any existing zoning or cause rezoning of forest land or timberland. No impact would result.

d) No aspect of this project would result in the loss of forest land or conversion of forest land to non-forest use. No impact would result.

e) The Dune Rehabilitation Project would not cause changes to the existing environment that would result in the conversion of any farmlands or forest land to non-agricultural or non-forest uses. Therefore, no impact would result.

III. AIR QUALITY.

ENVIRONMENTAL SETTING

MacKerricher SP is in Mendocino County, part of the North Coast Air Basin (Basin), the Mendocino County Air Quality Management District (MCAQMD), and the U.S. Environmental Protection Agency Region IX. Ocean winds, moderate levels of highway traffic, and a small industrial base result in relatively clean air in the vicinity of the Park. According to the MCAQMD, the entirety of the Basin has been designated as "attainment" for all criteria pollutants including; Ozone, CO_2, NO_2, NO_x, SO_2, NH_3 and Reactive Organic Gases (ROG), under federal Clean Air Act guidelines. However, the MCAQMD is in "non-attainment", having not met the state standard under the California Clean Air Act for a specified pollutant, particulate matter sized less than 10 microns (PM_{10}). In accordance with state non-attainment status for PM_{10}, MCAQMD has created the required Particulate Matter Attainment Plan to work toward attainment. The final draft of 2005 sets a target of "reasonable improvement" or a 5% reduction in PM_{10} emissions per year as a goal until attainment is reached. In June of 2010 the MCAQMD recommended that project planning agencies follow the Bay Area Air Quality Management District (BAAQMD) CEQA guideline thresholds to evaluate new projects.

The MCAQMD has high levels of biogenic volatile organic compounds (VOC) many of which are ROGs which through complex chemical reactions with ozone (O_3) result in PM_{10} creation. Higher rates of PM_{10} in the coastal Fort Bragg area, relative to the rest of the MCAQMD, are attributable to geogenic conditions of salt released into the air from the ocean. Additional PM_{10} sources are anthrogenic, including more hazardous particle matter less than 2.5 microns in size ($PM_{2.5}$) often associated with combustion engines. Wood smoke also contains $PM_{2.5}$ which tends to bind into PM_{10} after some time. As of 2009 Mendocino County had no high emitting facilities for any criteria pollutants (ARB, 2009).

PM_{10} levels fluctuate in the coastal area of the MCAQMD seasonally relative to temperature and rainfall. Highest levels of PM_{10} are registered in the late fall as temperatures dip and seasonal rains have yet begun. The increase in woodstove use, fugitive dust and lifting of burn bans are all anthrogenic factors adding to the heightened levels. Once winter rains begin, fugitive dust diminishes, lowering PM_{10} levels. The MCAQMD has seen a decrease in the PM_{10} levels from the late 1980's through the 1990's to the early 2000's, attributable to increased rain amounts, improvements in emissions and efficiency of combustion engines, reductions in forest industry activities, enforcement of district outdoor burning policies and woodstove emission standards implementation.

In 2008 Northern California wildfires elevated PM_{10} and $PM_{2.5}$ to levels exceeding the National Ambient Air Quality Standards (NAAQS) for much of the summer throughout the MCAQMD. The California Air Resources Board appealed to have particulate levels measured at monitors influenced by the resulting smoke excluded from federal and state standards due to an "Exceptional Event". Other recent wildfire events dramatically elevating PM_{10} and $PM_{2.5}$ levels for Mendocino County include the Biscuit Fire in southern Oregon in 2002 and the Shasta Fire in 1999.

The Inglenook Fen – Ten Mile Dunes Natural Preserve is bordered by the Pacific Ocean on the west side and small residential neighborhoods which lie between the eastern edge of the preserve and Highway One. The prevailing winds carry salt spray, bits of sea plant and animal material, and gases created during decomposition, as well as small sand particles northwest to southeast (the process creating the dunes). Geogenic and biogenic processes are the primary creators of compounds contributing to criteria pollutants during prevailing winds. The residential neighborhoods to the northeast, east and southeast contribute compounds creating criteria pollutants through the use of wood burning stoves, burning carbon based fuels, and operating primarily light duty combustion engines.

WOULD THE PROJECT*:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Conflict with or obstruct implementation of the applicable air quality plan or regulation?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d) Expose sensitive receptors to substantial pollutant concentrations (e.g., children, the elderly, individuals with compromised respiratory or immune systems)?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

* Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied on to make these determinations.

DISCUSSION

a) Work proposed by this project, and any associated emissions, would not conflict with or obstruct the implementation of any applicable air quality management plan for MCAQMD. All work would fall within the Air Quality Management District Large Grading Project (207.27) permit guidelines. Appropriate thresholds recommended in the BAAQMD would be evaluated within the permitted guidelines. Therefore, the project would have no impact.

b-c) The project would implement guidelines stated within the 207.27 permit to minimize criteria pollutant creating emissions to avoid substantial increases in PM_{10}. Current trends for Mendocino County and the City of Fort Bragg indicate average levels of both PM_{10} and $PM_{2.5}$ are no longer decreasing, but are not trending toward an increase either, except for periodic wildfires during summer months. While $PM_{2.5}$ levels for the county (measured in Ukiah) remain below exceedance for the county, PM_{10} levels measured in Fort Bragg remain in exceedance, contributing to the non-attainment status for the district. The California Air Resources Board's 2009 Almanac estimates for Mendocino County suggest PM_{10} levels will creep slightly upwards over the next decade while $PM_{2.5}$ remain at current levels (ARB Almanac 2009 , Appendix A). The MCAQMD indicates dust from unpaved and paved roads is a major contributor to county PM_{10} and $PM_{2.5}$ levels, as direct sources of fugitive dust. Geogenic factors such as salt spray and wind-blown sand particles currently contribute to air quality conditions at the project site. Project activities would include disturbance and removal of rock and gravel, as well as removal and redistribution of sand, but these activities would be temporary and impacts would be short-term. Fugitive dust associated with these activities would be distributed across the dunes by prevailing winds, which mimics natural processes in a dune system.

Table 3.AIR–01: Mendocino County 2010 Estimated Non-attainment Compliance Particulate Matter Pollutant and Modeled Project related Particulate Emissions

Mendocino County Estimated Emissions			Project Associated Estimated Emissions	
Particulate Pollutant	2010 Average in tons		Total (tons) Particulate Emissions[2]	Percent of Annual Estimates
	Daily[1]	Annual		
PM^{10}	21	7665	0.81	0.01057%
$PM^{2.5}$	5	1825	0.14	0.00767%

1 ARB Almanac 2009 – Appendix A: County Level Emissions and Air Quality by Air Basin
2 California Emissions Estimation Modeler (CalEEMod) Version 2011.1 February 2011

Standard Project Requirements implemented during the project would minimize generating compounds contributing to criteria pollutants. Post-project conditions would result in a net loss of paved and unpaved roadway available to create PM_{10} and $PM_{2.5}$ pollutants. Therefore the project would have a less than significant negative impact on air quality standards, either existing or projected.

d-e) The immediate area of all project activities, areas with the highest likelihood of pollutant emission concentrations, would be closed to the general public. However, areas of the Inglenook Fen Creek – Ten Mile Dunes Natural Preserve adjacent to the project would remain open and accessible to the general public, as well as the rest of MacKerricher State Park. Notification of project activities would be posted at the primary access points for the Preserve.

The majority of the project would be concentrated along the remnant haul road and remote from residential and commercial areas. (See Appendix A.1 - Dune Rehabilitation Project Overview Map) However, at the northern end of the Preserve the nearest residential area sits 0.12 mile (200 m) across the Ten Mile River from the project site. Sources of pollutants from this location would include emissions from vehicles and heavy equipment required to complete the project. Project vehicles and equipment would likely include the following: 1 excavator; 2 950-series front end loaders; 1 Caterpillar 416 backhoe; 3 to 5 off-highway dump trucks; 6 highway approved 10-wheel dump trucks; 2 D-6 tractors;1 light-duty truck with 100-gallon fuel tank; up to15 crew transport vehicles. Some minor changes in types of equipment may be needed depending on the contractor hired to complete the project. Not all vehicles and equipment would operate simultaneously within the Preserve. Most crew vehicles would be parked at staging areas within the project site where crew members would transfer to project work vehicles. Some equipment would only be operating during certain stages of the project depending on the work being done. Other vehicles, such as the 10-wheel dump trucks, would be moving materials from the staging areas within the project site to a recycling facility chosen by the contractor, nearby timber property, or to a storage site on State Park property approximately 20 miles (32 km) south at Big River. On most days there would be four to six heavy equipment operators working on road removal, 3 to 5 dump trucks traveling from the removal site and up to 6 highway approved dump trucks hauling materials away for recycling or disposal. Traffic on nearby Highway 1 at the Ten Mile River Bridge is a regular source of vehicle emissions in the same residential area.

In addition to the road removal, excavation work would be done to remove two culverts at Fen Creek and Inglenook Creek. The nearest residential areas to the Inglenook Creek crossing are within approximately 0.43 mile (700 m) to the east at Beal Lane and Ocean View Drive. At the Fen Creek crossing the nearest residence is approximately 0.62 mile (1000 km) to the east. Air quality would not likely be affected at this distance.

Part of the project includes treatment of European beachgrass and removal of non-native trees and shrubs in backdune areas. Some of these locations are within 160 to 375 feet (50 to 115 m) of adjacent private property. Project equipment may include chainsaws, but these project activities would be focused in small areas and short in duration.

The closest area hospital or healthcare facilities are over 4.4 miles (7 km) to the south in the city of Fort Bragg. Area public schools are over 4.4 miles (7 km) to the south in Fort Bragg and 6 miles (10 km) to the north in Westport. One private school operates on Highway One by Virgin Creek just over 2.5 miles (4 km) to the south-southeast.

During project activities there would be temporary increases in pollutants and odors associated with project vehicles and equipment. Application of guidelines under the 207.27 permit and implementation of Standard Project Requirements would minimize these impacts. All thresholds under guidelines from the BAAQMD would be met. Post-project conditions in the Preserve would have no net change in concentrations of pollutants or odors. The project would not subject sensitive receptors to substantial pollutant concentrations or substantial objectionable odors affecting a substantial number of people. The project would have a less than significant impact.

IV. BIOLOGICAL RESOURCES.

ENVIRONMENTAL SETTING

The 1285-acre Inglenook Fen-Ten Mile Dunes Natural Preserve (Preserve) was designated in 1995 in recognition of its regional and statewide significance and the need to protect its important natural resources. The State Park and Recreation Commission resolution establishing the Preserve (CSP 1995*c*) specifically distinguishes wetlands and riparian areas, a rare coastal dune ecosystem, the only remaining coastal fen in California, eight rare natural communities, and eight special plant species as the important elements. Home to many species of wildlife and an important stop-over for migratory birds, the Preserve provides USFWS-designated critical wintering and nesting habitat for the western snowy plover. The Preserve also supports two populations of federally endangered plant species.

The Preserve is bordered by the Pacific Ocean to the west and moderate to steep upland terraces to the east. The actively moving dunes extend northward for approximately four and a half miles from the coastal terraces near Ward Avenue to the Ten Mile River. Upland topography and vegetation are influential in halting sand movement inland, as is the bulk of sand accumulated and the dissipation of winds sufficient to move the sand.

Plant and animal species that inhabit the dunes are specially adapted to the dynamic system of moving sand and wind. Plants that grow within the permeable, blowing substrate are either short-lived or persist through the development of deep, extensive root systems. Vegetation patterns within the dunes are strongly correlated with dune morphology (Pickart 1998). Seedling establishment is variable depending upon the species and micro-environments to which the seeds are carried.

Animals that inhabit coastal dune habitats are subject to physical stresses that include sand movement, salt spray, temperature variability, wind, and disturbances such as storms. Their adaptations are mostly behavioral. Species such as western snowy plover shelter in depressions in the sand, in the coastal strand where they also forage and breed. Invertebrate species such as globose dune beetle and Ten Mile shoulderband snail complete their entire life cycle in the dune habitat. Open areas or low vegetation in dune areas can support ground-nesting species such as burrowing owl and northern harrier. The same areas may provide foraging opportunities for many other birds of prey that do not nest in the project area, such as American peregrine falcon, merlin, white-tailed kite, sharp-shinned hawk, and Cooper’s hawk.

Osprey and California brown pelican are often observed diving for prey in the Ten Mile River or offshore, while purple martins have occasionally been seen catching insects or perching on vegetation west of the Ten Mile River Bridge. Inglenook Creek and Fen Creek provide aquatic and riparian habitat for a variety of species. Within or near the project area, potentially suitable habitat exists for amphibians such as northern red-legged frog and foothill yellow-legged frog, and reptiles such as western pond turtle. There is also potential for the occurrence of tidewater goby in the lower reaches of the creeks, though this small fish species has not been documented to occur there. The coastal strand provides potential areas for marine mammals to haul out; all marine mammals are protected by the Marine Mammal Protection Act.

Areas of riparian vegetation may support nesting by a host of migratory bird species, which are protected under the Migratory Bird Treaty Act.

The Inglenook Fen, which occurs between the southernmost and middle dune lobes, is an area of great biological significance. It is the southernmost in a series of fens extending from Alaska south to this area. It is the only known remaining coastal fen in California, containing a unique assemblage of plants and insects representing a relict biotic community from the Pleistocene. Many species growing here are rare or endemic.

VEGETATION AND OTHER LAND COVER

This section discusses land cover types in the Preserve, including their characteristics, locations relative to the Project area, and their potential to sustain Project-related impacts. While land cover characterized by plant life is of primary interest for biological, ecological, and regulatory concerns, significant portions of the Preserve do not support extensive cover by plants.

Land Cover Types Lacking Substantial Plant Cover

For the purposes of this discussion, land cover with 5% or less plant cover is considered “non-vegetated,” although some such areas may include scattered plants (Table 3 BIO-01).

Asphalt: Intact segments of the haul road that are not buried under sand and are greater in area than 43 ft^2 (4 m^2) account for the total of 3.1 acres (1.27 ha) of this land cover type. The thin layer of weathered asphalt (consolidated tar and other petrochemical products mixed with mineral sand and gravel) surface is underlain throughout with coarse, typically sharp-angled rock fragments of various sizes (road base ballast), which is readily apparent along most of the haul road, extending up to several meters in width from either side of the asphalt surface. Remnants of road base are also scattered across adjacent unpaved land surfaces, evidence of wave action or tidal surges during storms.

Removal of the remaining sections of the haul road is consistent with the legally defined purposes of State of California natural preserves (PRC Sec. 5019.71). Asphalt and road base are not representative of natural features of the dune ecosystem and landscape, nor do they facilitate or contribute to the restoration or sustenance of natural environmental processes in the dune ecosystem.

While the asphalt surface does not support any plant life, Project activities related to its removal are likely to have impacts on adjacent land cover types and individual plant and animal species. These impacts are discussed below in sections on the individual vegetation types and plant and animal species. Project impacts that are considered potentially significant have been addressed for the purposes of avoidance of, or ecological compensation for those impacts in an appended Project Mitigation, Monitoring, and Restoration Plan (Appendix E.2). These impacts are essential to address, to encompass the full scope of Project-related effects. Nevertheless, the primary goal of removing asphalt and road base, along with other artifacts of human industry in the dune ecosystem, is to restore environmental and physical processes in the Project site in order to rehabilitate habitat for native plants and animals.

Open Sand: This land cover type includes parabolic dunes, transverse dunes, sand sheets, and deflation plains where vegetation cover is generally less than 5%. Also included in this cover type are haul road edges, including road base, that do not sustain at least 5% plant cover.

Table 3. BIO-01: Non-Vegetated Land Surfaces Within the Project Area

Non-Vegetated Land Surface	Acres	Hectares
Asphalt	3.13	1.266
Open Sand	24.48	9.905

Vegetation (Land Cover with Substantial Cover by Plants)
This section discusses existing conditions and characteristics of plant cover types in the project area, as well as notes on potential project-related consequences to those types. By convention, all plant cover types with an estimated cover by plants of 5% or greater are included in this section.

Since discussion of land cover by plants generally involves use of several related yet often conflated terms, some clarification of these terms is in order. Unfortunately, the literature and regulatory guidelines for discussing vegetation are still characterized by inconsistency with regards to use of these terms. Wherever possible, attempts to clarify ambiguity in the use of these terms, as well as their applications to naming and describing vegetation cover, will be made below.

Vegetation is, most simply, land cover by plants, and is generally defined both by the overall *structure* of the component plants and by species *composition*. General structure, geography, and spatial arrangement on a landscape are generally sufficient to describe broader vegetation types. However, the science of classifying and describing vegetation has increasingly refined the distinctions among types through reference to and naming of vegetation types according to characteristic plant species. The two most refined levels of organization for classifying vegetation, by general convention in North America, are the "alliance" (more inclusive) and the "association" (more specific). Accordingly, vegetation may be described generally, such as "forest" or " grassland," but also provides for much more specific definition through reference to component, prevalent species, such as the *Sequoia sempervirens* Forest Alliance (Coast Redwood Alliance), or one of its many component associations, such as the *Sequoia sempervirens-Notholithocarpus densiflorus*/*Vaccinium ovatum* (coast redwood-tanoak with black huckleberry) Association. Sawyer, et al. (2009) provides further discussion on vegetation classification and naming, especially with regard to California vegetation.

Plant communities are assemblages of plants that, according to some ecologists, tend to appear repeatedly across a landscape or region with some regularity. In naming and defining a plant community, its geographical or ecological location, general structure, species composition, or other characteristics are often incorporated. In many cases, plant communities are relatively well defined and references to them generally accepted and understood among ecologists. Unlike the classification of vegetation, however, plant community naming and describing, and defining boundaries among plant communities, are often subjective. In designating any plant community, further clarification through reference to common species therein is critical in order to reduce the potential for ambiguity or misunderstanding.

Flora refers only to the species composition of a defined geographical or ecologically defined area, such as the flora of California (all plant species within the geopolitical boundaries of the state). Flora may apply as a term for the plant species composition of any area, provided some definition of that area is also provided.

Special-Status and Other Natural Communities (Vegetation Alliances) In the Project Area
The California Department of Fish and Game defines special status natural communities (DFG 2009):

> "Special status natural communities are communities that are of limited distribution statewide or within a county or region and are often vulnerable to environmental effects of projects. These communities may or may not contain special status species or their habitat. The most current version of the Department's *List of California Terrestrial Natural Communities* indicates which natural communities are of special status given the current state of the California classification.

> Most types of wetlands and riparian communities are considered special status natural communities due to their limited distribution in California. These natural communities often contain special status plants such as those described above. These protocols [for mapping natural plant communities] may be used in conjunction with protocols formulated by other agencies, for example, those developed by the U.S. Army Corps of Engineers to delineate jurisdictional wetlands or by the U.S. Fish and Wildlife Service to survey for the presence of special status plants."

Further information on the conversion of DFG's natural community listing system to conform with current vegetation classification and special-status ranking can be found at http://www.dfg.ca.gov/biogeodata/vegcamp/natural_comm_background.asp. (DFG 2012). For the purposes of this document, special-status listing by DFG is retained under the "Natural Communities" listing, although many of the vegetation types listed conform to current alliance and association designations.

A scoping list of rare natural communities with potential for occurrence in the project area was derived from a state-wide list (DFG 2010) (Appendix C.3 - Natural Communities Scoping List). From the scoping list, alliances observed in the field and as described in Sawyer, et zl. (2009) were compiled in Table 3. BIO–02. Vegetation sampling for the purpose of naming alliances and associations was not conducted, and the alliances listed are those estimated from qualitative observations only. Discussion here is limited to vegetation alliances with high probability for presence within the project area.

Vegetation communities were mapped by using a combination of walking the perimeter with a GPS and digitizing from aerial photographs (USDA 2010), (Appendix A.7 - Natural Communities Maps). Vegetation types and boundaries are estimated from field observations; no sampling data were compiled according to accepted protocols (CNPS 2012) to support the delineation of these communities. The difficulties and limitations of mapping vegetation according to alliance and association designations are discussed more thoroughly in Sawyer, et al. (2009).

Table 3. BIO–02 A list of Natural Communities (Vegetation Alliances) in the Project Area. Where denoted with an asterisk (*), alliances may be considered natural communities of special concern (S1, S2, or S3, NatureServe's Heritage Methodology) or include associations so ranked. These types are recommended for consideration of project-related impacts during preparation of CEQA documents by DFG (2012).

Alliance	Rank	Acres	Hectares
Ammophila arenaria (European beachgrass swards) Semi-natural Stands	None	58.78	23.789
Eucalyptus (*globulus*, *camaldulensis*) (Eucalyptus groves) Semi-natural Stands	None	0.15	0.059
Scirpus microcarpus (Small-fruited bulrush marsh) Alliance*	G4 S2	0.01	0.003
Carex obnupta (Slough sedge swards) Alliance*	G4 S3	0.02	0.008
Argentina egedii (= *Potentilla anserina* ssp. *pacifica*, Pacific silverweed marshes) Alliance*	G4 S2	0.05	0.021
Leymus mollis (= *Elymus mollis*, Sea lyme grass patches) Alliance*	G4 S2	0.05	0.019
Abronia latifolia - Ambrosia chamissonis (Dune mat) Alliance*	G3 S3	53.81	21.774
Garrya elliptica (Coastal silk tassel scrub) Provisional Alliance*	G3? S3?	0.57	0.232
Morella californica (Wax myrtle scrub) Alliance*	G3 S3	0.54	0.218
Salix hookeriana (Coastal dune willow thickets) Alliance*	G4 S3	1.13	0.457
Salix sitchensis (Sitka willow thickets) Provisional Alliance*	G4 S3?	0.66	0.268
Pinus muricata (Bishop pine forest) Alliance*	G3 S3	0.01	0.002
Pinus contorta var. contorta Alliance (Beach pine forest)	G5 S3	<0.01	<0.001

A review of Table 3 shows that all alliances characterized by native species in the project area are considered of special concern, while those dominated by non-native plants (semi-natural stands) have no global or state rank, and are thus not considered of "special concern" (DFG 2010). Discussion of each of these alliances follows.

Semi-Natural Types (Non-native Plant-dominated)

***Ammophila arenaria* Semi-Natural Herbaceous Stands** (European beachgrass swards)
This alliance is characterized by stands of vegetation where European beachgrass comprises at least 80% relative cover in the herbaceous layer (Sawyer et al. 2009). For this discussion, the type includes vegetation where European beachgrass has been treated with herbicide but remains as dead biomass. Cover by plants other than *Ammophila* is very low in living stands of this alliance. In areas of herbicide-treated, dying or dead *Ammophila*, *Pseudognaphalium stramineum*, *Cryptantha leiocarpa*, and *Calystegia soldanella* are common early successional species.

Ammophila arenaria has become established in the Preserve relatively recently; its establishment may have been a result of natural (current- and tidal-dispersed) establishment, since evidence of human introduction is lacking. A comparison of the extent of European beachgrass made from aerial photograph interpretation shows that European beachgrass spread from approximately 8 acres (3.2 ha) in 1975 to approximately 119 acres (48.2 ha) in 2009 (Appendix A.2 - Comparison of European Beachgrass Infestation from Aerial Photo Interpretation – 1975 & 2009). Its habitat expansion in the Preserve is also evident by comparing oblique aerial photographs that were taken approximately 25 years apart (Appendix B.1 - Comparison of European Beachgrass Infestation from Oblique Aerial Photos, 1979 & 2005).

Upon initial establishment in a dune system, European beachgrass reduces sand movement through its growth of long rhizomes and densely tufted leaf blades. Sand accumulating at the base of the plant stimulates rhizome and leaf growth. The repeated cycle of accumulating sand and consequent growth causes foredunes to become steeper and taller. Storm wave action on foredunes forms a near-vertical dune scarp and slump blocks that steepen the seaward foredune slopes. Steep foredune slopes may persist, or recovery may occur during beach progradation and periods of wind-transport of sand (Wiedemann & Pickart 1996).

A comparison of photographs of the Ten Mile foredunes from pre-1980 through 2011 demonstrates the effect of European beachgrass on dune structure. Figure 3 BIO-01, a photograph taken in 2001, shows the steep seaward dune faces formed from *Ammophila* growth. Figure 3 BIO-02 is a photograph from several decades earlier, showing a low- to no-dune profile in the absence of *Ammophila*. Figure 3 BIO-03 (2011) demonstrates the results of *Ammophila* removal: recovery of dune mat vegetation across a lower profile dune formation. In addition to displacing native dune plant cover, the influence of European beachgrass on dune morphology contributes to a reduction in available nesting and foraging habitat for the federally endangered western snowy plover (*Charadrius alexandrinus nivosus*).

Manual removal of European beachgrass comprises a significant portion of the project proposal. As demonstrated in areas cleared of beachgrass to date, the beachgrass alliance displaces native plant communities, especially those nested in the broad *Abronia latifolia—Ambrosia chamissonis* Alliance. These native-plant dominated alliances recover rapidly upon removal of Ammophila. Losses of small portions of native plant alliances during haul road de-construction will be compensated through the restoration of natural dune-forming processes and the eventual recovery of native plant communities.

Areas formerly dominated by European beachgrass, now comprised of elements of native dune vegetation types (e.g.,dune mat plant associations), may be considered as sites for the implementation of compensation measures for project impacts on native vegetation or special-status plant species. Beachgrass removal, as part of the project, will represent partial compensation for impacts rendered to native vegetation within the project area, and rehabilitation of habitat from *Ammophila*-dominated stands to native vegetation cover will be implemented, monitored, and evaluated as one component of the project Mitigation, Monitoring, and Restoration Plan (Appendix E.2) and its objectives.

Figure 3. BIO-01: Wave-cut Steepened Foredunes with European Beachgrass, Ten Mile Dunes, 2001.

Figure 3. BIO-02 (left): Ten Mile Haul Road, pre-1980, prior to European beachgrass invasion, and **Figure 3. BIO-03** (right) demonstrating recovery of dune mat vegetation in 2011 following removal of beachgrass
Historic photo printed with permission from the collection of the Fort Bragg – Mendocino Coast Historical Society.

Eucalyptus globulus **Semi-Natural Woodland Stands** (*Eucalyptus* groves)
This non-native forest or woodland type is characterized by at least 80% cover by *Eucalyptus* in the tree layer (Sawyer et al. 2009). Typically, shrub and herbaceous cover in these stands is relatively low.

In addition to displacing native vegetation, these stands represent a considerable risk for wildland fire ignition or spread due to substantial accumulations of surface litter and ladder fuels, and the content of volatile compounds in living and dead plant material. Trees are well adapted to fire, and readily sprout from stumps or snags after burning.

These stands contribute to micro-climate change within stands, where trees can augment seasonal moisture through condensation of fog on leaves (P. Warner, personal observation). As a result, bluegum stands often provide supplemental moisture for mature trees, as well as for seedlings and sapling spreading primarily from the perimeter of stands. Bluegum stands wholly or substantially displace existing and potential native vegetation, including coastal scrub, riparian woodland, pine forests and woodlands, and coastal grassland.

Substantial stands of *Eucalyptus globulus* (Tasmanian bluegum) grow along the eastern edge of the Preserve, on the 2 more northern dune lobes, with most stems growing outside the Preserve on private property. An element of the project calls for removal of exotic trees and shrubs in the Preserve, and some stems that have become established in the Preserve will be removed systematically over a long period of time and in conjunction with the establishment of native vegetation. *Eucalyptus* seedlings and saplings will be removed mechanically or manually along the eastern edges of the Preserve in order to preserve the integrity of adjacent native plant communities within Preserve boundaries. Because this vegetation type is not characterized by native species nor of special concern, minor project impacts on this vegetation type will not be significant. Removal of saplings, seedlings, or trees encroaching into the Preserve is consistent with broader management goals to maintain and enhance native plant communities.

Natural Communities of Special Concern
Other than the semi-natural vegetation types discussed above, all other vegetation types (alliances) mapped in the project area are considered natural communities of special concern (DFG 2010, 2012); DFG (2012) recommends all for consideration in the preparation of CEQA documents for projects that might affect these types. Moreover, the presence of a diversity of special-status plant communities within the Preserve provides ample testimony to the ecological value of the preserve designation, as well as for the management of the ecological processes that sustain these vegetation types. The essential goals of the road-, culvert-, and European beachgrass-removal project – the restoration of ecological processes and functions -- are themselves intrinsic to rehabilitating and sustaining the Preserve's diversity of rare and imperiled vegetation types and wildlife habitats.

<u>Terrestrial dune vegetation</u>

***Abronia latifolia - Ambrosia chamissonis* Alliance** (Dune mat)
Dune mat is a characteristic vegetation type in Northern California coastal dunes, growing generally outside the tidal-wave inundation and intensive salt spray zones. In addition to presence of either of its two namesake species, dune mat typically includes signicant cover by a few to many other herbs and sometimes, low woody shrubs; canopy height is typically less than 50 cm. Other common species in the Preserve dune mat alliance include *Artemisia pycnocephala, Calystegia soldanella, Poa douglasii*, and *Camissoniopsis cheiranthifolia* ssp. *cheiranthifolia* (Sawyer et al. 2009). In addition to these widespread plant species, the dune mat alliance in the Preserve includes populations of special-status species: *Abronia umbellata* ssp. *breviflora*, *Chorizanthe howellii*, *Erysimum menziesii* ssp. *menziesii*, and *Gilia millefolita*; other rare taxa (i.e., *Horkelia marinensis* and *Oenothera wolfii*) may grow within the dune mat community, but their habitats distinctly extend into other cover types. In areas where European beachgrass has been removed from the foredunes, and downwind on newly formed, otherwise barren sand drifts (Figures BIO-03 and BIO-04), *Abronia*, *Ambrosia*, *Artemisia*, *Calystegia*, and *Camissionopsis* soon become established.

Figure 3. BIO–04: Sand Drift and Establishment of Dune Mat. As sand moves on to the haul road, plants such as dune sage soon become established.

Along the haul road edges, typical dune mat species composition has been modified by several non-native herbaceous species, including silver European hairgrass (*Aira praecox*), ripgut brome (*Bromus diandrus*), brome fescue (*Festuca bromoides*), stork's bill filaree (*Erodium cicutarium*), rough cat's-ear (*Hypochaeris radicata*), California burclover (*Medicago polymorpha*), English plantain (*Plantago lanceolata*), and four-leaved allseed (*Polycarpon tetraphyllum*); Howell's spineflower (*Chorizanthe howellii*) also grows in abundance along the haul road edge in gaps between active sand drifts. This local weedy vegetation zone in the haul road edges tracks the local pattern of contamination of dune sand by fine sediment and soil imported with the road base. These weeds are normally excluded by dune sand substrate properties

Dune rush (*Juncus brewerii*) is the dominant rush in the Preserve, growing primarily within swales and on adjacent slopes) of the *Abronia latifolia - Ambrosia chamissonis* Alliance (dune mat). Sawyer et al (2009) do not describe a separate *Juncus breweri* alliance for the North Coast, although they note the likelihood of *Juncus breweri* forming stands in dune swales from Point Arena (southern Mendocino Co.) southward, and note that Pickart (personal communication) cites *J. breweri* as the common rush in dune swales and dune mat vegetation. Positive identification of various rushes in the dune ecosystem and vegetation sampling to determine the alliance present is warranted.

Drifting sand has provided substrate for establishment of dune mat along approximately 30% of the remaining length of road in the Preserve. Along with nascent dune mat forming on sand drifts across the road, a considerable area of this alliance could be directly affected – crushing or removal of individual plants, burial, and so on – by project activities along either side of the road. Up to about 30 acres of dune mat has been estimated for potential project-related impacts, although the actual area affected is likely to be much less.

Measures to reduce impacts from road and culvert removal activities include the implementation of standard and specific project requirements BIO 2a and BIO 2b. Sand removed from the road corridor will be stored in specific sites selected to minimize impacts to dune mat and all native plant species, including Howell's spineflower; this sand, along with dormant plant propagules, will be re-distributed along the road corridor upon removal of asphalt and road base. In light of the current establishment of dune mat on drifting sand in the Preserve, rapid reclamation of habitat by its component species is anticipated in the project area. In consideration of the project goal of rehabilitating dune mat vegetation, and current evidence of its regenerative capacity, potential impacts to this alliance are considered to be less than significant.

Removal of European beachgrass and other non-native plants is likewise anticipated to facilitate recovery of dune mat vegetation in the foredunes. Restricting removal in areas supporting Howell's spineflower to its dormant season (August through December), on-site monitoring during project implementation, and scrupulous selection of sand storage sites will reduce the potential for impacts beyond those temporarily incurred through excavations of asphalt and road base. A comprehensive approach to mitigation measures is provided in the Mitigation, Monitoring, and Restoration Plan (Appendix E.2).

Leymus mollis (= *Elymus mollis*) **Alliance (**Sea lyme grass patches)
This alliance sustains at least 50% relative cover by sea lyme grass in the herbaceous layer. Small stands of *Elymus mollis* occur on the coastal strand, in foredunes, and along the Ten Mile River estuary. Some stands are associated with elements of coastal strand (e.g., *Cakile maritima*) or dune mat (e.g., *Abronia latifolia*) alliances. None of the mapped stands occur within the project area.

The removal of European beachgrass in the Preserve, has to date fostered an increase in cover by *Elymus*. Further removals can reasonably be expected to increase the number of stands and increase its overall proportional cover in the foredune ecosystem. vegetation community has increased after the removal of European beachgrass. In light of the lack of existing stands in the project area, and its likely benefit from road and beachgrass removal, potential impacts will be less than significant.

***Garrya elliptica* Provisional Alliance** (Coastal silk tassel scrub)
In this provisional alliance, coastal silk tassel is dominant, often sharing habitat with several other woody plants, such as *Baccharis pilularis*, *Ribes* spp., *Rubus* spp., *Gaultheria shallon*, *Lonicera involucrata*, and *Sambucus racemosa* (Sawyer et al. 2009). A large mixed stand of silk tassel and pink-flowering currant (*Ribes sanguineum* var. *glutinosum*) grows in the southern part of the Preserve, adjacent to a stand of European beachgrass proposed for removal. No impacts to this alliance are expected.

***Pinus contorta* var. *contorta* Alliance** (Beach pine forest)
In this vegetation type, *Pinus contorta* var. *contorta* (beach or shore pine) constitutes greater than 50% relative cover in the tree canopy; other conifers and hardwood trees and shrubs may be co-dominant or conspicuous associates (Swayer et al. 2009). A few isolated trees and small stands of this allliance grow in the Preserve, well away from the haul road and culvert removal areas. No direct impacts will

accrue from this work or from *Ammophila* removal, although alterations in local dune structure and drainage alignments, as a result of project work and natural processes, could result in some shifts in area covered by this alliance over time. Augmentation of this type through invasive plant removals or through introduction of beach pine may comprise an element of project-related rehabilitation and mitigation.

***Pinus muricata* Alliance** (Bishop pine forest)
Bishop pine forest is characterized by a minimum of 15% cover by *Pinus muricata*, constituting an open to closed, evenly distributed tree canopy; numerous other conifers and hardwoods may be co-dominant or abundant. Fire is a critical necessity in the long-term health and regeneration of bishop pine forest stands (Sawyer et al. 2009).

Small stands of bishop pine with *Notholithocarpus densiflorus* (tan oak), *Abies grandis* (grand fir), *Pseudotsuga menziesii* (Douglas-fir), *Morella californica* (wax myrtle), and *Ribes sanguineum* var. *glutinosum* (pink-flowering currant) grow in a few dune swales in the Preserve, and on dune slopes and crests towards the Preserve's southeastern boundary. European beachgrass removal will occur near one or more of these stands, but direct project-related impacts will be minimal.

<u>Wetland vegetation</u>
Wetland vegetation affected by the project includes *Myrica* (Morella) *californica* alliance, *Scirpus microcarpus* alliance, Carex obnupta alliance, and *Argentina egedii* alliance.

Removal of culverts may result in some alteration of wetland geomorphology, hydrology, and dynamics. The existing culverts artificially establish stabilized incised channels (summer pools) above and below the haul road. Removal of the artificially fixed channel alignments (concentrated flow and channel erosion) above and below the culverts may result in reversion vegetated fen wetlands, and loss of artificial channel cross-sections linked to the culverts. This may gradually reduce floating aquatic vegetation and increase emergent sedge, bulrush, or willow-waxmyrtle scrub following culvert removal. However, long-term effects of culvert removal may result in increased duration and frequency of natural beach and dune impoundment of the fen outlets, resulting in increased depth and duration of wetland inundation at least some years, providing dynamic expansion and contraction of floating aquatic and emergent fen wetland vegetation. Culvert removal, as a mechanism to restore natural hydrology to both Fen and Inglenook Creeks and adjacent wetlands, is consistent with rehabilitation of ecological processes in the Preserve.

CSP conducted a routine wetland delineation of the areas within and adjacent to the project area to locate wetlands that may be under the US Army Corps of Engineers (USACE) jurisdiction and/or the California Coastal Commission (CCC) jurisdiction (Appendix E.3 - Wetland Delineation).

***Scirpus microcarpus* Alliance** (Small-fruited bulrush marsh)
This aliance is defined by vegetation stands with at least 30% relative cover by *Scirpus* in the herbaceous layer (Sawyer et al. 2009). In the Preserve, stands of *Scirpus* include three-square bulrush (*Schoenoplectus pungens* var. *longispicatus* as a common associate, with the latter more abundant in areas as ambient salinity increases; *Scirpus* is less tolerant of saltwater and more abundant in freshwater marshes.

Approximately 0.08 acre of this alliance occurs in the project area on the north bank of Inglenook Creek downstream from the culvert, where it functions as a sediment binder in shallow, slowly flowing water. More substantial stands of *Scirpus* grow upstream from the haul road stream crossings at Fen and Inglenook Creeks.

Implementation of project requirements BIO 2a, BIO 2b, BIO 3a, and BIO 3b, including on-site monitoring, erosion control, and restoration measures, will reduce impacts to this natural community to a less-than-significant level.

***Morella californica* Alliance** (Wax myrtle scrub)
Pacific wax-myrtle constitutes at least 50% cover in the shrub canopy layer in this vegetation type. This alliance grows primarily in dune swales, in marshes, and along drainages and streams, often in association with willows (*Salix* spp.) or rushes (*Juncus* spp.). The project includes a proposal to remove European beachgrass adjacent wax myrtle scrub. No impacts are expected, since beachgrass is typically non-existent to sparse in wax-myrtle habitat.

Argentina egedii (= *Potentilla anserina* ssp. *pacifica*) **Alliance** (Pacific silverweed marshes)
This alliance is defined by relative cover of at least 60% in the herbaceous layer, or greater than 30% when silverweed is co-dominant with one of several other wetland plant taxa (Sawyer et al. 2009). Along Fen Creek and in adjacent marshland, Pacific silverweed is co-dominant with *Carex obnupta*, *Oenanthe sarmentosa*, *Mentha arvensis*, and *Schoenoplectus pungens* var. *longispicata*, Whether this type occurs in these areas was not substantiated through data compilation, although Pacific silverweed is clearly a co-dominant plant in many of the marshy areas of the Preserve.

Approximately 0.03 acre of this alliance may be disturbed or lost during project work or as a result of altered hydrology or streambed morphology; the specific location and spatial quantity of its potential recovery in this area is uncertain. This minor impact will be mitigated through implementation of standard and specific project requirements BIO 2a, BIO 2b, BIO 3a, and BIO 3b.

***Carex obnupta* Alliance** (Slough sedge swards)
This alliance is characterized by 50% or greater relative cover by slough sedge (Sawyer et al. 2009). *Carex obnupta* is the dominant plant of the freshwater marsh upstream from the Fen Creek culvert, and a small patch grows near the culvert outlet. As with *Scirpus microcarpus*, *Carex obnupta* provides ecosystem services including sediment capture, oxygenation of the rhizosphere, and habitat for wildlife.

Slough sedge covers about 0.01 acre (0.004 ha) in the project area. The outcome of project activities on the extent of this alliance within and adjacent to the project area is uncertain, although recovery of local ecological processes through culvert and road removal and other rehabilitation efforts (e.g., non-native plant removals) will promote the integrity of native plant communities. Implementation of standard and specific project requirements BIO 2a, BIO 2b, BIO 3a, and BIO 3b will reduce impacts to slough sedge swards to a less-than-significant level, and mitigation measures will promote the restoration of this and other local vegetation alliances.

***Salix hookeriana* Alliance** (Coastal dune willow thickets)
This alliance is characterized by 50% or greater covery by Hooker willow (Sawyer et al. 2009). These thickets occur sporadically in the Preserve, in dune swales and along Fen and Inglenook Creeks. In project areas adjacent to the culvert removal sites, and along the haul road, minor impacts (up to 0.56 acre) to these stands, such as cutting or uprooting of stems, is likely to occur. However, the greater proportion of these clonal thickets will remain intact, and injured growth will recover rapidly. Manual removal of European beachgrass in areas near thickets will have no direct impact; indirect impacts may occur as a result of dune geomorphological and hydrological alterations, with re-alignment of stream corridors, wetlands, and dune swale, Implementation of standard and specific project requirements BIO 2a and BIO 2b will reduce potential impacts to a less-than-significant level.

***Salix sitchensis* Provisional Alliance** (Sitka willow thickets)
Sitka willow is a dominant shrub or low tree canopy component in this alliance, with *Alnus rubra* (red

alder), *Salix* spp., (willows), and other wetland shrubs and trees also present (Sawyer et al. 2009). In the Preserve, Sitka willow is common in marshy areas, including Inglenook Fen, and along Inglenook and Fen Creeks, European beachgrass removal, near Sitka willow thickets, will have no direct impacts on this alliance. Indirect impacts may occur as a result of geomorphological and hydrological re-alignments of dunes, swales, and drainages, although overall cover of this type will likely not change significantly. Standard and specific project requirements BIO 2a and BIO 2b will contribute to maintaining impacts to a less-than-significant level.

Special Status Plants

The policy of CSP is "to protect rare plants and their habitats in fulfillment of its mission to help preserve the State's extraordinary biological diversity, and in accordance with the California Endangered Species Act and the California Native Plant Protection Act" (DOM 0310.5.1). For the purposes of this IS/Draft MND document, the definition of "special status plants" used by the California Department of Fish and Game (May 2012) is used here. They include all plant species that meet one or more of the following criteria:

- Listed or proposed for listing as threatened or endangered under ESA [Endangered Species Act] or candidates for possible future listing as threatened or endangered under the ESA (50 CFR §17.12).
- Listed or candidates for listing by the State of California as threatened or endangered under CESA [California Endangered Species Act] (Fish and Game Code §2050 *et seq.*). A species, subspecies, or variety of plant is endangered when the prospects of its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, disease, or other factors (Fish and Game Code §2062). A plant is threatened when it is likely to become endangered in the foreseeable future in the absence of special protection and management measures (Fish and Game Code §2067).
- Listed as rare under the California Native Plant Protection Act (Fish and Game Code §1900 *et seq*.). A plant is rare when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens (Fish and Game Code §1901).
- Meet the definition of rare or endangered under CEQA §15380(b) and (d). Species that may meet the definition of rare or endangered include the following:
  - Species designated as "rare, threatened, or endangered in California" (Ranks 1A, 1B.1, 1B.2, 1B.3, and 2.1, 2.2, and 2.3) under the CRPR (California Rare Plant Rank) system.
  - Species that may warrant consideration on the basis of local significance or recent biological information;
  - Some species included on the California Natural Diversity Database's (CNDDB) *Special Plants, Bryophytes, and Lichens List* (California Department of Fish and Game, May 2012).
  - Considered a locally significant species, that is, a species that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region (CEQA §15125 (c)) or is so designated in local or regional plans, policies, or ordinances (CEQA Guidelines, Appendix G). Examples include a species at the outer limits of its known range or a species occurring on an uncommon soil type.

A scoping list of plant species, subspecies, or varieties considered to be special status plants and that have the potential for occurrence in the project area was derived from the most recent "Special Vascular Plants, Bryophytes, and Lichens List" (CDFG 2012), RareFind (CDFG 2012), BIOS (CDFG 2012), and the California Native Plant Society's Online Inventory of Rare and Endangered Plants

(CNPS 2012), and plants of local or regional significance not on any list (Appendix C.2 - Special Status Plant Scoping List).

Surveys in areas potentially affected by proposed project activities for rare plants were conducted by CSP Natural Resources staff for a total of 16 days spread out over a period of time starting in early April and ending in August, 2011. Surveys were conducted within a 100 to 400 ft. corridor extending along the haul road. Survey methodology followed California Department of Fish and Game's "Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities" (DFG 2009). To aid in the identification of plants, lists of plant species compiled by recognized professional botanists (Teresa Sholars and Peter Warner) were used as references (CSP 2007, Sholars 2006). The survey extended throughout the project area, which included approximately 485 acres within and around the road corridor and the European beachgrass treatment areas (Appendix A.1 - Dune Rehabilitation Project Overview Map). During the field surveys all plants encountered were documented to produce a floristic inventory of the project site (Appendix A.5 - Project Area Floristic Inventory) and all special status plants were mapped (Appendix A.6 - Special Status Plant Maps).

Surveys for federally- and state-listed species (*Chorizanthe howellii* and *Erysimum menziesii* ssp. *menziesii*) was not limited to the project area, but included all occurrences throughout the Preserve. This extensive survey and mapping was conducted by USFWS (US Fish & Wildlife Service) and CSP to estimate the 2011 occurrences of federally listed plants that were growing within the vicinity of the road relative to an estimate of the total occurrences of these species within the Preserve.

***Abronia umbellata* ssp. *breviflora* – Pink Sand-Verbena**
CRPR List 1B.1 - This species is endemic to the coastal strand and foredunes of Oregon and California. As an annual or short-lived perennial, plants established behind the foredunes can persist for several years. Pink sand verbena has occurred in small numbers in the Ten Mile foredunes, but the occurrences were primarily observed to the south bank of the Ten Mile River near the mouth. During the past several years since the initial removal efforts of European beachgrass, pink sand verbena has been found in new areas of the foredunes and coastal strand.

Pink sand verbena occurs in two areas along the haul road where road removal activities will directly impact approximately 14 plants. Two plants, each in a different area, occur approximately 60 ft (18 m) from the road and may potentially be impacted by the road removal. Seed collection and direct seeding into suitable habitat areas, and the removal of weed infestations within 50 ft (15 m) of the road are proposed for mitigation (Appendix E.2 - Mitigation, Monitoring, and Restoration Plan).

***Angelica lucida* – Sea-Watch**
CRPR List 4.2 - This perennial herb is found in coastal scrub, often on rocky bluffs. Approximately 25 plants were found at the edge of the project boundary, approximately 100 ft (30.5 m) from the work area. No direct impacts from construction or indirect impacts from sand burial are anticipated due to the distance from the haul road.

***Chorizanthe howellii* – Howell's Spineflower (spineflower)**
CRPR 1B.2, Federally Endangered, California Threatened - This species is found in semi-stabilized soil in sand dunes, coastal bluffs and coastal prairies from the Ten Mile River southward to Glass Beach. Historical occurrences are documented from the Fort Bragg headlands north of Noyo River and the headlands in the vicinity of Jug Handle Creek. The northern portion of the Preserve represents the northernmost occupied habitat for the entire range of the species.

Throughout the Preserve, spineflower is often found along the edge of the haul road and in dune mat vegetation. The haul road edge provides suitable habitat for spineflower because the sand is stabilized by the rocks that comprise the road base. Dominant plants occurring in this habitat are *Bromus diandrus, Festuca myuros, Medicago polymorpha, Rumex acetosella, Daucus pusillus, Polycarpon tetraphyllum, m Melilotus indicus, Erodium cicutarium, Hypochaeris radicata*, and *Artemisia pycnocephala.* It was also weakly associated with areas of dead European beachgrass (*Ammophila arenaria*) where *Cryptantha leiocarpa,. Pseudognaphalium stramineum, Artemisia, and Ammophila* were dominant plants. In the dune mat alliance, spineflower is strongly associated with the *Artemisia pycnocephala - Poa douglasii* vegetation association where golden aster (*Heterotheca sessiliflora* ssp. *bolanderi*) is a dominant component of the plant cover.

For an annual species such as spineflower, population numbers and areas of occurrence can fluctuate widely between years, particularly in dynamic ecosystems. Weather patterns and sand movement can affect seed dispersal patterns, seedling survival, and seed production. Since the dunes are a dynamic system, fluctuations in microhabitats are to be expected and are often unpredictable. Thus, the location of mitigation sites for spineflower relocation cannot be fixed and must be allowed to fluctuate over time based on changing site conditions. Seed collection, habitat restoration, protection of some existing habitat within the project area, spineflower introduction and re-establishment, non-native plant removals, and other compensatory measures have been proposed to reduce and mitigate negative project impacts on existing spineflower plants and habitat. Conservative, generous spatial allowances for improving existing habitat and fostering new habitat have been incorporated into restoration planning, in order to meet and exceed the level of anticipated losses of spineflower habitat as a result of project implementation (see Appendix E.2 – Mitigation, Monitoring, and Restoration Plan).

The population size of spineflower in the Preserve was estimated (see Appendices A.3 – Comparison of Spineflower (*Chorizanthe howellii*) Mapped Occurrences, 2001 & 2011 and A.4 – Population Estimates Methodology) to aid in developing appropriate mitigation measures for spineflower habitat affected by project activities.

***Eryisimum menziesii* ssp. *menziesii* – Menzies' Wallflower (wallflower)**
CRPR 1B.1, Federally Endangered, California Endangered - This species is found in sand dunes and sandy areas in coastal bluffs between the Ten Mile River and Pudding Creek. It does occur throughout the project area next to the haul road primarily in the Ten Mile River area, and near Inglenook and Fen Creeks, but the majority of the total population occurs away from the project site.

Although the road removal may eliminate individual plants, road removal, in conjunction with European beachgrass removal, will re-establish physical and ecological processes in the project area. The primary goal for this project is to restore these processes, and to provide for the re-establishment of more integral native vegetation and species' habitats over time. A related goal is that re-establishment of a greater proportion of dune habitat that will be unencumbered of asphalt, road base, non-native plants, and other human alterations will also increase the potential for sustaining habitat for all native plants, rare and more common. Restoration activities, as provided in the Mitigation, Monitoring, and Restoration Plan (Appendix E.2) for this project, include propagule (seeds, cuttings, etc.) collection of native plants, re-planting, monitoring, non-native plant removals, and other measures designed to adapt management activities towards the objectives of increasing the quantity and quality of native plant vegetation and individual species' habitats. With the ambiguities of climate and sea level changes, acute climatic fluctuations, storms, and other physical and ecological factors beyond the realm of this project to predict or control, the restoration plan provides for a long-term management process aimed towards achieving long-term maintenance of all native ecosystems.

Gilia millefoliata – Dark-Eyed Gilia
CRPR 1B - This species is found in sand dunes and in sandy areas in coastal bluff scrub and prairies. Plants are known to occur nearthe project area. A small occurrence of approximately 5 individuals occurs at least 125 ft (38.1 m) from the edge of the road-removal area. The occurrence is sufficiently far enough from the project activities and no impacts are expected. No mitigation measures are proposed. More broadly applied restoration measures will incorporate retaining or improving habitat for this species.

Horkelia marinensis – Point Reyes Horkelia
CRPR 1B.2 - This perennial herb is found in sandy coastal flats in coastal scrub and prairies. It is known to occur in several locations within and near the Preserve. One of the occurrences found during the survey was near the Ten Mile River, approximately 250 ft (76 m) from the haul road, sufficiently far from the project activities so that no impacts are expected. A previously documented occurrence at Inglenook Cr., approximately 45 ft. (14 m) east of the haul road, was also located during this survey. Although it occurs within a sand storage exclusion zone, which will be flagged, the *Horkelia* will additionally be flagged to ensure avoidance. With the implementation of Specific project Requirements, all plants will be avoided. No mitigation measures are proposed. More broadly applied restoration measures will incorporate retaining or improving habitat for this species.

Oenothera wolfii – Wolf's evening-primrose
CRPR 1B.1 - This biennial herb grows in dune swales and in scrub and herbaceous vegetation along drainages (e.g., Fen and Inglenook Creeks) in the dunes, primarily west of the paved haul road. Some stands may potentially be affected by project activities, and one occurrence (< 100 plants) on the edge of Inglenook Creek downstream of the culvert may be eliminatedby the removal of the road bed and culvert. Direct seeding into suitable habitat and surveys for new weeds and their removal are proposed as mitigation measures (Appendix E.2 - Mitigation, Monitoring, and Restoration Plan).

FAUNA

Special Status Animal Species

For the purposes of this document, special-status animal species are defined as those that are legally protected or that are considered sensitive by federal, state, or local resource agencies and organizations. Specifically, this includes species listed as state or federally Threatened or Endangered, those considered as candidates for listing as Threatened or Endangered, and species defined by CDFG as Species of Concern, Fully Protected, Protected or Watch Listed.

A query of the California Department of Fish and Game's Natural Diversity (CNDDB) was conducted for sensitive animal species within the six USGS quads containing and surrounding the project area (Fort Bragg, Inglenook, Dutchman's Knoll, Noyo Hill, Mathison Peak and Mendocino). Additional occurrence information was obtained through the review of other current and historical records. Special status animal species that occur in the proposed project area are discussed in this section. All sensitive species and their habitats were evaluated for potential impacts by this project. Species not known to occur within the project area, but which appear in CNDDB or other occurrence records for nearby areas, are addressed in Appendix C.1 - Wildlife – Sensitive and Special Status (including CNDDB).

Many common species are afforded protections under various federal and state laws and regulations. Every effort will be made to avoid negative impacts to all wildlife species. Restoration of native, naturally dynamic dune habitat is an important objective of the project. Any potential impacts to native animal species are likely to be minimal and temporary, while the benefits are expected to endure. Project requirements have been developed and will be implemented to avoid, or reduce impacts to a less than significant level to the native fauna including the sensitive and special status species (see Biological Project Requirements BIO 4-8).

Invertebrates

Globose dune beetle (*Coelus globosus*) – This flightless burrowing beetle, a nocturnal detritivore, was once common in low beach foredunes from central to southern California as well as Baja California, Mexico. Globose dune beetles and their larvae are associated with yellow sand verbena (*Abronia maritima*), beach bur (*Ambrosia chamissonis*) sea rocket (*Cakile maritima*) and other common dune plant species, and are typically found within 2-4 inches (5-10 cm) beneath these plants. Adults, larvae and pupae spend most of their time in the sand. Globose dune beetle has been detected on Ten Mile beach. In 1978 the USFWS proposed listing this species as threatened or endangered, and identified the narrow strip of dune habitat on the west side of the haul road between the Ten Mile River and the mouth of Mill Creek as potential critical habitat. However, the species is not currently listed under either federal or state Endangered Species Acts. The Proposed Rule in the Federal Register for the listing of this beetle specified the spread of *Ammophila* as one of the factors leading to loss of its habitat, stating that "heavy foot traffic, development and the introduction (intentional or accidental) of European dune grass (under which it cannot survive) are the chief reasons why its preferred habitat has become so highly disturbed." Globose dune beetles are not expected to occur within areas of dense *Ammophila*, and in other areas are expected to occur most frequently under the sand surface.

Ten Mile shoulderband snail (*Noyo intersessa*) – Likely endemic to the Ten Mile dunes, this species uses areas of coastal dune and coastal scrub vegetation. Little specific information on this snail is available, but based on the biology of related species, growth, copulation, and egg-laying most likely occur during the rainy season. There is documented occurrence of the Ten Mile shoulderband snail at the south end of Ten Mile beach. This species is not listed.

Vertebrates

Fish

Standard project requirements to protect water quality are detailed in the Hydrology and Water Quality Project Requirements. The project area (including Fen Creek and Inglenook Creek) does not contain suitable habitat for Chinook salmon, Coho salmon or steelhead trout. Therefore, no impacts to these species are anticipated. However, potentially suitable habitat for Tidewater goby does occur. Biological Project Requirement BIO 6c describes measures to avoid potential impacts.

Tidewater goby (*Eucyclogobius newberryi*) - Tidewater goby is listed as endangered under the federal Endangered Species Act and as a DFG Species of Special Concern due to habitat loss and modification resulting from coastal development, channelization of habitat, diversion and alteration of water flows, and groundwater over-drafting. The small, benthic tidewater goby, endemic to California, inhabits brackish coastal waters including lagoons, estuaries, marshes and lower stream reaches where the water is fairly still but not stagnant. Tidewater goby occurs in the Ten Mile River, at the northern boundary of the Dune Preserve; Virgin Creek within MacKerricher State Park; and Pudding Creek on the southern boundary of the park.

USFWS conducted surveys at the Inglenook Fen in 2003 but did not detect or capture any tidewater gobies. Surveys conducted by DFG staff with assistance from CSP staff in 2011 failed to detect tidewater goby in the estuarine waters of either Inglenook or Fen Creek (during two survey efforts separated by one month), but did successfully capture and identify individuals in the Ten Mile River. While both Inglenook Creek and Fen Creek contain marginally suitable habitat near and downstream of the project area, tidewater goby presence is unlikely due to the low quality of the potential habitat. All USFWS-designated critical habitat for the species occurs in southern California.

Surveys for tidewater water goby will be conducted within 30 days prior to removal of culverts at Fen Creek and Inglenook Creek. Avoidance measures recommended by the USFWS will be implemented as a precaution to prevent potential impacts to tidewater goby and habitat.

Amphibians and Reptiles

There is the potential to disturb amphibians and reptiles during project work, especially where restoration activities will take place in wetland habitats. Project requirements have been developed and will be implemented to avoid, or ensure impacts to amphibians and reptiles will remain at a less than significant level (see Biological Project Requirements BIO 5).

Western pond turtle (*Emys marmorata*) – Western pond turtle is a DFG Species of Special Concern. It is typically associated with permanent ponds, lakes, streams, or irrigation ditches, or permanent pools along intermittent streams, with some shallow-water habitat. This aquatic turtle is believed to leave the water to reproduce, to aestivate, and to overwinter, though activity patterns vary throughout its range and are poorly understood. A variety of aquatic habitats are utilized, usually consisting of vegetative cover and exposed basking sites such as logs or boulders. As opportunistic dietary generalists, pond turtles consume a variety of slow-moving aquatic invertebrates, carrion, and aquatic vegetation. Breeding typically occurs in April or May, and eggs are deposited in a shallow depression in May or June. Potential habitat occurs within the project area.

Northern red-legged frog (*Rana aurora*) – Northern red-legged frog is a DFG Species of Special Concern due to habitat degradation caused by coastal development, timber harvesting and grazing, as well as exotic predatory fishes in many coastal watersheds. The northern red-legged frog inhabits quiet pools of streams, marshes, and occasionally ponds throughout its California range in the Coast Ranges from Del Norte County to Mendocino County, usually below 4000 feet (1,220 km) elevation. Historical references document occurrence of Northern red-legged frog in the Inglenook Fen – Ten Mile Dune Preserve and it is likely to occur in the project area.

Foothill yellow-legged frog (*Rana boylii*) – Foothill yellow-legged frog, a highly aquatic species rarely encountered far from permanent, shallow, flowing water, is a DFG Species of Special Concern due to threats within its range such as water diversion, water-quality issues associated with logging and livestock grazing, and the introduction of exotic predatory aquatic fauna. It occurs in or near rocky streams in coastal scrub, wet meadow and valley-foothill riparian habitats. Breeding and egg-laying occur after spring flooding from mid-March to May for approximately two weeks. Foothill yellow-legged frogs prefer shorelines with extensive vegetation. Habitat used by adult frogs includes patches of dense grassy or shrubby vegetation that maintain substrate moisture, such as willow thickets and dense sedge swales. Foothill yellow –legged frog is historically known to occur in the Coastal Redwood Forest habitat within the Inglenook Fen – Ten Mile Dune Preserve, and may potentially be present in the project area.

Birds

Project activities have the potential to cause disturbance to birds that use the project area for foraging, roosting, or nesting. Project requirements have been developed and will be implemented to avoid any potential impacts to bird species (see Biological Project Requirements BIO 7a-d).

Mendocino District maintains a 10(a)(1)(A) Recovery Permit for western snowy plover monitoring and conservation work. Some local staff members are listed on the permit and qualified to carry out required project surveys.

Cooper's hawk (*Accipiter cooperii*) – During nesting, Cooper's hawk is a DFG Watch Listed Species. It is associated with patchy, second-growth conifer and forested riparian habitats. These habitats are essential for hunting and nesting. Prey includes small birds, mammals, amphibians, and reptiles. Potential foraging habitat occurs in the project area.

Sharp-shinned hawk (*Accipiter striatus*) – During nesting, sharp-shinned hawk is a DFG Watch Listed Species. This riparian-associated species typically uses areas with dense forest stands near open areas: roosting in intermediate to high canopy forest, wintering in woodlands, and nesting near water in even-aged, single-layer forest canopy. Its typical prey consists mostly of birds but also includes mammals, insects, reptiles, and amphibians. Suitable foraging habitat potentially occurs in or near the project area.

Burrowing owl (*Athene cunicularia*) – Burrowing owl is designated as a USFWS Bird of Conservation Concern and a DFG Species of Special Concern. Burrowing owls can be found throughout California in areas of low and/or scattered vegetation with flat or low rolling topography. The owls use burrows excavated into flat ground or along slopes often dug by mammals or themselves. On occasion, owls will utilize structures buried or protruding from the ground which offer an accessible cavity, such as culverts, irrigation infrastructure, and woody or fibrous debris or buried rock. Numerous buried driftwood logs offer adequate substrate for burrows and ground level cavities used by burrowing owls. Several historical records exist for MacKerricher State Park, and within the Preserve, and individuals have recently been observed near the project area during winter.

Western snowy plover (*Charadrius alexandrinus nivosus*) **–** Western snowy plover is a federally listed threatened species, and a DFG Species of Special Concern. On the Pacific coast, western Snowy

Plover occurs primarily on sandy beaches and estuarine areas. The primary causes of Snowy Plover population declines are habitat loss and degradation attributable to development, dune alteration and urbanization in areas of coastal habitats, the spread of invasive European beachgrass (*Ammophila arenaria*), depredation by native and non-native predators, and human-caused disturbance. Suitable habitat in the Inglenook Fen – Ten Mile Dune Preserve includes the entirety of the coastal strand, from the low tide line to the foredune where plovers are frequently observed. The entire beach and dune habitat of the Inglenook Fen – Ten Mile Dune Preserve has been designated as critical habitat by USFWS. The Mendocino District holds a 10(a)1(A) Recovery Permit for western snowy plover monitoring and management activities; project requirements detailed in Biological Requirements BIO 7d are conditions included in that permit.

Northern harrier (*Circus cyaneus*) **–** During breeding from April to September northern harrier is a DFG Species of Special Concern. Northern harriers utilize open areas with low vegetation, often near water or in wetlands, for foraging and hunting. Harriers construct nests of vegetative matter within ground vegetation concealed in grassy, marshy areas. Foraging occurs on the wing in low coursing flights over open areas, where harriers hunt for small rodents, reptiles or birds. Perching on the ground or atop low substrates is most common. Dune troughs and associated vegetation and hydrological accumulations create ample habitat for the northern harrier along the eastern portion of the haul road over much of the project area, and harriers are often observed hunting in the project area.

White-tailed kite (*Elanus leucurus*) – White-tailed kite is a DFG Fully Protected Species. Often found near agricultural areas, and in herbaceous stages of most habitats. Prey are primarily small diurnal mammals, but also include birds, reptiles, amphibians and insects. Trees with dense cover, especially near grassy, open foraging areas, are important for cover and nesting. Suitable foraging habitat occurs near the project area.

Merlin (*Falco columbarius*) – Although it does not breed in coastal California, the merlin is a frequently observed on the Mendocino coast during migration and winter months, September to May. During those months, it is a DFG Species of Special Concern. Merlin, a predator of small birds, prefers wide open areas of low and/or sparse vegetation, which allows it to chase down prey on the wing. Suitable foraging habitat occurs in and around the project area.

American peregrine falcon (*Falco peregrinus anatum*) – On the federal endangered Species list beginning in 1970, the peregrine falcon was delisted at the federal level due to population recovery in 1999, and in California in 2009. Peregrine falcon is currently designated as a Bird of Conservation Concern by USFWS and as Fully Protected by DFG. Peregrine falcon occurs in coastal areas throughout California year-round. The species is commonly found in areas proximate to water and often nests in aeries, unlined scrapes or ledges, along cliffs and bluffs; or utilizes a man-made vertical structures, such as a building or bridge; as well as nesting on the ground atop prominences or low hills in rare instances. Foraging habitat occurs in the project area.

Osprey (Pandion haliaetus) Documented to occur near the project area during its breeding season, osprey is a DFG Watch Listed Species during that time. Habitat requirements include mixed-conifer habitats near a large, fish-bearing body of water. Nest is a platform of sticks constructed on a large snag, dead-topped tree, cliffs, or manmade structures; occasionally nest may be on the ground. Prey is mostly fish, though mammals, birds, amphibians, reptiles, and invertebrates are also eaten.

California brown pelican (Pelecanus occidentalis californicus) A DFG fully protected species on its nesting colonies and communal roosts, brown pelican has been delisted from federal and state endangered species lists. Pelicans are observed in flight and resting on the shore at MacKerricher during post-breeding dispersal and migration periods, but do not breed on the Mendocino coast.

Purple martin (Progne subis) A DFG Species of Special Concern. Often found in open, multi-layered, old-growth forest and woodland with snags during breeding season. Riparian, forest, and woodland areas are important for foraging on insects. Nesting occurs from April to August; nest sites are usually an old woodpecker cavity in a tall, isolated tree or snag. Purple martins have been observed near the Ten Mile River bridge to the north, and may forage in or near the project area, although no suitable nesting habitat occurs there

Mammals

Several species of mammal occur or have the potential to occur in the Ten Mile Dunes, including marine mammals that may temporarily use the beach for resting or may become stranded. However, no special status mammals are expected to occur within the project area, and no significant impacts are anticipated for any mammalian species. Project requirements have been developed and will be implemented to avoid potential impacts to marine mammals if they are found (see Biological Project Requirements BIO 8).

IMPACT	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO
WOULD THE PROJECT:				
a) Have a substantial adverse effect, either directly or through habitat modification, on any species identified as a sensitive, candidate, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service?	☐	☐	☒	☐
c) Have a substantial adverse effect on federally protected wetlands, as defined by §404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☒	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

DISCUSSION

a) A primary goal of the road removal is the improvement of stream and dune habitat for, and protection of, rare, threatened, and endangered species and special-status vegetation communities. The project includes avoidance and mitigation measures that will be implemented to reduce the potential for adverse impacts to sensitive species to a less than significant level. The project will be conducted in compliance with all applicable State and Federal threatened and endangered species protection laws and regulations. The USFWS has provided assistance for the planning and implementation phases of the restoration work, specifically spineflower mitigation.

CSP will obtain a Streambed Alteration Agreement (SAA) from DFG for each watercourse crossing. Clean Water Act Section 401 and Section 404 permits will be obtained for restoration work that involves the removal of fill from stream crossings. If during the application for a 401 Clean Water Act permit, the permitting federal agency (USACE) determines that the project is likely to adversely affect a federally listed species, even temporarily, the agency will submit to the USFWS a request for formal consultation. CSP will work with USFWS to prepare a biological opinion addressing whether the proposed project will potentially result in jeopardy of the species. Additionally, CSP will work with the California Department of Fish and Game for appropriate permits regulating state listed plant species.

Despite best efforts to avoid any adverse impacts to sensitive species there is the potential for less-than-significant impacts with mitigation. The project is expected to benefit special status species over the long-term by enhancing and expanding habitat with the removal of the paved road, culvert crossings, and European beachgrass, features that hinder the natural processes of the dune environment.

The mitigation measures identified below and described in detail in Appendix E.2 - Mitigation, Monitoring, and Restoration Plan, will ensure that any adverse impacts to special status species resulting from project activities will be less than significant.

MITIGATION MEASURE BIOLOGICAL 1 – PLANTS

The proposed action could adversely affect the special status plant species described under "Environmental Setting". However, as referenced above, the Mitigation, Monitoring, and Restoration Plan (Appendix E.2) includes Mitigation Measure BIO 1, designed to reduce impacts to special status plants to a less than significant level.

MITIGATION MEASURES – BIO 1 (PLANTS)
For all mitigation, refer to Appendix E.2 - Mitigation, Monitoring, and Restoration Plan. **All special status plant species** • All areas within 50 ft (15 m) of the road will be searched for weeds, specifically iceplant, and will be removed for a 5 year period. ***Abronia umbellata* ssp. *breviflora* – Pink Sand-Verbena** • A mitigation, monitoring, and restoration plan for maintaining existing populations, and the introduction and establishment of new populations through direct seeding is proposed in areas where appropriate habitat is identified through monitoring. Plants near the haul road that can be avoided will be flagged. Execution of the mitigation plan and avoidance measure is expected to reduce project-related impacts to a less-than-significant level with a mitigation ratio of a minimum of 4:1. ***Chorizanthe howellii* – Howell's spineflower** • A mitigation, monitoring, and restoration plan for maintaining existing populations, and the introduction and establishment of new populations through direct seeding is proposed in areas where appropriate habitat is identified through monitoring. Plants near the haul road that can be avoided will be flagged. Execution of the mitigation plan and avoidance measure is expected to reduce project-related impacts to a less-than-significant level with a mitigation ratio of a minimum of 8:1. Because the project occurs within a State Natural Preserve, the largest feasible mitigation ratio was used. ***Eryisimum menziesii* ssp. *menziesii* – Menzies' Wallflower** • A mitigation, monitoring, and restoration plan for maintaining existing populations, and the introduction and establishment of new populations through direct seeding is proposed in areas where appropriate habitat is identified through monitoring. Plants near the haul road that can be avoided will be flagged. Execution of the mitigation plan and avoidance measure is expected to reduce project-related impacts to a less-than-significant level with a mitigation ratio of a minimum of 8:1. Because the project occurs within a State Natural Preserve, the largest feasible mitigation ratio was used. ***Oenothera wolfii* – Wolf's evening-primrose** • One small patch of evening-primrose at the northern bend in the haul road is within the 50 ft (15 m) potential impact buffer. It will be flagged and avoided. Other plants near Fen Creek may be eliminated by the project; therefore direct seeding into suitable habitat at a 4:1 ratio will be implemented as mitigation, increasing the number of plants and reducing the impacts to a less-than-significant level.

b) This project will not have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service. The removal of the culverts and road will have temporary direct impacts on several natural communities during project implementation; however, the project is designed to remove these unnatural features and improve the overall habitat of natural vegetation communities in the dune system. The project is considered to be self-mitigating and, coupled with the implementation of Standard and Specific Project Requirements BIO 2a and BIO 2b, any temporary impacts are considered to be less than significant.

c) This project will have temporary and thus, a less than significant impact on federally protected or state protected wetlands. The project design is to improve wetland habitat by removing culverts and expand wetland habitat by removing an earthen road prism. In addition, implementation of Standard and Specific Project Requirements BIO 3a and BIO 3b will ensure that the potential for impacts are further reduced.

d) This project will have less than significant impact on the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors. Restoration activities will enhance wildlife habitats and will not result in any significant adverse impacts.

e) The proposed project is not conflicting with local policies or ordinances protecting biological resources, such as Mendocino County's coastal policies. The proposed project temporarily impacts biological resources but affords mitigating measures to lessen the impacts to a level that is less than significant. No impact.

f) The project will not conflict with the provisions of any adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan because none exist for the project location. No impact.

V. CULTURAL RESOURCES.

ENVIRONMENTAL SETTING

The project area is located within MacKerricher State Park (SP) on the northern Mendocino Coast. The park spans approximately 2,520 acres west of Highway 1 and encompasses much of the land west of the town of Cleone on a strip of coastline between Fort Bragg and Ten Mile River. The Park includes one of the few flat ocean terraces on the Mendocino coast with an elevation range from sea level to 120 feet (36.5 m) at the northern end (CSP 1995).

Situated on the western edge of the Coast Range, MacKerricher SP is characterized by marine terraces and extensive dune fields which divide the park into two distinct sections, north and south. The actual project area is located in the northern portion of the park in the Inglenook Fen - Ten Mile Dunes Natural Preserve which extends south from Ten Mile River to north of Ward Avenue. The northern portion of the park which includes the Preserve is comprised of five and a half miles of sandy shoreline backed by low bluffs and coastal dunes. The southern portion of the park, which is outside of the project area, is an open, relatively flat marine terrace with rocky bluffs and small secluded beaches that gradually slopes up from the Glass Beach parcels, north towards Lake Cleone and Laguna Point.

The natural topography in the park supports diverse plant communities including coastal strand vegetation on the beaches; dune swale plant communities, grasslands and coastal scrub, conifer forests, and riparian vegetation associated with the numerous streams, lagoons, lakes (Sandhill Lake and Lake Cleone), Inglenook Fen, and other wetland communities located throughout the park. In addition to the varied terrestrial plant communities, the marine and tidal environments are plentiful and diverse, consisting of a wide range of marine habitats supported on the sandy beaches and rocky shores. This environment has strongly influenced the rich cultural diversity found within the park.

CULTURAL SETTING

There are two main categories of cultural resources, the archaeological environment and the historic environment, both influenced by the resources available in the area. The topography, weather, and abundance of natural resources on the Mendocino Coast provided an ideal setting for both prehistoric and historic utilization and settlement in the region. Archaeological and ethnographic data from studies in the park suggest Native populations heavily utilized the area encompassing MacKerricher SP including the Ten Mile dunes, the Lake Cleone locale, and the southern bluffs (coastal terraces). These areas provided access to a rich and varied ecological setting, ideal for subsistence which included resource procurement and processing, and other activities related to occupation of major year-round villages to short term campsites. Historically, the entire park was part of the Mendocino Indian Reservation. When the reservation was abandoned and placed in the public domain, the land was bought for settlement and used for agriculture and ranching. Several years later as the value of timber in the region increased, the land now located within MacKerricher SP was used for transporting timber.

Prehistoric/Ethnographic Background –

<u>Prehistory</u>

Human presence on the Mendocino Coast extends back approximately 11,000 years; however, because archaeological investigations in the region are limited, knowledge of the prehistory remains sparse. Since populations during the earliest periods are assumed to have been quite meager and mobile, archaeological evidence associated with these periods is underrepresented and poorly defined. The region's archaeological record of the last 3,000 years is more comprehensive, and as a result, more clearly understood. Investigations on the Mendocino Coast by Layton (1990) and White (1989), as well as numerous others have aided in developing regional chronological sequences for the area and have furthered our understanding of prehistoric settlement patterns on the north coast.

White (1989) focused his archaeological studies at MacKerricher SP. In addition to White's work at the park, Lindahl conducted a subsurface investigation in 2003 at a large shell midden site on the south side of Virgin Creek, approximately 2.5 miles (4.02 km) south of the Natural Preserve. To date, it is unclear if this work has been completed or published. This investigation was particularly important because it produced some of the oldest reliable dates for prehistoric sites in the park and possibly some of the oldest dates on the Mendocino Coast. Additionally, the site has the potential to produce significantly older prehistoric site dates in deeper deposits that currently have not been investigated. Dates derived from radiocarbon analysis range from circa 900 +/- 40 BP to 2890 +/- BP and fit well with the dates obtained through obsidian hydration of several specimens collected at the site.

The work by White (1989) is the most comprehensive and includes both an archaeological survey and the excavation of 11 prehistoric sites at MacKerricher SP. The excavations generated chronological data for reliable radiocarbon dating and distinctive "time-marker" artifacts that were used to develop a local expression of the late cultural history related to prehistoric sites in the park. The chronological sequence generated from this work has been grouped into three cultural/historical phases.

The phases developed by White (1989:141) for late period sites at MacKerricher SP include:

- MacKerricher Phase – is radiocarbon dated between AD 0 and AD 530. This phase was characterized by residency over fairly long periods on the coast. Occupation occurred sometime during the late spring through summer season. Visits may have been scheduled to correspond to the appearance of elk on the coastal prairie, and Steller sea lion in the near-by shore zone. Shellfish were a significant staple and were probably taken by searching out a varied catch from tide pools and rocks on the open coast, selecting for larger individuals.
- Sandhill Phase – is radiocarbon dated between AD 1300 and 1850. This phase was characterized by short term camps used in the early fall season. The site inventories reflect a narrow economic spectrum focused on mussel, supplemented by opportunistic hunting of terrestrial and marine mammals and gathering of vegetal foods. In comparison to MacKerricher Phase's seasonal residences, the Sandhill Phase deposits could be regarded as simple shellfish processing camps, probably used once or twice and then abandoned for long stretches in favor of other locations.
- Ten Mile Phase – is radiocarbon dated between 1850 and 1870. This phase characterized residence as limited, possibly seasonal episodes. Seasonal data are unclear, although summertime occupation is indicated. The economy included both native foods and foods obtained from the reservation authority.

Ethnography

Two Native American groups reportedly inhabited the MacKerricher SP area before the 1850s; however, the boundaries are not necessarily agreed upon since traditional settlement patterns had already been altered from Euro-American intrusions prior to conducting comprehensive ethnographic studies in the area. Additionally, critical resource procurement areas were shared by different tribal and linguistic groups. Generally, the location north of Cleone was Coast Yuki territory with Lake Cleone forming the approximate southern boundary. To the north, Coast Yuki territory extended past Rockport. The Northern Pomo occupied the coastline around Fort Bragg and extended north to Virgin Creek and present day Lake Cleone. In the Lake Cleone area, the territory of the Coast Yuki and Northern Pomo overlapped (CSP 1995).

Coast Yuki

Dialectically, the Coast Yuki was a subgroup of the inland Yuki, speaking a language representing a small, isolated speech family (Kroeber 1925). The Coast Yuki comprised 11 groups who inhabited a 50 mile strip along the Mendocino Coast (Miller 1978). In MacKerricher, the Coast Yuki groups were the *Laliam-ontilka* near Cleone, the *Lilhuyak-ontilka* at Inglenook Beach, and the *Metkuyak-ontilka* at the mouth of Ten Mile River. After Euro-American settlement in the region, the population of the Coast Yuki dropped significantly. In 1972, they were determined ethnographically extinct (Miller 1978).

According to Kroeber (1953), the Coast Yuki called themselves *Yukoht-ontilka* (ocean people). Described as a small group of shell mound dwellers that occupied beach camps in the summer months and in the winter, groups moved more inland (Miller 1978). Although their economy focused on a variety of marine and terrestrial resources, their quest for marine foods was of particular importance. Invertebrates from the mid to high littoral rocky coast were gathered by everyone. Mussels and barnacles were preferred but gastropods and bivalves were also collected. Other resources from the ocean environment and littoral zone were seaweed, surf fish and sea lions, seal, and salt. Salmon caught in the local rivers was also vital to the Coast Yuki diet. Important terrestrial resources included acorns, seeds, and other vegetal products as well as elk and deer. Women were responsible for collecting plant resources and the men hunted and fished. The Coast Yuki traveled to neighboring areas to acquire resources not readily available in their territory.

The Northern Pomo

The Northern Pomo were one of seven tribes that spoke languages of the Pomoan linguistic family (McLendon and Oswalt 1978). Various tribelets of the Northern Pomo inhabited central Mendocino County on 22 miles (35.4 km) of coastal frontage that extended into present day MacKerricher SP. To the east, their territory extended in an irregular band to the northwest shore of Clear Lake and followed the Navarro River south. The *Mato-Poma* was a tribelet whose territory encompassed MacKerricher SP (McLendon and Oswalt 1978). Not until encroachment by Euro-American settlers into the interior valleys around 1850, did the Northern Pomo live year-round on the coast. Prior to permanent occupation on the coast, various Northern Pomo tribes had favorite coastal campsites and procurement areas which were occupied during the summer months.

In addition to their own territory, the Northern Pomo hunted and gathered food and procured various other resources in the Ten Mile River watershed and north along the coast in the tribal lands of the Coast Yuki. Like their Yuki neighbors, the Northern Pomo had similar resource preferences and relied heavily on the rich littoral resources of the coast which provided an abundance of shellfish, seaweed, and surf fish. Marine mammals including sea lions and seal were hunted while runs of salmon and steelhead were taken seasonally in the larger drainages. Terrestrial animals including deer, elk, and mammals such as rabbit were hunted or trapped. Tan oak, black oak, and hazel were important vegetal resources to the Northern Pomo. Birds were valued mainly for their brightly colored feathers, used to adorn baskets and ceremonial regalia (Van Bueren 2007).

Mendocino Indian Reservation

MacKerricher SP found its beginnings as an Indian Reservation. The Mendocino Indian Reservation was established in 1856 and was the first official reservation in the northwestern section of the State. It was established because of pressures from American settlers troubled by Indian depredations, who threatened vigilante reprisals unless the government intervened (CSP 1995). The reservation was approximately 25,000 acres and included the entire Ten Mile Township and covered all of what is now MacKerricher SP. The Noyo River formed the southern boundary of the reservation which extended north to Ten Mile River. The coast formed the western boundary, and inland, the boundary was the first forested ridgeline.

The primary objective of the reservation was to concentrate Native people into one area where they could be controlled, less vulnerable to attacks by Euro-American settlers, and could be taught farming and simple trades (CSP 1995). In addition to the local Native American groups, the U.S. Army brought indigenous people from throughout Northern California to the reservation including Indians from Anderson Valley, Ukiah, Round Valley, Russian River Valley, Sulphur Creek, Bodega Bay, Humboldt County, Pit River, Hat Creek, Butte Creek, Feather River, and the greater Mendocino County. This grouping of local Native American tribes with more distant neighbors resulted in former enemies residing in close contact on reservation land. The inevitable consequence related to this assemblage of people was constant strife amongst the various tribal groups.

In 1856, it was reported that over three-thousand Indians were residing on the reservation (CSP 1995). On the reservation, the government attempted to establish agricultural activities and educate the Indians. In addition to farming, the Indians were encouraged to continue gathering their traditional foods, particularly fish (CPDR 1995).

In 1857, the town of Fort Bragg was established as a military garrison to maintain order and keep peace on the reservation and surrounding land. Troops stationed at Fort Bragg watched over the reservation and attempted to mitigate problems between the various tribal groups and between Native populations and settlers. During the 1850s and 1860s, the presence of the military had little effect at reducing the continued conflict between the settlers and the Indian population (CSP 1995).

The Mendocino Indian Reservation was considered a failure and was abandoned in 1867. Several years later when the value of timber resources and other economic opportunities were realized in the region, pressure was put on the government to release reservation property into public domain so the lands could be purchased. Once put into public domain, the land was offered for settlement and development at $1.25 per acre (Unit History File n.d.).

After the Mendocino Indian Reservation was terminated most Native people returned to their former homes, especially those forced onto the reservation from out of the area. For local tribal groups, their traditional ancestral lands were taken over by settlers. Traditional life-ways, including hunting, fishing, and gathering places were no longer available. As a result, local Native American groups gradually became more dependent on employment for their livelihood. Many were allowed to settle on large ranches with the owner's permission, and as needed, worked on the ranches. Other employment included working in the hop and grain fields or as wood choppers (Unit History File n.d.).

Historic Background

Early Exploration

Established in 1812, Fort Ross was the first permanent settlement on the Northern California coast. After the Russians left Fort Ross in 1841, California's Mexican government encouraged permanent settlement in the Mendocino region by making land grants available to Mexican citizens. By 1845, William Richardson established one of two ranchos on the Mendocino Coast. Richardson's Albion Rancho, situated approximately ten miles south of present-day MacKerricher SP, aided in the settlement of the Mendocino Coast by making the region more accessible to other settlers (CSP 1995:47).

By 1851, a handful of settlers occupied the Mendocino coast and settled in the Big River area north of Richardson's Albion Ranchero. In the winter of 1850-51, the brig *Frolic* heading for San Francisco with a cargo of Chinese goods wrecked in the ocean near Point Cabrillo. The salvage crew sent from San Francisco was unable to retrieve the lost cargo but did report back on the established settlements and giant redwoods along the Mendocino Coast. This report revealed potential opportunities for a redwood lumber industry in the region. In 1852, the first lumber mill in the area was constructed at Big River. The timber industry expedited the influx of American settlers into the Mendocino area. As the timber industry expanded and economic opportunities expanded, settlement in the area continued to increase.

Towns were established along the Mendocino Coast in locations where the topography was conducive to loading ships with lumber. As settlement in the region increased, so did agitation between the Native people and settlers. This resulted in demands for both a military outpost and establishment of an Indian reservation (Mendocino Indian Reservation).

History Relevant to the Park

Duncan MacKerricher was one of the first settlers in the Mendocino area to purchase land released from the reservation. MacKerricher with his wife settled on the Mendocino Coast in 1864. Originally, MacKerricher worked on the Mendocino Indian Reservation’s dairy. After the federal government abandoned the reservation, MacKerricher purchased 640 acres of the newly available reservation land for $1.25/acre. Eventually, MacKerricher amassed over 1200 acres. A portion of MacKerricher’s holdings became the core of the present-day state park (CSP n.d., 1866, 1868; CSP 1995:48).

MacKerricher raised crops and livestock on his ranch. In 1882, MacKerricher allowed Alexander Jefferson and Sam Kennedy to build a wharf, an apron chute, and a shipping yard on his property. The shipping point served two sawmills; one built in 1883 on Laguna Creek (present day Mill Creek) and the other built around the same time on the south fork of Ten Mile River. In 1855, winter storms washed out the chute and wharf but were replaced soon thereafter.

The Little Valley Lumber Company incorporated in 1885 and purchased Jefferson and Kennedy’s Laguna Creek Mill to add to their holdings. In 1887 MacKerricher sold a tract of land one mile up Laguna Creek for a sawmill site and deeded a 30 foot roadway easement down to the county road, now State Highway 1, to Little Valley. The Little Valley Lumber Company constructed a tramway two and a half miles long to transport timber from their Laguna Creek Mill to the wharf (CSP n.d. 1887; CSP 1995: 49).

Duncan MacKerricher operated the ranch until 1908 when he and his wife moved to the town of Fort Bragg. MacKerricher’s wife died in 1923, and in 1926, MacKerricher died. The ranch property, though reduced in size from prior parcel sales, remained in the family until 1949, at which time, the heirs to MacKerricher sold a 205 acre parcel to the State for use as a state park.

Logging

When the first lumber mill was established 1852, the Mendocino area was sparsely settled. As the demand for lumber grew, settlement and development in the area increased. In 1882, Charles Russell Johnson, James Hunter, and Calvin Stewart established the Newport Sawmill Company on Mill Creek which was located within the boundaries of the present-day State Park. In an effort to improve shipping facilities, the Newport Sawmill Company merged with the Noyo Lumber Company in 1884, forming the Fort Bragg Redwood Company. A new mill was constructed in 1885 in Fort Bragg by the Fort Bragg Redwood Company which moved all its milling operations to this location. Construction of the new mill in Fort Bragg led to increased settlement and development near the new mill and eventually led to the incorporation of the town of Fort Bragg in 1889 (CSP 1996).

The Fort Bragg Redwood Company merged with other small lumber companies in 1891 to increase capital for expansion. Between 1905 and 1921, the Union Lumber Company acquired controlling interest in Glen Briar Redwood Company, the Little Valley Lumber Company, and the California Lumber Company (CSP 1996)

The Haul Road

In 1916, the Union Lumber Company (CA-MEN-2946H) constructed the Ten Mile River Railroad to transport timber from the Ten Mile River watershed to their mill in Fort Bragg. The railroad alignment traveled north from the mill in Fort Bragg, crossing Pudding and Virgin Creeks and continued north along the coastal terrace to Laguna Point. From Laguna Point the grade dropped in elevation to almost level with the beach along the edge of Ten Mile Dunes. At Ten Mile River, the railroad alignment turned east and then south, paralleling the river into the watershed.

In order for the railroad alignment to maintain elevation along the coast, the Union Lumber Company constructed a berm for the tracks. Construction of the berm at Mill Creek resulted in the formation of Lake Cleone. From 1917 to 1949, the Union Lumber Company transported over 95 percent of their timber harvest to the mill using the Ten Mile Railroad. In 1949, the Union Lumber Company converted the railroad grade to a truck hauling road. This conversion included the removal of rails and ties along the alignment. Several layers of gravel and road base rock were imported from a quarry up the north fork of Ten Mile River. The gravel was used to cap over the grade footprint to construct the road. Eventually, the haul road was paved (chip-sealed).

Within MacKerricher SP, the Union Lumber Company continued to use the haul road to transport timber. In the summer of 1977, the Georgia Pacific Corporation (merged operations with Union Lumber Company in 1969) opened the haul road to the public on the weekends. Vehicle use of the road continued until 1983, when a violent storm washed out a half-mile portion of the road along the beach in the Ten Mile Dunes vicinity. Since being abandoned in 1983, degradation of the haul road has continued and as a result, is no longer viable as a travel corridor in the Preserve. However, the haul road south of Ward Avenue is an important recreational venue for the park and is used by visitors for a myriad of recreational activities including biking, hiking, and access to the beach.

The Park

The State acquired lands for MacKerricher SP after massive park expansion fueled by California's booming population and economy after World War II. The park opened to the public on a limited basis in 1951 and officially opened in 1953 with the completion of a 20-site campground and day-use facilities. In 1992 the State purchased the Pudding Creek Trestle and in 1994 the remaining segments of the Haul Road situated in the park.

ARCHAEOLOGICAL AND HISTORICAL RESOURCES

The library and other archival records and sources on file at the CSP Northern Service Center (NSC) were consulted for the project to assemble pertinent information related to the archaeological and historical resource potential in the project area. Additionally, the cultural resource specialist reviewing the project contacted relevant institutions and searched pertinent data bases for further information concerning cultural resources in the park.

This comprehensive information search yielded significant information related to the archaeological and historic resources in the park, and in particular the project area. The information search indicates MacKerricher SP and the Ten Miles Dunes area have been the subject of numerous archaeological investigations and cultural resource inventories over the last 60 years. These studies have consisted of both terrestrial surveys and subsurface investigation related to park projects (development and maintenance) and scientific studies associated with Universities. The first official archaeological investigation was conducted in 1949, when the park was acquired and included the survey of the entire unit. Schulz (1985) surveyed the entire park unit in 1985 for a coastal site protection program and bluff stabilization project. The study by Schulz resulted in the subsurface investigation of 11 prehistoric sites identified as having been damaged or threatened by bluff or dune erosion. Greg White carried out the investigation of these sites in 1988. The work by White was important because it led to the development of a regional chronology (prehistoric) based on three periods of settlement, beginning around AD 80 and terminating in 1866 with the demise of the Mendocino Indian Reservation. Since the 1980s, numerous other archaeological studies have taken place in the park for a multitude of projects including major and minor projects, routine park maintenance, and deferred maintenance.

Several terrestrial surveys and subsurface investigations have overlapped into the Ten Mile Dunes area and encompass the project area. The results of these investigations have assisted in the identification of cultural resources in the Area of Potential Effect (APE) and have aided in the development of the project treatment and cultural mitigation measures that would insure potential impacts to these resources are maintained at a “less than significant” level.

Currently, University of California, Davis (UCD) is conducting both surface and subsurface investigations in the Inglenook Fen - Ten Mile Dunes Natural Preserve. Results from the work by UCD are pending.

Archaeological Resources -

Over 40 Native American and numerous historic archaeological sites have been recorded in the park unit. Many of the Native American sites have historic components related to aboriginal occupation of the area during the Mendocino Indian Reservation era. Fourteen of these sites are documented in the Inglenook Fen – Ten Mile Dunes Natural Preserve. Ten are within or near the APE. All but two of these resources are related to aboriginal utilization and occupation. Historic archaeological resources are related to transportation and habitation.

The concentration of Native American sites at MacKerricher SP including those present in the project area represent a unique and relatively intact series of settlement systems in an area used with varying intensity over the last 3,000 to 4,000 years along the Mendocino Coast. The archaeological resources represent Pomoan and Coast Yuki occupation and are significant in their demonstrated potential to answer research questions relating to chronology, resource utilization, settlement dynamics, and acculturation processes (CSP 1995) either as individual sites or when studied in a larger context of an “archaeological district.” To date, these Native American sites have not been officially evaluated for inclusion into the National Register of Historic Places (NRHP). Until an official determination of significance is made in consultation with the California State Historic Preservation Officer (SHPO), these sites would be treated as eligible for inclusion into the NRHP because of their potential scientific value.

Historic archaeological resources include the location of a former structure/habitation site and a segment of the former Union Lumber Company Haul Road (CA-MEN-2946H). The artifact scatter at the structure/habitation site suggests an occupation date post 1945. The historic site is located on private property adjacent to the project area but would not be subjected to project work.

The other historic site, the Union Lumber Company Haul Road is a major component of this project. Restoration efforts include the removal of a 2.7 mile (4.3 km) segment of the road that was heavily impacted by past storm events, and is no longer contiguous with the road south of Ward Avenue. Because the haul road is 50 plus years old and a segment of the abandoned road would be removed as part of the project, an evaluation of the site for potential listing on the National Register was warranted. The evaluation of the Union Lumber Company Haul Road was conducted by State Park personnel and was sent to SHPO for review. The evaluation concluded the haul road was not eligible for listing on the NRHP due to a loss of integrity, as well as not meeting any one of the four criteria required for listing. The evaluation viewed the former Union Lumber Company Haul Road as an isolated segment of an abandoned road that has no potential to be considered significant under any of the four National Register criteria. The haul road is not unique; but rather, one of literally hundreds of such facilities throughout the lumber regions of California. Additionally, it is neither associated with an important historical event (Criterion A), nor is it associated with a historically important person (Criterion B). The road does not embody unique characteristics of a type, period, or method of construction (Criterion C). The potential to yield significant information that would address important research questions (Criterion D) is lacking given the degradation of the alignment and commonality of construction and use. Not only does the haul road not meet any of the criteria for the National Register, the integrity of the road alignment has been severely compromised, the result of constant coastal erosion, wave action along the bluff, and severe winter storm events. Due to these actions, large portions of the road in the dunes have eroded away. Given the conclusions from this National Register evaluation, the Union Lumber Company Haul Road (CA-MEN2946H) in not considered a “historic property” and would be removed in locations where appropriate in the project area.

Historic Resources

One historic structure has been documented in the Ten Mile Dunes Preserve. The structure consists of a barn, originally constructed ca.1880. The Ross Barn is located outside of the project area east of Inglenook Fen. The barn was demolished and rebuilt in the 1960s. The reconstruction efforts included new framing and the original historic siding.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Cause a substantial adverse change in the significance of a historical resource, as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource, pursuant to §15064.5?	☐	☐	☒	☐
c) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐

CRITERIA FOR DETERMINING SIGNIFICANCE

The analysis for determining the significance of impacts of the Proposed Action to Cultural Resources is based on criteria **a – c**, described in the environmental checklist above.

DISCUSSION

a) HISTORICAL RESOURCE

One reconstructed historic structure has been documented in the Ten Mile Dunes Natural Preserve. The Ross Barn is located outside of the project area and would not be impacted by work related to this restoration project. Therefore, no impact would result.

b) ARCHAEOLOGICAL RESOURCES

Archival research and field investigations confirm MacKerricher SP including Inglenook Fen – Ten Mile Dunes Natural Preserve has a very high degree of archaeological sensitivity. Fourteen archaeological sites have been documented in and adjacent to the project area, and copious others have been recorded in other areas throughout the park. Most of these sites are related to Native American utilization of the area, both prehistorically and historically (Mendocino Indian Reservation era).

Project work associated with these restoration efforts has the potential to impact many of these culturally sensitive areas since most are located within the haul road corridor or in other areas where restoration activities are planned. The proposed project includes the excavation and removal of remnant segments of the old haul road, removal of two culverts, treatment of approximately 60 acres to eradicate non-native invasive plant species, and revegetation of impaired habitat. All of the proposed project tasks have varying degrees of associated ground disturbances. These ground disruptions could significantly impact archaeological resources. Implementation of Standard and Specific Project Requirements and Avoidance Measures for Cultural Resources as defined in the Chapter 2.7 of this document will maintain potential impacts at a “less than significant” level.

Staging Areas: Certain locations for staging/storage of vehicles, equipment, and/or material used during restoration efforts could impact culturally sensitive areas. Implementation of Specific Project Requirement CULT-2B and CULT-3B will maintain impacts at a “less than significant” level.

Excess Material Disposal: This project would generate large amounts of excess materials from removal of the haul road and sand which currently cover portions of the road. Disposal of these materials within the Inglenook Fen – Ten Mile Dunes Natural Preserve has the potential to impact both documented and undocumented archaeological sites. The implementation of Specific Project Requirement CULT-2C and CULT-3D will maintain potential impacts at a “less than significant” level.

Removal of the Haul Road: The actual removal of the haul road has the potential to significantly impact documented archaeological sites located within the Inglenook Fen-Ten Mile Dunes Preserve. Many of the sites are situated adjacent to or are bisected by the feature. The road has acted like a protective cap over these archaeological deposits for the last 90 years. Ground disturbing activities to remove the road material could penetrate archaeological deposits currently capped by the haul road. Additionally, in some locations, the only thing protecting archaeological deposits from being destroyed by coastal erosion is the haul road cap which acts as a barrier. To maintain potential impacts at a “less than significant” level, Specific Project Requirements for Documented Archaeological Site Avoidance drafted by a CSP State Archaeologist will be incorporated into the Sensitive Resources Avoidance Plan. The Sensitive Resources Avoidance Plan will identify these locations and specific treatment measures to be implemented by CSP staff and the project contractor. Due to the sensitive nature of the information, the specifics of the Avoidance Plan will be provided to the project manager and other appropriate project personnel but will not be included in this document.

Habitat Restoration Work/ European Beachgrass Removal: The Inglenook Fen-Ten Mile Dunes Natural Preserve has been inundated with European beachgrass and has diminished habitat for native plants and animal species. In addition to removal of the haul road, other restoration efforts include the removal of European beachgrass in previously untreated and treated area. The European beachgrass is ubiquitous throughout the dunes including locations where archaeological resources are present. To maintain potential impacts to both documented and undocumented archaeological resources at a “less than significant” level, Standard Project Requirement CULT-1E and Specific Project Requirement CULT-3C will be implemented.

Inadvertent Finds: The boundaries of the prehistoric sites located in the project area are based primarily on surface observations from terrestrial archaeological surveys and limited surface investigations. The reliability of these surface surveys is dependent on ground visibility and the extent of the surface manifestation associated with the archaeological deposits. Given the inherent nature of archaeological deposits, often located below the surface, and the placement of these archaeological deposits on the sand dunes, it is probable the full extent of these sites and their boundaries are not clearly defined. Concise determination of the horizontal and vertical distributions of these archaeological sites is difficult at best. To maintain impacts at a “less than significant” level, Standard Project Requirement CULT-7B will be implemented in the event of inadvertent finds during project work.

c) DISCOVERY OF HUMAN REMAINS

MacKerricher SP including the Inglenook Fen-Ten Mile Dunes Natural Preserve was used intensively by indigenous groups for thousands of years. Given the intensive utilization of the area, it is not surprising that human remains associated with Native American burial practices have been recorded at various locations throughout the park including the Preserve. In 1910, during construction in the dunes for the Union Lumber Company railroad bed a group of skeletons were found, indicating a cemetery was there (Berry 1977). Since that time, human remains have been exposed in other locations throughout the Preserve as the dunes shift and move.

To address the inadvertent discovery of human remains during any project work, CSP and the Native American Heritage Commission (NAHC) have developed a protocol for the treatment of such finds. Implementation of this protocol will maintain impacts at a “less than significant” level. Refer to Standard Project Requirement s CULT 8A - CULT-8D.

VI. GEOLOGY AND SOILS.

ENVIRONMENTAL SETTING

The Ten Mile Dunes consist of three main lobes, formed by the active movement of sands that originated from sediments flowing from the Ten Mile River and other offshore sands carried in from the north and south during large storm events (Bedrossian 2011). Within each dune lobe, a series of broad, partially vegetated, sub-parallel transverse sand ridges, about 100 to 200 feet (30 to 60 meters) wide and up to 100 feet (30 meters) high inland, parallel the coastline. The three lobes are separated at an average distance of 1500 feet (460 meters) by the Inglenook and Fen Creek drainages which flow through the dunes, creating moist, interlobe depressions (Fox and Barry 1977). Coastal terraces of the Franciscan Formation, bordering the dunes to the east, form the upland topography and associated woody vegetation that are influential in halting sand movement inland.

Traces of the active San Andreas Fault Zone lie roughly parallel to the coast, within 1 to 5 miles (1.6 to 8.0 kilometers) offshore (CGS, 2010). The abstract of a report by local geologist David Springer entitled “Evidence Of Late Pleistocene To Holocene Earthquakes And Coseismic Subsidence Preserved Near Fort Bragg, California” (Springer, David J. 1999) further describes fault activities as follows:

> The Ten Mile dune area of MacKerricher State Park, Ft. Bragg, California lies within the northern portion of the San Andreas fault system between the offshore trace of the San Andreas fault proper and the northern extension of the Maacama fault. Although the area has remained largely aseismic for many decades, a history of intense and recurrent paleoseismicity is recorded by a number of primary and secondary features recently revealed by coastal erosion. Primary features include a two-meter high bedrock fault scarp (N5W/80E), offset Pleistocene and Holocene beach deposits, and an episodically subsided shoreline of tilted and folded organic strata with interbedded sand. Secondary features include an alignment of three large sand blows, multiple sand dikes, a 20- to 30-cm thick sheet of extruded white sand and a unit of highly disrupted organics.
>
> Radiocarbon dating of buried, life-position tree stumps indicates episodes of subsidence occurred around 2450 B.P. and 4270 B.P. A thick layer of peat near the base of the Pleistocene section yielded a ^{14}C age pf circa 29,000 B.P. More recent episodes of subsidence are suggested by the composition and location of several Native American middens lying along the coastal strand. Although the middens contain primarily the remains of rocky intertidal organisms, they lie as much as three kilometers from the nearest present-day occurrence of rocky intertidal shoreline. Occupancy dates for the middens suggest major shoreline-altering seismic events occurred as recently as AD 1400 and again around AD 1700. Fracture traces preserved in Holocene sand overlying the newly-revealed fault, coupled with historic accounts of an anomalously high degree of damage suffered by Ft. Bragg during the great San Francisco earthquake of 1906, suggest movement may have occurred on the fault during that event. The new fault lies approximately 10 km east of, and runs subparallel to, the assumed offshore trace of the San Andrea.

Three soil types dominate the Ten Mile Dunes and Inglenook Fen area (U. S. Dept. of Agriculture, Natural Resources Conservation Service 2003). Duneland soils have little, if any, profile development, rapid permeability, and low water capacity, resulting in an effective rooting depth of greater than 60 inches (150 centimeters). Tropaquept soils are more common in adjacent coastal prairie and in drainages. These are deep, poorly drained, and of variable permeability and water capacity. Effective rooting depths are limited by seasonal soil saturation. Some of these soils probably developed, in part, under forest canopy cover that has since been removed (Fox and Barry 1977). Sirdrak soils are deep and excessively drained, forming on aeolian sand deposits. They are rapidly permeable, with moderate water capacity and a rooting depth of greater than

60 inches (150 centimeters). In the fen and fen-carr areas, soils are classified as organic hydromorphic, formed from decomposition and sedimentary deposition of upstream organic materials (Fox and Barry 1977); these soils include peats. Upslope from the fens and dunes, and not abundant on State Parks property, two other soil types are common on the mid- and upper marine terraces: Hugo loams from older parent material, and Empire sandy loams, of considerably younger geological origin (Fox and Barry 1977).

The sand movement and depositional pattern of the dune system is naturally broken into discrete series of transverse mobile dune complexes and intervening deflation plains (dune slacks; wetland and meadow-like flats) with stabilized vegetation. There are currently no major continuous belts of mobile dunes extending from the active foredunes to the more mobile interior dunes; the entire foredune complex terminates with a landward edge in either stabilized, vegetated dune slacks, or low-relief stabilized dune grassland and scrub. The interior mobile dune complexes are characterized by wide, unvegetated, gently sloping windward faces located upwind of stabilized dune slacks or low vegetated dunes. The interior mobile dune complexes are remnants of larger, past, more continuous mobile dune sheets that have differentiated into mobile dunes and stabilized slacks. The landward mobile dunes are internally recycling older deposits, while the foredunes only slowly encroaching the vegetated, stabilized slacks and dunes landward (Dr. Peter Baye, personal communication 2012). Cooper (1967) described the supply of sand and rate of onshore wind transport of sand as “feeble” even in the mid-20th century, contrasting with the very high rates and topographic relief of the residual mobile landward dunes.

Sand movement primarily within the foredune environment is described in a 2012 report by the California Geologic Survey (Subject: MacKerricher State Park – Sand Grain Size and Mineral Composition Analyses, Ten Mile Dunes Road Removal and Dune Rehabilitation Project, Appendix E.4 - Sand Analysis). Soil samples for the California Geologic Survey report were taken from the immediate vicinity of the haul road, so the sand analysis report focuses on those project activities most related to the road removal. Soil samples for the report were not taken from the interior stabilized dune and dune slack complex landward of the mobile foredunes, and none were taken from the independent, larger old interior unvegetated transverse dune complex. However, visual observation of sands from the foredunes versus the interior dune complex show a “clear discontinuity between the freshly deposited beach-foredune sand that lacks iron oxide weathering/staining (wave-washed grayish-white sand), and the internally reworked and older interior/landward transverse dunes that have faint iron oxide weathering evident (warmer tan-colored sand). Also there are coarse sand lag surfaces in the seaward dune slacks at the NW that are not present in the interior dunes” (Dr. Peter Baye, e-mail communication, June 22, 2012).

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map, issued by the State Geologist for the area, or based on other substantial evidence of a known fault? (Refer to Division of Mines and Geology Special Publication 42.)	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable, as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1997), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste disposal systems, where sewers are not available for the disposal of waste water?	☐	☐	☐	☒
f) Directly or indirectly destroy a unique paleontological resource or site, or unique geologic feature?	☐	☐	☐	☒

DISCUSSION

a) The proposed project would not involve the construction of any structure intended for human use and no structures or facilities for human use exist within the Preserve. While ground shaking from a major earthquake would be felt, and localized areas of saturated sand could result in liquefaction near wet areas, the risk of injury or death resulting from liquefaction, slides, or other soil movements would not be increased as a result of project activities. The removal of remnant road segments and asphalt fragments would enhance public safety along certain sections of the beach, particularly where the road forms steep cliffs that have been undercut by erosion and storm events. The project would have no impact. The project would have no impact.

b) The proposed project includes the removal of two culverts located at Fen Creek and Inglenook Creek, as well as the removal of the remnant haul road. The portion of the haul road scheduled for removal was originally constructed in an active dune system. Removal of the asphalt and road base would expose the soil beneath, which consists of unconsolidated sand particles. It is expected that the native sands would be dispersed by the prevailing NW winds and blow inland (nearshore) over the short-term, forming a series of longitudinal-shaped foredunes perpendicular to the coastline. The small nearshore dunes would collect more sand and continue to grow, most likely around small clumps of vegetation, until some threshold size is reached. The movement of sand from the nearshore foredunes to farther inland areas is inhibited by the large expanses of dune and wetland vegetation that occur between the foredunes and the separated transverse dunes to the east. These processes are consistent with the goal of the project, i.e., to return the dune system to a more natural state and restore the dynamic processes within the Preserve.

   A short-term increase in erosion may also occur within the project area during the removal of culverts and the remnant road sections at the creek crossings. The removal of culverts and debris from the channels can be accomplished using a conventional track-mounted excavator (Reynolds 2011). To minimize the potential for impacts to the streams, cofferdams would be used for dewatering, providing access to the work area and minimizing the introduction of fine sediment (see Hydrology and Water Quality). Erosion control measures would also be introduced as part of the restoration of the natural channels once the culverts are removed. Implementation of Standard and Specific Project Requirements (BIO-5b, GEO–1 and HYDRO–1) would ensure impacts would remain at a less than significant level.

c) The project is not located within a geologic unit or soil that is known to be unstable, based upon available data. However, the coastal margin of California is subject to coastal bluff erosion and seismically induced liquefaction can also occur in unconsolidated granular soils that are water saturated. Analyses of sand samples collected within the project area indicated between 61 and 99% of the grains are fine grained sand between 0.5 and 1.7×10^{-3} inch (0.125 and 0.425 millimeters) in size (Bedrossian 2011). In most sample areas, some degree of moisture was encountered 3 to six inches (8 to 15 centimeters) below the surface. While localized areas of saturated sand could result in liquefaction, particularly near wet areas, the risk of injury or death resulting from liquefaction, slides, or other soil movements would not be increased as a result of project activities. The project would not include new construction and would be removing deteriorated road material and culverts from a Preserve and potentially avoiding future collapse of undercut road sections. The project would have no impact.

d) Expansive soils do not exist in the project area. No new structures are being constructed. The project would have no impact.

e) The project does not involve the installation of a septic system or waste water disposal. The project would have no impact.

f) The project is not located within a known paleontological resource area. The entire project area is part of a unique geologic feature which has already been designated a Natural Preserve. The road and culvert removal project would return the dune system to a more natural state and restore the dynamic processes within the Preserve. The project would have no impact.

VII. GREEN HOUSE GAS EMISSIONS AND CLIMATE CHANGE

ENVIRONMENTAL SETTING

The Mendocino County Air Quality Management District has not adopted formal CEQA Thresholds in the past. The District has traditionally relied informally on the CEQA thresholds adopted by the Bay Area Air Quality Management District (BAAQMD) with minor modifications reflecting location conditions. In 2010 the Bay Area Air Quality Management District formally adopted new Criteria and Greenhouse Gas emissions CEQA thresholds.

The Mendocino County District currently requests that the Bay Area Air Quality Management District CEQA thresholds and CEQA guidelines be followed to evaluate air quality impacts. In addition to the BAAQMD guidelines, this project would comply with state recommendations and guidelines to reduce GHG emissions.

California Assembly Bill No. 32 (AB-32), also known as the Global Warming Solutions Act, was passed on August 31, 2006. AB 32 codifies the state's goal by requiring that the state's greenhouse gas (GHG) emissions be reduced to ten percent below the 1990 GHG emissions level as a target to be achieved by 2020. Regulating carbon dioxide (CO_2), which is the major GHG contributor to global warming, has been the main focus for achieving the 1990 levels.

In December 2009, the Natural Resource Agency adopted amendments to the *Guidelines for Implementation of the California Environmental Quality Act* addressing the significance of impacts for greenhouse gas emissions (State of California 2009). Section 15064.4 of the amended CEQA Guidelines states: "A lead agency should make a good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate or estimate the amount of greenhouse gas emissions resulting from a project."

BAAQMD does not have an adopted *Threshold of Significance* for construction-related Greenhouse Gas (GHG) emissions. However, lead agencies should quantify and disclose GHG emissions that would occur during construction, and make a determination on the significance of these construction-generated GHG emission impacts in relation to meeting AB 32 GHG reduction goals. The BAAQMD also encourage agencies to incorporate best management practices to reduce GHG emissions curing construction.

Best management practices may include, but are not limited to: using alternative fueled (e.g., biodiesel, electric) construction vehicles/equipment of at least 15 percent of the fleet; using local building materials of at least 10 percent; and recycling or reusing at least 50 percent of construction waste or demolition materials.

According to the Mendocino County General Plan, the county is primarily rural and thus the amount of greenhouse gases generated by human activities (primarily the burning of fossil fuels for vehicles, heating and other uses) is small in total compared to other more urban counties (although higher per capita due to the distances involved in traveling around the county) and miniscule in statewide or global terms. However, Mendocino County acknowledges its responsibility to reduce GHG emissions. In the long-term County efforts will focus on reductions in the sources of greenhouse gases in the county through a comprehensive greenhouse gas reduction plan for both County operations and the broader area governed by Mendocino County. For the near-term, the General Plan identifies energy-reducing policies that will lower overall CO_2 emissions (County of Mendocino 2009).

California State Parks (CSP) has developed a "Cool Parks" initiative to address climate change within the State Park system. Cool Parks proposes that CSP itself as well as resources under its care adapt to the environmental changes resulting from climate change. In order to fulfill the Cool Parks initiative, State Parks is dedicated to using alternative energy sources, low emission vehicles, recycling and reusing supplies and materials, and educating staff and visitors on climate change (CSP 2008).

The best available data for analyzing potential GHG emissions are models that apply project specific data to a modeling program for calculating impact to air quality. The closest model currently available to a state park environment is the California Emissions Estimator Model (CalEEMod) as developed by the South Coast Air Quality Management District. The CalEEMod is a land use based model with a recreation option that includes a city park subtype. Project specific data including annual operations and construction activities can be input to the model and project based results generated. As a baseline reference for existing statewide GHG emissions, the Mendocino County Criteria Pollutants annual estimates for 2010 were used for ROG, NO_x, CO, PM^{10} and $PM^{2.5}$. The California transportation sector annual CO_2 estimates for GHG-contributing emissions was used as the carbon dioxide baseline

Sea Level Rise

Under CSP policy, landscapes are allowed to change through natural occurrences and processes. However, climate change is generating natural changes beyond conventional boundaries. Sea level and storm surge are two processes affected by climate change. A sea level rise (SLR) of as much as 55 inches (1.4 meters) is predicted by 2100, 8 times the sea level increase of the prior century (Pacific Institute, 2009).

CSP began assessing the susceptibility of State Parks and Beaches to SLR beginning in 2011 with the help of the Pacific Institute and the United State Geological Survey (USGS). MacKerricher SP scores a “high” vulnerability criterion in both Pacific Institute and USGS Coastal Vulnerability Index (CVI) models used for CSP project evaluation (both models use elevation as a primary metric and acknowledge local conditions may vary results). Pacific Institute modeling for the year 2100 suggests the mean tide line would remain west of the project area. However, modeling demonstrates the potential for dune erosion affecting a large portion of the foredunes currently stabilized by the remnant haul road. Further, modeling depicting future high tides in conjunction with a 100 year flood event indicates flooding could occur into the current deflation zones (interdune depressions) and inundate portions of the Inglenook and Fen Creek watersheds within the Preserve (see Appendix A.8 - Sea-Level Rise).

Natural processes formed the dynamic dune ecosystem’s coastal strand, foredunes, deflation zones, sand sheet and wetlands. The haul road and European beachgrass alter dune system processes and impede the landscape-shaping influences of the wind and ocean. Fresh water and salt water inundations are evident throughout the Preserve. CSP natural resources staff mapped the driftwood resting on the eastern side of the haul road and in the deflation plains giving evidence of storm surges moving debris well inland or creating blowouts through the foredunes (Wollenburg and Maslach, 2004). Inglenook Creek and Fen Creek and their accompanying watersheds host wetlands and open water features including a fen and a small lake.

SLR modeling projects the inundation of areas with known sensitive cultural resources. CSP has collaborated with archeologists in the past identifying and documenting cultural sites throughout the Preserve. Numerous sites were remapped in 2011 in conjunction with a University of California at Davis summer study program.

SLR modeling suggests inundation of areas containing plant and animal species with state and/or federal designations as well as sensitive plant communities. CSP natural resources staff surveyed and mapped these locations in 2011 and plans to monitor these populations as part of the standard project requirements. Since the native species are adapted to the changing dune environment, preserve management is performed in support of natural processes upon which these species and communities depend.

The Preserve infrastructure affected by SLR would include potential inundation of boundary signs along the northern boundary. No other CSP maintained infrastructure exists in the preserve.

Access to and through the Preserve affected by SLR would be minimal. No official CSP maintained trails exist within the Preserve. The non-maintained Coastal Trail stretches along the beach from Ward Avenue to the Ten Mile River. The actual location of the trail varies with the contour of the coastline as it follows the coastal strand.

There are no foreseeable effects to recreational opportunities or park revenue in the Preserve due to SLR in relation to the proposed project.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environmental?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

DISCUSSION

a) Currently, the State has not developed specific GHG thresholds of significance for use in preparing environmental analyses under CEQA, although the State has provided guidance to lead agencies in determining significant impacts from GHG emissions. The Mendocino County Air Quality Management District has not adopted GHG thresholds to determine significance. Therefore, in lieu of thresholds, a qualitative discussion of the GHG emissions related to the Dune Rehabilitation Project and its potential impacts is included, as well as calculations of project GHG emissions generated by the CalEEMod program based on project-specific data.

The transportation sector is the largest contributor to GHG emissions. Project vehicles and equipment would likely include the following: 1 excavator; 2 950-series front end loaders; 1 Caterpillar 416 backhoe; 2 D-6 tractors; 5 off-highway dump trucks; 6 highway approved 10-wheel dump trucks; 1 light duty truck with 100-gallon fuel tank; and up to 15 crew transport vehicles. Some minor changes in types of equipment may be needed depending on the contractor hired to complete the project. Not all vehicles and equipment would operate simultaneously within the Preserve. Most crew vehicles would park at staging areas within the project site where crew members would transfer to work equipment. Some equipment would only be operating during certain stages of the project depending on the work being done. Other vehicles, such as the 10-wheel dump trucks, may be moving materials from areas within the project to a disposal and recycling facilities chosen by the contractor and/or to a storage site on State Park property approximately 20 miles (32 km) south at Big River, and would not operate within the Preserve. On most days there would be four to six heavy equipment operators working and 3 to 11 dump trucks hauling materials from the project site to stockpile and disposal sites.

Based on calculations provided by project engineers and equipment operators, CSP estimates that the Dune Rehabilitation Project construction period would last approximately 45 days if project activity is conducted 5 days per week. Seasonal restrictions, weather, and high tide events could affect the schedule and prolong activity at the project site. The project engineers estimate 23 workers on site during peak activities. Peak project activities would occur at the time the remnant haul road segments and road base are removed and at the time these materials are being hauled out of the Preserve. An estimated 17 heavy equipment vehicles would support project activities during peak construction activities over the 45-day project period.

Currently at State Parks all diesel-fueled equipment and vehicles use California Air Resources Control Board certified motor vehicle diesel fuel, and heavy equipment such as dump trucks equipped with particulate traps result in 99.7% cleaner running vehicles. All contractors involved in the project would be required to meet or exceed CSP standards and follow Best Management Practices for the reduction of GHG emissions.

Standard Project Requirements would require all construction related equipment engines to be maintained and properly tuned up (according to manufacturer's specifications), and in compliance with all state and federal requirements. This requirement is designed to reduce project-related emissions of CO_2 and N_2O.

The construction-related phase of the proposed Dune Rehabilitation Project involving equipment and vehicle use would be short-term and GHG emissions from project equipment and vehicles would be temporary and limited. The proposed project is primarily a restoration effort located in a remote part of MacKerricher State Park where only pedestrian and equestrian access is normally allowed. Therefore, there would be no anticipated increase in the number of vehicle trips to and from this area of the park in the long term and no significant operational increase of GHG emissions. The project would have a less than significant impact.

The Project would contribute less than 1/100% for ROG, CO, and $PM^{2.5}$ pollutants when compared with annual Mendocino County pollutant emissions estimated by the Air Resources Board and less than 1/10% of NO_x and PM^{10} (see Table 3. GHG–01: Mendocino County 2010 Estimated Criteria Pollutant (GHG contributors) and Modeled Project related Emissions). When compared to GHG CO_2 emissions within the transportation sector, modeled Project emissions would contribute less than 1/1000% as compared with the 2008 GHG Inventory estimates for all on road vehicles and less than 1/100% of Heavy Duty Vehicles (see Table 3. GHG–2: Modeled Project CO_2 Emissions and ARB Greenhouse Gas contribution for Transportation Sector). The project related contributions would occur only during the implementation of the Project. No operational GHG contributing emissions are associated with the project. Emissions contributing to GHG associated with the project would be less than significant.

Table 3. GHG–01: Mendocino County 2010 Estimated Criteria Pollutant (GHG contributors) and Modeled Project related Emissions

	ROG	NO_x	CO	PM^{10}	$PM^{2.5}$	CO_2
tons/day[1] (annual average)	11 (4015)	12 (4380)	65 (23725)	21 (7665)	5 (1825)	Not defined
Project Total[2] Percent of Annual Estimates	0.40 0.00996%	3.47 0.07922%	1.65 0.00695%	0.81 0.01057%	0.14 0.00767%	429.91

Table GHG 02: Modeled Project CO_2 Emissions and ARB Greenhouse Gas contribution for Transportation Sector

Total project CO_2 emissions[2] In metric tons	2008 California Transportation Sector CO_2 GHG contributions[3] In million metric tons	
Year 2012	All On Road Vehicle	Heavy Duty Vehicle
429.91	163.3	34.79
Project % of 2008 Sector Contributions	0.000263264%	0.001235729%

1 ARB Almanac 2009 – Appendix A: County Level Emissions and Air Quality by Air Basin
2 California Emissions Estimation Modeler (CalEEMod) Version 2011.1 February 2011
3 Air Resources Board California Greenhouse Gas Inventory 2000 – 2008. Updated May 2010

b) As stated in “Discussion A” above, the State has not developed specific GHG thresholds of significance for use in preparing environmental analyses under CEQA, and the Mendocino County Air Quality Management District has not adopted GHG thresholds to determine significance. The Association of Environmental Professionals’ document *Alternative Approaches to Analyzing Greenhouse Gas Emissions and Global Climate Change in CEQA Documents,* states that emissions for criteria pollutants tend to follow similar patterns as the emissions for GHG emissions”(AEP 2007). Therefore, it is reasonable to assume that if all other pollutants from the Project are determined to be less than significant, the CO_2 emissions can also be deemed less than significant. The proposed Dune Rehabilitation Project would not violate Mendocino County’s air quality standards and would not result in a cumulatively considerable increase in emissions. Therefore, the proposed Dune Rehabilitation Project would not generate significant GHG emissions and would therefore not conflict with the current State and Mendocino County guidelines or any applicable plans, policies or regulations concerning GHG emissions.

To reduce potential GHG emissions due to construction activities, the project would undertake the following best management practices:

- Use alternative-fueled (e.g., biodiesel, electric) construction vehicles/equipment as feasible.
- Use local (within 100 miles) building materials of at least ten percent.
- Recycle at least 50 percent of construction waste or demolition materials.

In addition, the project would implement Standard Project Requirements to limit impacts to air quality and reduce GHG emissions during project activities. Implementation of these project requirements would ensure that the project would have a less than significant impact.

VIII. HAZARDS AND HAZARDOUS MATERIALS.

ENVIRONMENTAL SETTING

The haul road was originally part of a rail line constructed in 1916 by Union Lumber Company to carry timber from the Ten Mile River drainage to the mill site in Fort Bragg. Tracks were removed and the rail alignment was converted to a road for use by logging trucks in 1949. Portions of this paved "Haul Road" are now part of the MacKerricher Coastal Trail, open to foot traffic and in some areas bicycle and equestrian use. The southern portion of this trail currently starts at the northern abutment of the Pudding Creek Trestle. The northern portion runs beyond the Inglenook Fen-Ten Mile Dunes Natural Preserve boundary and continues east below the Ten Mile River Bridge onto private property. Between Ward Avenue and the Ten Mile River the haul road has been severely eroded, washed away or covered by drifting sand over large sections of the roadway, and is no longer contiguous with the road within the park. Winter storm events, erosion and exposure to harsh coastal conditions continue to cause deterioration.

There is no known hazardous contamination of the area where the haul road is located, and there is no indication that the project area contains any hazardous waste, debris, or soils. However, it is possible that wooden structural elements or ties from the original rail line remain within the historic road alignment and make up parts of the road base and creek crossings. These materials may consist of pressure-treated wood, which contains several potentially hazardous materials (e.g., arsenic), or weatherproofed in some manner possibly with creosote, a human carcinogen
The project site is located in a remote area of MacKerricher State Park with limited vehicle access. No fuel storage facilities exist within or adjacent to the project area. During the proposed project fuel would be transported to approved locations outside of sensitive resource areas for refueling of heavy equipment.

There are eleven schools and one district school office located within a two and a half-mile radius of the project site. None of the schools are within a quarter-mile of the project area.

The Fort Bragg Airport is located approximately 4 miles (6.4 km) south of the project area. There are approximately 12 single engine aircraft based at this privately owned airport. Operations average 64 flights per month. Another small private airstrip is located approximately 10 miles (16.1 km) southwest of the Preserve. Activity at this location is unknown, and there is no published approach for this airstrip. Air traffic from both airstrips would only overfly the project area.

State Route (Highway) 1 is a designated truck route occasionally used by trucks transporting Level I, II, and III hazardous materials. The project location is approximately 500 feet (152.4 m) from the closest approach of the southbound lane of Highway 1 as it passes over the Ten Mile River Bridge.

Maintenance yards for MacKerricher SP are several miles south of the proposed project area and none of the unit's facilities use or store substantial amounts of hazardous materials on-site.

The project area is situated in coastal dunes, coastal strand and coastal scrub habitat. Vegetation consists mostly of non-native European beachgrass, coastal mat species and some wetland species in riparian areas. Fuel for wildfires is extremely limited.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials, substances, or waste into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites, compiled pursuant to Government Code §65962.5, and, as a result, create a significant hazard to the public or environment?	☐	☐	☐	☒
e) Be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport? If so, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) Be located in the vicinity of a private airstrip? If so, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury, or death from wildland fires, including areas where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒	☐

DISCUSSION

a-b) The proposed project does not involve the disposal of hazardous materials. However, project activities would require the use of potentially hazardous materials such as fuels, oils, and solvents. These materials are generally used for excavation equipment and other vehicles, and would be contained in vessels engineered and designed for safe storage. Due to the remote location of the project site, it would not be practical or efficient to drive to a refueling station. Routine transportation of small amounts of diesel fuel to an appropriate staging area within the work site and refueling of vehicles would be necessary. A light-duty truck equipped with an approved 100-gallon fuel tank would be used for this purpose. Fueling of equipment and vehicles would only occur at designated locations outside of sensitive areas and at least 200 feet (61 meters) from stream courses and the ocean. Designated refueling sites would be located on existing roadway surfaces and equipment operators would be required to use a portable containment device beneath equipment before pumping fuel. A Spill Kit would be stored at the designated refueling location and project crew members and contractors would be trained in its proper use. All maintenance of project vehicles would occur off-site at the MacKerricher State Park maintenance yard, the maintenance shop at District Headquarters at Russian Gulch, or at a contractor's private facility. Large quantities of fuel or hazardous materials would not be stored on-site.

Spills, upsets, or other work-related accidents could result in a release of fuels or other hazardous substances into the environment. Accidental spills or improper use of these materials could result in a significant impact to Inglenook Creek, Fen Creek, Ten Mile River and the Pacific Ocean. Implementation of Standard Project Requirement HAZMAT 1, which includes the development of a spill prevention and cleanup plan, would reduce the potential for these incidents to occur and ensure impacts would remain at a less than significant level.

c) There are no schools or proposed schools within one-quarter mile of the Dune Rehabilitation Project. The nearest school (Three Rivers Learning Center) is located approximately 3 miles (4.8 km) from the project site. No impact.

d) The Ten Mile Haul Road is not included on a list of hazardous materials sites (Cortese List) compiled by the California Department of Toxic Substances Control, pursuant to Government Code §65962.5. No impact.

e-f) The proposed project site is not located within an airport land use plan, within two miles of a public airport, or in the vicinity of a private air strip. As noted in the Environmental Setting above, the privately owned Fort Bragg Airport is located approximately 4 to 7 miles (6.4 to 11.3 km) south of the project area and there is a private air strip approximately 10 miles (16.1 km) to the southwest. No work associated with the project would interfere with airport operations. No impact.

g) All proposed project activities would occur within the boundaries of MacKerricher SP and would not restrict access to or block any public road. Most areas within the Preserve would remain open to the public during the project, although access to the areas under active construction would be restricted to authorized personnel only. A general safety protocol for backcountry heavy equipment operations has been adopted by the North Coast Redwoods District, California State Parks (Merrill 2003) for use within state parks and would be implemented as part of this project. This protocol outlines broad safety issues common to all projects and presents guidelines on how to address those issues. The project would not impact emergency response or evacuation plans. Therefore, there would be no impact.

h) The Dune Rehabilitation Project area is located primarily in coastal dune habitat, with some areas of coastal scrub, coastal wetland and riparian habitat. This vegetation does not pose a high fire hazard, but equipment could get very hot with extended use and would sometimes be in close proximity to dry vegetation, especially dead European beachgrass. Improperly outfitted exhaust systems or friction between metal parts and/or rocks could generate sparks, resulting in a fire. Implementation of Project Requirement HAZMAT-3, would reduce the potential for fire-related adverse impacts and ensure impacts from this project remain at a less than significant level.

IX. HYDROLOGY AND WATER QUALITY.

ENVIRONMENTAL SETTING

Excluding the Ten Mile River, two primary streams, Inglenook Creek and Fen Creek, flow through the Preserve. These streams drain upland forested and grassland marine terraces with scattered rural residential housing. Perennial and ephemeral seeps and rain water catchments in dune swales also occur throughout the Preserve (see Appendix A.9 - Preserve Hydrology Map).

The hydrological conditions of the Preserve are strongly influenced by the “Mediterranean maritime”, which aptly describes the climate on the Mendocino coast and its proximity to the ocean. The climate consists of moderate temperatures with small daily and seasonal fluctuations, frequent dense fogs, and northwesterly winds. The average annual temperature is about 54 degrees F (12.2 ° C). The rainy season is October through April with average annual precipitation in the park around 40 inches (1.02 m). This can vary from 20 to 80 inches (0.51 to 2.03 m) (CSP 1995).

Between 6,000 and 10,000 years ago, in the Fen Creek watershed within the Preserve, dunes formed a barrier to the outlet of surface and ground water, forming Sandhill Lake and Inglenook Fen (Fox and Barry 1977). Six surface streams drain the Fen Creek watershed, although sub-surface flows are considered of equal or greater importance in the overall supply of water to the Fen (Erman and Roby 1977). A fen is a wetland of more recently accumulated peat deposits with a higher pH than a more acidic bog, and is generally considered transitional to a bog as peat and organic sediments accumulate. Inglenook Fen’s pH is influenced by the supply of water rich in calcium and magnesium, generally resulting in a mildly acidic to alkaline pH. Volume of incoming water, climate, and other factors control the rate of succession of a fen to a bog.

Inglenook Creek
The Inglenook watershed is slightly less than 1100 acres (445 hectares) with the Inglenook Creek main stem flowing west- to northwestward between the north and middle dune lobes, about 2.2 miles (3.5 kilometers) in total length. Using geomorphologic measurements and modeled flow rates for the Inglenook watershed, projected flow volumes for estimated flood events were calculated by CGS (Reynolds, 2011). At the Inglenook Creek crossing, flow at the bankfull stage (return period, RP, is approximately 1.5 years) is estimated to be on the order of 127 feet^3 (3.6 meters^3) per second. Flows for the 2, 5, 10, and 100-year storm events were estimated to be 177, 353, 494, and 812 feet^3 per second (5, 10, 14, and 23 meters^3 per second), respectively. Additional hydrological influence is generated by high energy storm waves and surge and extreme tides as evidenced by the large woody debris present in the downstream pool and on the haul road immediately north of the crossing.

Inglenook Creek passes under the haul road via a 5 foot (1.5meter) corrugated culvert roughly 60 feet (18 meters) long. At least one large diameter log was reported to have been lodged within the culvert in 2004, but a flow was still evident. Heavy brush on both sides of the Inglenook Creek crossing and no visible water flow into the downstream pool suggest that the culvert may be further blocked. Literature suggests the culvert is set to an angle at grade of the thalweg, the lowest point in the channel, as to encompass the entire length with fill (Wollenburg, 2004). In addition to old trestle materials and rock dumped from rail cars, fill at the crossing’s west side includes concrete blocks greater than several feet in diameter which may be armoring against upstream tidal surges. Ground Penetrating Radar suggests the culvert is bedded in sand below the ballast and fill materials roughly 6 feet (1.8m) deep.

Fen Creek
The Fen Creek watershed covers just over 1630 acres (660 hectares) with the main stem of Fen Creek flowing between the middle and south dune lobes, about 3.4 miles (5.4 kilometers) in total length. Using geomorphological measurements and modeled flow rates for the Fen Creek Watershed, projected flow volumes for estimated flood events were calculated by CGS (Reynolds, 2011). At the Fen Creek crossing, flow at the bankfull stage (return period, RP, is approximately 1.5 years) is estimated to be on the order of 177 $feet^3$ (5 $meters^3$) per second. Flows for the 2, 5, 10, and 100-year storm events were estimated to be 283, 530, 671, and 1130 $feet^3$ per second (8, 15, 19, and 32 $meters^3$ per second), respectively.

Fen Creek passes under the haul road via a 5 foot (1.5 meter) corrugated culvert roughly 60 foot (18 meter) long. The western end of the pipe is rusted away at the base, but the length is still intact and remains unblocked. However, the east side of the culvert is overgrown with willow. The water course is open just upstream from the crossing. Ground Penetrating Radar suggests this culvert may be bedded in ballast materials roughly 6 feet (1.8 meters) deep.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through alteration of the course of a stream or river, in a manner which would result in substantial on- or off-site erosion or siltation?	☐	☐	☒	☐
d) Substantially alter the existing drainage pattern of the site or area, including through alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in on- or off-site flooding?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f) Substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map, or other flood hazard	☐	☐	☐	☒

	delineation map?				
h)	Place structures that would impede or redirect flood flows within a 100-year flood hazard area?	☐	☐	☐	☒
i)	Expose people or structures to a significant risk of loss, injury, or death from flooding, including flooding resulting from the failure of a levee or dam?	☐	☐	☐	☒
j)	Result in inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

DISCUSSION:

a) During excavation and removal of remnant asphalt, road base and culverts, a release of sediment to Fen Creek, Inglenook Creek and their associated coastal lagoons could occur. Therefore, this project is likely to increase the short-term potential for the introduction of increased levels of sediment to the creeks. Other potential impacts to water quality could result from releases of fuels or other fluids from vehicles and equipment during the excavation. These activities could result in a violation of water quality standards and waste discharge requirements. The removal of culverts and debris from the channels can be accomplished with conventional excavation, primarily a track-mounted excavator. To minimize the potential for impacts to the streams, paired sandbag cofferdams would be used for dewatering, to provide access to the work area, and minimize the introduction of fine sediment. Standard project requirements have been developed and will be implemented to avoid potential impacts (see HYDRO-1).

During the permissible construction period, July through September, it is anticipated that the flow in Fen Creek will be on the order of 1.06 $feet^3$ (0.03 $meters^3$) per seconds (Erman and Roby, 1977). Based upon CGS stream survey data, flows of this magnitude would result in a wetted channel approximately 3.3 feet (1 meter) wide with a maximum depth of 0.5 feet (0.15 meters). These wetted channel dimensions are very amenable to simple sandbag cofferdam diversion.

Water impounded at the upstream cofferdam would be pumped around the work area and discharged downstream of the downstream cofferdam. If the discharged water is too turbid, the discharge would be pumped through a sediment bag (Figure 3.HYDRO.a–01) prior to discharge back into the channel.

Prior to any incursion into the channel, fish netting (barriers) would be placed approximately 33 feet (10 meters) up and downstream of the cofferdams. The actual location of the fish netting would be determined by the project biologist to optimize their effectiveness. The channel between the fish barriers would be examined for the presence of fish and other species of concern. If are found, they would be removed prior to initiating instream activities.

If fish need to be relocated, the project biologist or appropriately trained designee would determine the best site(s) for relocation. Fish may be relocated either upstream or downstream depending upon a number of factors, including but not limited to, quality of nearby habitat, number and age class of fish at any given location, number of fish needing relocation, avoidance of overcrowding, and minimizing stress on the fish. The project biologist would, prior to initiating work, designate several relocation sites best suited to address the aforementioned criteria. Implementation of Standard Project Requirements (GEO–1 and HYDRO–1) would ensure that impacts on water quality would remain at a less than significant level.

Figure 3.HYDRO.a–01: Typical Setup of Sediment Capture Bag

b) The proposed project does not involve the extraction of groundwater or activities that would significantly alter groundwater recharge or lower the existing groundwater table levels. The removal of the remnant haul road and two culverts would likely improve natural water flow through the dune system by eliminating barriers and impediments. The project would have no impact.

c) The proposed project would remove a remnant haul road and two culverts with the goal of returning the dune system to a more natural state. Currently the remnant road acts as a barrier not only to the movement of sand but also natural drainage patterns through the dune system. After the removal of the road and invasive exotic European beachgrass, and the return of more natural dune dynamics, the steep dunes along the shoreline west of the old road would begin to decrease in size and the deflation plains that have formed east of the old road would begin to fill with sand. Drainage patterns would likely change within the dune system due to the changes in dune topography, but it is unusual to encounter flowing water over the dunes due to the porous nature of the sand. Where culverts are removed at Fen Creek and Inglenook, the creeks would continue to remain true to their upland channels and downstream lagoon outlets to the ocean, but like any dynamic system, the creeks could alter course in the future due to flooding or natural obstructions. The project would include alterations to short reaches along Fen Creek and Inglenook Creek through the removal of culverts, asphalt and road base and the re-establishment of historical streambank morphology and stream courses. Channel restoration would involve the removal of roadbed and railbed materials, culverts, and other debris dumped into the channel at the crossings. This would be accomplished using conventional excavation. Once foreign material is removed and native material is exposed, restoration activities would establish bank and channel capacities to withstand calculated flows determined by local geomorphological reference. Native vegetation salvaged from the immediate area may be planted where appropriate to enhance habitat consistent with surrounding riparian area. Implementation of Standard Project Requirements (AIR–2, GEO–1 and HYDRO–1) would ensure that impacts on drainage patterns would remain at a less than significant level.

d) The proposed project would remove remnant road sections and two culverts which currently act as barriers to natural dune formation and dune hydrology. These changes would not substantially increase the rate or amount of surface runoff or increase the potential for offsite flooding. Rather, beneficial changes in the lower hydrology of Fen and Inglenook Creeks will occur from the removal of the culverts and road berm that currently constrict the channels. Inglenook Fen has been a natural feature for 4,000 to 6,000 years (Barry, W.J. and Schlinger, E. I. 1977) long before the construction of the road; removal of the road and culverts will not impact the fen. The overall goal of the project is to return the dune system to a more natural state, which is likely to improve drainage within the Preserve in the long-term. Therefore, the project would have no impact.

e) The proposed project would not involve changing or altering any stormwater runoff management system and no substantial additional sources of polluted runoff would be expected from this project. Implementation of Standard Project Requirements (AIR–2, GEO–1 and HYDRO–1) would ensure that potential runoff impacts would remain at a less than significant level.

f) Proposed project activities such as removal of the remnant road, excavation of road base and removal of culverts at Fen Creek and Inglenook Creek could potentially degrade water quality in the short-term. In addition to channel dewatering (described in Hydrology and Water Quality Discussion a), integration of best management practices, such as coir mats and logs to control soil erosion and runoff, and emergency response spill release kits for vehicle or equipment fluids, and the implementation of Standard Project Requirements (AIR–2, GEO–1 and HYDRO–1) would ensure that potential impacts to water quality remain at a less than significant level.

g) Some portions of the project area are located within the 100-year floodplain of Fen Creek, Inglenook Creek and Ten Mile River according to the official Flood Insurance Rate Map prepared by the Federal Emergency Management Agency (FEMA 1983). However, this project does not include the construction of housing. This project would have no impact.

h) One of the goals of the proposed project is to restore natural stream flow at Fen Creek and Inglenook creek by removing two existing culverts. Currently, these culverts are partially blocked by debris from upstream flows and driftwood from tidal influences. Stream flow has been channeled through these culverts at least since 1949 when the rail bed was converted to a truck road. Once the culverts are removed and the stream beds have been restored to a more natural state stream flow would be redirected as each creek reestablishes its natural course. This would result in benefits to plant and animal communities and decrease the danger of flooding. The proposed project does not include the placement of any structures that would impede or redirect flood flows within a 100-year floodplain and would therefore have no impact.

i) The project would not expose people or structures to an increased significant risk of loss, injury, or death from flooding, including flooding resulting from the failure of a levee or dam. Fen Creek and Inglenook Creek are subject to seasonal flooding but work to remove the culverts would be scheduled to avoid periods of high flow for both safety reasons and to minimize impacts to sensitive aquatic species. Small check-dams may be constructed to temporarily divert stream flow during removal of the culverts, but these dams would not pose a significant risk to construction crews or park visitors. No structures exist within the project area. The project would have no impact.

j) The proposed project would take place in a coastal dune habitat that lies adjacent to the Pacific Ocean. Many locations along the coastline are at risk of inundation by a tsunami, including the proposed project area. A recent tsunami in March 2011 produced damaging waves at Noyo Harbor in Fort Bragg. While inundation is possible, this project would not increase the potential. The project area would not be susceptible to a seiche (wave generated in an enclosed water body) and there is no reasonable expectation that the area is subject to a mudflow. The project would have no impact.

X. LAND USE AND PLANNING.

ENVIRONMENTAL SETTING

The Dune Rehabilitation Project area is located within MacKerricher State Park just north of the city of Fort Bragg in Mendocino County. MacKerricher State Park is a 2,520-acre coastal recreation area zoned as Open Space in the Mendocino County General Plan (MCGP, 1981) and Coastal Element (1991). Open Space lands are those considered unsuitable for development or most valuable left in the undeveloped natural state.

The entirety of the Preserve lies within the California Coastal Zone, consequently potential human-caused alteration (e.g., development) or impacts to "environmentally sensitive habitats (ESHAs)" are subject to review under the California Coastal Act, Article 5, Section 30240(a). The provisions of the Coastal Act are administered locally by the Mendocino County Planning Department through the Coastal Element of the County General Plan. Chapter 3 of the Coastal Element describes the specific development activities that are permitted within ESHAs, including coastal dunes and wetlands. In addition to its location within an area designated as a Natural Preserve, the Dune Rehabilitation Project site lies adjacent to the Pacific Ocean on the west, the Ten Mile River to the north and areas of private property to the east and southeast. Adjacent properties are zoned rural residential.

Beyond the Open Space designation, the Inglenook Fen – Ten Mile Dunes Natural Preserve was established within MacKerricher State Park on June 21, 1995, by the California State Park and Recreation Commission to "provide for recognition and protection of the unit's important natural resources…" (CSP 1995*c*). The General Plan "directs that 1285 acres of land within MacKerricher State Park be classified as the Inglenook Fen-Ten Mile Dunes Natural Preserve to recognize the regional and statewide significance of the outstanding natural values of the Inglenook Fen complex and the Ten Mile Dunes" (CSP 1995*d*). The State Park and Recreation Commission resolution establishing the Preserve (CSP 1995*c*) specifically distinguishes wetlands and riparian areas, a rare coastal dune ecosystem, the only remaining coastal fen in California, eight rare natural communities, and eight special plant species as the important elements. Vehicle use within the boundaries of the Preserve is restricted to emergency access and specific short-term projects for resource management.

The California Public Resources Code provides for the classification of natural preserves within the State Parks system, as follows:

> Natural preserves consist of distinct nonmarine areas of outstanding natural or scientific significance established within the boundaries of other state park system units. The purpose of natural preserves shall be to preserve such features as rare or endangered plant and animal species and their supporting ecosystems, representative examples of plant or animal communities existing in California prior to the impact of civilization, geological features illustrative of geological processes, significant fossil occurrences or geological features of cultural or economic interest, or topographic features illustrative of representative or unique biogeographical patterns. Areas set aside as natural preserves shall be of sufficient size to allow, where possible, the natural dynamics of ecological interaction to continue without interference, and to provide, in all cases, a practicable management unit. Habitat manipulation shall be permitted only in those areas found by scientific analysis to require manipulation to preserve the species or associations that constitute the basis for the establishment of the natural preserve. (California Public Resources Code, Sec. 5019.71.)

The Department Operations Manual, Chapter 0300, provides further clarification and authority for the protection of ecosystem processes and the various biological elements, such as plants, animals, and fungi that function within those ecosystems. Two policies that are particularly pertinent to the proposed project include:

0306.5 Stream Restoration Policy

Stream restoration efforts would emphasize the conditions of dynamic equilibrium, whereby the stream system would be self-maintaining under a variety of natural conditions and flows, once properly designed and configured.

When stream restoration becomes necessary, it is the policy of the Department to first consider and use natural channel design methodology in lieu of traditional engineering practices that focus on symptoms rather than underlying causes. Such natural methodology would use native materials and take into account natural channel patterns, profiles and dimensions to the greatest extent practicable.

0310.1.1 Plant Management Policy

It is the policy of the Department to acquire, preserve, and interpret outstanding examples of native California species; and to acquire, perpetuate, and interpret natural plant communities, associations, natural processes (e.g. succession), and examples of rare, endangered, endemic, or otherwise sensitive native California plants. This would be done in concert with other agencies and organizations.

To maintain native plants as part of the natural ecosystems, the Department would:

a. Preserve and restore the natural abundance, diversity, dynamics, distributions, stand structure and species composition, and the communities and ecosystems in which they occur;
b. Protect state and federally-listed threatened, endangered, rare, or otherwise sensitive species;
c. Restore native plant populations in parks where they have been extirpated by past human-caused actions;
d. Minimize negative human impacts on native plants, populations, communities, ecosystems, and the processes that sustain them while providing opportunities for the public to experience plants native to California; and
e. Protect human health and safety (e.g. hazard tree removal).

The protection and restoration of all naturally occurring (established and living independent of human activities or influences) and native (extant prior to Euro-American human contact) biological elements in the Preserve are consistent with the provisions established within the Coastal Act, the California Public Resources Code, and the MacKerricher State Park General Plan (CSP 1995*q*), and California State Parks Department Operations Manual policies and directives.

	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
WOULD THE PROJECT:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with the applicable land use plan, policy, or regulation of any agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☒	☐

DISCUSSION

a) The proposed project site is wholly within the boundaries of MacKerricher State Park. The site does not contain or define an established community and no project activities would disrupt or divide any community functions. Project activities would not prevent access to adjacent landowners. No impact.

b-c) Development and uses within MacKerricher State Park are guided by California State Parks policies, the park's General Plan, Mendocino County's Local Coastal Plan (Coastal Element of the Mendocino County General Plan), and the regulations of various agencies with jurisdiction over some or all areas of the park. Vehicle and equipment use during the project would be necessary to complete the restoration of the dune system. Project activity would be concentrated along the existing haul road and adjacent disturbed areas. State Parks staff and the project contractors would adopt best management practices to limit impacts to the immediate project area. The project activity would be temporary in nature and would benefit the dune system in the long term. No other project elements would be in conflict with the zoning, regulatory policies, land use plans, conservation plans or ordinances for this area. All appropriate consultation and permits would be acquired, in compliance with all applicable local, state, and federal requirements. Implementation of project requirements and mitigation measures proposed in this document would reduce any potential adverse environmental impacts associated with project implementation to a less than significant level.

XI. MINERAL RESOURCES.

ENVIRONMENTAL SETTING

The main mineral resource in Mendocino County is aggregate, primarily sand and gravels mined from alluvial deposits (Mendocino County GP, 2009). No significant mineral resources have been identified within the boundaries of the project area. Mineral resource extraction on CSP-owned lands is not permitted under the Department's Resource Management Directives.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Result in the loss of availability of a known mineral resource that is or would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

DISCUSSION

a) The project would not result in the loss of availability of a known mineral resource, as no known mineral resources exist within the project boundary. The project would have no impact.

b) The project would not result in the loss of availability of a locally important mineral resource recovery site, as none exist within the project boundary. The project would have no impact.

XII. NOISE.

ENVIRONMENTAL SETTING

The Dune Rehabilitation Project site is located within the Inglenook Fen – Ten Mile Dunes Natural Preserve. It is one of the more remote locations within MacKerricher State Park. The most obvious and consistent source of ambient noise is the sound of the ocean as waves crash ashore Ten Mile Beach.

The nearest roads to the Preserve are Ward Avenue to the south and Highway 1 to the east. Noise levels from human activity are greatest near these locations due to vehicle traffic, proximity to residential areas, and higher concentrations of visitors at popular access points. At the northern end of the Preserve vehicle traffic can be seen but is rarely heard as it passes over the Ten Mile River bridge to the east. Private landowners and associated activities north of the Ten Mile River are too distant to be a factor in producing noise that would affect most visitors.

The majority of the proposed project would be concentrated along the remnant haul road and remote from residential and commercial areas. (See map) However, at the northern end of the Preserve a rural residential area sits 0.12 mile (200 m) across the Ten Mile River from the project site.

In addition to the road removal, excavation work to remove two culverts would be completed at Fen Creek and Inglenook Creek. The nearest residential areas to the Inglenook Creek crossing are within approximately 0.43 mile (700 m) to the east at Beal Lane and Ocean View Drive. At the Fen Creek crossing the nearest residence is approximately 0.62 mile (1000 km) to the east.

Part of the proposed project includes revegetation, treatment of European beachgrass, and removal of non-native trees and shrubs in backdune areas. Some of these locations come within 160 to 375 feet (50 to 115 m) of adjacent private property.

The nearest airport is located approximately 4 miles south of the Project site at the northern city limits of Fort Bragg. There are approximately a dozen single engine aircraft based at this privately owned airport. There are no commercial flights available from this location. Occasional air traffic is audible as small planes fly along the coast or over the dunes. Engine noise from small fishing boats off-shore may be present as well.

There are no known regulations governing noise levels for the project site. Standards for residential areas and public spaces [MCGP, Noise Policies, Policy DE-100] allow for a maximum exterior noise level of 50 to 60 dBA from 7am-10pm.

Project-related sources of noise would include vehicles and equipment needed to complete the Project objectives. These may include chainsaws, off-road vehicles, small trucks, tractors, excavators, and dump trucks.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Generate or expose people to noise levels in excess of standards established in a local general plan or noise ordinance, or in other applicable local, state, or federal standards?	☐	☐	☒	☐
b) Generate or expose people to excessive groundborne vibrations or groundborne noise levels?	☐	☐	☒	☐
c) Create a substantial permanent increase in ambient noise levels in the vicinity of the project (above levels without the project)?	☐	☐	☐	☒
d) Create a substantial temporary or periodic increase in ambient noise levels in the vicinity of the project, in excess of noise levels existing without the project?	☐	☐	☒	☐
e) Be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport? If so, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) Be in the vicinity of a private airstrip? If so, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

DISCUSSION

a) As noted in the Environmental Setting there are no known regulations governing noise levels for the project site. Standards for residential areas and public spaces [MCGP, Noise Policies, Policy DE-100] allow for a maximum exterior noise level of 50 to 60 dBA from 7am-10pm. However, location of the project site immediately adjacent to the ocean results in an ambient noise level that regularly exceeds the recommended 60 dBA. Where existing ambient noise levels exceed these standards, the ambient noise level as measured in dBA Leq (30 minutes) is the highest allowable noise level. There are no noise-sensitive human land uses (sensitive receptors) such as churches, schools, or residences located in the immediate vicinity of the Dune Rehabilitation Project area that would be substantially affected by the proposed construction-related activities. Construction noise levels at and near the project area would fluctuate, depending on the type and number of construction equipment operating at any given time, and would exceed ambient noise standards in the immediate vicinity of the project work site during some stages of the project. The distance from most vacation rentals and private residences located to the north of the Ten Mile River and on the eastern and southern boundaries of the Preserve would be sufficient to prevent objectionable levels of noise. Many of these homes are located adjacent to Highway 1 and are closer to the highway and its routine traffic noise than to the proposed project area. Under certain conditions and during certain phases of the project equipment noise could potentially disturb park visitors using open areas on the beach and in the dunes, as well as residents of homes located directly on the Ten Mile River and near non-native invasive plant treatment areas in the backdunes. Project equipment would include chainsaws and all-terrain vehicles, but this stage of the project would be focused in small areas and short in duration. Depending on the specific construction activities being performed, short-term increases in ambient noise levels could result in speech interference at the work site, making it difficult for project workers to communicate verbally with each other. Taking all these factors into consideration, construction-generated noise would potentially have a short-term impact. Implementation of Standard Project Requirements would ensure that potential noise impacts remain less than significant.

b) Construction activity would not involve the use of explosives, pile driving, or other intensive construction techniques that could generate significant ground vibration or noise. Minor vibration immediately adjacent to excavating equipment would only be generated on a short-term basis. Therefore, ground-borne vibration or noise generated by the project would have a less than significant impact.

c) Project-related noise would only occur during actual construction. Once the project is completed, all noise-generating equipment would be removed from the site. Nothing within the scope of the proposed project would result in a permanent increase in ambient noise levels. Therefore, the project would have no impact.

d) See discussion (a) above. Implementation of Standard Project Requirements Noise 1 would ensure that potential noise impacts remain less than significant.

e-f) This project is not located within an airport land use plan, within two miles (3.2 km) of a public airport, or in the vicinity of a private air strip. There is one privately owned airport (Fort Bragg Airport) and one small private airstrip within 10 miles (16 km) of the project site, but noise from the small aircraft operating from these locations is extremely limited with only the occasional fly-over occurring. There would be no exposure to excessive noise levels from aircraft. There would be no impact.

XIII. POPULATION AND HOUSING

ENVIRONMENTAL SETTING

The Inglenook Fen – Ten Mile Dunes Natural Preserve is located within MacKerricher State Park in Mendocino County, on the northern California coast. The park is bounded on the west by the Pacific Ocean, and its southern end adjoins the city limits of Fort Bragg. In 2009, approximately eight percent of the Mendocino County's total population of 89,938 people resided in Fort Bragg. The city's population was then estimated to be 6,848 residents. No residences are located within the project boundaries. As a Natural Preserve, the development of any type of permanent structure or feature is not a planned use for this part of the park. The Preserve is both a local recreational resource and a destination park, used by locals and out-of-town visitors alike. Aside from the campground's temporary accommodations and associated facilities in other areas, the park does not offer residential opportunities within its boundaries, other than a small residential area for staff housing located near the park entrance and maintenance yard. These facilities are 1.3 to 4.4 miles (2.1 to 7.1 km) south of the project area.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

DISCUSSION

a) The project would have no housing component and all work would take place within the confines of the park boundaries with no additions to the existing infrastructure. The project would have no impact.

b-c) The project is a resource management project in a Natural Preserve. The project would neither modify nor displace any existing housing nor displace any people, either temporarily or permanently. Therefore the project would have no impact.

XIV. PUBLIC SERVICES.

ENVIRONMENTAL SETTING

The Inglenook Fen – Ten Mile Dunes Natural Preserve is located at the northern end of MacKerricher State Park. The Park is bordered on the south by the City of Fort Bragg (population around 7,000), on the north by the Ten Mile River, on the east by the Mendocino County unincorporated community of Cleone, and on the west by the Pacific Ocean. The project area is located along a 3-mile (4.8 km) stretch of beach and coastal dunes between Ward Avenue and the Ten Mile River. Emergency access to the project site is via Ward Avenue at the southern end or Highway 1, a two-lane, paved and maintained state highway to the north. There are no maintained roads in the Preserve.

State Park Peace Officers (Rangers) are trained law enforcement officers. They provide immediate police protection within the park boundaries, with backup provided by both the Fort Bragg Police and Mendocino County Sheriff's Departments. Both departments have stations within 6-10 miles (10-16 km) of the proposed project site. The California Shock Trauma Air Rescue (CALSTAR 4) service helicopters, based at Ukiah Municipal Airport, provide air ambulance service for Mendocino County, available for medical emergencies, search and rescue, and fire support 24 hours a day, 7 days a week. Response time is generally under 30 minutes. The Mendocino Coast District Hospital, located in Fort Bragg, is the closest full-service medical facility to the project site. Due to its remote location in a natural setting, response time to the project location would vary depending on the nature of the emergency and the equipment needed.

Fire protection is provided by the California Department of Forestry and Fire Protection (CAL FIRE), as outlined in a Cooperative Fire Protection Agreement with CSP. They are supported by the Mendocino Fire Protection Department and the Fort Bragg Fire Department, as necessary. The CAL FIRE Fort Bragg Fire Station is approximately 5-9 miles (8-14 km) from the project site. Additional assistance is available from Parlin Fork Conservation Camp (California Department of Corrections). CAL FIRE also maintains an Air Attack Base at the Ukiah Municipal Airport, approximately 65 miles (105 km) and 15-20 minutes flight time away. The CAL FIRE Helitack Base is located in Willits, about 35 miles (56 km) to the east of Fort Bragg.

The Coast Guard maintains an active station at Noyo Harbor for search and rescue efforts and law enforcement at sea.

MacKerricher SP is in the Fort Bragg School District. There are no existing or proposed schools within one-quarter mile (0.40 km) of the Dune Rehabilitation Project site.

There are seven state parks within 20 miles (32 km) of the project area. The proposed project area is within the boundaries of the Inglenook Fen – Ten Mile Dunes Natural Preserve at MacKerricher SP, but not within the primary visitor area. There are no facilities associated with the Preserve. A parking area at Ward Avenue which provides pedestrian and equestrian access to the beach is owned by the county. The remnant road in the Preserve is no longer intact and its impediment to natural dune dynamics and need for removal is the reason for the proposed project. MacKerricher SP is owned and operated by the California State Parks.

There are no other public facilities in the vicinity of the proposed project area.

POTENTIALLY	LESS THAN SIGNIFICANT	LESS THAN

WOULD THE PROJECT:	SIGNIFICANT IMPACT	WITH MITIGATION	SIGNIFICANT IMPACT	NO IMPACT
a) Result in significant environmental impacts from construction associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:	☐	☐	☒	☐
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

DISCUSSION

a) The project does not include new governmental facilities, but proposes to remove remnants of an old road along a stretch of coastal dunes and beach. Winter storms, erosion and blowing sand have made much of the original roadway impassable by vehicle for over 10 years. Designation of Preserve status within the State Park system required that public vehicle access and vehicle use on the road be prohibited. On those few portions of the haul road that remain intact, vehicle access by park rangers, staff or emergency medical services is currently allowed in the event of an emergency. However, due to relatively low visitor use of the Preserve compared to other areas of MacKerricher SP, very few incidents occur that require emergency response. After removal of the road, access by ATV or other rescue equipment would be possible along the packed, wet sand on the beach.

The project would not create any increase in public service requirements. Demand for services would be equivalent to current calls for beach rescues and other infrequent incidents associated with improper and unauthorized activities. Restoration work and alterations associated with this project would not significantly increase visitation or the demand for public services, and therefore would not necessitate the construction of new facilities. Implementation of Standard Project Requirements would ensure that potential impacts associated with the proposed project would remain at a less than significant level.

<u>Fire Protection</u>: Use of construction equipment around flammable vegetation presents an increased fire risk that could result in the need for CAL FIRE CDF and local fire response teams during project implementation. Any impact on services would be temporary and no elements of the project would contribute to the need for an increase in the existing level of public service. In addition, State Park Rangers would be available to respond to incidents and provide support for logistics and public safety. Implementation of Project Requirement HAZ-3, combined with the availability of on-site fire suppression equipment (fire extinguishers) would ensure that potential impacts on Fire Protection services would remain at a less than significant level.

<u>Police Protection/Emergency Response</u>: State Park Rangers provide law enforcement protection within MacKerricher SP. However, demand for law enforcement would be no greater than present in the project area and would not require an increase in emergency personnel. No element of the

proposed project would create a situation that would significantly increase the demand for police protection, increase staffing needs, or adversely affect emergency response times. The project would have no impact.

Schools: There are no elements of this proposed project that would affect schools. No changes would occur that would require additional school facilities or personnel. The project would have no impact.

Parks or Other Public Facilities: Access to the Inglenook-Fen Ten Mile Dunes Preserve would remain open to the public except in the immediate project area. None of the project elements would interrupt normal activities at MacKerricher SP or contribute to a significant increase in visitation. The level of required services within the park is expected to remain relatively static, subject only to seasonal fluctuations in visitor use. County administrative requirements would be equivalent to any other minor commercial construction project. The proposed project has no unique properties and would have no significant impact on other public services. The project would have no impact.

XV. RECREATION.

ENVIRONMENTAL SETTING

In 1995 California State Parks and Recreation Commission established the Inglenook Fen – Ten Mile Dunes Natural Preserve in recognition of its regional and statewide significance and to protect its important natural resources. This unique area contains wetlands and riparian areas, a rare coastal dune ecosystem, the only remaining coastal fen in California, eight rare natural communities, and eight special plant species. Home to many species of wildlife and an important stop-over for migratory birds, the Preserve also provides critical habitat for wintering and nesting Western Snowy Plovers, a federally listed threatened shorebird.

The qualities that make this area a haven for wildlife and a hotspot for rare plant communities also attract visitors who seek open space, solitude and a natural landscape relatively untouched by development. Beach combing, bird watching, photography, jogging, horseback riding and picnicking are popular recreational uses of the Preserve, but it is not uncommon for visitors to have the beach or the dunes to themselves, especially in winter.

The Inglenook Fen-Ten Mile Dunes Natural Preserve has two frequently used entry points: at the north end near the Ten Mile River Bridge; and the south end off Ward Avenue, a county road. Both locations accommodate multiple vehicles. The north access point off Highway 1 traverses a California Department of Transportation (Caltrans) right of way and private property before entering the Preserve about 300 yards (275 m) west of the bridge. Although this access has existed for many years and is used mainly by local coast residents it is not a designated trail or official State Park access. Caltrans recently installed interpretive panels, native plants, benches, new parking spaces and "coastal view" signage on the south end of the new Ten Mile River Bridge.

With only these two highly visible entry points for this 4 mile (6.4 km) long area of the Preserve, much of the use occurs near these locations. Whether visitors enter at Ward Avenue or near the Ten Mile River Bridge, the beach is the destination area for most visitors in the Preserve. At Ward Avenue, visitors can follow the old haul road a short distance north on the headlands before it ends at a major washout where a gravel ramp now leads to the beach below. At the Ten Mile area, several noticeable trails lead from the remnant track of the old road along the edge of the Ten Mile River or through the dunes to the ocean. One of these trails is the designated route to the beach for equestrian use. The portion of the Coastal Trail that runs through the Preserve travels over the wet, packed sand along the shoreline. Equestrians are directed to ride on wet sand to protect sensitive plant and animal species. Due to the dynamic nature of the shore environment, conditions along the beach and dunes are constantly changing. Visitors sometimes need to negotiate around waves and across creek outlets along the beach during high tides, storm events and seasonal flooding of creeks.

Outside of the Preserve, the old haul road spans most of the southern portion of MacKerricher State Park, and is part of the Coastal Trail. With the exception of a short detour at Lake Cleone due to a washout, visitors can walk or bicycle the old haul road route from Glass Beach across the Pudding Creek Trestle and continue north for over 3 miles (4.8 km) to Ward Avenue, where the Preserve boundary begins. Shortly beyond this point the remnant road has been completely washed out, severely eroded or covered by sand due to constant wave action, storm events and shifting sand. The remnant road north of Fen Creek sits further back in the dunes and has been spared the force of the waves but is weathered and covered in multiple areas by sand as much as 3 feet (0.91 m) deep. For this reason, the portion of the Coastal Trail that crosses the Preserve is designated along the shoreline.

Several volunteer trails have been established from nearby residential areas and from Highway 1, which borders the Preserve in some areas to the east. These unauthorized trails are mostly used by private property owners with landholdings adjacent to the Preserve. The beaches at Inglenook Creek and Fen Creek at the remote center of the Preserve are often the destination for these local residents. These volunteer trails are visible throughout the back dune system as they meander across the dunes, cross over the old road and continue to the ocean.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Increase the use of existing neighborhood and regional parks or other recreational facilities, such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☒

DISCUSSION

a) During construction activities, access to the immediate project area would be closed to visitors to ensure public safety. The Inglenook Fen-Ten Mile Dunes Natural Preserve would remain open to the public throughout the project, as would the rest of MacKerricher State Park. Temporary closure of one of the two main access points may be necessary for brief periods during the project to accommodate equipment access and provide for public safety. In this instance alternative options for access would be publicized. State Parks would provide notification in the local media and through park postings prior to and during all restoration activities that would result in closures. At no point would the proposed project require that both major access areas be closed at the same time. Access to certain areas of MacKerricher State Park is routinely restricted or closed temporarily in winter due to storms, flooding, high tides or unsafe conditions. Seasonal and temporary closures to park access in the interest of public safety or resource protection are a standard practice of park management and park policy. In general the public understands the need for these temporary restrictions to access and the constantly changing nature of our coastal environment. Such closures have not resulted in the increased use or the deterioration of other recreational parks or facilities. Transportation of road materials to the Big River quarry would require closure of the M1 road at the Big River Unit of the Mendocino Headlands State Park from the entrance gate to the quarry. Hauling would occur only during daylight hours and would not occur on weekends or holidays. The closure would be temporary and short-term, estimated to last 3 weeks. All other areas of the park would remain open. The project would not cause increased use of other parks or recreational facilities nor would the project lead to physical deterioration of any known facilities. There would be no impact.

b) The intent of the Dune Rehabilitation Project is to restore natural dune processes that are crucial to the viability of endangered species and their habitats. The project would have a beneficial physical effect on the environment by removing a barrier to sand movement and water flow. A secondary benefit would be added safety for the public and improved recreational opportunities. The steep dunes and cliffs that form along the beach due to the impediment of the remnant road and stabilizing effect of the invasive European beachgrass result in a narrower beach strand. During high tides and storm events, waves may reach the base of these dunes and cliffs along several narrow sections of the beach. The high water undercuts the dunes and cliffs, making them steeper over time, and visitors are required to walk, and equestrians to ride, into the back dunes in order to go around the waves. Removal of the remnant road and eradication of the beachgrass would return the dune processes to a more natural state. The result would be a wider sandy beach with a more gradual slope leading to low, undulating foredunes. Historical photos of the dunes and nesting records of the Western Snowy Plover utilizing the backdune area indicate that Ten Mile Beach had these characteristics in the past. The proposed project would not include the construction or expansion of any recreational facilities within the Preserve. The project would have no impact.

XVI. TRANSPORTATION/TRAFFIC.

ENVIRONMENTAL SETTING

The Dune Rehabilitation Project site is located within the Inglenook Fen – Ten Mile Dunes Natural Preserve at the northern end of MacKerricher State Park in Mendocino County. This portion of northern California is somewhat isolated from the more heavily populated, central part of the state, with limited transportation routes and access into and through the area. There are no maintained roads within the Preserve. The removal of a remnant haul road is the purpose of the proposed project.

The main transportation route along the Mendocino Coast is State Highway 1, also known as the Pacific Coast Highway. The section of Highway 1 adjacent to MacKerricher State Park is a two-lane, state-maintained (Caltrans) highway and has been designated as a National Scenic Byway. Due to the limited number of transportation routes along the coast, Highway 1 is also a designated truck route and vehicle traffic includes local as well as regional delivery trucks. Traffic volumes vary seasonally, with increased traffic in the spring and summer months, including tour buses and recreational vehicles. Highway 1 is the main thoroughfare through the town of Fort Bragg and seasonal traffic can cause congestion in the downtown area. Bicycle tourists traveling the popular Pacific Coast Bike Route use Highway 1 as the designated bicycle route along the Mendocino Coast, especially during the summer months. A scenic alternative allows bicyclists to access MacKerricher State Park at Mill Creek Drive, where riders can continue south along the coast on the old Haul Road and over the restored Pudding Creek Trestle into the town of Fort Bragg. North of MacKerricher State Park the Coastal Trail is part of Highway 1. Hikers exploring the Coastal Trail within the Preserve follow a route along the beach between the Ten Mile River and Ward Avenue.

Caltrans defines the Level of Service (LOS) on state routes as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists. According to Caltrans, the recommended concept Level of Service for Highway 1 on the Mendocino coast is “E”, except through the City of Fort Bragg, where no concept level of service has been established. Level of Service “E” is defined as unstable traffic flow with rapidly fluctuating speeds and flow rates, short headways, low maneuverability and low driver comfort and convenience. Highway 1 is expected to operate at or above the established concept level of service through the year 2020.

There are two public parking areas associated with the Preserve. One is located on county property at the Ward Avenue access south of the Preserve boundary. It is unpaved and has space for 8 to 10 vehicles. At the northern end of the Preserve, Caltrans has improved what used to be an informal parking area on the south end of the Ten Mile River bridge. This area is now paved and accommodates 6 vehicles. It is not considered an official access point by State Parks and is not located on State Park property.

Historically there was significant rail traffic to and through Fort Bragg. What is now the remnant “haul road” within MacKerricher State Park was once a railroad line used to transport logs and lumber to and from the Fort Bragg mill. Eventually this line was removed and converted to a paved road for truck use. Much of this route has been washed away and heavily eroded on the northern end of the Park. Rail service on the coast is currently limited to excursion trips on the California Western Railroad’s famous Skunk Train (which travels from downtown Fort Bragg east to Willits). The Skunk Train provides roundtrip sightseeing tours but no regular passenger service. The Skunk Train rail line is not contiguous with the road segment to be removed by this project.

The Fort Bragg Airport is located approximately 4 miles (6.4 km) south of the Dune Rehabilitation Project site at the northern city limits of Fort Bragg. There are approximately a dozen single engine aircraft based at this privately owned airport. There are no commercial flights available from this location.

There is no bus service available to the project site. The closest bus stop for the Mendocino Transit Authority “BraggAbout” route is on the north end of Fort Bragg city limits, approximately 5 to 8 miles (8-13 km) south of the project area.

	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
WOULD THE PROJECT:				
a) Cause a substantial increase in traffic, in relation to existing traffic and the capacity of the street system (i.e., a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☒	☐
b) Exceed, individually or cumulatively, the level of service standards established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c) Cause a change in air traffic patterns, including either an increase in traffic levels or a change in location, that results in substantial safety risks?	☐	☐	☐	☒
d) Contain a design feature (e.g., sharp curves or a dangerous intersection) or incompatible uses (e.g., farm equipment) that would substantially increase hazards?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☒	☐
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

DISCUSSION

a) Most of the vehicle traffic and construction activities associated with the project would occur within the boundaries of MacKerricher SP. Traffic associated with the project would be concentrated at the northern end of the park and in the Preserve. Most visitor use at MacKerricher State Park takes place at the central and southern areas of the park and would therefore not be affected by project activities. None of the activities proposed as part of this project would have the potential to cause traffic delays on a public road. Highway 1 would be the primary access road leading to the project site. Vehicles would access the project area by using the gated road on the east side of Highway 1 that runs beneath the Ten Mile River Bridge. This road is located on private property and is accessed from a logging road that runs east along the southern bank of the Ten Mile River. The logging road is used by private timber operators and residents of the Ten Mile River valley with no indication that the highway intersection has safety or congestion issues. State Parks would obtain permission from property owners to use this access point during the proposed project. The general public does not have access to the gated road. Vehicles entering the road from Highway 1 would turn right onto the logging road and cause little delay in highway traffic. Project vehicle drivers would use caution before turning left from the logging road onto the gated road and yield to uphill traffic from the logging road. The intersection would be signed to notify other vehicles of construction traffic. Vehicles exiting the gated road would stop and yield to uphill traffic from the logging road before merging right. Vehicles exiting the logging road onto Highway 1 would stop and wait for traffic to pass before turning left to enter the highway and would cause no increase in congestion.

Highway 1 between Little Valley Road and Westport experiences traffic volumes on average of 1,500 vehicles per day, with truck traffic representing 9% of the total vehicle traffic (Caltrans Traffic Volumes, 2009). CSP estimate that the project would require up to 15 crew transport (passenger or light-duty trucks) vehicles and 17 to 23 light-duty trucks, tractors, and haulers to complete the work. The crew vehicles would likely make one to two trips daily to and from the project site. Delivery of the construction equipment would require one trip per vehicle to and from the site. Most construction vehicles would remain onsite or parked at the project staging areas when not in use. Three to five dump trucks would be used to haul away materials from the road removal work site. These materials would be stockpiled at the staging areas, and later transported by up to 6 highway-approved dump trucks to an appropriate facility for reprocessing and recycling by the contractor. A portion of the materials would also be transported to the old quarry site at the Big River Unit of Mendocino Headlands State Park for use in future CSP projects. CSP estimates that it would take up to 45 days with equipment working 5 days per week for dump trucks to haul all materials from the stockpile area to disposal sites. The time required to haul materials to the Big River site would be approximately 21 days. The addition of an estimated 15 crew vehicles making an estimated 1 to 2 round-trips daily and 6 highway approved dump trucks making up to 7 trips to and from the site daily would not constitute a substantial increase in traffic volume for Highway 1 or result in additional congestion. Therefore the project would have a less than significant impact.

b) As mentioned in the Environmental Setting, the recommended concept Level of Service for Highway 1 on the Mendocino coast at MacKerricher State Park is "E". Level of Service "E" is defined as unstable traffic flow with rapidly fluctuating speeds and flow rates, short headways, low maneuverability and low driver comfort and convenience.

The limited number of construction-related vehicles visiting the site daily would not substantially increase traffic volume or congestion on Highway 1 in the vicinity of the project area. The project would have a less than significant impact.

c) The project site is not located within an airport land use plan, within two miles (3.2 km) of a public airport, in the vicinity of a private air strip, and does not serve as a normal reporting point for air traffic in the area. Nothing in the proposed project would in any way affect or change existing air traffic patterns in the area. Therefore, no impact would occur as a result of this project.

d) No portion of the project design or implementation would alter existing roads or traffic conditions, or add any element that would increase hazards to traffic or other forms of transportation. The remnant haul road north of Ward Avenue has not been a viable transportation route for vehicles since 1983 due to numerous washouts and erosion. The project would have no impact.

e) The project area is located in the Inglenook Fen-Ten Mile Dune Preserve along a 3-mile stretch of beach and coastal dunes between Ward Avenue and the Ten Mile River. Emergency access to the Preserve is via Ward Avenue at the southern end or Highway 1 to the north. There are no maintained roads in the Preserve and the Preserve does not contain any roads open to vehicles. On those few portions of the remnant haul road that remain intact, vehicle access by park rangers, staff or emergency medical services is currently allowed in the event of an emergency. After removal of the road, access by ATV or other rescue equipment would be possible along the packed, wet sand on the beach. In the event of life-threatening emergencies, the California Shock Trauma Air Rescue (CALSTAR 4) service helicopters, based at Ukiah Municipal Airport, provide air ambulance service for Mendocino County, available for medical emergencies, search and rescue, and fire support. Response time is generally under 30 minute. However, due to relatively low visitor use of the Preserve compared to other areas of MacKerricher SP, very few incidents occur that require emergency response. Therefore, the impact of this project on emergency access or response would be less than significant.

f) No portion of the project design or implementation would result in reduced or inadequate parking capacity. Visitors wishing to access the Preserve at the southern end would have parking available at the Ward Avenue area. A Caltrans viewpoint also offers parking at the south end of the Ten Mile River Bridge near the northern end of the Preserve. Park staff and contractors associated with the proposed project would not access the Preserve from either of these parking areas or use the parking areas for staging or storing equipment. Potential staging areas for the project will be located within the project site. Use of these areas would not result in inadequate parking capacity for any areas within the Preserve or MacKerricher State Park. The project would have no impact.

g) No specific policies, plans, or programs supporting alternative transportation apply to this project. The remnant haul road is washed out, eroded or covered in sand over large segments within the Preserve. A feasibility study was conducted for a proposal to reconstruct and maintain a continuous hardened surface trail through the Preserve (Draft Feasibility Study for the Northern Segment of the MacKerricher Coastal Trail project, March 2000). Summary findings from this report found that a Coastal Trail Project in the Preserve was non-feasible due to economic costs, engineering difficulties and environmental compliance due to threatened and endangered species. Due to these findings State Parks is not currently initiating a trail project in the Preserve, nor are there plans to do so in the future. The existing Coastal Trail runs along the beach on packed or wet sand and provides users access to Ten Mile beach within the Preserve. The project would have no impact.

XVII. UTILITIES AND SERVICE SYSTEMS.

ENVIRONMENTAL SETTING

MacKerricher State Park is a 2,520-acre coastal park that borders the City of Fort Bragg to the south. Sewage for the park is transported via tight line from the park headquarters area near Lake Cleone to Fort Bragg. The underground line runs down the west side of the park along the haul road, extends under the road and adjacent Beachcomber Motel property, then follows Highway 1 south to the Fort Bragg lift station. The sewer lift station is situated on the edge of the Caltrans right of way which parallels Pudding Creek. Solid waste disposal service is provided under contract with Waste Management of Fort Bragg. Electrical power is obtained from Pacific Gas and Electric. The park supplies its own water from Lake Cleone, approximately 2 miles (3.2 km) from the southern end of the project site.

The Dune Rehabilitation Project would take place entirely within the Inglenook Fen-Ten Mile Dunes Natural Preserve. There are no utilities and no services provided within the Preserve or at the project site.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Exceed wastewater treatment restrictions or standards of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities?	☐	☐	☐	☒
Would the construction of these facilities cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities?	☐	☐	☐	☒
Would the construction of these facilities cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources or are new or expanded entitlements needed?	☐	☐	☒	☐
e) Result in a determination, by the wastewater treatment provider that serves or may serve the project, that it has adequate capacity to service the project's anticipated demand, in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statutes and regulations as they relate to solid waste?	☐	☐	☐	☒

DISCUSSION

a) MacKerricher State Park is within the jurisdiction of the North Coast Regional Water Quality Control District. The proposed project is a restoration project within a Natural Preserve and would not involve nor affect any wastewater facilities. The project would be in compliance with all applicable water quality standards and State Parks would obtain a water quality permit from the NCRWQCD if deemed necessary. No wastewater would be produced by this project. The project would have no impact.

b) As noted above, water for the park is supplied from CSP owned and/or controlled private water supplies. No new facilities are proposed, and there are no utilities available at the project site. The proposed project would not result in the expansion of the existing internal plumbing or wastewater lines and would have no impact on public wastewater treatment facilities. Portable toilets would be provided at the job site and maintained in compliance with North Coast Regional Water Quality Control District requirements. Therefore, the project would have no impact.

c) The proposed project would not require or result in the construction of new storm water drainage facilities or expansion of existing facilities. Removal of two culverts would restore the stream bed, bank, and channel to a natural condition and improve natural stream flow and drainage. The removal of culverts and debris from the channels can be accomplished with conventional excavation, primarily a track-mounted excavator. To minimize the potential for impacts to the streams, paired sandbag cofferdams would be used for dewatering, provide access to the work area, and minimize the introduction of fine sediment. The project would have no impact.

d) As indicated above, no new facilities would be constructed for the proposed project. The project site is located entirely within the Preserve, where no utilities or facilities exist. Implementation of the project would not require a source of water. Potable water is available for the crew if needed at the campgrounds and developed areas of MacKerricher State Park from CSP-owned and/or controlled private water supplies. Current supplies are adequate for existing demands, as well as the minimal additional demands associated with the proposed construction, and projected future use. Once completed, the project would not require additional water resources. The project would have a less than significant impact.

e) There are no utilities available at the project site. Portable toilets would be temporarily provided at the job site during project implementation and maintained as required. Once completed, the proposed project would have no impact on the Park's wastewater needs. The Project would have no impact.

f) The proposed project includes the removal of abandoned asphalt roadway and road base as well as two 5-foot diameter culverts. CSP would strive to recycle as much of the materials as possible. The asphalt and road base would be processed for reuse by the contractor or delivered for reuse on local logging roads, or to the old quarry on State Park property at Big River for future use. Concrete blocks may be crushed and reused or delivered to Akeff Construction or Baxman Gravel in Fort Bragg for recycling. Metal culverts would be recycled if possible or delivered to a disposal facility. Any timber associated with the culvert removal would be retained by CSP and reused for future park projects. Remaining waste material generated during the removal of the remnant haul road, if any, would be hauled to the appropriate transfer station for disposal. Mendocino County has no remaining operational landfills. Solid waste generated in Mendocino County is transported to the Potrero Hills Landfill located in Solano County (County of Mendocino 2009).The proposed project would not increase the park's solid waste disposal needs in the long-term and short-term impacts would be minimal. The Project would have a less than significant impact.

g) Solid waste generated from this project would include remnant asphalt pieces, road base and fill material, and two metal culverts. Efforts would be made to recycle all reusable materials in cooperation with local agencies and businesses such as the project contractor, Caltrans, Akeff Construction, and Baxman Gravel. All trash produced by Park staff, contractors and equipment operators would be removed from the site daily and disposed of properly at State Park facilities at MacKerricher or Russian Gulch maintenance yards. The project would comply with federal, state and local statutes and regulations related to solid waste. The project would have no impact.

CHAPTER 4
MANDATORY FINDINGS OF SIGNIFICANCE

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal?	☐	☒	☐	☐
b) Have the potential to eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐
c) Have impacts that are individually limited, but cumulatively considerable? (“Cumulatively considerable” means the incremental effects of a project are considerable when viewed in connection with the effects of past projects, other current projects, and probably future projects?)	☐	☐	☐	☒
d) Have environmental effects that will cause substantial adverse effects on humans, either directly or indirectly?	☐	☐	☒	☐

DISCUSSION

a) The California State Parks has evaluated the proposed project and its impacts on the environment, fish and wildlife, plants, animals and plant communities, and rare or endangered plants and animals. While the project has the potential to degrade the environment in the short-term, the purpose and goal of the project is restore a sensitive natural ecosystem. Most project activities have been designed to avoid potentially significant impacts to the physical or biotic environment. Standard and Specific Project Requirements have been developed to further avoid or ensure that potential impacts remain less than significant. In addition, for potentially significant impacts for which avoidance is infeasible in order to accomplish project objectives, mitigation measures have been incorporated into the project design. Full implementation of these measures would eliminate or reduce impacts to a less-than significant level. The overall goals of this project, as well as the individual site-specific goals and objectives, have been designed and would be implemented to result in a net benefit to the environment.

b) California State Parks has evaluated the proposed project for its potential impacts on historical, cultural, and archaeological impacts. The haul road removal area received a full surface assessment for cultural sensitivities. A full assessment of all European beachgrass treatment areas was not conducted, however no treatment for European beachgrass is proposed for areas of known archaeological sites. In addition, as a result of the evaluations of project sites as performed, several Standard and Specific Project Requirements have been incorporated into the project design, including avoidance of sensitive surface features, onsite archaeological monitoring during soil-disturbing project activities, and training for workers and stoppage-of-work requirements for any incidents of discovery of potentially significant archaeological or cultural resources; these measures are to be applied in project activity areas where soil disturbance activities are proposed. Implementation and fulfillment of these project requirements would render project impacts on cultural resources less than significant.

c) No other projects are planned for any of the proposed sites for this project within the foreseeable future. All sites would be regularly re-visited for up to 5 years following project implementation for the purposes of monitoring and maintenance. These activities themselves constitute the effective mitigations for any negative impacts that might accrue from this project. The cumulative impacts of the collective components of this project are designed to be to the benefit of the ecological condition of the Natural Preserve and its unique dune and wetland systems. Any negative impacts are expected to be less than significant, short-lived, and isolated during and immediately following project implementation and State Parks would respond to these impacts as they are detected, through regular monitoring and maintenance of restoration sites.

d) Most project activities would have no potentially significant effects on humans. However, environmental impacts on air quality (e.g., heavy equipment emissions), ambient noise levels (e.g., heavy equipment operation), could have substantially adverse effects on humans. While this project could have substantially adverse, direct or indirect effects on humans, implementation of this project according to designed safety standards, engineering specifications, park closure and warning notices and other prescribed safety precautions, project monitoring, and measures outlined in Standard and Specific Project Requirements would ensure potential impacts from emissions remain at a less than-significant level.

CHAPTER 5
SUMMARY OF MITIGATION MEASURES

The following mitigation measures would be implemented by CSP as part of the **DUNE REHABILITATION PROJECT.**

AESTHETICS
- No mitigation measures required

AGRICULTURAL RESOURCES
- No mitigation measures required

AIR QUALITY
- No mitigation measures required

BIOLOGICAL RESOURCES
All special status plant species
- All areas within 50 ft (15 m) of the road will be searched for weeds, specifically iceplant, and will be removed for a 5 year period.

Abronia umbellata **ssp.** ***breviflora*** **– Pink Sand-Verbena**
- A mitigation, monitoring, and restoration plan for maintaining existing populations, and the introduction and establishment of new populations through direct seeding is proposed in areas where appropriate habitat is identified through monitoring. Plants near the haul road that can be avoided will be flagged. Execution of the mitigation plan and avoidance measure is expected to reduce project-related impacts to a less-than-significant level with a mitigation ratio of a minimum of 4:1.

Chorizanthe howellii **– Howell's spineflower**
- A mitigation, monitoring, and restoration plan for maintaining existing populations, and the introduction and establishment of new populations through direct seeding is proposed in areas where appropriate habitat is identified through monitoring. Plants near the haul road that can be avoided will be flagged. Execution of the mitigation plan and avoidance measure is expected to reduce project-related impacts to a less-than-significant level with a mitigation ratio of a minimum of 8:1. Because the project occurs within a State Natural Preserve, the largest feasible mitigation ratio was used.

Eryisimum menziesii **ssp.** ***menziesii*** **– Menzies' Wallflower**
- A mitigation, monitoring, and restoration plan for maintaining existing populations, and the introduction and establishment of new populations through direct seeding is proposed in areas where appropriate habitat is identified through monitoring. Plants near the haul road that can be avoided will be flagged. Execution of the mitigation plan and avoidance measure is expected to reduce project-related impacts to a less-than-significant level with a mitigation ratio of a minimum of 8:1. Because the project occurs within a State Natural Preserve, the largest feasible mitigation ratio was used.

Oenothera wolfii **– Wolf's evening-primrose**
- One small patch of evening-primrose at the northern bend in the haul road is within the 50 ft (15 m) potential impact buffer. It will be flagged and avoided. Other plants near Fen Creek may be eliminated by the project; therefore direct seeding into suitable habitat at a 4:1 ratio will be

implemented as mitigation, increasing the number of plants and reducing the impacts to a less-than-significant level.

CULTURAL RESOURCES
- No mitigation measures required

GEOLOGY AND SOILS
- No mitigation measures required

GREENHOUSE GAS AND EMISSIONS
- No mitigation measures required

HAZARDS AND HAZARDOUS MATERIALS
- No mitigation measures required

HYDROLOGY AND WATER QUALITY
- No mitigation measures required

LAND USE AND PLANNING
- No mitigation measures required

MINERAL RESOURCES
- No mitigation measures required

NOISE
- No mitigation measures required

POPULATION AND HOUSING

- No mitigation measures required

PUBLIC SERVICES

- No mitigation measures required

RECREATION

- No mitigation measures required

TRANSPORTATION/TRAFFIC

- No mitigation measures required

UTILITIES AND SERVICE SYSTEMS

- No mitigation measures required

CHAPTER 6
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CHAPTER 7
Report Preparation

CALIFORNIA STATE PARKS

Aleman, Monica, State Historian I
Cebula, Alison Environmental Services Intern
Gruver, Dionne, Associate State Archaeologist
Hutchins, Adam, Environmental Services Intern
Liebenberg, Angela, Environmental Scientist
Maslach, William, Environmental Scientist
Moffatt, David R., Associate Landscape Architect, QSD
Pasquinelli, Renée, Senior Environmental Scientist

CALIFORNIA GEOLOGICAL SURVEY

Bedrossian, Trinda, Senior Engineering Geologist
Huyette, Michael, Engineering Geologist

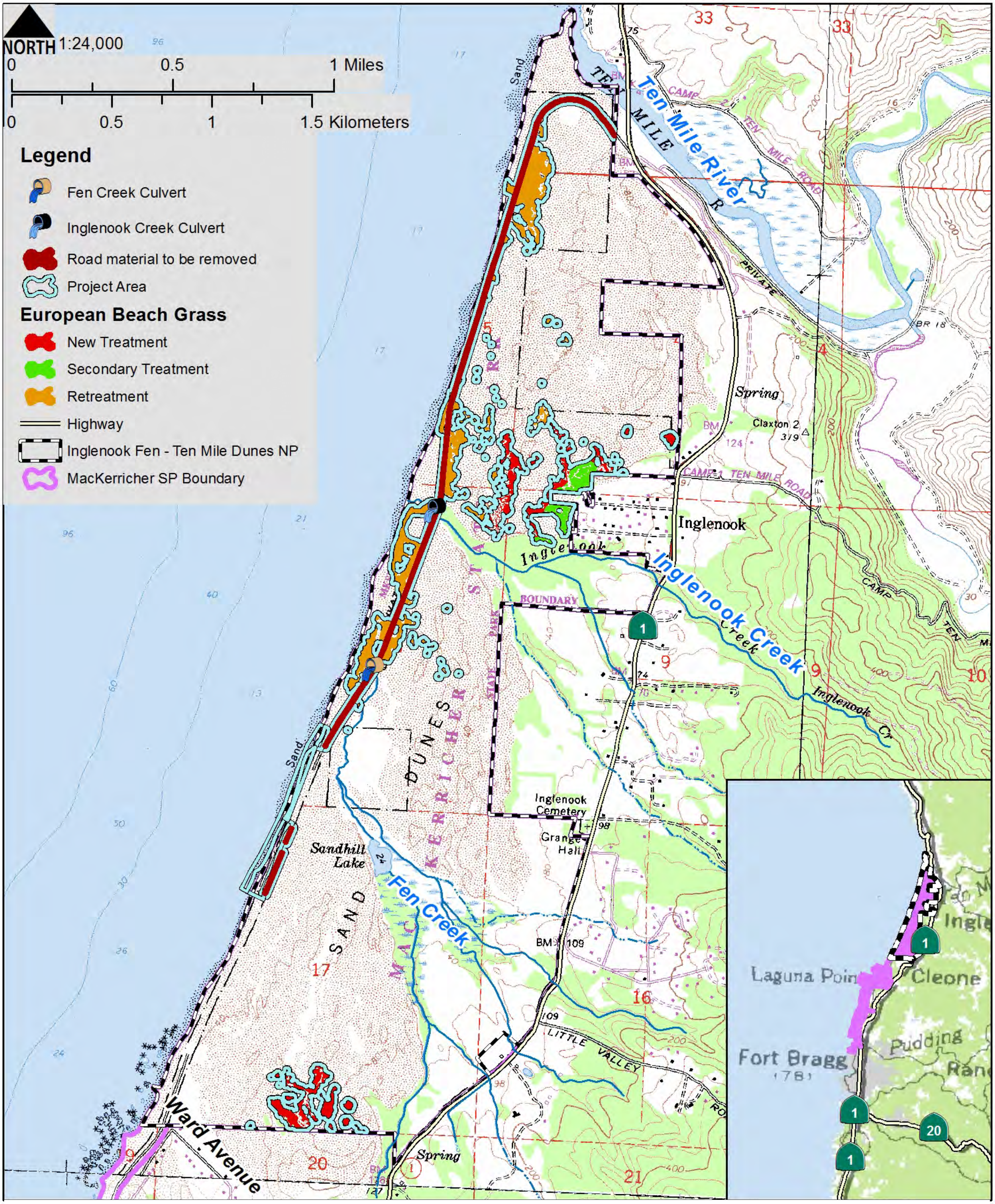
ECOLOGICAL CONSULTANTS

Baye, Dr. Peter, Coastal Plant Ecologist
Sholars, Teresa, Professor of Ecology, College of the Redwoods
Warner, Peter, Botanist, Plant Ecologist

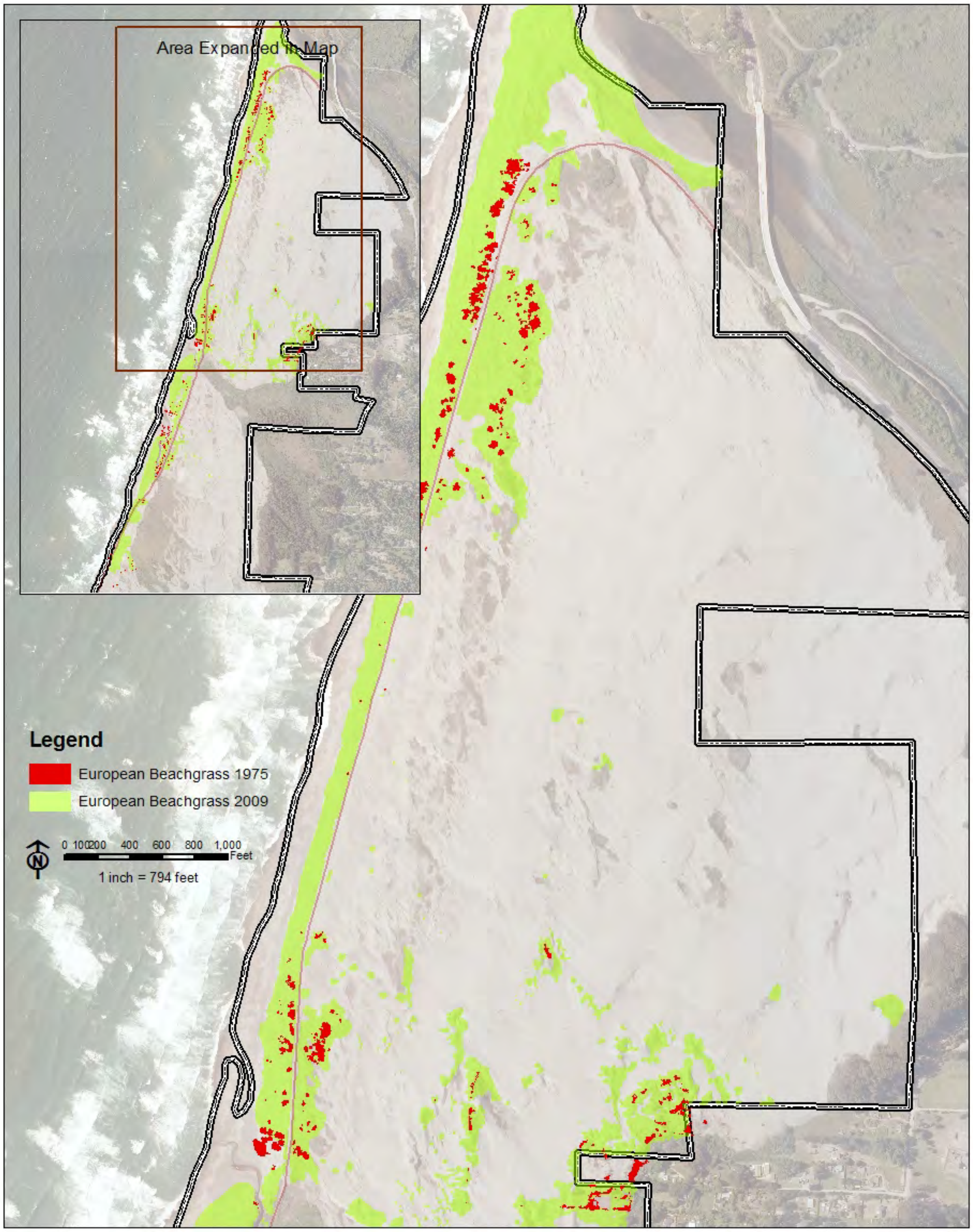
APPENDICES A.1 THROUGH A.9

MAPS, TABLES, AND CHARTS

APPENDIX A.1 – Dune Rehabilitation Project Overview Map



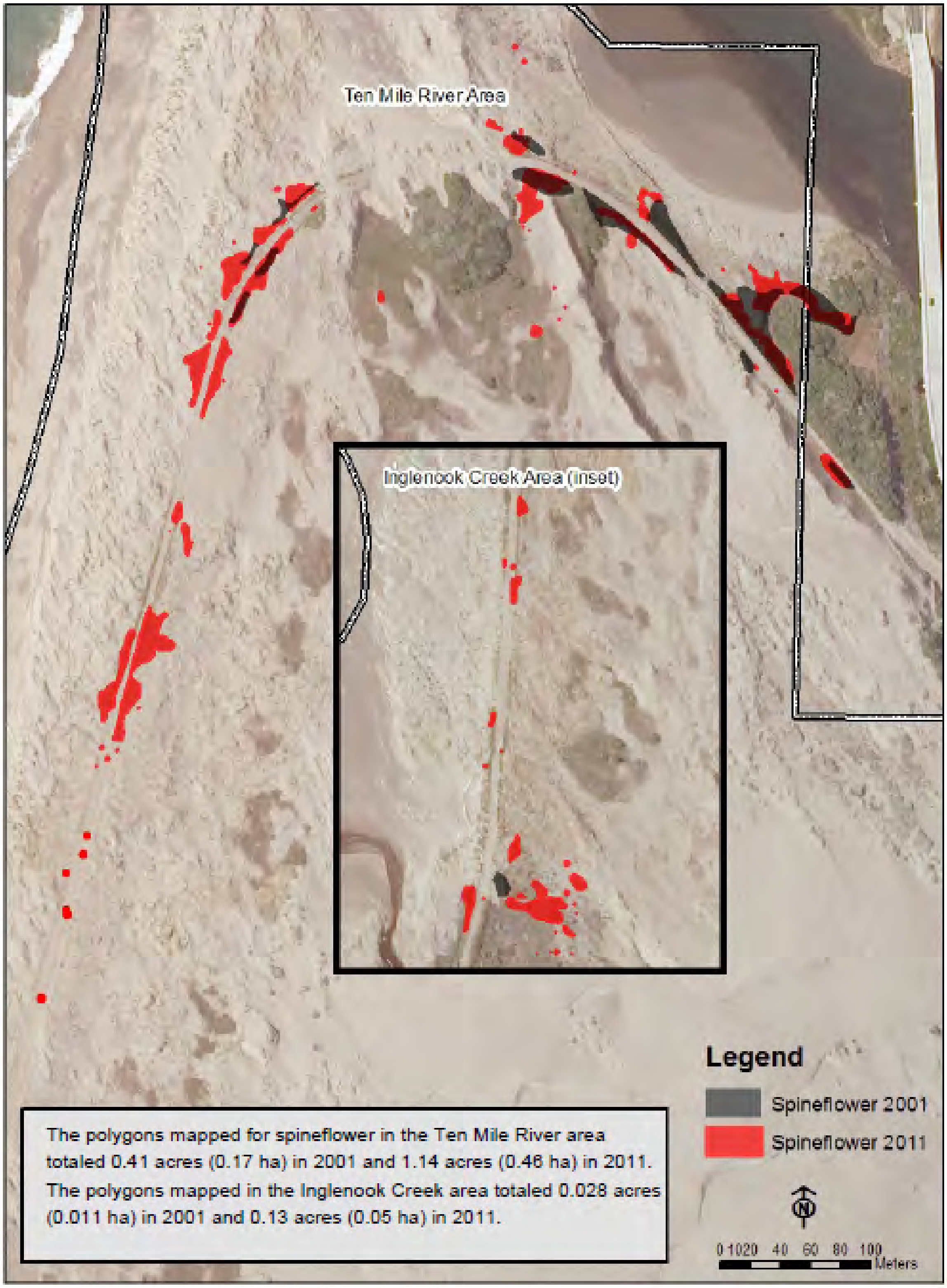
MacKerricher State Park Dune Rehabilitation Project Overview



APPENDIX A.2 - COMPARISON OF EUROPEAN BEACHGRASS INFESTATION FROM AERIAL PHOTO INTERPRETATION – 1975 & 2009.

The extent of European beachgrass was digitized in a GIS from georeferenced aerial photographs taken in 1975 and 2009.

Appendix A.3 - Comparison of Spineflower (*Chorizanthe howellii*) Mapped Occurrences, 2001 & 2011



Appendix A.4 – Population Estimates Methodology

Methodology for estimating population sizes of Howell's Spineflower (*Chorizanthe howellii*) and Menzies' Wallflower (*Eryisimum menziesii* ssp. *Menziesii*)

Howell's Spineflower

The occurrence of Howell's spineflower was mapped by CSP personnel using GPS throughout the Preserve in 2001. A total of 0.41 acres (0.17 ha) were mapped, however, the number of individual plants were not estimated. To estimate the 2011 Howell's spineflower population, CSP natural resource personnel used GPS to remap the 2001 areas plus all new stands located throughout the Preserve. The 2011 mapping documented 8.9 acres (3.6 ha) of spineflower in the entire Preserve, with approximately 1.14 acres in the northern part of the Preserve (see Appendix A.3 – Comparison of Spineflower (*Chorizanthe howellii*) Mapped Occurrences, 2001 & 2011). To estimate population numbers, a total of 425 sampled quadrats were selected in stands measured to be greater than 161 ft^2 (15 m^2). Within each quadrat, spineflower plants with a diameter greater than 0.28 in (7 mm) were then counted. A population size of approximately 1,040,500 individual plants ± 3,800 was estimated with 95% confidence by multiplying the mean number of plants in a quadrat by the total area of mapped spineflower stands.

CSP estimated the area of the 2011 Howell's spineflower population that grew within 50 ft (15 m) of the edge of road base material to be approximately 1 acre (0.4 ha).

Menzies' Wallflower

A similar methodology was used to estimate the population size of Menzies' wallflower growing within the Preserve. Wallflower stands in the Preserve were mapped in 2004, 2009, and 2011. Where wallflower was mapped in 2004 or 2009, the boundaries of the stands were checked in the field in 2011 and drawn to reflect current occupied habitat, which totaled 147.4 acres (59.7 ha). The population size was estimated by counting the number of individual plants within 440, 1 x 20 m quadrats distributed throughout the mapped occurrences, then multiplying the mean number of plants in a quadrat by the total area of mapped wallflower, which resulted in 134,000 plants.

In addition to the population estimate, CSP natural resource staff also counted the total number of individual wallflower plants in a zone spanning both sides of the haul road within 33 ft (10 m) of the edge of the asphalt, or approximate road edge if sand covered the asphalt. Polygons of these areas were digitized into the complied 2011 map of wallflower stands. Approximately 1,170 wallflower individuals were counted within the measured haul road zone, with the area of stands estimated to be approximately 0.23 acres (0.09 ha). Based on the 2011 population count and integrated mapping effort, the number of wallflower plants growing within the road zone in 2011 was approximately 0.9% of the total estimated population of wallflower growing within the Preserve. The area of wallflower stands occurring within the road zone was approximately 0.1% of the total occupied wallflower habitat found throughout Preserve.

Appendix A.5 - Project Area Floristic Inventory

Family	*Latin Binomial*	Common Name
Aizoaceae		
	*Carpobrotus chilensis**	sea fig; iceplant
	*Carpobrotus edulis**	Hottentot-fig; iceplant
Anacardiaceae		
	Toxicodendrom diversilobum	poison-oak
Apiaceae		
	Angelica hendersonii	Henderson's angelica
	Angelica lucida	wild celery
	*Conium maculatum**	poison hemlock
	*Daucus carota**	Queen Anne's lace
	Daucus pusillus	rattlesnake weed
	Heracleum maximum	cow parsnip
	Oenanthe sarmentosa	water parsley
Asteraceae		
	Achillea millefolium	yarrow
	Ambrosia chamissonis	beach bur
	Anaphalis margaritacea	pearly everlasting
	Artemisia pycnocephala	dune sagebrush
	Baccharis douglasii	salt marsh baccharis
	Baccharis pilularis var. *consanguinea*	coyote brush
	*Cirsium vulgare**	bull thistle
	*Cotula coronopifolia**	brass-buttons
	Erigeron canadensis	Canada horseweed
	Erigeron glaucus	seaside daisy
	Eriophyllum lanatum var. *arachnoideum*	woolly sunflower
	E. staechadifolium	seaside woolly sunflower
	Gamochaeta ustulata	purple cudweed
	Gnaphalium palustre	marsh cudweed
	Grindelia strict var. *platyphylla*	gumplant
	Heterotheca sessiliflora ssp. *bolanderi*	Bolander’s golden-aster
	*Hypochaeris glabra**	smooth cat's-ear
	*Hypochaeris radicata**	rough cat's-ear
	*Leontodon saxatilis**	hawkbit
	*Matricaria discoidea**	pineapple weed
	Pseudognaphalium stramineum	cotton-batting plant
	*Senecio glomeratus**	cutleaf burnweed
	*Senecio jacobaea**	tansy ragwort
	*Senecio minimus**	coastal burnweed
	*Senecio vulgaris**	groundsel
	*Soliva sessilis**	soliva
	*Sonchus oleraceus**	common sow-thistle
Azollaceae		
	Azolla filiculoides	mosquito fern
Betulaceae		

Alnus rubra	red alder
Blechnaceae	
Blechnum spicant	deer fern
Boraginaceae	
Cryptantha leiocarpa	dune cryptantha
Plagiobothrys reticulatus var. *reticulatus*	popcorn flower
Brassicaceae	
*Brassica nigra**	black mustard
*Cakile maritima**	European sea rocket
Cardamine oligosperma	bitter cress
Erysimum menziesii ssp. *menziesii*	Menzies's wallflower
*Raphanus sativus**	wild radish
Caprifoliaceae	
Lonicera involucrata var. *ledebourii*	twinberry
Caryophyllaceae	
Cerastium viride	western field chickweed
*Cerastium glomeratum**	mouse-eared chickweed
*Polycarpon tetraphyllum**	four-leaved allseed
*Stellaria media**	common chickweed
Chenopodiaceae	
Atriplex leucophylla	beach saltbush
Atriplex patula	spear orach
Atriplex prostrata	fat-hen
Dysphania botrys	Jerusalem oak
Convolvulaceae	
Calystegia soldanella	beach morning-glory
Cuscuta sp.	dodder
Cucurbitaceae	
Marah oregana	coast manroot; wild cucumber
Cyperaceae	
Carex obnupta	slough sedge
Schoenoplectus pungens var. *longispicatus*	threesquare
Scirpus microcarpus	bulrush
Dennstaedtiaceae	
Pteridium aquilinum var. *pubescens*	bracken
Dryopteridaceae	
Polystichum munitum	western sword fern
Ericaceae	
Gaultheria shallon	salal
Equisetaceae	
E. hyemale ssp. *affine*	common scouring-rush
Fabaceae	
*Cytisus scoparius**	Scotch broom
Lathyrus tingitanus	Tangier’s Pea
*Lotus corniculatus**	bird's-foot trefoil

	*Lupinus arboreus**	yellow bush lupine
	*Lupinus chamissonis**	silver dune lupine
	Lupinus littoralis	bluff lupine
	*Medicago polymorpha**	California burclover
	*Melilotus indicus**	sourclover
	Trifolium barbigerum	bearded clover
	*Trifolium dubium**	little hop clover
	*Trifolium repens**	white clover
	Trifolium wormskioldii	cow clover
	Vicia sativa ssp. *nigra**	winter vetch
Fagaceae		
	Notholithocarpus densiflorus	tanoak; tanbark oak
Garryaceae		
	Garrya elliptica	coast silktassel
Gentianaceae		
	Zeltnera sp.	
Grossulariaceae		
	Ribes divaricatum var. *pubiflorum*	spreading gooseberry
Iridaceae		
	Sisyrinchium californicum	Californica golden-eyed grass
	Sisyrinchium bellum	Blue-eyed grass
Juncaceae		
	Juncus bolanderi	
	Juncus breweri	rush
	Juncus bufonius	toad rush
	Juncus phaeocephalus	brown-headed rush
	Juncus xiphioides	iris-leaved rush
Lamiaceae		
	Mentha arvensis	wild mint
	*Mentha pulegium**	pennyroyal
	Prunella vulgaris var. *lanceolata*	selfheal
Lythraceae		
	*Lythrum hyssopifolia**	loosestrife
Montiaceae		
	Claytonia perfoliata	miner's lettuc
Myricaceae		
	Morella californica	Pacific wax myrtle
Myrsinaceae		
	*Anagallis arvensis**	scarlet pimpernel
Myrtaceae		
	*Eucalyptus globulus**	Tasmanian bluegum
Nyctaginaceae		
	Abronia latifolia	sand verbena
	Abronia umbellata ssp. *breviflora*	pink sand verbena
Onagraceae		
	Camissoniopsis cheiranthifolia	beach evening primrose
	Epilobium ciliatum ssp. *ciliatum*	willow-herb
	Oenothera wolfii	Wolf's evening primrose
Ophioglossaceae		
	Sceptridium multifidum	grape fern, moonwort

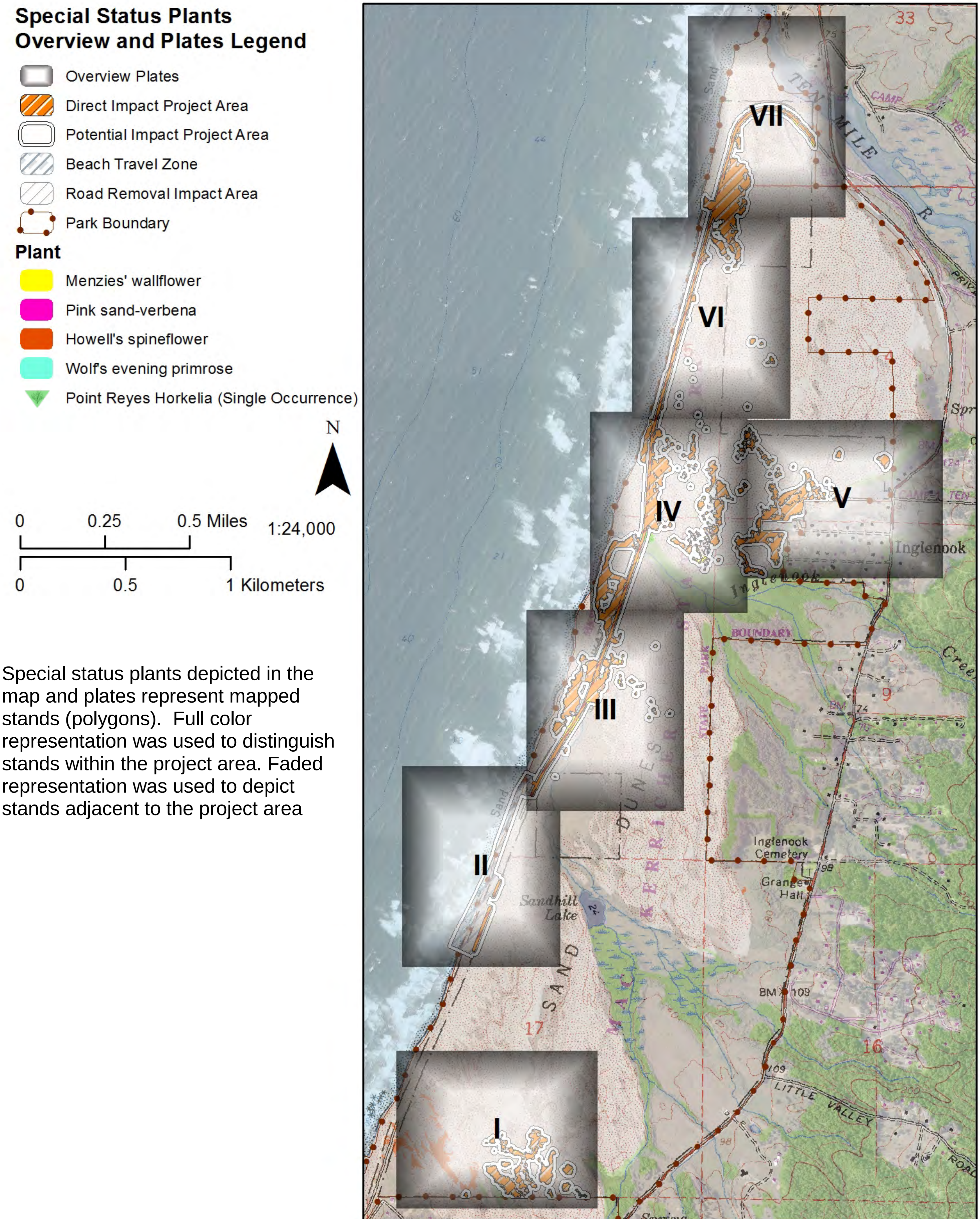
Orchidaceae		
	Spiranthes porrifolia	creamy ladies-tresses
Orobanchaceae		
	Orobanche californica ssp. *californica*	California broom-rape
	Triphysaria eriantha ssp. *rosea*	Johnny-tuck
Phrymaceae		
	Mimulus guttatus	common monkeyflower
Pinaceae		
	Abies grandis	grand fir
	Pinus contorta ssp. *contorta*	shore pine; beach pine
	Pinus muricata	Bishop pine
	*Pinus radiata**	Monterey pine
	Pseudotsuga menziesii	Douglas-fir
Plantaginaceae		
	Hippuris vulgaris	mare's-tail
	*Kickxia elatine**	roundleaf cancerwort
	*Plantago lanceolata**	English plantain
Plumbaginaceae		
	Armeria maritima ssp. *californica*	sea pink
Poaceae		
	*Aira caryophyllea**	silver European hairgrass
	*Aira praecox**	European hairgrass
	*Ammophila arenaria**	European beachgrass
	*Anthoxanthum odoratum**	sweet vernal grass
	*Avena fatua**	wild oats
	*Briza maxima**	rattlesnake grass
	Bromus carinatus var. *maritimus*	California brome
	*Bromus. diandrus**	ripgut brome
	*Bromus hordeaceus**	soft chess
	Calamagrostis nutkaensis	Pacific reed grass
	*Cynosurus echinatus**	dogtail grass
	Distichlis spicata	salt grass
	Elymus mollis	California beachgrass
	*Festuca bromoides**	brome fescue
	*Festuca myuros**	rattail fescue
	*Holcus lanatus**	purple velvet grass
	*Poa annua**	annual bluegrass
	Poa douglasii	dune bluegrass
	Poa unilateralis	ocean bluff bluegrass
	*Polypogon monspeliensis**	annual beard grass
	*Rytidosperma penicillatum**	hairy oatgrass
Polemoniaceae		
	Gilia millefoliata	dark-eyed gilia
Polygonaceae		
	Chorizanthe howellii	Howell's spineflower
	Eriogonum latifolium	coast buckwheat
	Pterostegia drymarioides	fairy mist
	*Rumex acetosella**	sheep sorrel
	*Rumex obtusifolius**	bitter dock
	Rumex crassus	seashore willow-dock

Polypodiaceae		
	Polypodium californicum	California polypody
Potamogetonaceae		
	Potamogeton nodosus	long-leaved pondweed
Rosaceae		
	Fragaria chiloensis	beach strawberry
	Horkelia marinensis	Pt. Reyes horkelia
	Potentilla anserina ssp. *pacifica*	beach cinquefoil
	*Rubus armeniacus**	Armenian blackberry
	Rubus ursinus	California blackberry
Rubiaceae		
	Galium aparine	bedstraw; goosegrass
Salicaceae		
	Salix hookeriana	coastal willow
	Salix sitchensis	Sitka willow
Scrophulariaceae		
	*Buddleja davidii**	butterfly bush
	Scrophularia californica	bee plant
Typhaceae		
	Typha latifolia	broad-leaved cattail
Woodsiaceae		
	Athyrium filix-femina var. *cyclosorum*	lady fern

* = non-native to this ecosystem

APPENDIX A.6 – Special Status Plants Maps

Overview Map and Plates 1 through 7



Special status plants depicted in the map and plates represent mapped stands (polygons). Full color representation was used to distinguish stands within the project area. Faded representation was used to depict stands adjacent to the project area

MacKerricher State Park Dune Rehabilitation Project Area Special Status Plants Overview Map

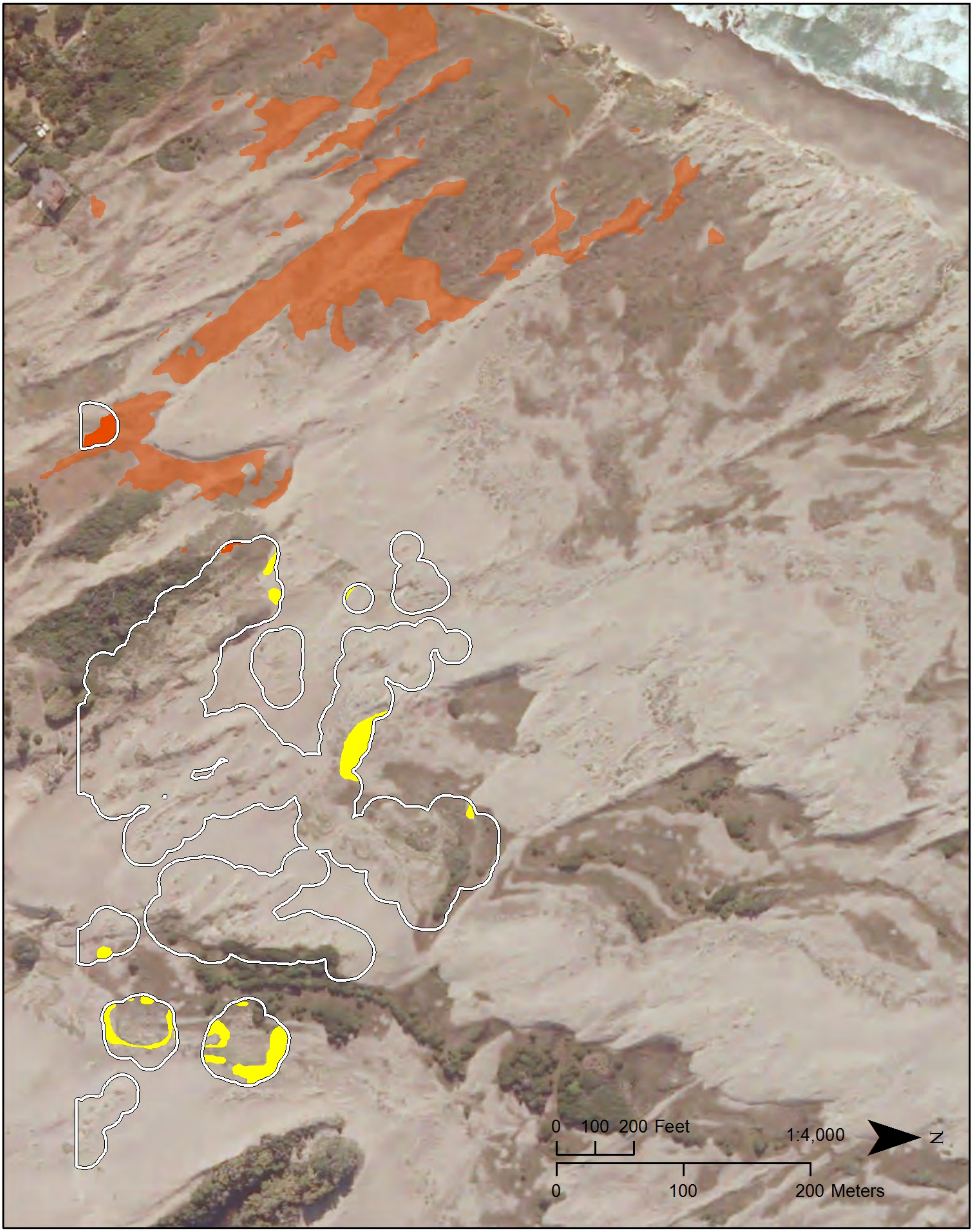


Plate I (note orientation shift)

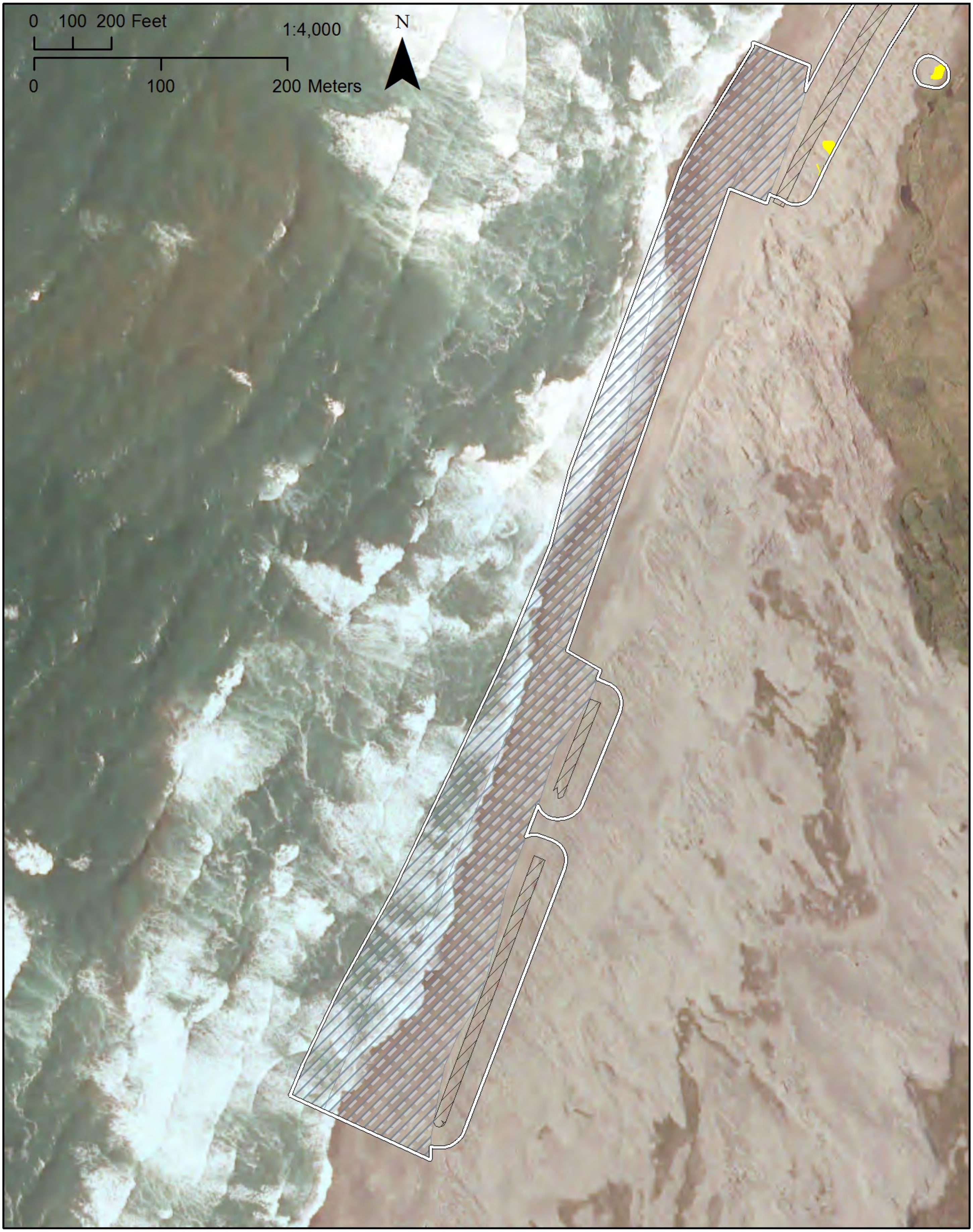


Plate II

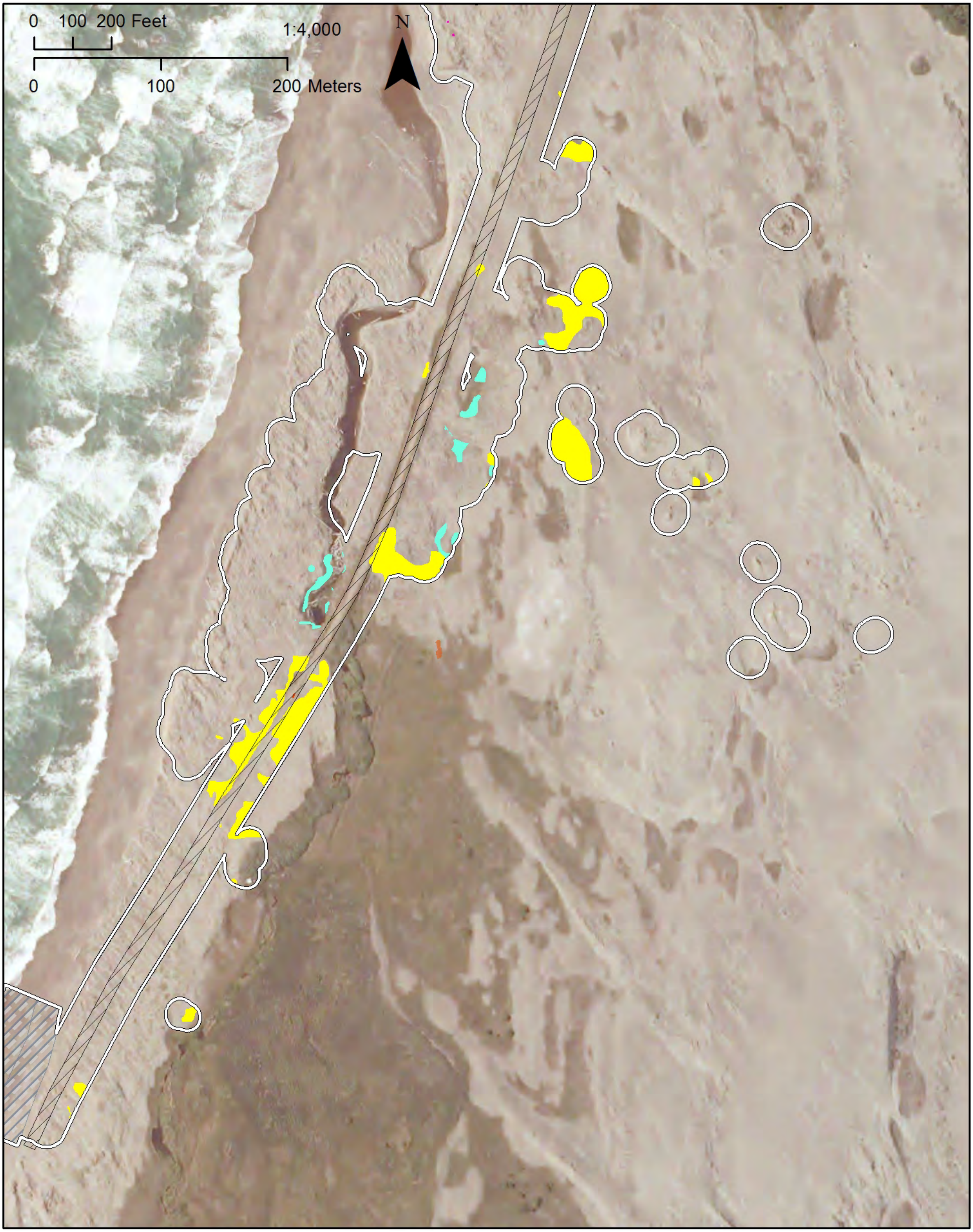


Plate III

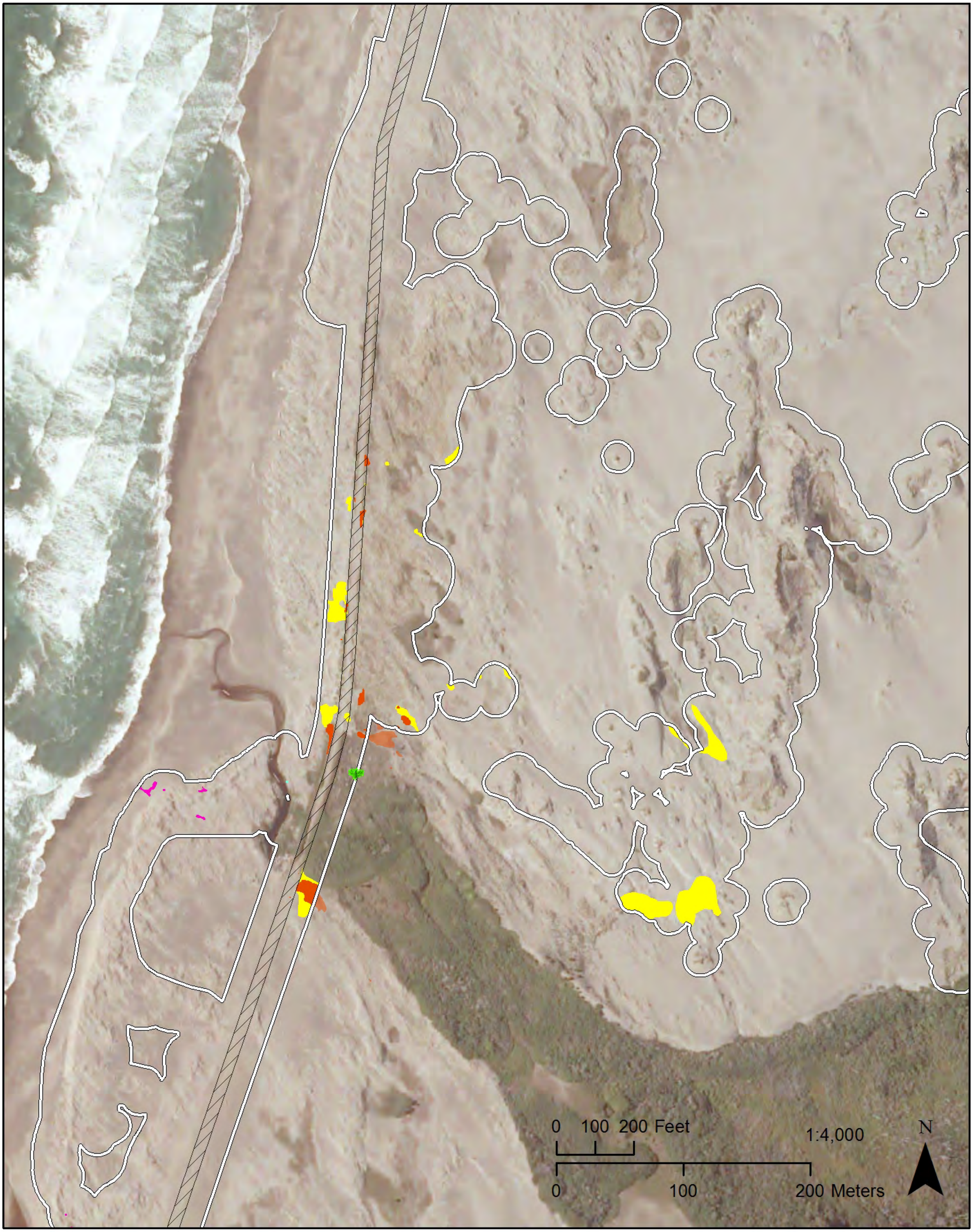


Plate IV

Plate V (note orientation shift)

Plate VI

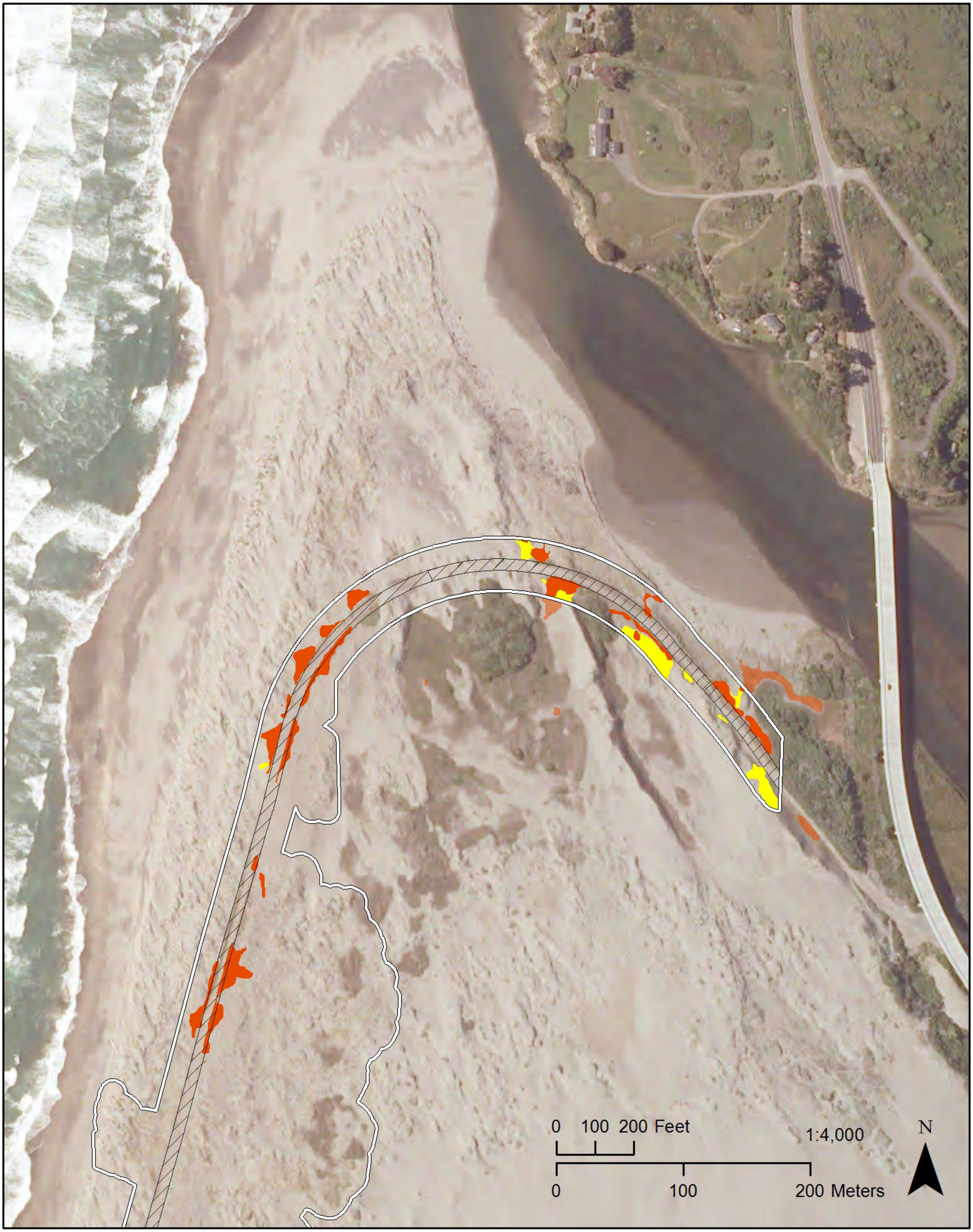


Plate VII

APPENDIX A.7 – Natural Communities Maps

Overview Map and Plates 1 through 7

Natural Communities Overview and Plates Legend

- Overview Plates
- Direct Impact Project Area
- Potential Impact Project Area
- Beach Travel Zone
- Road Removal Impact Area

Natural Communities within Project Area

Alliance

- European beachgrass sward
- Eucalyptus grove
- Small-fruited bulrush marsh
- Slough sedge sward
- Pacific silverweed marsh
- Sea lyme grass patch
- Dune mat
- Coastal silk tassel scrub
- Wax myrtle scrub
- Coastal dune willow thicket
- Sitka willow thicket
- Bishop pine forest (only at south perimeter)
- Beach pine forest (individuals)

Preserve

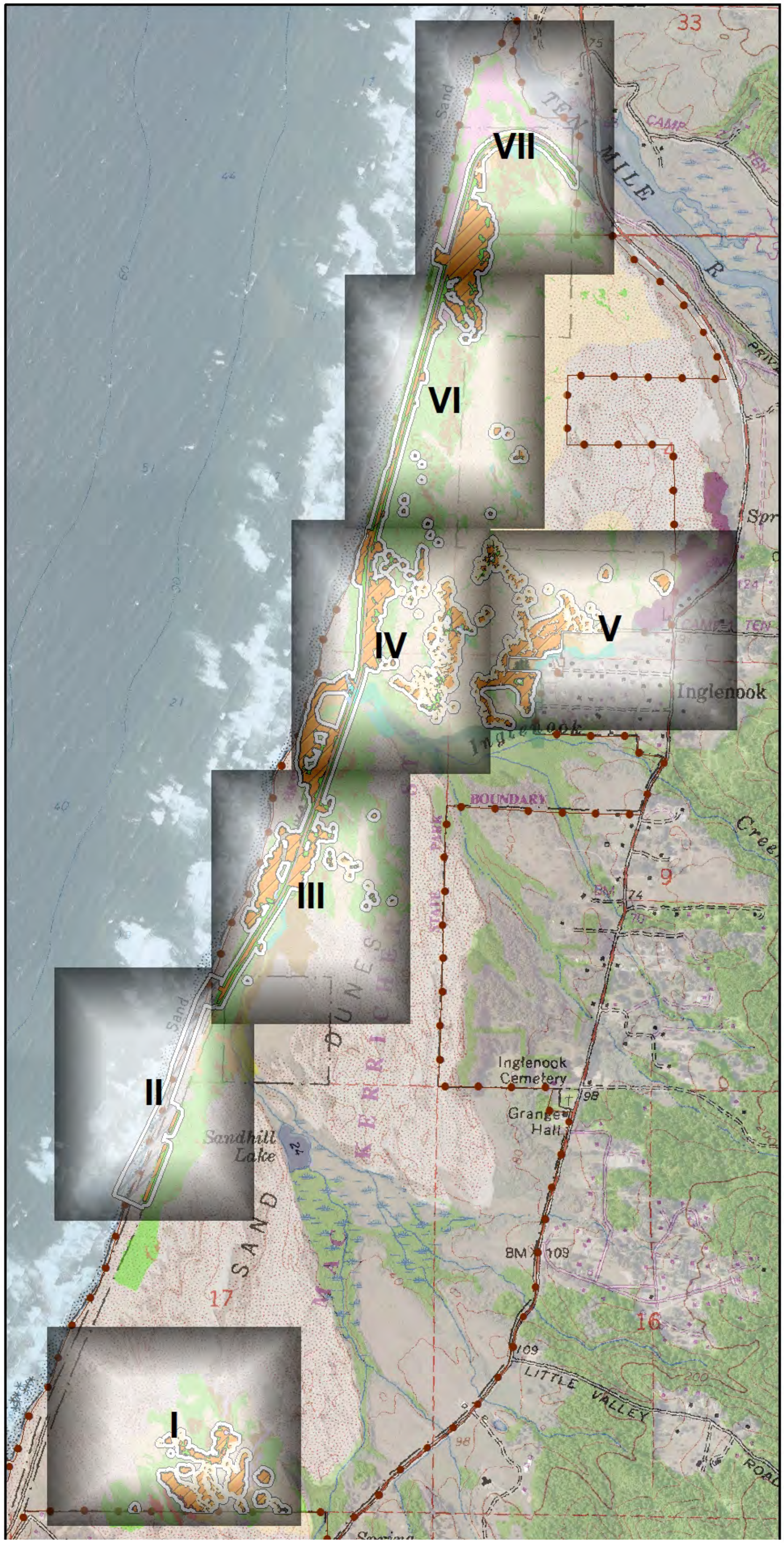
- Open Sand
- Water
- Asphalt
- Park Boundary

N

0 0.25 0.5 Miles

0 0.5 1 Kilometers

1:24,000



Natural Communities depicted in the Map and Plates represent alliance level communities (polygons). Full color representation was used to distinguish communities within the project area. Faded representation was used to depict communities adjacent to the project area

MacKerricher State Park Dune Rehabilitation Project Area Natural Communities Overview Map

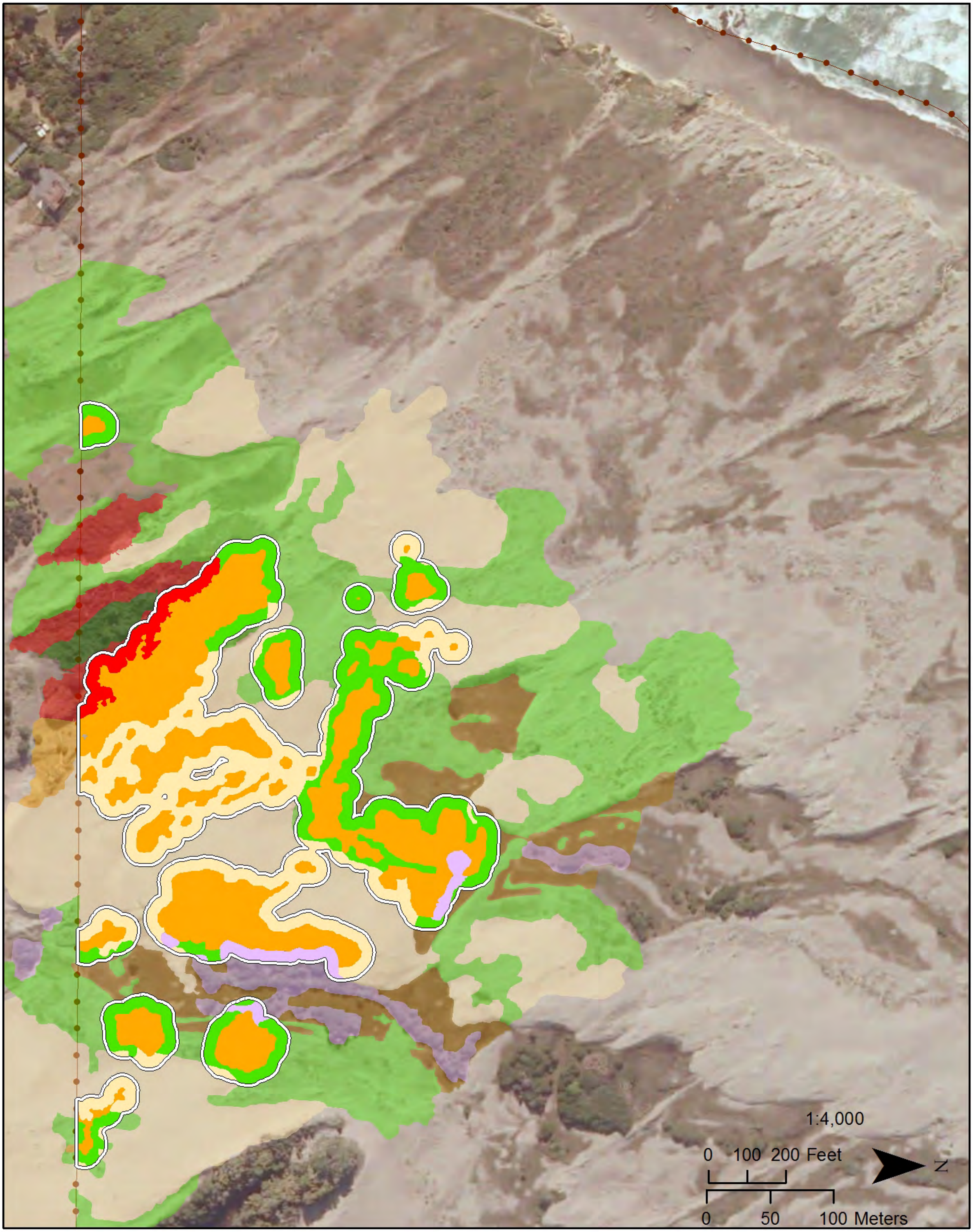


Plate I (note orientation shift)

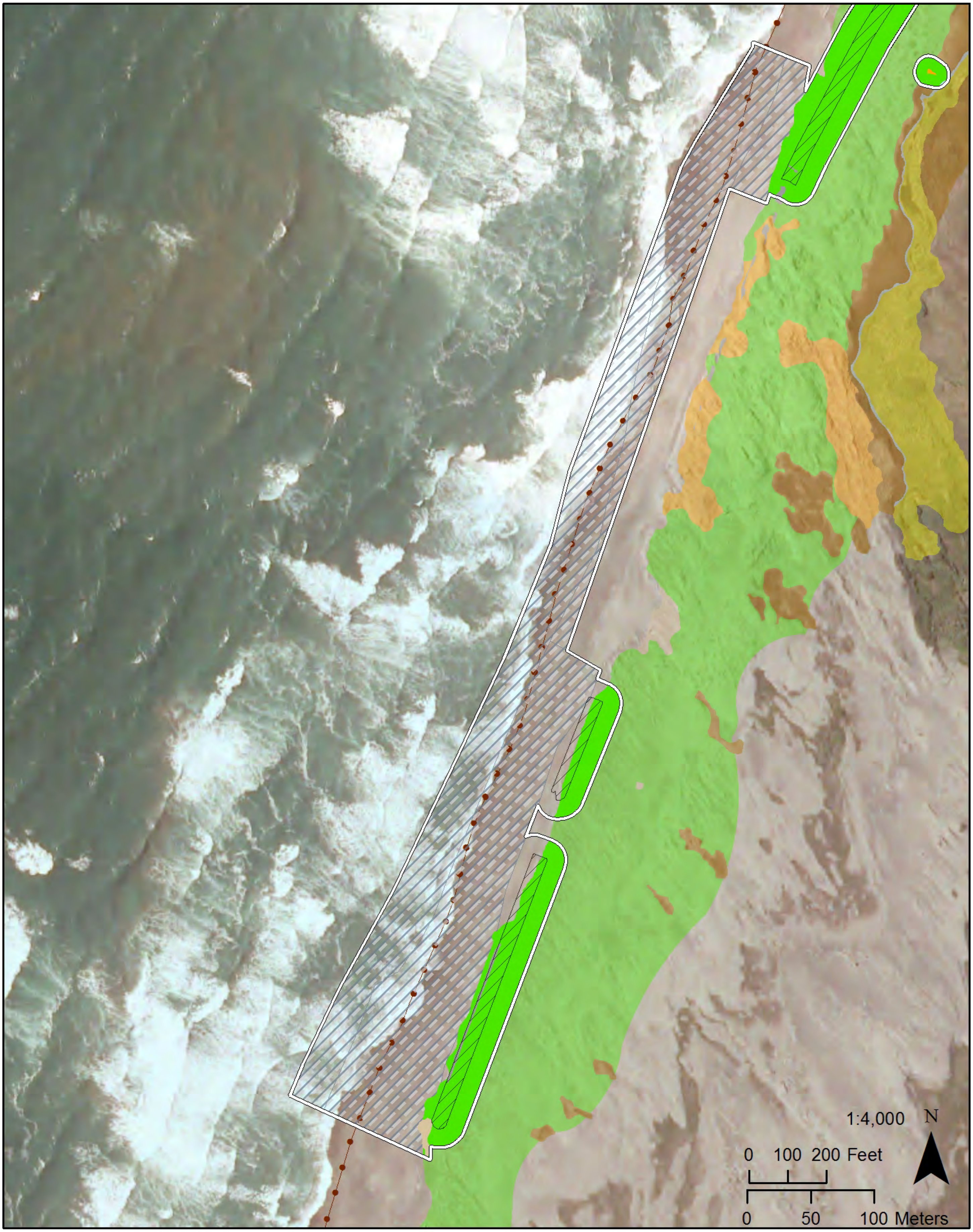


Plate II

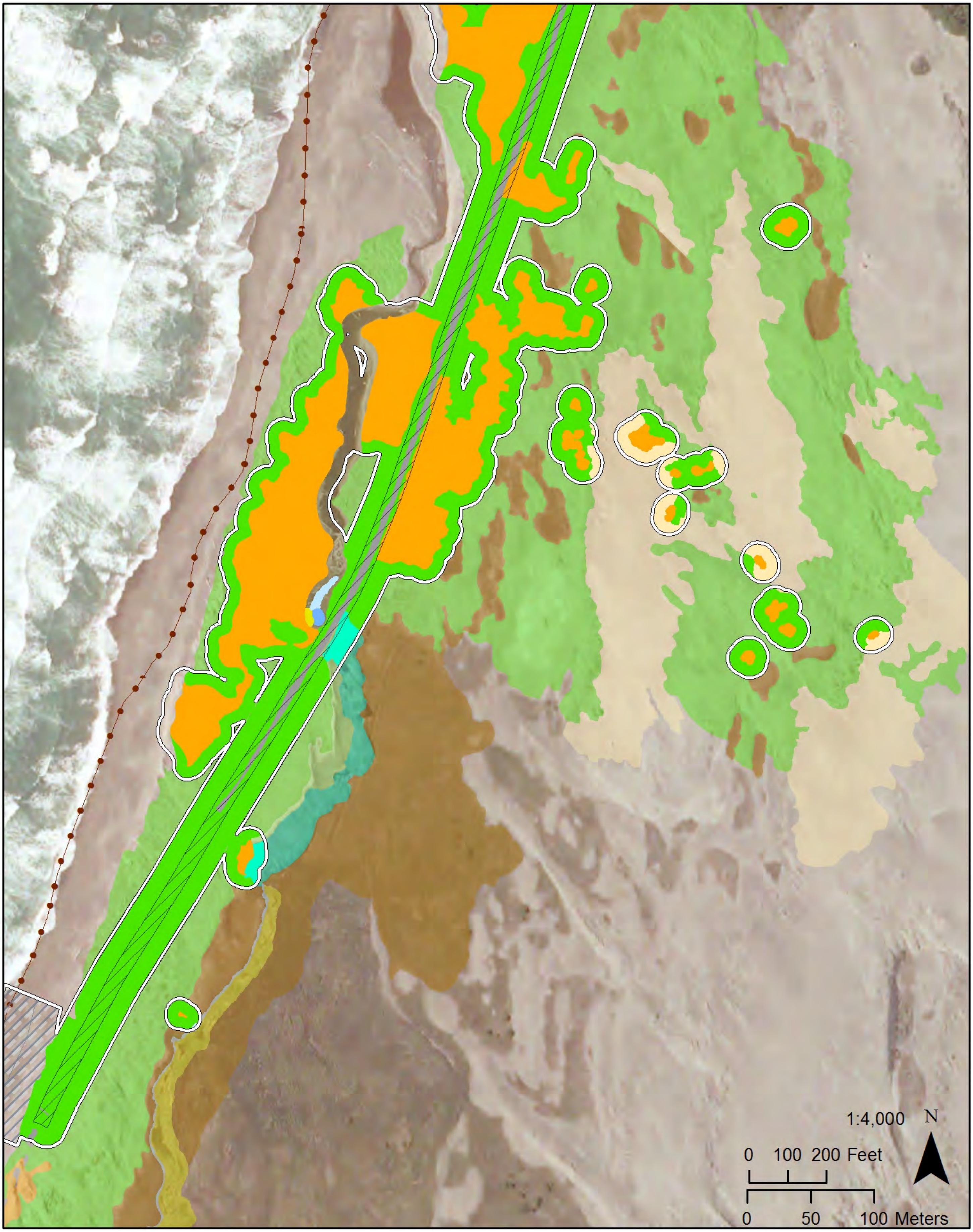


Plate III

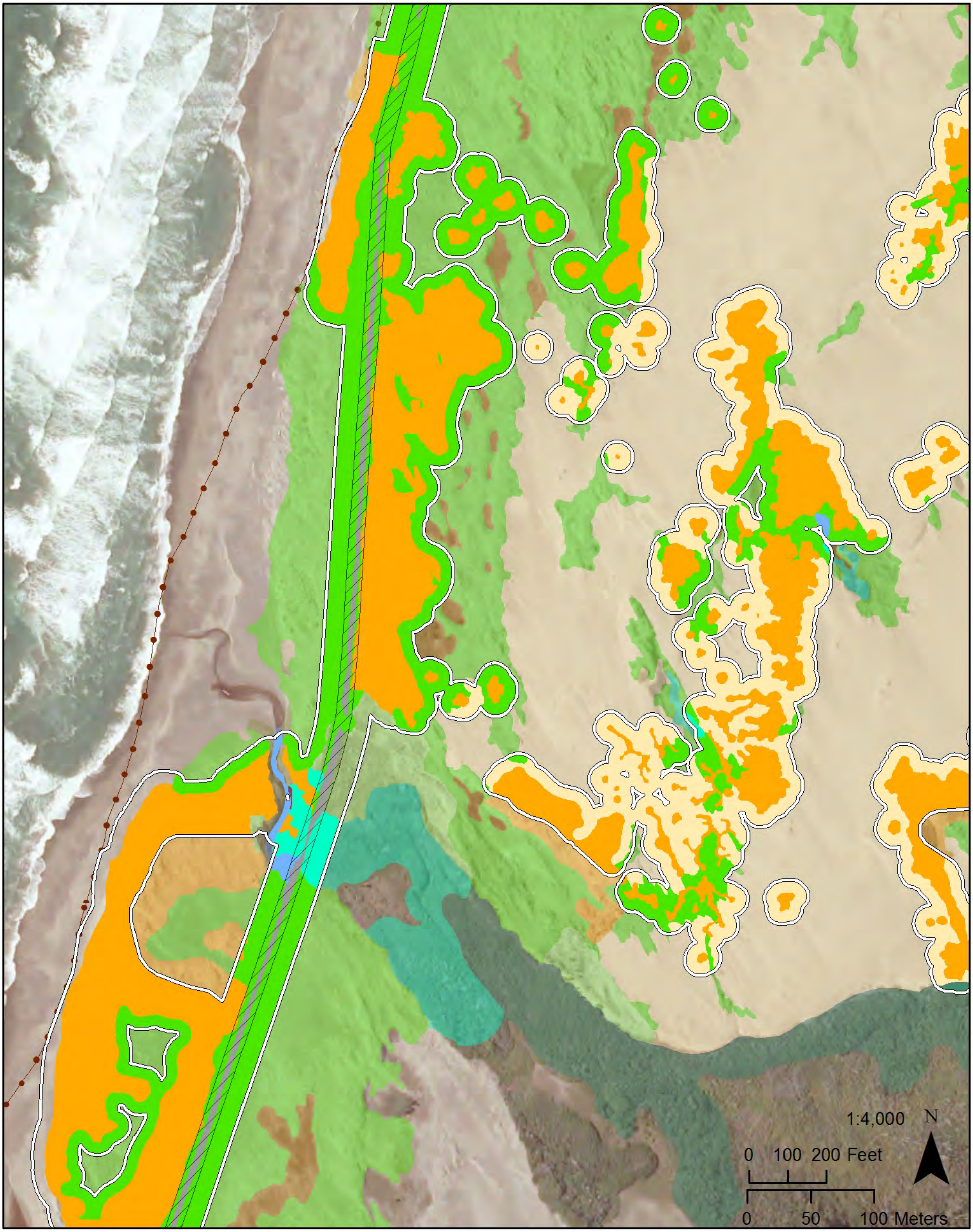


Plate IV

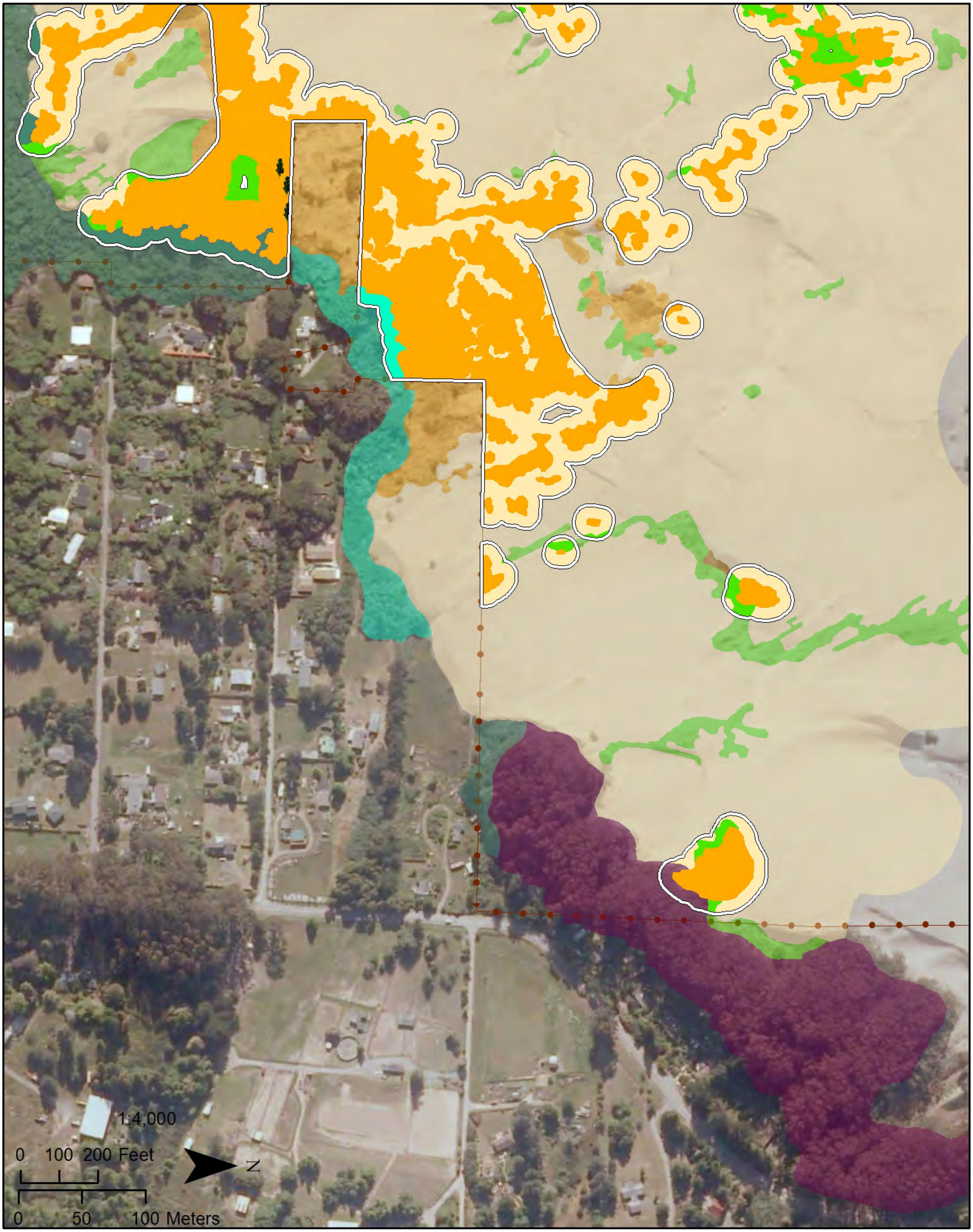


Plate V (note orientation shift)

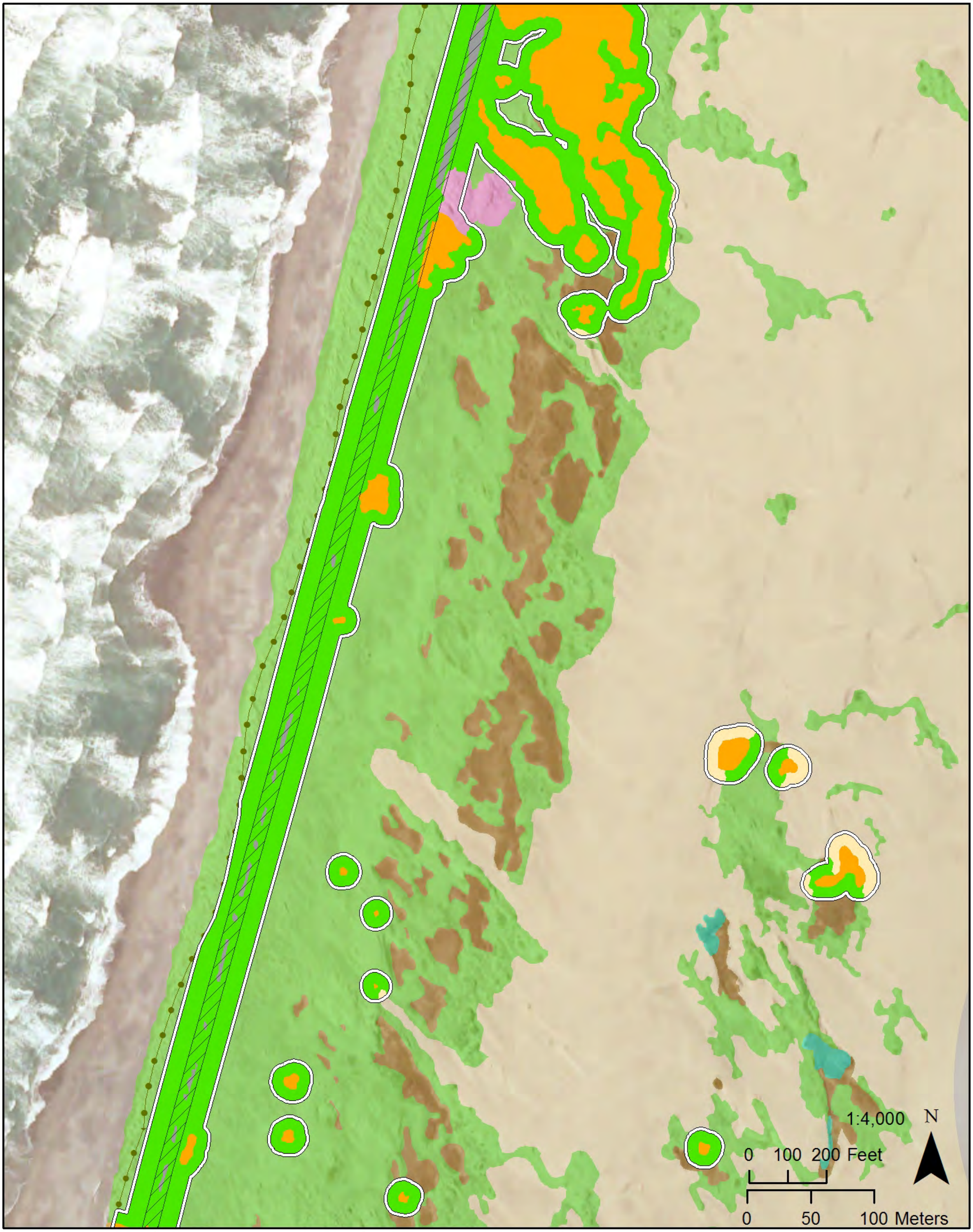


Plate VI

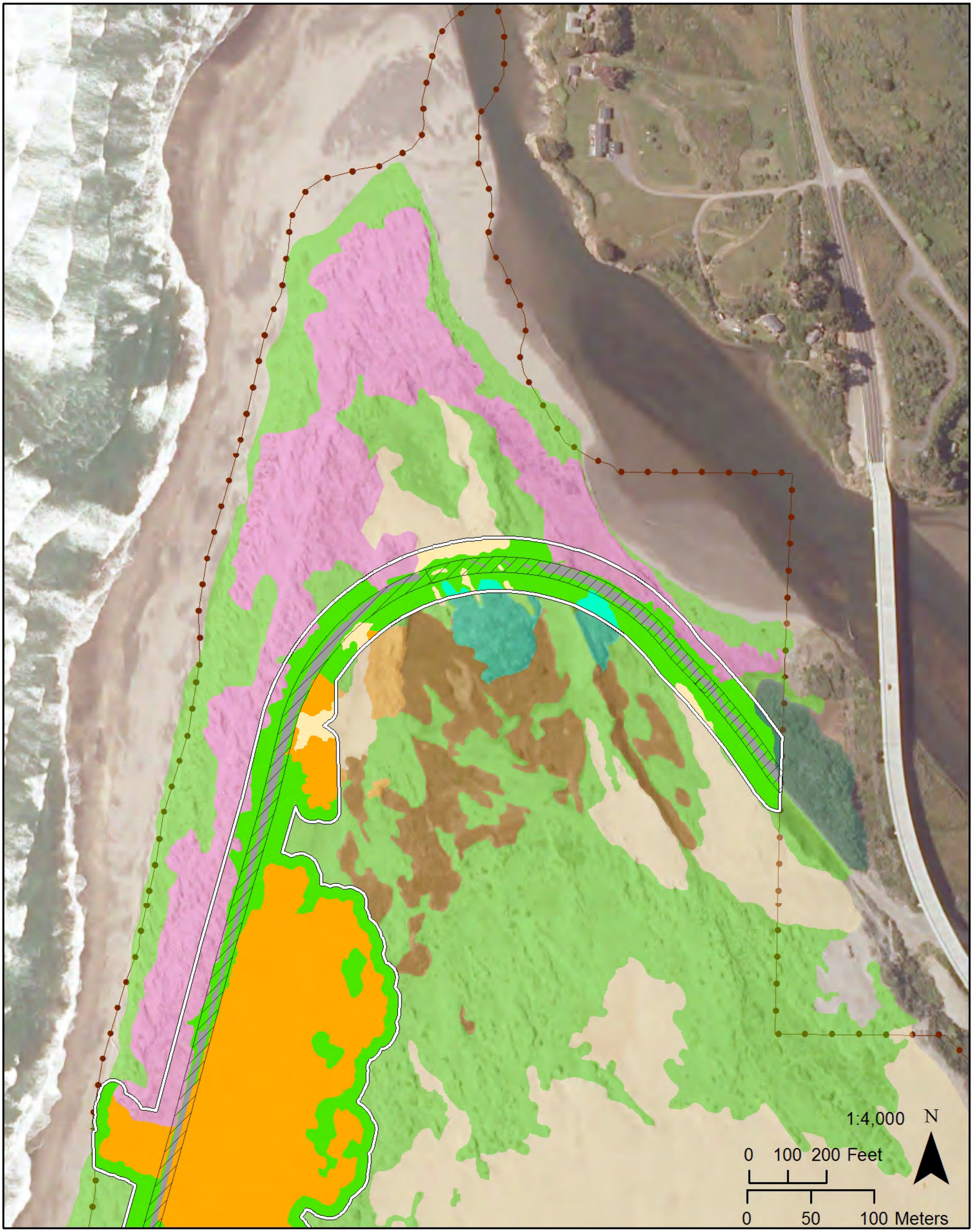
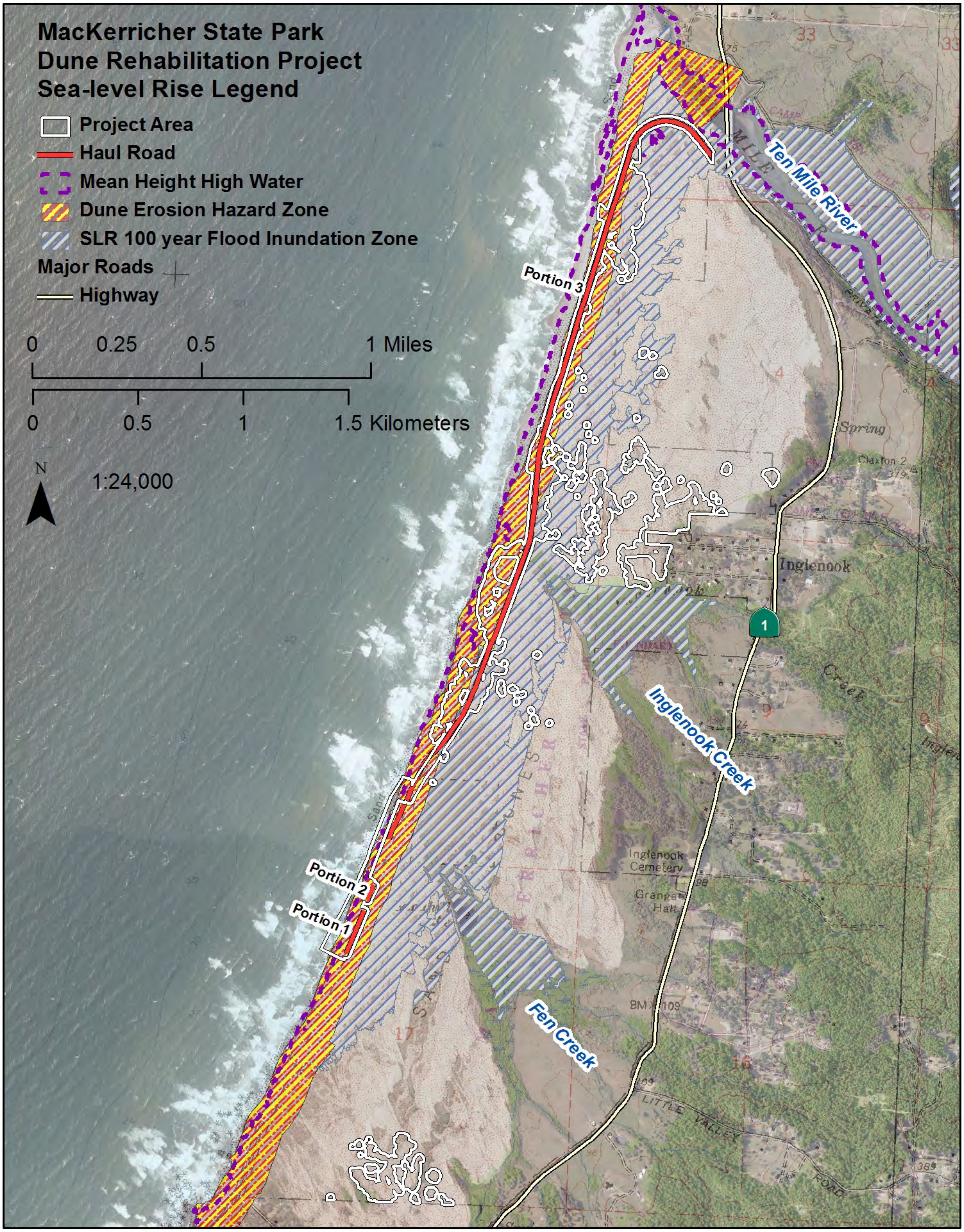
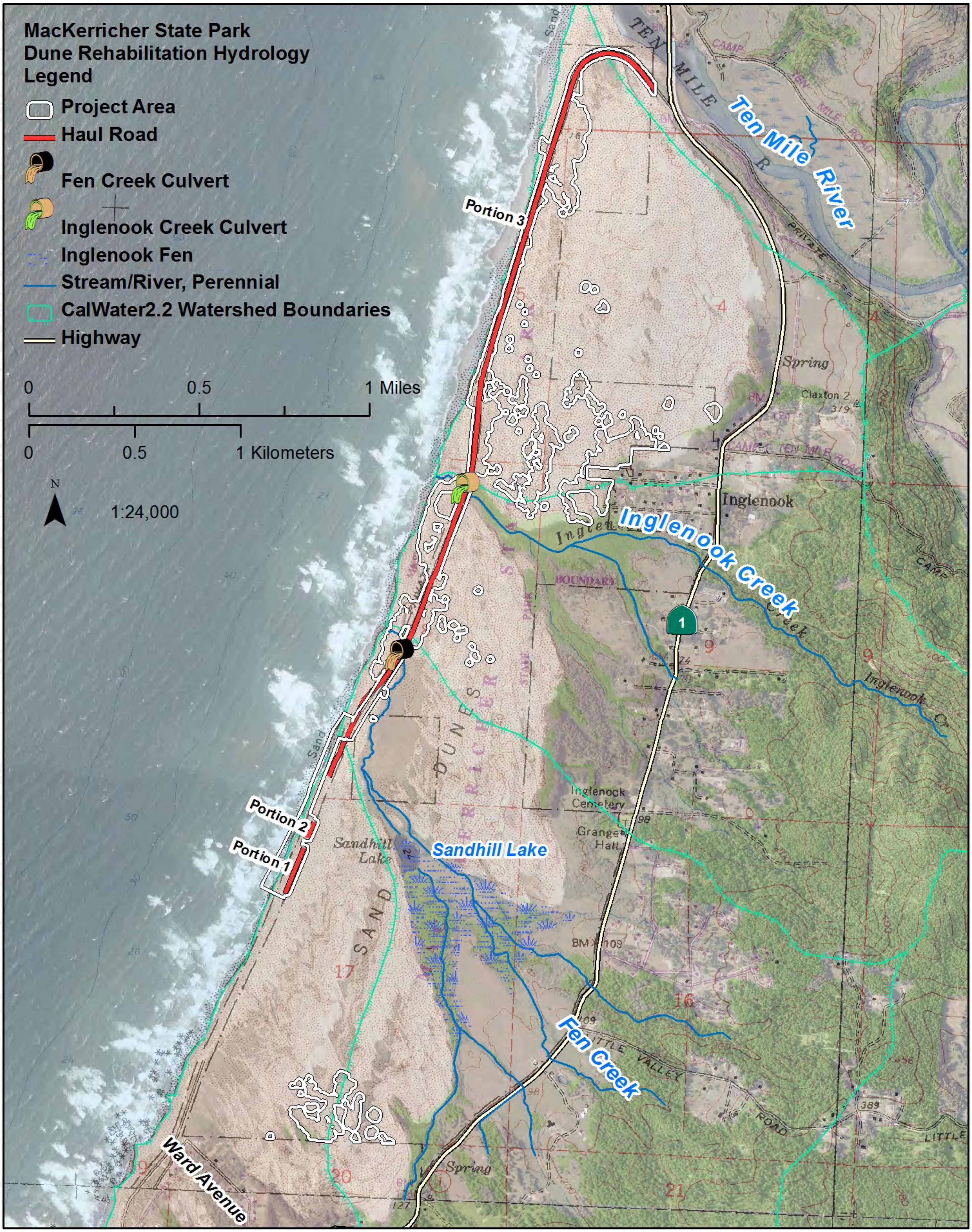


Plate VII

APPENDIX A.8 – Sea Level Rise Map

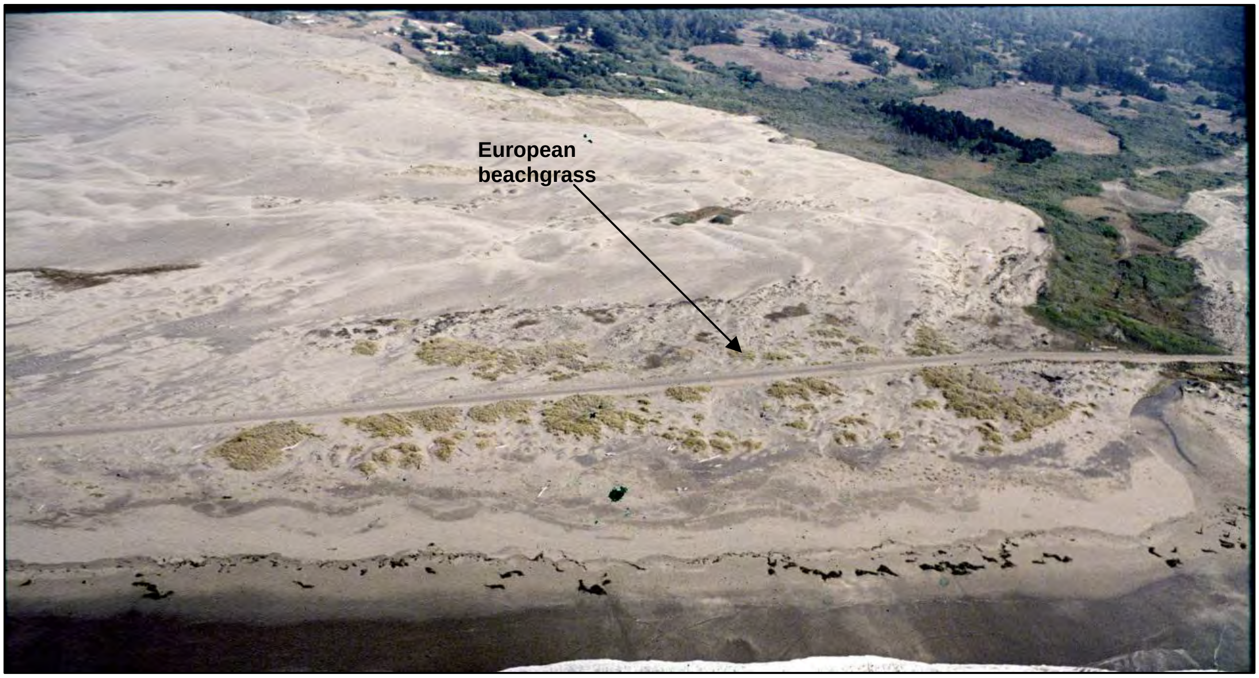

MacKerricher State Park
Dune Rehabilitation Project
Sea-level Rise Legend
Project Area
Haul Road
Mean Height High Water
Dune Erosion Hazard Zone
SLR 100 year Flood Inundation Zone
Major Roads
Highway
0 0.25 0.5 1 Miles
0 0.5 1 1.5 Kilometers
N
1:24,000
Portion 3
Portion 2
Portion 1
Ten Mile River
Inglenook Creek
Fen Creek
Inglenook
1
Inglenook Cemetery
Grange Hall

APPENDIX A.9 – Hydrology Map


MacKerricher State Park
Dune Rehabilitation Hydrology
Legend
Project Area
Haul Road
Fen Creek Culvert
Inglenook Creek Culvert
Inglenook Fen
Stream/River, Perennial
CalWater2.2 Watershed Boundaries
Highway
0
0.5
1 Miles
0
0.5
1 Kilometers
N
1:24,000
Ten Mile River
Portion 3
Inglenook Creek
Inglenook
Portion 2
Portion 1
Sandhill Lake
Fen Creek
Ward Avenue
Inglenook Cemetery
Grange Hall
Spring
Claxton 2
1

APPENDIX B
PROJECT GRAPHICS

Appendix B - Comparison of European Beachgrass Infestation from Oblique Aerial Photos, 1979 & 2005



Comparison of 1979 (top) and 2005 (bottom) oblique aerial photos (www.californiacoastline.org) shows European beachgrass has spread in areas of the Preserve.

Appendices C.1 through C.3

Sensitive Species and Habitat Lists

Appendix C.1 - Wildlife – Sensitive and Special Status Species (Including CNDDB)

Common name	Latin name	Status	Description
Northern goshawk	*Accipiter gentilis*	DFG-SC	During breeding, northern goshawk is a DFG Species of Special Concern. This species prefers middle to high elevations and mature, dense conifer forests, but can also be found in lower elevations on the coast, in foothills, and in northern deserts. Dense forested areas interspersed with openings such as meadows and riparian areas are habitat requirements. Snags and dead-topped trees are important for perches in the wooded areas where the goshawk hunts. Goshawk feeds mostly on birds, though squirrels, rabbits, and other similarly sized mammals are also taken. Suitable habitat does not occur in the project area.
Tri-colored blackbird	*Agelaius tricolor*	DFG- SC	Nesting colonies of tri-colored blackbirds are DFG Species of Special Concern. This species breeds near freshwater emergent wetlands and feeds mostly on seeds, cultivated grains, insects, and spiders in grasslands or crop lands. A small number of tri-colored blackbirds in peripheral colonies have been documented in Mendocino County. Though not documented to occur in or near the project area, potentially suitable habitat is present.
Pallid bat	*Antrozous pallidus*	DFG- SC	Designated a DFG Species of Special Concern and a species of high conservation concern by the Western Bat Working Group, Antrozous pallidus is susceptible to disturbance at roosts. To date, no Pallid Bat presence in the dune area or the immediately surrounding quadrants has been recorded, though it may potentially forage in dune areas. The pallid bat forages nocturnally, spending daylight hours roosting in caves, rock crevices, tree cavities and basal hollows; as well as in mines, tunnels, buildings or man-made structures. Suitable roosting habitat does not occur within the immediate project area.
Golden eagle	*Aquila chrysaetos*	DFG-FP	Golden eagle is a DFG Fully Protected Species. This species requires open terrain (such as grasslands, deserts, savannahs, and early successional stages of forest and shrub habitats) for hunting lagomorphs, rodents, and other small animals. Typically found in mountain areas, rolling foothills, desert, and sage-juniper flats. Large trees, or secluded cliffs with overhanging ledges, are used for cover. Golden eagles have been documented to occur inland, but not in the vicinity of the project area. Suitable habitat is not present, and golden eagles are not likely to occur in the project area.
Sonoma tree vole	Arborimus pomo	DFG-SC	Sonoma tree vole is a DFG Species of Special Concern. It inhabits only coastal coniferous forests that contain Douglas-fir, grand fir, western hemlock and/or Sitka spruce. Sonoma tree vole lives, nests, and feeds within the forest canopy. It is a dietary specialist, feeding on needles and wigs of Douglas-fir and grand fir. Although

			Sonoma tree vole has been documented in the Ten Mile watershed, no suitable habitat occurs within the immediate project area.
Pacific tailed frog	*Ascaphus truei*	DFG-SC	Pacific tailed frog is a DFG Species of Special Concern due to threats from timber harvest and poor water quality during vulnerable life stages. Pacific tailed frog larvae require 2 to 3 years to metamorphose in permanent streams of low temperatures occurring in conifer-dominated habitats including redwood, Douglas fir, mixed-conifer and ponderosa pine. Presently populations are known from Del Norte, Siskiyou, Humboldt, Trinity, Shasta, Tehama, and Mendocino counties. Removal of the haul road and culverts will temporarily alter Fen Creek and Inglenook Creek at the mouth of both drainages. No conifer-dominated habitat occurs near the creeks within or downstream from the project area, which consists instead of wax myrtle, willow riparian, and dune mat. Due to lack of suitable habitat, Pacific tailed frog it is unlikely to be present in the project area.
Marbled murrelet	*Brachyramphus marmoratus*	FT, SE	Listed as federally threatened and state endangered. This small seabird spends most of the year at sea, near the shore, feeding on zooplankton, squid, and fish. Marbled murrelets most often nest in trees, and are closely associated with old growth and mature forests during their breeding season. Murrelets have also been known to nest in younger forests that have suitable platforms. No suitable habitat for marbled murrelet occurs within or immediately surrounding the project area.
Northern fur seal	*Callorhinus ursinus*	none	Northern fur seal occurs in pelagic waters along the coast of California, and may haul out on offshore rocks, sloping rock outcroppings and sandy or cobble beaches. (This species is not formally listed by federal or state agencies, but it was recognized by an international agency to be vulnerable which is reflected on the January 2011 DFG Special Animals List.)
Olive-sided flycatcher	*Contopus borealis*	DFG-SC	Olive-sided flycatcher is a DFG Species of Special Concern. Breeding habitat is primarily late-successional conifer forests with open canopies. This flycatcher is mostly associated with edges, openings, and natural and human-created clearings in otherwise relatively dense forests, but will also occupy semi-open forests. The association with openings and edges extends to the entire landscape, as this species is more abundant in broad areas with a matrix containing clear-cuts or otherwise highly fragmented forest than in less-fragmented or unfragmented landscapes. Suitable habitat does not occur within the immediate project area, but olive-sided flycatcher may use nearby areas.
Townsend's big-eared bat	*Cornyorhinus townsendii*	DFG-SC	Designated a DFG Species of Special Concern and a species of high conservation concern by the Western Bat Working Group, this bat is highly susceptible to disturbance at roosts resulting in abandonment. Townsend's big-eared bat forages

			nocturnally, spending daylight hours roosting in caves, mines, tunnels, buildings or man-made structures To date, no Townsend's big-eared bat presence has been documented in the project area, although foraging in the dunes is possible.
Yellow warbler	*Dendroica petechia*	DFG-SC	Once found throughout California in abundance, lowland populations of yellow warblers are in decline and have been designated as DFG Species of Special Concern. Yellow warblers construct a small cup nest in low shrubs often using riparian and open woodland areas populated with willow, cottonwood, alders and other small trees. Yellow warblers mainly forage on insects and spiders but may eat berries. Migrating to California in April, their breeding season begins shortly after arrival, extends through August and may include several clutches. Stands of wax myrtle and willow within riparian areas adjacent to Fen and Inglenook Creek provide potential suitable breeding habitat, however the species is not known to breed at lower elevations along the coast in Mendocino County.
Steller (=northern) sea lion	*Eumetopias jubatus*	FT; MMC-SC	The Steller sea lion is listed as federally threatened under the ESA and as a Species of Special Concern by the Marine Mammal Commission. Steller Sea Lions primarily use rocky areas close to water when on land and for breeding but may haul out onto sandy beaches. No critical habitat, major haul outs or rookeries occur in the project area, or in or near MacKerricher State Park.
Tufted puffin	*Fratercula cirrhata*	DFG-SC	When in their nesting colonies, tufted puffins are DFG Species of Special Concern. Puffins nest along the cost on islands, islets, and rarely on mainland cliffs. Habitat requirements include a substrate into which they can burrow on island cliffs or grassy island slopes. No habitat for tufted puffin occurs in or near the project area.
Bald eagle	*Haliaeetus leucocephalus*	SE	Federally delisted, but listed as Endangered by DFG. In California, the bald eagle typically nests in mountain and foothill forests and woodlands near rivers, lakes, and reservoirs. Bald eagles require large bodies of water, or free flowing water, adjacent to snags or other perches. Fish, waterfowl, and carrion are their main food sources. Bald eagles have been frequently documented in Mendocino County, infrequently near the coast. Although there is not suitable nesting habitat within the project area, suitable foraging habitat occurs nearby.
Yellow-breasted chat	*Icteria virens*	DFG-SC	A DFG Species of Special Concern during nesting, the yellow breasted chat is a neotropical migratory bird. Brushy riparian thickets are required for nesting and cover. The breeding season is early May to early August. Although potentially suitable habitat does occur near the project area, yellow breasted chat is considered uncommon on the coast of northern California, and there do not appear to be records of yellow-breasted chat in the project area.
Humboldt	*Martes*	USFS-S	This extremely rare or possibly extinct subspecies of the American marten is a USFS

marten	*americana humboldtensis*		Sensitive Species. Historically it inhabited areas of mature coniferous forest in the coastal redwood zone, from the Oregon border to Sonoma County. Martens rely on snags and down logs as rest and den sites. Mostly carnivorous, martens feed on a variety of small rodents and other animals, but will also eat fish, eggs, fruits, nuts, and carrion. Suitable habitat does not occur within the project area.
Pacific fisher	*Martes pennanti pacifica*	DFG-SC	The fisher is a DFG Species of Special Concern, as well as a candidate for federal listing. It is particularly associated with mature, heavy stands of mixed tree species with a high percentage of canopy closure, but is also found in second growth forests and in forest openings. In California, fishers primarily inhabit areas consisting of Douglas-fir and associated conifers. Den sites are typically in cavities high in trees, hollow down logs, rock outcrops, or talus. Its variable diet is mainly carnivorous, but besides small animals it will also eat fish, eggs, fruits, nuts, and carrion. Suitable habitat does not occur within the project area.
Ashy storm-petrel	*Oceanodroma homochroa*	DFG-SC	Ashy storm-petrel is a DFG Species of Special Concern on its nesting colonies. This species occurs year-round in offshore waters of the continental slope from Cape Mendocino to northern Baja California, Mexico, and spends most of its time at sea, coming to land only to reproduce. Ashy storm-petrel nests in natural cavities, sea caves, or rock crevices on islands and on the mainland, and does not excavate a burrow or enlarge the cavity. No suitable habitat for this species exists within the project area.
Coho salmon	*Oncorhynchus kisutch*	FE, DFG-SC	The Central California Coast ESU Coho salmon are listed as federally endangered, and a DFG Species of Special Concern due to habitat loss and modifications resulting from logging, dams, water diversions, gravel mining, urbanization, stream channelization, wetland loss, and poor watershed management. The Central California Coast ESU includes all naturally spawned populations from Punta Gorda south to San Lorenzo River and all reaches, including estuaries and tributaries, are designated as critical habitat. The ESU population also includes Coho from four artificial propagation programs, one of which is located south of the project area on Noyo River. Coho, which are anadromous, often practice natal stream fidelity and return inland to clear-running streams with woody debris and gravel substrate, their required habitat, following heavy late autumn or winter rains to spawn. Coho salmon occur in the Ten Mile River and its tributaries to the north of the project area. Fen Creek and Inglenook Creek, perennial coastal streams located in the project area, do not currently provide suitable habitat for Coho salmon.
Steelhead	*Oncorhynchus mykiss*	FT	Steelhead, an anadromous trout which may spawn more than once, is listed as federally threatened in northern California due to habitat loss, poor watershed

			management, overharvest and poaching, disturbance due to human activities, and hatchery practices. Northern California Steelhead include populations from Redwood Creek in Humboldt County to the Gualala River in Sonoma County. Steelhead return inland between December and April when they seek out holding pools deeper than 9.8 feet (3 meters) with stream bank cover during migration and require cool, clear, well-oxygenated perennial streams with woody debris and gravel substrate for spawning. Steelhead have been documented to occur in the Ten Mile River, north of the project area. However, Fen Creek and Inglenook Creek, perennial coastal streams located within the project area, do not currently provide suitable habitat for Steelhead.
Chinook salmon	*Oncorhynchus tshawytscha*	FT	California coastal Evolutionarily Significant Unit (ESU) Chinook salmon are listed as federally threatened due to habitat loss and modification resulting from logging, dams, water diversions, gravel mining, urbanization, stream channelization, wetland loss, and poor watershed management. Habitat requirements include cool, clear streams with gravel substrate for spawning and shaded pools with large woody debris for resting and hiding. Chinook salmon migrate upstream from June through December with a peak in September and October. Chinook salmon have been documented to occur north of the project area in the Ten Mile River watershed, which has been designated as critical habitat. However, Fen Creek and Inglenook Creek within the Dune Preserve do not provide suitable habitat for Chinook salmon, and these areas are not critical habitat
Lotis blue butterfly	*Plebejus idas lotis*	FE	Historically found at several coastal locations in California, primarily in Mendocino County, but also in northern Sonoma County, and possibly northern Marin County. Location information for most of the historic lotis blue butterfly sites is vague, and based on specimens collected prior to the 1950's. The one exception is a population discovered in 1935, north of the town of Mendocino. The last confirmed observation was in 1983. Although little is known for certain about the species, USFWS reports that coast trefoil (*Lotus formosissimus*) is believed to be its larval food plant, and that the butterfly most likely occurs in wet meadows and sphagnum willow bogs. Neither habitat type occurs in the immediate project area, and the larval host plant *Lotus formosissimus* was not detected during botanical surveys of the project area
Southern torrent salamander	*Rhyacotriton variegatus*	DFG-SC	Southern torrent salamander is a DFG Species of Special Concern due to its vulnerability to watershed impacts and habitat loss resulting from timber harvesting. The southern torrent salamander occurs in cold, well-shaded permanent streams and spring seepages in old-growth redwood, Douglas fir and mixed conifer habitats in coastal forests of northwestern California south to Point Arena in Mendocino County. An historic reference (Inglenook Fen – A Study and Plan) documents the occurrence

			of *Rhyacotriton olympicus*, or the Olympic salamander, within the Coast Redwood Forest habitat in the Inglenook Fen – Ten Mile Dune Preserve. This species is now known as *Rhyacotriton variegatus*, in this portion of its range. Fen Creek and Inglenook Creek are perennial streams that provide potential habitat for the southern torrent salamander. However, this species is associated with cold-temperature streams in coastal old-growth forest habitat. It is unlikely to be present in the project area. Due to lack of suitable habitat, southern torrent salamander it is unlikely to be present.
Northern spotted owl	*Strix occidentalis*	FT, DFG-SC	The northern spotted owl is designated as federally threatened, and a DFG Species of Special Concern due to habitat loss through past timber harvesting, current wildfire threats and encroachment by barred owl. Northern spotted owl uses forested habitat with the characteristics and structure associated with late-successional/old growth forest in the Coastal, Cascade and Sierra ranges of California. No suitable habitat for northern spotted owl occurs within or near the project area. The nearest known northern spotted owl territory occurs to the northwest of the northern end of the project area, greater than 1.5 miles (2.5 km) east along the Ten Mile River.
American badger	*Taxidea taxus*	DFG-SC	Documented in an historical record. DFG designates the American badger as Species of Special Concern. Badgers occupy many habitats, particularly treeless grasslands, savannahs, or meadows near a forested area. Friable soil capable of supporting burrows and open, uncultivated ground appear to be the badger's main requirements, and are important for foraging, as many of their prey are dug from their underground burrows. Suitable habitat for American badger does not occur within the immediate project area.

Appendix C.2 - Special Status Plants Scoping List

Scientific Name	Common Name	Habitat	Habitat In Project Area?	GRANK[1]	SRANK[2]	Rare Plant Rank[3]	FED List	CAL List
Abronia umbellata ssp. *breviflora*	pink sand-verbena	• Coastal dunes	Yes	G4G5T2	S2.1	1B.1	None	None
Agrostis blasdalei	Blasdale's bent grass	• Coastal bluff scrub • Coastal dunes • Coastal prairie	Yes	G2	S2.2	1B.2	None	None
Angelica lucida	sea-watch	• Coastal bluff scrub • Coastal dunes • Coastal scrub • Marshes and swamps (coastal salt)	Yes	G5	S2S3	4.2	None	None
Arctostaphylos nummularia ssp. *mendocinoensis*	pygmy manzanita	• Closed-cone coniferous forest (acidic sandy clay)	No, pygmy forest	G3?T1	S1	1B.2	None	None
Astragalus agnicidus	Humboldt milk-vetch	• openings, disturbed areas, sometimes roadsides. • Broadleafed upland forest • North Coast coniferous forest	No, forest habitat	G2	S2.1	1B.1	None	Endangered
Blennosperma nanum var. *robustum*	Point Reyes blennosperma	• Coastal prairie • Coastal scrub	Yes	G4T1	S1.2	1B.2	None	Rare
Boschniakia hookeri	small groundcone	• North Coast coniferous forest	No, usually redwood	G5	S1S2	2.3	None	None
Calamagrostis bolanderi	Bolander's reed grass	mesic. • Bogs and fens • Broadleafed upland forest • Closed-cone coniferous forest • Coastal scrub • Meadows and seeps (mesic) • Marshes and swamps (freshwater) • North Coast coniferous forest	Yes	G3	S3.2	4.2	None	None
Calamagrostis crassiglumis	Thurber's reed grass	• Coastal scrub (mesic) • Marshes and swamps (freshwater)	Yes	G3Q	S1.2	2.1	None	None
Calamagrostis foliosa	leafy reed grass	• Coastal bluff scrub (rocky) • North Coast coniferous forest	No	G3	S3.2	4.2	None	Rare
Calystegia purpurata ssp. *saxicola*	coastal bluff morning-glory	• Coastal dunes • Coastal scrub • North Coast coniferous forest	Yes	G4T2	S2.2	1B.2	None	None

Scientific Name	Common Name	Habitat	Habitat In Project Area?	GRANK[1]	SRANK[2]	Rare Plant Rank[3]	FED List	CAL List
Campanula californica	swamp harebell	• Bogs and fens • Closed-cone coniferous forest • Coastal prairie • Meadows and seeps • Marshes and swamps (freshwater) • North Coast coniferous forest Many occurrences have few plants.	Yes	G3	S3	1B.2	None	None
Carex californica	California sedge	• Bogs and fens • Closed-cone coniferous forest • Coastal prairie • Meadows and seeps • Marshes and swamps (margins)	Marginal	G5	S2?	2.3	None	None
Carex lenticularis var. *limnophila*	lagoon sedge	• Shores, beaches; often gravelly • Bogs and fens • Marshes and swamps • North Coast coniferous forest	Yes	G5T5	S1S2.2	2.2	None	None
Carex livida	livid sedge	• Bogs and fens	Yes	G5	SH	1A	None	None
Carex lyngbyei	Lyngbye's sedge	• Marshes and swamps (brackish or freshwater)	Yes	G5	S2.2	2.2	None	None
Carex saliniformis	deceiving sedge	• Mesic sites • Coastal prairie • Coastal scrub • Meadows and seeps • Marshes and swamps (coastal salt)	Yes	G2	S2.2	1B.2	None	None
Carex viridula var. *viridula*	green yellow sedge	• Marshes and swamps (freshwater) • North Coast coniferous forest (mesic)	Yes	G5T5	S1.3	2.3	None	None
Castilleja affinis ssp. *litoralis*	Oregon coast paintbrush	• Sandy sites • Coastal bluff scrub • Coastal dunes • Coastal scrub	Yes	G4G5T4	S2.2	2.2	None	None
Castilleja ambigua ssp. *humboldtiensis*	Humboldt Bay owl's-clover	• Marshes and swamps (coastal salt)	Yes	G4T2	S2.2	1B.2	None	None
Castilleja mendocinensis	Mendocino Coast paintbrush	• Coastal bluff scrub • Closed-cone coniferous forest • Coastal dunes • Coastal prairie • Coastal scrub	Yes	G2	S2.2	1B.2	None	None
Ceanothus gloriosus var. *exaltatus*	glory bush	• Chaparral	No	G3G4T3	S3.3	4.3	None	None

Scientific Name	Common Name	Habitat	Habitat In Project Area?	GRANK[1]	SRANK[2]	Rare Plant Rank[3]	FED List	CAL List
Ceanothus gloriosus var. *gloriosus*	Point Reyes ceanothus	• Sandy • Coastal bluff scrub • Closed-cone coniferous forest • Coastal dunes • Coastal scrub	Yes	G3G4T3	S3.3	4.3	None	None
Chorizanthe howellii	Howell's spineflower	• Sandy, often disturbed areas • Coastal dunes • Coastal prairie • Coastal scrub	Yes	G1	S1.2	1B.2	Endangered	Threatened
Clarkia amoena ssp. *whitneyi*	Whitney's farewell-to-spring	• Coastal bluff scrub • Coastal scrub	Yes	G5T2	S2.1	1B.1	None	None
Collinsia corymbosa	round-headed Chinese-houses	• Coastal dunes	Yes	G1	S1.2	1B.2	None	None
Coptis laciniata	Oregon goldthread	• Meadows and seeps • North Coast coniferous forest streambanks	No, not in coastal dune seeps	G4G5	S3	2.2	None	None
Erigeron supplex	supple daisy	• Coastal bluff scrub • Coastal prairie	Marginal	G1	S1.1	1B.2	None	None
Erysimum menziesii ssp. *menziesii*	Menzies' wallflower	• Coastal dunes	Yes	G3?T2	S2.1	1B.1	Endangered	Endangered
Erythronium revolutum	coast fawn lily	• Bogs and fens • Broadleafed upland forest • North Coast coniferous forest	Marginal	G4	S2S3	2.2	None	None
Fritillaria roderickii	Roderick's fritillary	• Coastal bluff scrub • Coastal prairie • Valley and foothill grassland	No, no wet clay soils	G1Q	S1.1	1B.1	None	Endangered
Gilia capitata ssp. *chamissonis*	blue coast gilia	• Coastal dunes • Coastal scrub	Yes	G5T2	S2.1	1B.1	None	None
Gilia capitata ssp. *pacifica*	Pacific gilia	• Coastal bluff scrub • Chaparral (openings) • Coastal prairie • Valley and foothill grassland	Yes	G5T3T4	S2.2?	1B.2	None	None
Gilia capitata ssp. *tomentosa*	woolly-headed gilia	• Coastal bluff scrub • Valley and foothill grassland • Rocky, outcrops.	No, rocky coastal scrub	G5T1	S1.1	1B.1	None	None

Scientific Name	Common Name	Habitat	Habitat In Project Area?	GRANK[1]	SRANK[2]	Rare Plant Rank[3]	FED List	CAL List
Gilia millefoliata	dark-eyed gilia	• Coastal dunes	Yes	G2	S2.2	1B.2	None	None
Glyceria grandis	American manna grass	• Bogs and fens • Meadows and seeps • Marshes and swamps (streambanks and lake margins)	Yes	G5	S1.3?	2.3	None	None
Hemizonia congesta ssp. *congesta*	seaside tarplant	• Valley and foothill grassland • Sometimes roadsides	No	G5T2T3	S2S3	1B.2	None	None
Hesperevax sparsiflora var. *brevifolia*	short-leaved evax	• Coastal bluff scrub (sandy) • Coastal dunes	Yes	G4T2T3	S2S3	1B.2	None	None
Hesperocyparis pygmaea	pygmy cypress	• Closed-cone coniferous forest (usually podzol-like soil)	No	G2	S2	1B.2	None	None
Horkelia marinensis	Point Reyes horkelia	• Coastal dunes • Coastal prairie • Coastal scrub • Sandy sites	Yes	G2	S2.2	1B.2	None	None
Horkelia tenuiloba	thin-lobed horkelia	• Broadleafed upland forest • Chaparral • Valley and foothill grassland mesic openings, sandy. • Mesic openings, sandy.	No, out of range	G2	S2.2	1B.2	None	None
Juncus supiniformis	hair-leaved rush	• Bogs and fens • Marshes and swamps (freshwater)	Yes	G5	S2.2?	2.2	None	None
Lasthenia californica ssp. *bakeri*	Baker's goldfields	• Closed-cone coniferous forest (openings) • Coastal scrub • Meadows and seeps • Marshes and swamps	Yes	G3TH	SH	1B.2	None	None
Lasthenia californica ssp. *macrantha*	perennial goldfields	• Coastal bluff scrub • Coastal dunes • Coastal scrub	Yes	G3T2	S2.2	1B.2	None	None
Lasthenia conjugens	Contra Costa goldfields	• Cismontane woodland • Playas (alkaline) • Valley and foothill grassland • Vernal pools	No	G1	S1.1	1B.1	Endangered	None

Scientific Name	Common Name	Habitat	Habitat In Project Area?	GRANK[1]	SRANK[2]	Rare Plant Rank[3]	FED List	CAL List
Lilium maritimum	coast lily	• Broadleafed upland forest • Closed-cone coniferous forest • Coastal prairie • Coastal scrub • Marshes and swamps (freshwater) • North Coast coniferous forest • Sometimes roadsides	Yes	G2	S2	1B.1	None	None
Lotus formosissimus	harlequin lotus	• Wetlands, roadsides • Broadleafed upland forest • Coastal bluff scrub • Closed-cone coniferous forest • Cismontane woodland • Coastal prairie • Coastal scrub • Meadows and seeps • Marshes and swamps • North Coast coniferous forest • Valley and foothill grassland	Yes	G4	S3.2	4.2	None	None
Lycopodium clavatum	running-pine	• Lower montane coniferous forest (mesic) • Marshes and swamps • North Coast coniferous forest (mesic) • often edges, openings, and roadsides	No, not coastal fen	G5	S4.1	4.1	None	None
Microseris borealis	northern microseris	• Bogs and fens • Lower montane coniferous forest • Meadows and seeps • mesic	No, not in low elevation	G4?	S1.1	2.1	None	None
Microseris paludosa	marsh microseris	• Lower montane coniferous forest (mesic) • Marshes and swamps • North Coast coniferous forest (mesic) • often edges, openings, and roadsides	No, out of range	G2	S2.2	1B.2	None	None
Mitella caulescens	leafy-stemmed mitrewort	• Broadleafed upland forest • Lower montane coniferous forest • Meadows and seeps • North Coast coniferous forest • Mesic sites, and roadsides	No	G5	S4.2	4.2	None	None

Scientific Name	Common Name	Habitat	Habitat In Project Area?	GRANK[1]	SRANK[2]	Rare Plant Rank[3]	FED List	CAL List
Oenothera wolfii	Wolf's evening-primrose	• Coastal bluff scrub • Coastal dunes • Coastal prairie • Lower montane coniferous forest • sandy, usually mesic	Yes	G1	S1.1	1B.1	None	None
Packera bolanderi var. *bolanderi*	seacoast ragwort	• Coastal scrub • North Coast coniferous forest • Sometimes roadsides	No	G4T4	S1.2	2.2	None	None
Phacelia insularis var. *continentis*	North Coast phacelia	• Coastal bluff scrub • Coastal dunes • sandy, sometimes rocky	Yes	G2T1	S1.2	1B.2	None	None
Pinus contorta ssp. *bolanderi*	Bolander's beach pine	• Closed-cone coniferous forest (podzol-like soil)	No, pygmy forests	G5T2	S2	1B.2	None	None
Pleuropogon hooverianus	North Coast semaphore grass	• Broadleafed upland forest • Meadows and seeps • North Coast coniferous forest • Open areas, mesic.	No, found in forests	G1	S1.1	1B.1	None	Threatened
Pleuropogon refractus	nodding semaphore grass	• Mesic • Lower montane coniferous forest • Meadows and seeps • North Coast coniferous forest • Riparian forest	No, riparian forests on site not open	G4	S3.2?	4.2	None	None
Puccinellia pumila	dwarf alkali grass	• Marshes and swamps (coastal salt)	Yes	G4?	S1.1?	2.2	None	None
Rhynchospora alba	white beaked-rush	• Bogs and fens • Meadows and seeps • Marshes and swamps (freshwater)	Yes	G5	S2	2.2	None	None
Sanguisorba officinalis	great burnet	often serpentinite • Bogs and fens • Broadleafed upland forest • Meadows and seeps • Marshes and swamps • North Coast coniferous forest • Riparian forest	Yes	G5?	S2.2	2.2	None	None
Sidalcea calycosa ssp. *rhizomata*	Point Reyes checkerbloom	• Marshes and swamps (freshwater, near coast)	Yes	G5T2	S2.2	1B.2	None	None

Scientific Name	Common Name	Habitat	Habitat In Project Area?	GRANK[1]	SRANK[2]	Rare Plant Rank[3]	FED List	CAL List
Sidalcea malachroides	maple-leaved checkerbloom	• Broadleafed upland forest • Coastal prairie • Coastal scrub • North Coast coniferous forest • Riparian woodland • often in disturbed areas	Yes	G3G4	S3S4.2	4.2	None	None
Sidalcea malviflora ssp. *patula*	Siskiyou checkerbloom	• Coastal bluff scrub • Coastal prairie • North Coast coniferous forest • often roadcuts	Marginal	G5T2	S2	1B.2	None	None
Sidalcea malviflora ssp. *purpurea*	purple-stemmed checkerbloom	• Broadleafed upland forest • Coastal prairie	Marginal	G5T2	S2.2	1B.2	None	None
Triquetrella californica	coastal triquetrella moss	• Coastal bluff scrub • Coastal scrub	Yes	G1	S1	1B.2	None	None
Usnea longissima	long-beard lichen	• Semi-open canopy forests • Old-growth forests	No	G4	S4.2	None	None	None
Veratrum fimbriatum	fringed false-hellebore	• Mesic • Bogs and fens • Coastal scrub • Meadows and seeps • North Coast coniferous forest	Yes	G3	S3.3	4.3	None	None
Viola palustris	alpine marsh violet	• Bogs and fens (coastal) • Coastal scrub (mesic) .	Yes	G5	S1S2	2.2	None	None

[1]**Global Ranking**
The *global rank* (G-rank) is a reflection of the overall status of an element throughout its global range. **Both Global and State ranks represent a letter+number score that reflects a combination of Rarity, Threat and Trend factors, with weighting being heavier on Rarity than the other two.**
SPECIES OR NATURAL COMMUNITY LEVEL
G1 = **Critically Imperiled**—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2 = **Imperiled**—At high risk of extinction due to very restricted range, very few populations often 20 or fewer), steep declines, or other factors.
G3 = **Vulnerable**—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4 = **Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5 = **Secure**—Common; widespread and abundant.
Subspecies Level
Subspecies receive a **T-rank** attached to the G-rank. With the subspecies, the G-rank reflects the condition of the entire species, whereas the T-rank reflects the global situation of just the subspecies or variety. For example: *Chorizanthe robusta* var. *hartwegii*. This plant is ranked G2T1. The G-rank refers to the whole species range i.e., *Chorizanthe robusta.* The T-rank refers only to the global condition of var. *hartwegii*.

[2]**State Ranking**
The *state rank* (S-rank) is assigned much the same way as the global rank, but state ranks refer to the imperilment status only within California's state boundaries.
S1 = **Critically Imperiled**—Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2 = **Imperiled**—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
S3 = **Vulnerable**—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4 = **Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 = **Secure**—Common, widespread, and abundant in the state.

[2] **The California Rare Plant Ranks**
1A. Presumed extinct in California
1B. Rare or Endangered in California and elsewhere
2. Rare or Endangered in California, more common elsewhere
3. Plants for which we need more information - Review list
4. Plants of limited distribution - Watch list

Threat ranks:
The CRPR's use a decimal-style threat rank. This extension replaces the E (Endangerment) value from the R-E-D Code. Rare Plant Ranks therefore read like this: 1B.1, 1B.2, etc.
New Threat Code extensions and their meanings:
•0.1-Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)
•0.2-Fairly threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)
•0.3-Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known)
Note that all List 1A (presumed extinct in California) and some List 3 (need more information- a review list) plants lacking any threat information receive no threat code extension.

List of rare plants with the potential for occurrence in the project area was derived from “Special Vascular Plants, Bryophytes, and Lichens List” (DFG 2011a), RareFind (DFG 2011b), BIOS (DFG 2011c), and the California Native Plant Society’s Online Inventory of Rare and Endangered Plants (CNPS 2011).

Appendix C.3 - Natural Communities Scoping List

List of special status vegetation communities with the potential for occurrence in the project area was derived from a state-wide list of natural communities from

California Department of Fish and Game (CDFG). List of Vegetation Alliances (Natural Communities List). Sacramento, CA. September 2010. Website: http://www.dfg.ca.gov/biogeodata/vegcamp/natural_comm_list.asp

Scientific Name	Common Name	Global and State Rank	CaCode
Alnus rubra (Red alder forest) Alliance	Red alder forest	G5 S4 (some associations are of high priority for inventory)	61.410.00
Alnus rubra / Gaultheria shallon			61.410.02
Alnus rubra / Rubus spectabilis			61.410.07
Alnus rubra / Rubus spectabilis - Sambucus racemosa			61.410.06
Red Alder Forest		G4 S3.2	
Red Alder Riparian Forest		G3 S2.2	
Tan Oak Forest		G4 S4	
Abies grandis (Grand fir forest) Alliance	Grand fir forest	G4 S2	88.100.00
Beach Pine Forest		G4 S2.1	
Grand Fir Forest		G1 S1.1	
Pinus contorta var. contorta			87.060.01
Pinus contorta var. contorta (Beach pine forest) Alliance	Beach pine forest	G5 S3	87.060.00
Eucalyptus (globulus, camaldulensis) (Eucalyptus groves) Semi-natural Stands	Eucalyptus groves		79.100.00
Freshwater Swamp		G2 S2.2	
Morella californica			37.930.01
Morella californica (Wax myrtle scrub) Alliance	Wax myrtle scrub	G3 S3	37.930.00
North Coast Riparian Scrub		G3 S3.2	
Salix hookeriana			61.203.01
Salix hookeriana (Coastal dune willow thickets) Alliance	Coastal dune willow thickets	G4 S3	61.203.00
Salix hookeriana / Rubus ursinus			61.203.02
Salix lucida ssp. lasiandra / Urtica urens - Urtica dioica			61.204.01
Salix sitchensis (Sitka willow thickets) Provisional Alliance	Sitka willow thickets	G4 S3?	61.206.00
Broom (Cytisus scoparius and Others) (Broom patches) Semi-natural Stands	Broom patches		32.180.00

Genista monspessulana			32.180.01
Bromus diandrus			42.026.21
Bromus diandrus - Mixed herbs			42.026.11
Lotus purshianus (Spanish clover fields) Provisional Alliance	Spanish clover fields	G4? S4?	52.230.00
Vulpia microstachys - Plantago erecta			44.108.04
Zigadenus fremontii (- Lolium perenne)			41.321.12
Veratrum californicum			45.423.02
Veratrum californicum (White corn lily patches) Alliance	White corn lily patches	G5 S4	45.423.00
Agrostis stolonifera			45.106.02
Holcus lanatus			42.050.08
Holcus lanatus - Anthoxanthum odoratum			42.050.09
Holcus lanatus - Anthoxanthum odoratum (Common velvet grass - sweet vernal grass meadows) Semi-natural Stands	Common velvet grass - sweet vernal grass meadows		42.050.00
Poa secunda (Curly blue grass grassland) Alliance	Curly blue grass grassland	G4 S3?	41.180.00
Calamagrostis nutkaensis			41.190.03
Calamagrostis nutkaensis - Baccharis pilularis			41.190.01
Calamagrostis nutkaensis - Carex obnupta. - Juncus spp.			41.190.02
Calamagrostis nutkaensis (Pacific reed grass meadows) Alliance	Pacific reed grass meadows	G4 S2	41.190.00
Coastal Terrace Prairie		G2 S2.1	
Festuca rubra			41.255.01
Festuca rubra (Red fescue grassland) Alliance	Red fescue grassland	G4 S3?	41.255.00
Gaultheria shallon - Rubus spectabiis - Rubus parviflorus			63.901.01
Poison Oak Chaparral		G3 S3.3	
Rubus (parviflorus, spectabilis, ursinus) (Coastal brambles) Alliance	Coastal brambles	G4 S3	63.901.00
Rubus armeniacus			63.906.01
Rubus armeniacus - Rubus ursinus			63.906.02
Rubus armeniacus (Himalayan black berry brambles) Semi-natural Stands	Himalayan black berry brambles		63.906.00
Rubus parviflorus			63.901.03
Rubus ursinus			63.901.05
Toxicodendron diversilobum - Baccharis pilularis - Rubus parviflorus			37.940.01
Toxicodendron diversilobum - Diplacus aurantiacus			37.940.03
Toxicodendron diversilobum (Poison oak scrub) Alliance	Poison oak scrub	G4 S4	37.940.00
Toxicodendron diversilobum / herbaceous			37.940.08

Toxicodendron diversilobum / Pteridium aquilinum			37.940.07
Abronia latifolia - Ambrosia chamissonis (Dune mat) Alliance	Dune mat	G3 S3	21.100.00
Abronia latifolia - Erigeron glaucus			21.101.01
Abronia latifolia - Leymus mollis			21.101.02
Active Coastal Dunes		G3 S2.2	
Ambrosia chamissonis - Abronia maritima - Cakile maritima			21.102.02
Ambrosia chamissonis - Abronia umbellata			21.102.01
Ambrosia chamissonis - Eriophyllum staechadifolium (- Lupinus arboreus)			21.100.03
Ammophila arenaria			42.010.02
Ammophila arenaria - Cardionema ramosissimum			42.010.03
Ammophila arenaria (European beach grass swards) Semi-natural Stands	European beach grass swards		42.010.00
Artemisia pycnocephala - Calystegia soldanella			21.100.01
Artemisia pycnocephala - Poa douglasii			21.110.04
Artemisia pycnocephala - Polygonum paronychia			21.110.02
Baccharis pilularis			32.060.23
Baccharis pilularis - Frangula californica - Rubus parviflorus			32.060.16
Baccharis pilularis - Rubus ursinus / weedy herb			32.060.15
Baccharis pilularis - Toxicodendron diversilobum			32.060.17
Baccharis pilularis (Coyote brush scrub) Alliance	Coyote brush scrub	G5 S5 (some associations are of high priority for inventory)	32.060.00
Baccharis pilularis / Ammophila arenaria			32.060.07
Baccharis pilularis / Annual Grass - Herb			32.060.20
Baccharis pilularis / Carex obnupta - Juncus patens			32.060.13
Baccharis pilularis / Eriophyllum staechadifolium			32.060.01
Baccharis pilularis / Leymus triticoides			32.060.03
Baccharis pilularis / Native Grass (Mixed)			32.060.21
Baccharis pilularis / Polystichum munitum			32.060.04
Cakile (edentula, maritima) (Sea rocket sands) Provisional Semi-natural Stands	Sea rocket sands		21.125.00
Cakile maritima - Abronia maritima			21.125.01
Cakile maritima - Ambrosia chamissonis - Carpobrotus edulis			21.102.04
Carex pansa (Sand dune sedge swaths) Provisional Alliance	Sand dune sedge swaths	G4? S3?	45.184.00
Carpobrotus edulis or other Ice Plants (Ice plant mats) Semi-natural Stands	Ice plant mats		21.200.00
Frangula californica - Baccharis pilularis / Scrophularia californica			37.920.01

Frangula californica (California coffee berry scrub) Alliance	California coffee berry scrub	G4 S4 (some associations are of high priority for inventory)	37.920.00
Garrya elliptica (Coastal silk tassel scrub) Provisional Alliance	Coastal silk tassel scrub	G3? S3?	39.040.00
Gaultheria shallon - Baccharis pilularis - Ceanothus thyrsiflorus			32.060.28
Leymus mollis - Abronia latifolia - (Cakile sp.)			41.260.03
Leymus mollis - Ammophila arenaria			41.260.02
Leymus mollis - Carpobrotus edulis			41.260.01
Leymus mollis (Sea lyme grass patches) Alliance	Sea lyme grass patches	G4 S2	41.260.00
Northern Coastal Bluff Scrub		G2 S2.2	
Northern Coyote Bush Scrub		G4 S4	
Northern Dune Scrub		G2 S1.2	
Northern Foredune Grassland		G1 S1.1	
Northern Foredunes		G2 S2.1	
Northern Salal Scrub		G4 S3.2	
Northern Silk Tassel Scrub		G3 S2.3	
Silk Tassel Forest		G3 S3.2	
Fen		G2 S1.2	
Ledum Swamp		G2 S2.1	
Sphagnum Bog		G3 S1.2	
Argentina egedii			38.140.01
Argentina egedii - Eleocharis macrostachya			38.140.03
Argentina egedii (Pacific silverweed marshes) Alliance	Pacific silverweed marshes	G4 S2	38.140.00
Carex obnupta			45.183.01
Carex obnupta - Juncus lescurii			45.183.02
Carex obnupta - Juncus patens			45.183.03
Carex obnupta (Slough sedge swards) Alliance	Slough sedge swards	G4 S3	45.183.00
Coastal and Valley Freshwater Marsh		G3 S2.1	
Juncus (lescurii) - Distichlis spicata			45.569.02
Juncus effusus			45.561.01
Juncus effusus (Soft rush marshes) Alliance	Soft rush marshes	G4 S4?	45.561.00
Juncus lescurii			45.569.01
Juncus lescurii (Salt rush swales) Alliance	Salt rush swales	G3 S2?	45.569.00
Juncus patens (Western rush marshes) Provisional Alliance	Western rush marshes	G4? S4?	45.564.00

Oenanthe sarmentosa			52.119.01
Oenanthe sarmentosa (Water-parsley marsh) Alliance	Water-parsley marsh	G4 S2?	52.119.00
Schoenoplectus acutus			52.122.01
Schoenoplectus acutus - Typha latifolia			52.122.04
Schoenoplectus acutus - Xanthium strumarium			52.122.06
Schoenoplectus acutus (Hardstem bulrush marsh) Alliance	Hardstem bulrush marsh	G5 S4	52.122.00
Schoenoplectus californicus			52.114.02
Schoenoplectus californicus - Eichhornia crassipes			52.114.04
Schoenoplectus californicus - Schoenoplectus acutus			52.114.01
Schoenoplectus californicus - Schoenoplectus acutus / Rosa californica			52.114.06
Schoenoplectus californicus - Typha latifolia			52.114.05
Schoenoplectus californicus (California bulrush marsh) Alliance	California bulrush marsh	G5 S4?	52.114.00
Scirpus microcarpus			52.113.01
Scirpus microcarpus (Small-fruited bulrush marsh) Alliance	Small-fruited bulrush marsh	G4 S2	52.113.00
Typha (angustifolia, domingensis, latifolia) (Cattail marshes) Alliance	Cattail marshes	G5 S5	52.050.00
Typha latifolia			52.103.02
Typha latifolia - Typha angustifolia			52.050.04
Grindelia (stricta) (Gum plant patches) Provisional Alliance	Gum plant patches	G3? S3?	52.206.00
Vernal Marsh		G2 S2.1	
Carex aquatilis			45.168.01
Carex aquatilis - Carex lenticularis			45.168.04
Freshwater Seep		G4 S3.2	
Coastal Brackish Marsh		G2 S2.1	
Distichlis spicata - Ambrosia chamissonis			41.200.11
Distichlis spicata - Bromus diandrus			41.200.16
Distichlis spicata - Cotula coronopifolia			41.200.17
Distichlis spicata - Sarcocornia pacifica			41.200.20
Distichlis spicata (Salt grass flats) Alliance	Salt grass flats	G5 S4 (some associations are of high priority for inventory)	41.200.00
Distichlis spicata / annual grasses			41.200.13
Northern Coastal Salt Marsh		G3 S3.2	
Potomogeton spp.			52.107.02
Isoetes (bolanderi, echinospora, howellii, nuttallii, occidentalis) (Quillwort beds) Provisional	Quillwort beds	G3 S3?	52.109.00

Alliance			
Nuphar lutea (Yellow pond-lily mats) Provisional Alliance	Yellow pond-lily mats	G5 S3?	52.110.00

Appendix D
Acronyms

Appendix D - Acronyms

ARB/CARB	California Air Resources Board
ATV	All-terrain vehicle
BAAQMD	Bay Area Air Quality Management District
BMP	Best Management Practice
CalEEMod	California Emissions Estimator Model
CALSTAR	California Shock Trauma Air Rescue
Caltrans	California Department of Transportation
CBOC	California Burrowing Owl Consortium
CCR	California Code of Regulations
CAL FIRE	California Department of Forestry and Fire Protection
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CGS	California Geological Survey
CIAP	Coastal Impact Assistance Program
CNDDB	California Natural Diversity Database (California Department of Fish and Game)
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CRPR	California Rare Plant Rank
CSP	California State Parks
CVI	Coastal Vulnerability Index
CWA	Clean Water Act
dBA	decibel A filter (adapts the measured sound response to the human sense of sound)
DDT	a synthetic pesticide banned in the United States in 1972
DFG	Department of Fish and Game (California)
EBG	European beachgrass
EIR	Environmental Impact Report
ESA	Endangered Species Act
ESHA	Enviromentally Sensitive Habitat Area
ESU	Evolutionarily Signficant Unit
FEMA	Federal Emergency Management Agency
FMMP	Farmland Mapping and Monitoring Program
GHG	Greenhouse Gas
GPS	Global Positioning System
IS/MND	Initial Study / Mitigated Negative Declaration
LOS	Level of Service
MCAQMD	Mendocino County Air Quality Management District
MCGP	Mendocino County General Plan
MLD	Most Likely Descendant
MND	Mitigated Negative Declaration
MSDS	Material Safety Data Sheet

NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NCRWQCB	North Coast Regional Water Quality Control Board
NH_3	Ammonia
NMFS	National Marine Fisheries Service
N_2O	nitrous oxide
No_x	nitrogen oxides
PI	Project Inspector
PM 10	particulate matter (particles with an aerodynamic diameter of 10 Microns or less)
PM 2.5	particulate matter (particles with an aerodynamic diameter of 2.5 Microns or less)
ROG	reactive organic gases
RV	Recreational vehicle
SAA	Streambed Alteration Agreement
SLR	Sea Level Rise
SO_2	Sulphur dioxide
SP	State Park
SPCC	Spill Prevention, Control, and Countermeasure
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	volatile organic compounds

APPENDICES E.1 THROUGH E.5
SUPPORTING DOCUMENTS

Appendix E.1
Best Management Practices - Inglenook Fen-Ten Mile Dune Rehabilitation Project

The following specifications and best management practices were adapted from two California Department of Parks and Recreation (CSP) publications (Merrill and Casaday, 2001, and 2002) and a CSP and California Geological Survey (CGS) publication. This compilation of specifications and practices may be altered to meet the specific needs of the Inglenook Fen – Ten Mile Dunes Preserve within MacKerricher State Park as remediation and restoration efforts proceed.

To ensure that State Park restoration goals are met, CSP will provide a full-time Project Inspector (PI), and qualified cultural and biological monitors as necessary, to oversee project activities. Within specific constraints defined within the Mitigated Negative Declaration (MND), the PI may adjust specifications and excavation designs as excavations proceed. Contractors and equipment operators must be able to accurately interpret written and verbal excavation details as stated in the contract or given by the PI. They must be able to visualize and plan all aspects of work required at each site. Skill in operation and coordination of heavy equipment is necessary for cost-effective restoration of these state park lands. Adverse impacts to park resources (e.g. natural ground surface, water quality, vegetation, wildlife habitat, etc.) must be minimized in accomplishing the required work.

The Contractor shall not initiate any earth moving work or vegetation manipulation unless the PI is present at the worksite. By monitoring excavations as they progress, the PI shall assist the contractor in adjusting the excavation grade and alignment to achieve a topographic match, and also shall determine the suitability of the grade achieved. Indicators of original (natural) grade may include: original topsoil or channel features (small woody debris and rock), bedrock outcrops, or naturally introduced large woody debris. These boundary conditions exist naturally in a stream channel or its valley prior to road building and functioned as natural control for the channel forming processes. It is extremely important not to remove or disturb these natural grade indicators.

Area of disturbance

Areas of Disturbance are established for the road and culvert removal components of the project and define the maximum area anticipated to be impacted by the proposed work. Sensitive areas to be avoided are depicted on the project maps and are delineated for compliance with various environmental regulations and requirements. The Areas of Disturbance do not represent areas of unrestrained access for earthmoving equipment and support vehicles. More specifically, any necessary staging areas, parking areas, or equipment access ramps required for the remediation work are to be contained within the Areas of Disturbance and each such area shall be approved by the PI and CSP and marked with fluorescent flagging, pin flags or fencing.

Parking Areas, Heavy Equipment Staging Areas, and Access Ramps

Parking areas for two-wheel drive vehicles as well as staging areas for heavy equipment shall be located within the Areas of Disturbance for the project area. Each such area shall be identified and approved by the PI and CSP, and will be flagged on the jobsite by the PI.

Photo Point Locations

Photo points are locations that have been used to photo-document the restoration areas. They will be identified by stakes with yellow flagging, and will be located out of the way of any anticipated equipment work. They must not be disturbed.

Responsibilities of the Project Inspector

An engineering geologist with the California Geological Survey (CGS), or his/her designee, shall be designated by CSP as the Project Inspector (PI) and authorized to provide full-time inspection during heavy equipment operation for the length of the project. The PI works closely with the contractor and equipment operators to maintain a professional work environment and to maximize the quality and quantity of work accomplished. The inspector shall have five primary responsibilities.

a. The PI is responsible for making sure all reference marks, photo point locations, watercourses, culverts, and project boundaries are accurately flagged prior to the commencement of restoration activities. Additionally, the PI explains the proposed design to the heavy equipment operators and makes on-site design modifications as the project proceeds. The PI oversees the day-to-day heavy equipment operations and assists the operators in understanding the design specifications. This requires maintaining frequent and professional dialogue with the operator. However, the PI shall refrain from telling equipment operators how to conduct the excavation and grading. Instead, the PI shall remain focused on the design of the finished product.
b. The PI is responsible for protecting the natural, cultural, and capital resources of CSP. The PI shall exercise the authority given to him/her by CSP and permitting agencies to halt operations if equipment work poses a threat to any resources outside the work area.
c. The PI keeps detailed records of the project's progress. This includes equipment operating time, operator's time on the job, time spent on individual tasks such as brushing or recontouring, and other topics of interest. On some jobs, the PI shall keep track of equipment production for many different phases of the project to better analyze the overall job effectiveness. The PI shall document work efforts such as bucket loads of soil moved per hour, time spent positioning equipment, and equipment efficiency.
d. CGS is responsible for preparing an "as-built" report that describes each phase of the heavy equipment work and includes appropriate tables, maps, and figures.
e. The PI is responsible for maintaining clear and professional communication with the equipment operator(s) throughout the length of the project.

Responsibilities of the Contractor

It is the contractor's responsibility to coordinate with the PI and equipment operators to insure that the project objectives and goals are achieved. In addition, the contractor shall have the following responsibilities:

a. The contractor shall maintain all equipment engines in good condition, in proper tune (according to manufacturer's specifications), and in compliance with all State and federal requirements.
b. The contractor shall inspect all equipment and vehicles for leaks immediately prior to the start of construction, and regularly thereafter until the equipment and/or vehicles are removed from park premises.
c. The contractor shall clean and repair (other than emergency repairs) all equipment outside park boundaries, whenever possible. Contaminated water, sludge, spill residue, or other hazardous compounds will be disposed of outside park boundaries at a lawfully authorized destination

Responsibilities of the Heavy Equipment Operator

An operator's main job is to work to reconstruct the desired landscape according to the design specifications. Based on the specifications, the operator shall develop the most efficient procedure for accomplishing the prescribed work. The operator shall have four primary responsibilities:

d. The operator is responsible for all safety related to the operation of the equipment and must take all precautions to avoid accidents. Road removal jobs are often complex, difficult, and can be extremely hazardous. The operator shall communicate with other onsite personnel about blind spots and/or the limitations of the equipment in particular situations or locations.
e. The equipment operator is responsible for determining the safest and most efficient use of equipment. It is the operator's responsibility to decide the best way to maneuver and position equipment on uneven terrain. This includes the order in which work is done and any intermediate steps that may be required to complete the project work. Operators shall consult with the PI on strategies that increase the efficiency of the work.
f. The equipment operator shall document the number of hours worked on each project. The hour meter in the machine can be used and it shall be double-checked using a watch. Each day the operator shall confer and concur with the PI as to the number of hours worked. The operator and the PI shall each keep a notebook to record time worked. Depending on the contract specifications, some projects pay by the operator time, some pay by equipment time, some pay by the volume of soil moved, and some pay by a total cost estimate. Equipment time contracts require the most careful record-keeping because time for breakdowns, fueling, and maintenance is not paid. In some cases, the number of hours of equipment time can be different from the number of hours the operator works each day.
g. The equipment operator is responsible for maintaining clear and professional communication with the PI throughout the length of the project.

Heavy Equipment Selection

Equipment selection is an essential component of remediation work because the choice of equipment affects the cost of the earthmoving. In general, the largest machine that will safely fit on a road or project site while not limiting maneuverability shall be used.

Limitations on the size of the machine depend primarily on the road width and the proximity to valuable resources.

Hours of Work

The PI must be present during all equipment operations involving excavation or placement of fill. Hours of work shall be determined by the project activities schedule. Heavy equipment work is only permitted between sunrise and sunset. Heavy equipment work outside of the days and hours specified in the project activities schedule may be performed only with prior consent of the PI, with notification at least 48 hours in advance. Sound judgment shall be exercised in the case of bona fide emergencies, or where resource damage may result if work does not continue.

Rough Grading for Watercourse Crossing Removal

a. The excavator shall prepare the site by first removing all vegetation growing on the cutslope, roadbed, and embankment fillslope of the adjacent road sections. Vegetation growing on the crossing fill shall also be removed. Mulch shall be stockpiled on the top of the adjacent road cutslopes or elsewhere in the crossing excavation area. Mulch may be stockpiled in piles but shall be left accessible to the excavator when earthmoving tasks are complete.
b. If the stream is flowing, water shall be diverted away from the excavation area(s) to minimize turbidity. Diversion techniques shall be developed through consultation with project engineers and regulatory agencies.

Finish Grading

a. The final earthmoving task is finish grading to eliminate berms or depressions. Small windrows usually remain after this step but they are eliminated when the excavator spreads mulch on the finished surfaces. Finish grade must be approved by the PI and CSP before the mulch is placed. Removing mulch to change the shape of the recontoured fill is very time consuming and does not produce good results.

Mulching

a. Once the final shape has been achieved, the excavator shall place previously removed trees and brush on top of the recontoured fill (“slash packing”). Woody material is spread evenly over the newly recontoured slope. Tamping woody material down onto the ground provides contact with the soil reducing sheet erosion. Large clumps of brush shall be pulled apart and spread whenever possible. In general, any larger tree trunks shall be laid perpendicular to the slope to break up surface runoff and catch fine sediment. In coastal climates, the use of straw mulch is not necessary and may actually slow down natural revegetation.

REFERENCES

Merrill, B.R., and Casaday, E., 2001, Field techniques for forest and range road removal: unpublished agency report by California State Parks, 70 p.

Merrill, B.R., and Casaday, E., 2002, Best management practices for road rehabilitation, partial road recontouring: unpublished agency report by California State Parks, 19 p.

Merrill, B.R., and Casaday, E., 2002, Best management practices for road rehabilitation, road-stream crossing removal: unpublished agency report by California State Parks, 25 p.

Standard Specifications & Best Management Practices for Disturbed Lands Remediation, Big River Unit, Mendocino Headlands State Park Mendocino County, California, 2006, unpublished agency report by California Department of Conservation- California Geological Survey and California State Parks, 23 p.

Appendix E.2

A Mitigation, Monitoring, and Restoration Plan for Vegetation and Rare Plants
Appendix to a
Mitigated Negative Declaration for the
Dune Rehabilitation Project
Inglenook Fen – Ten Mile Dunes Natural Preserve, MacKerricher State Park

Introduction

This ecological mitigation, monitoring and restoration plan describes a process for implementing actions that are designed to avoid, reduce, or otherwise compensate for unavoidable and negative impacts to rare plants and rare plant habitat. This plan applies specifically to impacts on plants and vegetation that may accrue through implementation of the Dune Rehabilitation Project (the Project) at the Inglenook Fen – Ten Mile Dunes Natural Preserve (the Preserve) at MacKerricher State Park, Mendocino County, California. This plan augments information on sensitive plants and habitats provided within the Draft Initial Study/Mitigated Negative Declaration prepared by California State Parks (CSP) for this project.

The proposed Project will cause short-term, local impacts on vegetation types and plant populations. However, in removing existing impediments to physical and ecological processes in the dune ecosystem, net effects on vegetation and plants will include expansion of native plant and animal habitat. This mitigation plan acknowledges in-Project requirements that will avoid or reduce potential impacts, and also provides for measures that will additionally promote the quality and quantity of rare plant habitat and native vegetation.

The specific goals, actions, and methods in this plan represent an initial phase of a longer term ecological monitoring and adaptive management plan to be designed for the Preserve. Specifically, this mitigation and restoration plan discusses compensation and remedial measures for 4 rare plant species (with listing status in parentheses), as follows:

- *Abronia umbellata* ssp. *breviflora* (CA Rare Rank 1B.1);
- *Chorizanthe howellii* (CA Rare Plant Rank 1B.2, Federal Endangered, California Threatened);
- *Erysimum menziesii* ssp. *menziesii* (CA Rare Plant Rank 1B.1, Federal Endangered, California Endangered);
- *Oenothera wolfii* (CA Rare Plant Rank 1B.1).

In addition to these plants, *Gilia millefoliata* (dark-eyed gilia) and *Horkelia marinensis* (Point Reyes horkelia) are reviewed for consideration of potential Project-related impacts in the MND (Chapter 3, Section IV. Biological Resources), as both grow close to the Project area. However, according to CSP data, no *Gilia* or *Horkelia* plants will be directly affected by Project activities. Although alignments or locations of habitat and other ecological conditions affecting these plants may occur in the future, including those resulting from local morphological or hydrological alterations after removal of road, culverts, or beachgrass, such alterations could also occur with or without Project implementation, due to ambient processes and natural events. Ascertaining such cause-and-effect relationships would require elaborate experimental designs and expenditures, and is well beyond the scope of this mitigation plan. The Project itself rests on the well-supported premise that removal of the road, culverts, and non-native plants that obstruct natural environmental processes is a fundamental necessity towards restoring those processes. For *Gilia* and *Horkelia*, discussion here is limited to a review of potential, direct Project-related impacts on these species.

This plan is organized into the following sections (page numbers in parentheses):

A NOTE ON THE CONCEPTUAL APPROACH FOR THIS PLAN

Beyond the development of a plan that specifically prescribes measures through which to compensate for potential damage or losses of individual rare plants or their habitats (i.e., this mitigation plan), this document represents both a prologue to a broader scaled, long-term effort to sustain the ecological conditions in which these plants grow, as well as the start, perhaps, of another chapter in the Preserve's ecological history. In the recent history of the Preserve, planning and management actions have aimed to rehabilitate and maintain both form and function of its ecosystems. These actions include establishment of the Preserve in 2001 in order to protect its unique environmental and biotic assets, prior campaigns to reduce and eliminate encroachments of human construct and non-native plants, the development of an overall Preserve management plan, and the current road- and European beachgrass-removal proposal and attendant mitigation measures. We intend that the provisions of this plan are consistent with prior planning and management actions, and conducive to improving and maintaining optimal ecological structure and functions throughout the Preserve.

While this specific plan addresses the need for "mitigation" measures applied to sensitive biotic elements that may sustain Project-related impacts, we also aim to establish a comprehensive and holistic, process-oriented approach to Preserve ecosystem management. We are not so interested in mitigation measures formulated to satisfy regulatory quotas or to achieve strictly numerically based objectives as we are in providing for the rehabilitation and maintenance of the entirety of the Preserve's ecology. We aim to work with existing environmental conditions rather than force rigid or contrived solutions into places and habitats where they won't work.

With a more broadly scaled approach to "mitigation" in mind, this plan is developed within a conceptual context of adaptive management: the application of repeated cycles of objective (quantifiable results) formulation, task implementation, monitoring, evaluation, and response to changing ecosystem conditions. The cyclical design of the adaptive management process can be considered an approach to understanding the dynamic state of the Earth, from a human perspective of both uncertainty and curiosity. We will move forward with this uncertainty and curiosity, perhaps to learn some small part of what the Earth has to teach us.

Geographical Scope

We intend to implement this plan across the entire Preserve, with a smaller proportion of restoration or rehabilitation sites possibly located south of the Preserve in MacKerricher State Park, north of Lake Cleone. We will select specific sites across a diversity of existing conditions (see below, Mitigation Site Selection) in which to evaluate the relative success of our efforts to provide suitable environmental conditions for the rare plant species of concern. The defined Project area will constitute part of this array of mitigation sites, but we expect to actively pursue most mitigation measures outside the Project area. The short-term ecological disturbance of the Project area and subsequent re-establishment of ecosystem processes, with resulting geomorphological and hydrological alterations and realignments, could confound efforts to re-establish rare plant populations in those areas. So, we will initially diversify site selection to include a number of habitat types and treatment conditions within and just outside the Preserve. With monitoring in place, we expect, over time, to winnow later mitigation site selections (secondarily established in response to management objectives not achieved) to those types that demonstrate greater success in supporting rare plant populations. Future site selection, as conditions change, may include areas currently within the proposed Project area.

The development of a long-term adaptive management program for the Preserve will incorporate considerations for monitoring and rehabilitation throughout all its ecosystems, covering a diversity of environmental conditions and vegetation types. Our broad goals, as with the current Project and short-term mitigation measures, will include sustaining (enhancing where considered appropriate) the integrity of ecosystem structure and function. Our immediate mitigation planning herein represents but one foothold towards the pursuit of such an ecosystem-wide approach to an observation-and-response type of management. We expect to complete preparation of such a comprehensive, holistic adaptive management program for the Preserve within the next 2 years.

Ecological Scope

As discussed above, both the proposed Dune Rehabilitation Project and this mitigation plan are intended to follow through on the stated intentions of previous documents establishing and providing management direction for the Preserve. The theme of "restoring ecosystem processes" is central to all the documentation about Preserve management and to past, current, and future management actions. However, the means and methods by which to "restore ecosystem processes" are not by any means quite so clear or straightforward, planned or accomplished. Much of what constitutes "ecosystem processes" is completely out of the realm of deliberate human accomplishment -- even as our "deliberate accomplishments" unwittingly, in total, might lead to complete and irreversible ecological function and form -- as ecosystems worldwide are subject to the dynamics and disturbances characteristic of the planetary environment, including the uncharted territory of human contributions to those dynamics and disturbances. The Ten Mile Dunes ecosystem provides excellent opportunities to observe and digest the results of those dynamics.

Nevertheless, we can attempt to make some adjustments in our interactions with ecosystems through learning about the ecologically deleterious impacts of human-imposed alterations, and in some cases, attempting to reverse or moderate those impacts. We can take small steps that may help to restore ecological processes, functions, and structures to some semblance of what might exist were we to have eschewed some of our human cultural artifacts and attempts to "control" nature in the past. We cannot necessarily obliterate the consequences of past human actions, for better or worse, but we might be able to nudge the physical and biotic processes a bit closer, at a slightly enhanced rate, towards what they might have been, and might still be in the future.

While we may not be able quantify the sum of ecological processes and functions, we can use components of ecosystems to communicate how well those ecosystems are functioning. At least, we can convince ourselves, with some arrogance as well as with humility, that designing studies and implementing actions intended to relieve ecosystems of presumed obstructions of ecological process and function will abet our understanding as well as facilitating ecological recovery, insofar as we might presume to know what either means or requires.

The Dune Rehabilitation Project and this mitigation plan are attempts to restore ecological processes and functions, and the adaptive management program for implementing mitigation actions and monitoring are attempts to assess success towards that broader goal of ecological rehabilitation. This will be accomplished, as partly provided in this plan, through observing and measuring attributes of ecological indicators such as native plant species (individuals and populations) and native vegetation types. The primary indicators selected for these purposes, in part due to legally mandated requirements to do so, are plants designated as rare by the State of California, the California Native Plant Society, and other governmental bodies and conservation organizations. We also pay attention to the protection and enhancement of native plant vegetation types as part of our holistic approach to Preserve management. Project actions and attendant mitigation measures have been designed to improve habitat for native plants, animals, and other organisms, and we will make observations and render evaluations to assess the relative effectiveness of those actions. Until additional and more comprehensive programs for assessing ecological processes and functions can be designed and implemented, we will trust that success in conserving ecological components, such as rare plants and animals and their habitats, will tell us how well the ecosystems are working.

Rare Plants

This section provides a summary of the biology and ecology for each rare plant known from the general vicinity of the proposed Project area. Additional information on the regulatory status and rarity of each plant is also provided, along with text that incorporates considerations of its distribution within the Preserve and of potential Project-related impacts. The environmental documentation (MND) for the Project lists the following 6 plant taxa as occurring in the general vicinity of the proposed Project, and considers these for potential Project-related impacts:

1. *Abronia umbellata* Lam var. ***breviflora*** (Standl.) L.A. **(pink sand-verbena)**
Nyctaginaceae

Description: perennial herb**. Inflorescence:** flowers 10–18. **Flower:** perianth tube 6–10 mm, ± green to magenta, throat with a cream to light yellow spot, limb 5–11 mm wide, light to bright magenta. **Fruit:** wings poorly to moderately developed. Flowering: June-October.
Niche: Disturbed sandy areas, coastal dunes and scrub; < 100 m.
Distribution: North Coast, Central Coast (Marin Co.); sothern Oregon (Murdock, 2012). Most occurrences have few plants.

Rankings:

- **California Rare Plant Rank** 1B.1 [1B:Rare, threatened, or endangered in California and elsewhere; .1: Seriously endangered in California]
- **State Rank**: S2.1 [S2: Imperiled; .1: Very threatened]
- **Global Rank**: G4G5T2 [G4: (species" apparently secure, considering populations outside California; G5: (species) secure, considering populations outside California; T2: Imperiled]
- **Element Code**: PDNYC010N2

- **Notes**: Threatened by vehicles, non-native plants, and foot traffic. State-listed as Endangered in OR (CNPS, 2012)

The following information on the life history, population dynamics, population genetics, pollination and breeding system, fruits and seeds, and seed bank for pink sand verbena is adapted from Kaye, et. al. (2006):

Life-history

Pink sand-verbena has a predominantly annual life cycle and individuals reproduce by seed only. The plants are tap-rooted and do not root adventitiously from the stems. Most individuals observed in demographic studies behave as annuals, flowering and dying in their first year of growth. However, a small percentage of individuals in a natural population at Port Orford, Oregon, grew and flowered for two years, and transplanted individuals on dredged sand had a high probability of living for two seasons. Pink sand-verbena appears to be capable of growing for more than one year if protected conditions are available without too much competition from associated vegetation.

Population dynamics

Because pink sand-verbena populations typically occur on beaches, generally at or below the zone of driftwood accumulation, most are obliterated each winter by storms that reshape the shore. Each spring, populations re-establish from seeds that persist in the sand or that are washed into the site from another location. Because oceanic processes may result in sand being removed from beaches and stored in off-shore sand deposits during winter, then re-deposited on beaches during summer, pink sand-verbena seeds may be stored in this way as well for one or more years at a time.

Because of the highly stochastic nature of its habitat, population sizes of pink sand verbena are variable from one year to the next. Long-term monitoring of a wild population at Otter Point, Oregon, has documented this type of annual variation.

Population genetics

Populations of pink sand-verbena appear to have a high degree of genetic similarity with one another. Published reports by McGlaughlin, Karoly, and Kaye (2002) and McGlaughlin (1999) found that all 14 sampled populations in southern Oregon and California had a genetic identity of greater than 92%.

Pollination and breeding system

Pink sand-verbena produces 8-20 (average 14-15) flowers in hemispheric clusters. An individual plant may produce from one to thousands of these clusters, depending on growing conditions. The flower tubes are approximately 6-7 mm deep, and long-tongued insects such as bumblebees, skippers and other butterflies visit the unscented flowers and probe for small amounts of nectar. Also, in Oregon pink sand-verbena is fully self-compatible and will self-pollinate in the absence of insect visitors, suggesting that the taxon has a mixed-mating system. This observation is in contrast to Tillet's (1967) conclusion that *A. umbellata* ssp. *umbellata* is self-sterile, producing neither fruit nor seed from self pollination. This difference in breeding system between the southern and northern subspecies may be an important factor in their evolutionary divergence, and may also partly explain the low frequency of observed interspecific hybrids in Oregon.

Fruits and seeds
Each pink sand-verbena flower produces a single-seeded fruit (achene), which is broadly 3 to 5-winged, presumably to promote dispersal by wind. These wings may also facilitate long-distance dispersal by ocean waves and currents. Typically, 80% to 90% of the fruits contain a seed.

Seed bank
Long-term persistence of pink sand-verbena populations may depend on the development and maintenance of a long-lived persistent seed bank. Results from germination tests with seeds of various ages (stored in paper sacks at room temperature) show that seeds of this species can remain viable for long periods of time. Loss of viability over time appears to be very slow, and even seeds stored for ten years retained over 90% viability. The stochastic behavior of natural populations, such as Otter Point, Oregon, can result in a decline to zero plants in some years, followed by the re-emergence of the species the following year, which suggests that the species can re-colonize sites from a local seed pool. Taken together, these lines of evidence provide strong support for the notion that pink sand-verbena is capable of maintaining a persistent seed bank, and that buried seeds may play an important role in the population dynamics of this species and should be fostered in reintroduction attempts.

Up to 14 plants may be affected by Project activities (MND, p. 63); the nature of impacts is uncertain, but complete elimination of plants will be presumed, for the purposes of proposing mitigation measures. As an annual to short-lived perennial plant, loss of individual *Abronia* plants may be less critical in sustaining its local population than are more holistic, broadly scaled efforts to sustain, enhance, or restore the species' habitat. In this regard, restoration of natural dune system dynamics, processes, and structure through removal of human-caused ecosystem alterations (e.g., roads, culverts, and introduced plants) is a necessary first step towards implementing effective, integrated ecosystem management that will benefit all component species (Kaye, 2006). Specific management objectives directed towards conservation and restoration of *Abronia* and its habitat have been included in this mitigation plan.

2. *Chorizanthe howellii* Goodman **(Howell's spineflower)** Polygonaceae

Description: Short lived annual**.** Plant generally spreading or decumbent, 0.3–1 dm, 1–5 dm diam, hairy. **Leaf**: blades 1–3 cm, 0.5–1.5(1.8) cm wide. **Inflorescence**: bracts 2, awns 0; involucre 3–4 mm, 3-angled, 6-ribbed, teeth 6, 0.5–1 mm, margins white, awns 0.5–2 mm, straight, abaxial longest. **Flower**: 1 (3)3.5–4.5 mm, hairy; perianth 2-colored,

floral tube white, lobes white to rose, jagged; stamens 9. **Fruit**: 3–4.5 mm. n=(36–38)40(41–45). Flowering: May–July.
Niche: Coastal dunes; < 20 m.
Distribution: North Coast (central Mendocino Co.) (Costea 2012)

Rankings:

- **California Rare Plant Rank** 1B.2 [1B:Rare, threatened, or endangered in California and elsewhere; .2: Fairly endangered in California]
- **Federal listing status:** FE
- **State listing status** CT
- **State Rank**: S1 [critically imperiled]
- **Global Rank**: G1 [critically imperiled]
- **Element code**: PDPGN040C0
- **Notes:** Known only from north of Ft. Bragg. Threatened by development, foot traffic, recreational activities, vehicles, and non-native plants. Potentially threatened by trail construction. Closely related to *C. pungens*. See *Annals of the Missouri Botanical Garden* 21:44 (1934) for original description, and *Phytologia* 66(2):131-132 (1989) for taxonomic treatment. (CNPS, 2012)

The specific nature of impacts to *Chorizanthe howellii* as a result of Project implentation is uncertain, since annual plants survive from one growing season to the next as seeds – these propagules will likely survive the short-term disturbance effects of the Project. Promoting the environmental conditions conducive for seed germination is decidedly more important than mitigating negative impacts on individual plants. This topic is elaborated below.

According to 2011 CSP data (MND Appendix A.4 – Population Estimates Methodology), approximately 1.0 acres of *Chorizanthe* grows in the Project area between Inglenook Creek and the Ten Mile River, along the haul road. The citation of a specific number of plants growing within that area would comprise, at best, an estimate. The acreage provided by CSP, further informed by habitat area measurements and evaluations to be conducted during Project implementation, will constitute one element within an array of relevant factors in designing appropriate mitigation measures.

Project implementation will occur primarily during the dormant season for this annual plant -- August through onset of the rainy season. Plants extant within the Project area will essentially be dead from the outset of more intensive and destructive work activities -- only seeds survive year to year, and most seeds are "ripe" and parent plants dead by mid-summer. In light of its annual life cycle, consideration of losses of individual plants is immaterial, as most spineflower seeds will likely survive Project activities; seed production and survival for future germination are the essence of the annual plant life cycle. Thus, impacts on potential seed germination opportunities (sites and environmental conditions) within the Project area are more important in considering appropriate compensation. As stated above for *Abronia*, sustaining and enhancing, where possible, the environmental conditions necessary for long-term species' survival is more critical than are efforts merely to replace individual plants. As provided under "Mitigation and Restoration Objectives" below, mitigation efforts will include attempts to maintain and enhance the northern Preserve spineflower population in or near to the proposed Project area. Long-term conservation measures for this species will be addressed in the forthcoming ecological monitoring and management program for the Preserve.

3. ***Erysimum menziesii*** (Hook.) Wettst. **(Menzies's wallflower)** Brassicaceae

Description: Biennial or short-lived perennial herb. **Stem**: 0.2–2.5(3.5) dm.
Leaf: 0.5–1.5 cm wide, spoon-shaped, entire to lobed, flat; hairs (2)3–5(7)-rayed.
Flower: sepals 7–14 mm; petals 15–30 mm, 6–14 mm wide, yellow, claw 10–15 mm.
Fruit: 3–14 cm, 2–4 mm wide, cylindric when green, flat parallel to septum when dry, not constricted between seeds; valves outside with (2)3 or 4(6)-rayed hairs, inside glabrous, midvein obscure; style 0.3–2 mm; pedicel spreading, 4–15 mm.
Seed: 32–74, 1.8–2.8(3.5) mm, oblong; wing widest at tip. 2n=36.
Niche: Coastal dunes, headlands, cliffs; < 300 m
Distribution: North Coast, Central Coast; to southern Oregon (Al-Shehbaz, 2012)

Rankings:

Erysimum menziesii ssp. ***menziesii*** used in CNPS Ranking:

- **California Rare Plant Rank** 1B.1 [1B:Rare, threatened, or endangered in California and elsewhere; .1: Seriously endangered in California]
- **Federal listing status:** FE
- **State listing status** CE
- **State Rank**: S1 [critically imperiled]
- **Global Rank**: G3/T1 [critically imperiled; G3: species vulnerable]
- **Element Code** ERMEM2
- **Notes**: Nearly extirpated on the Monterey Peninsula. Seriously threatened by development, vehicles, deer browsing, and non-native plants. See *E. menziesii* in *TJM 2*; USFWS also uses this name (CNPS, 2012)

Individual plants typically survive from 2 to a few years, and like *Abronia* and *Chorizanthe*, *Erysimum* is well adapted to the disturbance regimes common in a dune ecosystem. As with other native plants in this ecosystem, loss of habitat or impediments to ecosystem processes posed by artificial surface features and non-native plants may constitute more significant threats to this population than do short-term impacts such as crushing, uprooting, or sand burial.

According to CSP data and mapping, the Project may affect up to 0.23 acres of wallflower habitat; this information will be reviewed during Project implementation in order to augment existing spatial and population data. However, maintaining a vision for long-term habitat sustainability is more critical in designing mitigation measures than are considerations of one-time impacts on individual plants. Compensation and enhancement mitigation measures for Erysimum have been included in this plan, and considerations for its long-term conservation will be addressed in the plan for a Preserve monitoring and management program.

4. *Gilia millefoliata* Fisch. & C.A **(dark-eyed gilia)** Polemoniaceae

Description: Annual. Plant densely glandular, odor skunk-like. Stem: 8–30 cm; main stem short; branches generally long-decumbent. **Leaf**: ± fleshy; basal in rosette, 1–2-pinnate-lobed, lobes 2–5 mm; upper shorter, palmate. **Inflorescence**: clusters; flowers 2–6; pedicels 2–5 mm. **Flower**: calyx 4–6 mm, 8–11 mm in fruit, glandular, membranes narrower than lobes, purple or colorless; corolla 8–11 mm, tube yellow, throat included, funnel-shaped, pale yellow with paired purple spots, lobes 3–5 mm wide, obovate, blue-white; stamens, style ± reaching corolla lobe bases; pollen white. **Fruit**: 7–9 mm, < calyx, narrowly ovoid to ellipsoid. **Seed**: 25–50. 2n=18. Flowering: March–July.
Niche: Stabilized coastal dunes; < 10 m
Distribution: North Coast, northern Central Coast; southern Oregon; formerly in San Francisco. (Porter, 2012)

Rankings:
- **California Rare Plant Rank** 1B.2 [1B:Rare, threatened, or endangered in California and elsewhere; .2: Fairly endangered in California]
- **State Rank**: S2.2 [Imperiled; .2: Threatened]
- **Global Rank**: G2 [Imperiled]
- **Element Code:** PDPLM04130
- **Notes**: Threatened by development, vehicles, foot traffic, grazing, and non-native plants. Endangered in Oregon. See *Aliso* 3(1):33 (1954) for taxonomic treatment (CNPS, 2012)

Dark-eyed gilia is an annual plant. The MND (p. 65) indicates that *Gilia* does not grow within the Project area, and that no direct or indirect impacts resulting from the Project are anticipated.

As an annual, any accruing impacts to habitat are more critical in considering potential remedial measures than are direct impacts to plants. Project work will be conducted outside of the active growing season for this species, and extant habitat is not directly jeopardized. Nevertheless, compensation measures for other rare plants and, in general, for general habitat sustainability, are incorporated into this plan, and will apply towards retention and enhancement of suitable habitat for this species. No further specific information on *Gilia millefoliata* will be provided in this plan, although it will be subject to monitoring, and perhaps habitat enhancement (restoration) actions, as part of a Preserve adaptive management program plan currently in development.

5. *Horkelia marinensis* (Elmer) Crum **(Pt. Reyes horkelia)** Rosaceae

Description: Perennial, generally ± glandular, generally resinous-smelling; caudex generally branched. Plant matted, ± gray; resinous odor strong. **Stem**: decumbent to ascending, generally 10–30 cm. **Leaf**: generally 4–10 cm; stipules entire to basally lobed;

leaflets generally 5–10 per side, ± crowded, 7–12 mm, generally ± wedge-shaped, ± 5–10-toothed ± 1/3–1/2 to base, hairs dense. **Inflorescence**: ± dense; clusters indistinct, 5–10-flowered; pedicels generally 1–6 mm. **Flower**: hypanthium width 4–5 mm, > 2 × length, inner wall hairy, bractlets ± 1 mm wide, lanceolate; sepals 3–6 mm; petals generally 4–6 mm, oblong to oblanceolate; filaments 1–2.8 mm, base ± 0.5 mm wide, anthers ± 0.7 mm; pistils generally 20–30, style 2–4 mm. **Fruit**: 1.5–2 mm. 2n=56. Plants in central North Coast may be distinct. Flowering: May–September.
Niche: Sandy coastal flats; ± 15–760 m.
Distribution: central North Coast (Fort Bragg), northern Central Coast (Point Reyes to Santa Cruz). (Ertter 2012)

Rankings:

- **California Rare Plant Rank** 1B.2 [1B:Rare, threatened, or endangered in California and elsewhere; .2: Fairly endangered in California]
- **State Rank**: S2.2 [S2: Imperiled; .2: Threatened]
- **Global Rank**: G2 [Imperiled]
- **Element Code:** PDROS0W0B0
- **Notes:** Populations from near Ft. Bragg, Mendocino County may be varietally distinct. Historical occurrences need field surveys. Threatened by non-native plants and residential development. Possibly threatened by road maintenance and foot traffic. See Systematic Botany 18(1):137-144 (1993) for distributional information (CNPS, 2012)

This perennial plant grows in at least two sites adjacent to the Project area. These sites will be flagged prior to Project work in those areas, and on-site monitoring during Project work will reduce the potential for direct impacts. Indirect impacts, as for all other plants in or adjacent to the Project area, could include eventual burial by drifting sand, tidal inundation, or other environmental consequences, as a direct or indirect effect from local alterations in topography or hydrology resulting, at least in part, from road, culvert, or *Ammophila* removal.

Although direct impacts are unlikely, this mitigation plan incorporates measures, such as weed removal in rare plant habitat, designed to sustain suitable habitat for *Horkelia* in the Preserve. These measures will include those intended to compensate for indirect impacts such as habitat loss incurred through short-term topographical fluctuations adjacent to extant patches of this plant. Along with all extant rare plant populations, *Horkelia* will be included in long-term monitoring of Preserve ecosystems, vegetation, and plant species in the future.

6. *Oenothera wolfii* (Munz) P.H. Raven et al **(Wolf's evening-primrose)** Onagraceae

Description: Biennial, rosetted, densely minutely strigose; many hairs also with red, blister-like base, some glandular. **Stem:** erect, 5–10 dm. **Leaf:** cauline 5–18 cm, narrowly lanceolate to elliptic, wavy-dentate, distal dentate. **Inflorescence:** spike. **Flower:** hypanthium 30–46 mm; sepals 17–28 mm, free tips in bud erect, 1–3 mm; petals 13–23

mm, yellow fading red-orange. **Fruit:** 30–48 mm, 5–8 mm wide, ± cylindric, ± straight. **Seed:** 1–2 mm, angled, irregularly pitted. 2*n*=14.
Niche: Coastal sand, including dunes, bluffs, roadsides, generally moist places (perhaps also inland); < 100 m
Distribution: (± 800 m, Carrville, Trinity Co.). Northern North Coast, Klamath Ranges; Oregon. (Wagner, 2012)

Rankings:

- **California Rare Plant Rank** 1B.1 [1B:Rare, threatened, or endangered in California and elsewhere; .1: Seriously endangered in California]
- **State Rank**: S1.1 [S1: Critically imperiled; .1: Very threatened]
- **Global Rank**: G1 [Critically Imperiled]
- **Element Code**: PDONA0C1K0
- Known from approximately twenty occurrences. Threatened by road maintenance, development, foot traffic, invasive plant control, non-native plants, and hybridization with non-native *Oenothera* spp. State-listed as Threatened in OR. See *Aliso* 2:16 (1949) for original description, and *Systematic Botany* 4:242-252 (1979) for revised nomenclature (CNPS. 2012)

This biennial plant grows in in the Project area along both Fen and Inglenook Creeks, including downstream from proposed culvert removals, according to CSP (MND, p. 65), where less than 100 plants could be affected. The nature of Project-related impacts, direct or indirect, is uncertain, but could include burial, removal, crushing, or future fresh-water or tidal inundation, resulting in loss of plants and reproductive potential. While direct impacts may destroy existing plants, this species is well adapted to disturbance, and the population is likely to sustain Project impacts and persist beyond Project implementaiton in suitable environments within or adjacent to proposed activities.

Restoration of natural hydrological patterns and processes, through removal of culverts, could result in indirect effects on plants in the area, including plants growing downstream or upstream. Consequential realignment of surface and sub-surface hydrological patterns will likely alter existing *Oenothera* habitat conditions at or near this site. Compensation measures, as detailed in this plan, have incorporated considerations for potential loss of both individual plants as well as loss of local habitat due to culvert removal and resulting hydrological or topographical changes.

Vegetation Types: Natural Communities of Special Concern

This mitigation plan recognizes more general, extant impacts to ecosystems supporting rare plants and animals and other associated organisms. Based on existing data on rare plant populations, including CSP mapping data and personal observations, neither of the non-native plant-dominated vegetation types within the Project area (i.e., *Ammophila arenaria*, *Eucalyptus globulus* Semi-Natural Stands; Sawyer et al. 2009) provides suitable habitat for any rare plants; indeed, these stands demonstrate the competitive superiority of the dominant non-native plant taxa, as native plant cover is very low in these types. Since such non-native plant-dominated vegetation apparently does not promote natural dune processes, nor contribute to native plant cover, these types are not included for discussion here; they are described in the MND (Chapter 3, Section IV. Biological Resources – Vegetation) and in Sawyer et al. (2009). Retention or promotion of non-native vegetation is simply not consistent with the fundamental management principles and values for which the Preserve was established and will be maintained.

The following native plant-dominated vegetation types (alliances) grow within the defined Project area, as noted in the MND (Chapter 3, Section IV. Biological Resources). Nomenclature, descriptions, general ecology, and membership criteria noted below are from Sawyer et al. (2009). Additional background information on dune vegetation, non-native plants, and general dune ecology has been gleaned from Pickart and Sawyer (1998), or is based on personal observations of this plan's authors and California State Parks scientists.

Abronia latifolia – Ambrosia chamissonis Alliance (dune mat)
This alliance occupies coastal foredunes, or areas of active sand movement immediately inland from foredunes, associated with adjoining river mouths, sand bars or coastal spits. This vegetation is comprised of one to several low-growing, herbaceous (non-woody) perennial plant species; annuals or scattered woody plants may be present.

While *Abronia latifolia* (yellow sand-verbena) and *Ambrosia chamissonis* are common dominant species, many other herbaceous species grow in the Preserve's dune mat community, including *Artemisia pycnocephala* (dune sage), *Calystegia soldanella* (beach morning-glory), *Cakile maritima* (sea rocket), *Camissoniopsis cheiranthifolia* ssp. *cheiranthifolia* (beach evening-primrose), *Carpobrotus* spp. (iceplant), *Erigeron glaucus* (seaside daisy), *Eriogonum latifolium* (coast buckwheat), *Fragaria chiloensis* (beach strawberry), *Juncus breweri* (Brewer's rush), *Poa douglasii* (dune bluegrass), and *Pseudognaphalium stramineum* (cotton-batting plant). *Baccharis pilularis* var. *consanguinea* (coyote brush) and *Lupinus arboreus* (bush lupine – usually the blue-flowering form) are sporadically distributed among the herbs.

Non-native plants, especially *Ammophila arenaria* (European beachgrass) and *Carpobrotus* spp., directly compete with the native plant species characteristic of dune mat vegetation. These plants alter ecosystem geomorphology, hydrology, and chemical processes, in addition to displacing native plants. Removal of these especially invasive non-native plants, along with other weedy herbaceous annuals and perennials, is consistent with Preserve management goals and will provide opportunities for rehabilitation and reclamation of dune mat vegetation.

CSP estimates that dune mat covers about 54 acres within the Project area; this includes considerable areas of conspicuous cover by *Juncus breweri*, *Pseudognaphalium stramineum*, and *Equisetum hyemale* ssp. *affine*, among other native perennial herbs. A considerable area of dune mat vegetation is likely to be directly affected by Project activities, including temporary displacement of plants and substrate during clearance of sand from the road surface. As this vegetation type has amply demonstrated previously, in areas of *Ammophila* removal, and through the deterioration and elimination of sections of the road surface, rapid recovery of plant cover will likely result in an overall increase in dune mat cover within a few years of Project completion. The restoration of dune physical processes and removal of confounding or obstructive elements (road prism, European beachgrass) will augment the current recovery of this vegetation type. Regular monitoring will track progress towards the goal of increasing dune mat cover, and management measures to facilitate its fulfillment are specified in the Mitigation and Restoration Objectives section below.

Argentina egedii (= *Potentilla anserina* ssp. *pacifica*) Alliance (Pacific silverweed marshes)

This alliance occupies seasonally flooded, brackish marshes at intermediate tidal elevations, and is characterized by greater than 60% relative cover in the herbaceous layer of vegetation, or co-dominance at greater than 30% with other herbs (including *Eleocharis macrostachya* in this dune system). Other species noted from this alliance include numerous sedges and relatives from the Cyperaceae: *Carex, Bolboschoenus, Cyperus, Eleocharis, Isolepis, Schoenoplectus, Scirpus, et al*. spp., *Rumex* spp. (docks), *Juncus* spp. (rushes), and other wetland herbs. Willows, alders, wax myrtle, beach pine, and a few other hydric regime-tolerant woody plants may grow along the periphery of this alliance, where salinity levels of soil or water are within ranges of tolerance for those plants.

Potentilla anserina ssp. *pacifica* is a salt-tolerant, stoloniferous perennial, often forming an open ground cover among other, often taller, herbs. In the Project area, it occurs primarily within or adjacent to the Inglenook and Fen Creek channels, or in other seasonally inundated marshland. Primary ecological threats to this vegetation type, other than catastrophic alterations of topography or hydrology, include loss of habitat due to encroachment of non-native herbs, such as *Holcus lanatus* (purple velvet grass) and *Rubus armeniacus* (Armenian blackberry).

This alliance occupies less than 0.1 acre within the Project area. While impacts direct impacts are anticipated to be minimal, hydrological and geomorphological alterations stemming from road, culvert, and European beachgrass removals may shift the distribution and total cover of this alliance in the dune ecosystem. Allowances for monitoring and enhancing habitat for this alliance will be incorporated into mitigation measures, and restoration will incorporate provisions for augmenting stands of this vegetation type.

Carex obnupta Alliance (slough sedge swards)

Slough sedge swards grow in seasonally inundated swales in old deflation plains and sand dune complexes, in shallowly inundated freshwater to saline marshland adjoining seasonal streams or estuaries, along rivers, in roadside ditches, and numerous other wetland habitats; soil organic content is typically high. In this type, *Carex obnupta* accounts for greater than 50% relative cover in the herbaceous layer.

Common associates of slough sedge in the Preserve include other member species of the Cyperaceae, *Juncus* spp. (rushes), *Potentilla anserina* ssp. *pacifica* (Pacific silverweed), *Salix* spp. (willows), and *Morella californica* (wax myrtle). Non-native grasses (e.g., *Holcus lanatus*) and Armenian blackberry may encroach on stands of slough sedge.

In the Project area, this vegetation type covers less than 0.1 acre. Direct impacts on this type are likely to be minimal, and monitoring post-project will incorporate all such wetland stands in the Project area in order to evaluate appropriate response measures should these types suffer reductions in area following Project implementation.

<u>*Garrya elliptica* Provisional Shrubland Alliance</u> (coastal silk tassel scrub)
This provisional alliance features dominant cover by Garrya elliptica, where it grows with other shrubs and emergent trees. Among these are *Baccharis pilularis* var. *consanguinea* (coyote brush), *Lonicera involucrata* (twinberry), *Ribes menziesii* (Menzies's gooseberry), *Ribes sanguineum* var. *glutinosum* (pink-flowering currant), *Rubus ursinus* (California blackberry), *Rubus parviflorus* (thimbleberry), *Gaultheria shallon* (salal), and *Sambucus racemosa* var. *racemosa* (red elderberry. Emergent trees, such as *Umbellularia californica* (California bay) and *Pinus muricata* (bishop pine), may also grow in association with this alliance.

The alliance description cites coastal bluffs, headlands, and exposed slopes and gaps in forest as typical habitat for this alliance, in the Preserve it is mapped along the southern Preserve boundary, in a dune swale and on adjoining slopes, alongside a stand of European beachgrass proposed for removal. Along with adjacent stands of forest and scrub, this alliance provides a stabilizing influence on potential sand movement in this area.

While European beachgrass encroachment or removal activities pose little threat to this vegetation, non-native trees and shrubs (notably, Armenian blackberry), also grow in habitats that would otherwise support silk tassel shrubland.

About 0.6 acre of this alliance grows within the beachgrass removal area.

<u>*Leymus mollis* (= *Elymus mollis*) Herbaceous Alliance</u> (sea lyme grass patches)
This alliance is characteristic of seaward edges of active foredunes, especially in areas devoid of other plants, where *Elymus* thrives on active sand accretion delivered by wind or water. Here, *Elymus* is commonly associated with dune mat species, including *Abronia umbellata* ssp. *breviflora* (pink sand-verbena), and European beachgrass. Inclusion in this alliance requires greater than 50% relative cover of *Elymus mollis*; emergent woody plants are typically not present.

Encroachment by *Ammophila arenaria* poses the greatest non-native plant threat to this alliance (along with the dune mat alliance). Its capacity for rapid recovery of habitat once competing *Ammophila* is eliminated, as well as for providing some stability to otherwise highly mobile sand, is demonstrated well in the southern parts of the Preserve, where the human-effected demise of *Ammophila* has resulted in recovery by *Elymus* and dune mat vegetation. While *Elymus* provides, in typically small stands, some stability to active dune sand, it does not result in the vertical dune development typical of

Ammophila growth, and thus promotes a lower profile dune structure compatible with the habitat requirements of the federally endangered shorebird, the western snowy plover.

Sea lyme grass patches account for about 0.05 acre of vegetation in the Project area. Since no activities are scheduled for this immediate area, direct impacts will be negligible in effect, while the long-term prognosis for restoration of habitat supporting this alliance is a fundamental objective of dune rehabilitation in the Preserve.

Morella californica Shrubland Alliance (wax myrtle scrub)

Wax myrtle scrub grows in moist to wet soils, along brackish lagoon or marsh edges and freshwater streams, and in marshes and seasonally wet, low-lying depressions. The alliance is defined by greater than 50% relative cover of *Morella* in the shrub canopy layer of vegetation. In this vegetation type, *Morella* is associated with other wetland, forest, and scrub species, such as *Garry elliptica* (coast silk-tassel), *Rubus* spp. (blackberry, thimbleberry, salmonberry), *Holodiscus discolor* (ocean spray), *Toxicodendron diversilobum* (poison-oak), and *Ribes sanguineum* var. *glutinosum* (pink-flowering currant). Both *Pinus contorta* ssp. *contorta* (beach pine) and *P. muricata* (bishop pine) may be scattered within wax myrtle scrub habitat, along with *Alnus rubra* (red alder).

In the Preserve, *Morella*-dominated stands are scattered in seasonally moist, low-lying areas and along drainages and marsh edges. While adjacent *Ammophila* stands are unlikely to invade these relatively soggy areas, *Rubus armeniacus* (Armenian blackberry) constitutes a threat of some proportion to native plants in moist to wet habitats in the Preserve.

Just over 0.5 acre of this type coincides with proposed Project activities, with most of that area adjacent to beachgrass removal sites. Impacts will be negligible, as European beachgrass removal is very unlikely to damage shrubs. No shrubs will be removed during road and culvert removal, and the potential for significant impact to this alliance is very low.

Pinus muricata Forest Alliance (bishop pine forest)

Bishop pine forest is defined as a relatively open forest type, with greater than 15% cover by *Pinus muricata* in an evenly spaced tree canopy. The alliance grows along the California coast, including the Channel Islands, typically on drier uplands, rocky headlands, and sand dunes. Stands generally include other hardwood and coniferous trees, such as *Sequoia sempervirens* (coast redwood), *Abies grandis* (grand fir), *Pseudotsuga menziesii* (Douglas-fir), and *Notholithocarpus densiflorus* (tanoak). Common shrubs in this forest, of sparse to abundant cover, include *Vaccinium ovatum* (blue huckleberry), *Gaultheria shallon* (salal), *Morella californica* (wax myrtle), and *Lonicera hispidula* (hairy honeysuckle). Herbaceous cover may be sparse to dense. Periodic burning is an essential element in maintaining bishop forest vitality and regenerating senescent stands.

Bishop pine forest in the Preserve is limited to a few small stands, mostly in upland, eastward sites. One stand of about 0.01 acre lies within an area proposed for European beachgrass removal, and will not be affected by Project activities.

Salix hookeriana Alliance (Coastal dune willow thickets)
This alliance is comprised of stands with greater than 50% relative cover *by Salix hookeriana*. These stands grow along the northern California coast, in areas of seasonal soil saturation or inundation, such as deflation plains, along marsh and lagoon borders, and on alluvial plains near creek and river outlets. Common associates include *Salix sitchensis* (Sitka willow), *Salix lucida* ssp. *lasiandra* (shining willow), *Salix lasiolepis* (arroyo willow), *Morella californica* (wax myrtle), and *Rubus* spp. (blackberries, et al.). Smaller statured shrub and herbaceous cover in this type is typically very sparse. Like many willow species, Hooker (dune) willow regenerates rapidly following disturbances such as flooding, debris flows, and alluvial deposition of silt; its seeds germinate readily on bare, moist mineral soil, provided moisture levels are sufficient.

In the Preserve, dune willow thickets occur in low-lying areas of seasonal saturation or inundation, such as in some dune swales, and especially along Fen and Inglenook Creeks, and more so towards the outlets of those creeks. Some thickets are so dense that competing species cover is very low. Nevertheless, non-native plants successful in wet-soil habitats, especially *Rubus armeniacus*, compete for seed germination sites, and pose a limited threat to the dune willow alliance.

About 1.2 acres of Hooker willow habitat lies within the proposed Project area, notably along the creeks at the stream crossing culvert sites, as well as in a dune hollow at the north end of the haul road. Project activities will undoubtedly register minor impacts to these stands, such as removal of stems to allow equipment passage along the haul road. In light of the willow's clonal growth habit, and its propensity to recover rapidly from cutting or stem removals, no significant impacts to any of these stands are likely.

Hooker willow will likely comprise a primary element of restoration along creek channels and in other seasonally to permanently wet dune swales. Monitoring of this alliance is incorporated into this plan.

Salix sitchensis Provisional Shrubland Alliance (Sitka willow thickets)
This alliance is characterized by dominance by Sitka willow in the tall shrub or low tree canopy layer of vegetation. Other common species in this alliance include *Salix hookeriana* (dune or Hooker willow), *Salix lucida* ssp. lasiandra (shining willow), *Alnus rubra* (red alder), *Rubus* spp. (blackberries, thimbleberry, et al.), *Cornus sericea* ssp. *sericea* (red osier dogwood), *Lonicera involucrata* (twinberry), *Sambucus racemosa* var. *racemosa* (red elderberry), and other wetland shrubs. Along the northern California coast, habitat for this willow is similar to that for *S. hookeriana*: areas of seasonal saturation or inundation, such as tidally influenced marshes, and along streams, drainages, and the margins of marshes.

Sitka willow thickets occupy similar habitats as dune willow thickets in the Preserve, and they often intergrade or adjoin each other, such as along Fen and Inglenook Creeks. From personal observation (P. Warner), Sitka willow thickets tend to be somewhat less dense in stems per unit area, and may afford light and space for cover by lower-growing shrubs and herbs. As with other wetland types, Armenian blackberry represents a marginal threat to this alliance, in terms of compositional integrity and potential seed germination sites.

Sitka willow thickets extend into the Project area to cover about 2/3 an acre. As with Hooker willow, Sitka willow is adapted to various disturbance regimes, and recovers rapidly from cut stems and roots following surface disturbance or stem injuries. Little to no direct impact is anticipated on this alliance as a result of Project activities.

Scirpus microcarpus Herbaceous Alliance (small-fruited bulrush marsh)
This alliance grows in poorly aerated soils of marshes, riparian corridors, and roadside ditches; membership in this alliance is constituted by greater than 30% over by *Scirpus* in the herbaceous layer, including sites where shrubs provide less than 15% absolute cover. Other herbs known from this alliance include *Potentilla anserina* ssp. *pacifica* (Pacific silverweed), *Carex* spp. (sedges), *Schoenoplectus pungens* var. *longispicata* (threesquare bulrush), *Epilobium ciliatum* sspp. (hairy willow-herb), *Oenanthe sarmentosa* (water parsley), and *Rumex* spp. (docks).

Bulrush marsh vegetation occurs sporadically along Fen and Inglenook Creeks in the Preserve, generally in stands less than an acre in size. This type may also overlap considerably with the mapped *Schoenoplectus pungens* or *Carex obnupta* alliances, and often abuts and intergrades with the *Argentina egedii* (Pacific silverweed) Alliance, and with the *Salix* spp.-dominated alliances.

As mapped, only 0.01 acre of this alliance occurs in the Project area. Extant stands of this type may shift in extent or distribution as a result of long-term alterations in local hydrology. Along with other wetland types, this vegetation will be subject to long-term monitoring as a component of a general management goal to retain the full diversity and integrity of all native vegetation types in the Preserve.

Review of Potential Project Impacts on Rare Plants and Vegetation
Information on the potential impacts on rare plant individuals, populations, and habitat are discussed above for each species under "Ecological Scope – Rare Plants."

Impacts on Howell's spineflower and Menzies's wallflower are likely to extend across considerable portions of their habitat within the Project area; in both cases the habitat areas affected constitute relatively small proportions of their total Preserve populations and of their geographical distributions. Impacts have been assessed according to habitat areas affected in each case, since both plants are abundantly distributed inside the Project area, and population levels fluctuate over years. Accordingly, mitigation measures have been designed to extend habitat and improve existing habitat for both species at an estimated compensatory ratio of 8:1, habitat created, restored, or rehabilitated.to habitat affected.

For pink sand-verbena and Wolf's evening-primrose, Project-related impacts are likely to be less extensive in terms of individual plants lost or damaged, although not necessarily with regard to the proportion of their individual populations so affected. In each case, mitigation measures include counting individual plants damaged or destroyed during Project implementation, and introducing propagules (seeds or container-grown plants) to compensate for individual plant losses at a ratio of at least 4:1, plants introduced and established to plants lost or damaged.

In addition, for Wolf's evening-primrose and pink sand-verbena, as well as Point Reyes horkelia, project requirements provided in the MND specify in-Project measures designed to avoid or minimize impacts on individual plants.

Review of Project Requirements

This section briefly summarizes Project requirements that apply specifically to plant life or to plant habitats, as provided in the MND, Chapter 2, Section 2.7, items BIO–1a. through BIO–3b. Since these are necessary components of the Project, these requirements will not be specifically included as mitigation measures in this plan. They may be incorporated into the text in reference to other measures.

BIO–1a. This item provides for qualified, botanically experienced monitoring and surveys of the Project site and rare plant populations before (in 2012) and during its implementation, including flagging of plant populations to minimize direct impacts.

BIO–1b. This requirement specifies 1) sand movement and storage precautions to avoid rare plant populations and habitat (*i.e.*, sand storage exclusion zones), 2) flagging of *Horkelia* and *Oenothera* populations in or near the Project area, 3) methods of travel to remote Preserve sites for *Ammophila* removal work, and 4) seed collection, for the purpose of retaining genetic integrity in restoration efforts, from the Preserve only.

BIO–2a. This section provides for qualified monitoring and training of work personnel in the identification and means for avoidance or minimizing impacts on sensitive vegetation types, including on-site direction and flagging of sensitive habitat boundaries.

BIO–2b. This requirement specifies similar sand storage and avoidance of sensitive plant habitat information as in 1b.

BIO–3a. With regard to potential impairment of water quality, this item requires measures to avoid spills or other potential contamination of water bodies in the Project area.

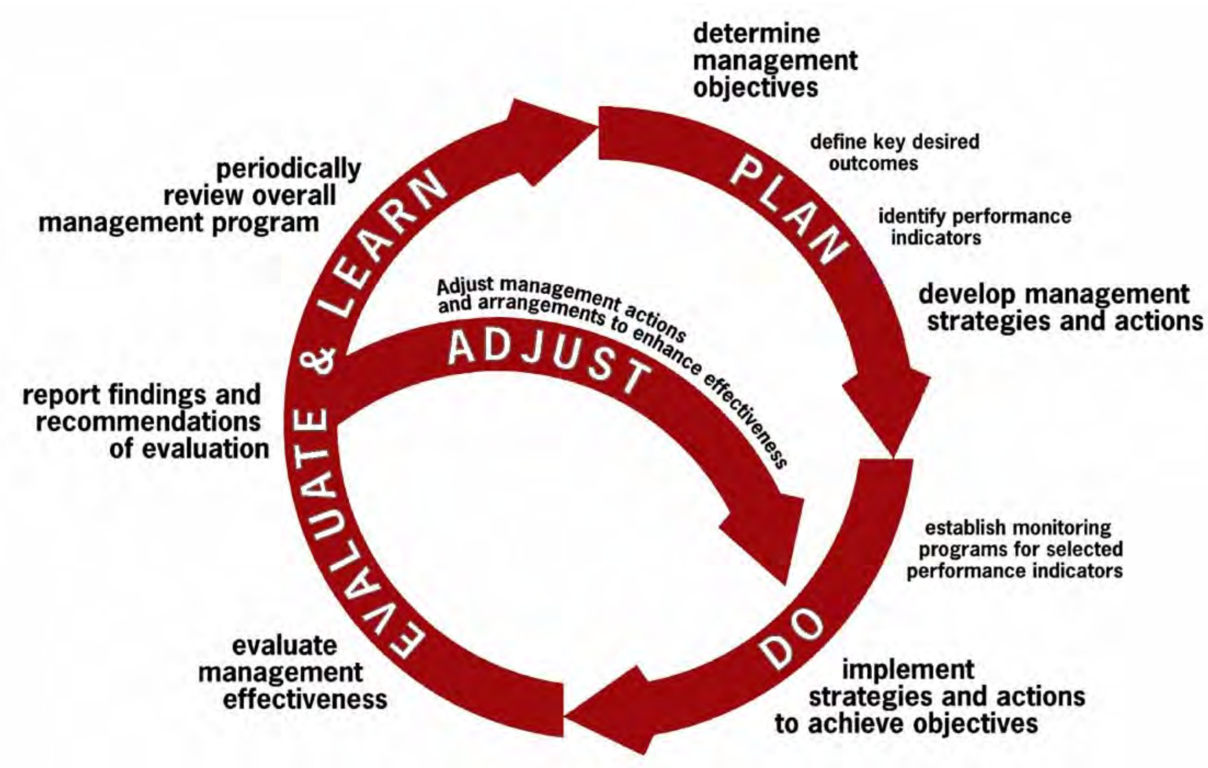
BIO–3b. This requirement specifies that fill around the culverts will be removed in its entirety from the stream channel, unless it's otherwise used to augment re-grading of those areas.

Mitigation and Restoration Program -- Process and Goals

The essential purpose of this mitigation and restoration plan is to provide the details for a programmatic approach aimed towards compensation for potential impacts incurred by the proposed road-, culvert-, and European beachgrass-removal project. The goals articulated below, once achieved, are intended to fulfill the legal mandate for providing compensation for project impacts. Moreover, for this particular project, these goals are formulated to be contiguous and consistent, in theory and in practice, with the original intentions for which the Preserve was dedicated by the State Parks and Recreation Commission. In that sense, this mitigation and restoration plan is designed to complement prior management directives for the Preserve as well as to fulfill the goals of the currently proposed project.

Application of the practical measures through which to achieve these goals will be accomplished according to accepted scientific practice (*i.e.*, observation, hypothesis formulation, study design and implementation, data compilation, analysis of results, re-formulation of hypotheses, etc.). We intend that an adaptive management model (Figure 1) will be applied throughout the pursuit of this mitigation and restoration program.

Figure 1. A diagram illustrating the components of the adaptive management process.



General Mitigation Plan Goals

The goals of this mitigation, monitoring, and restoration plan are as follows:

1. Rehabilitation and retention of the full suite of natural environmental and ecological processes in the Ten Mile Dunes ecosystem, with specific attention towards removal of human-fabricated and -imposed constraints on those processes, including:
    a. Removal of human infrastructural elements, and
    b. Removal of non-native species from the Preserve;
2. Provision for sustaining or restoring ecological conditions that have, through a history of natural selection, genetic dynamics, and other evolutionary processes, contributed to the diversity and integrity of rare and native plant, animal, fungal, and microorganismal individuals, populations, species, and communities;
3. Enhancement and retention of the quality and quantity of native vegetation types and native plant populations through strategically designed and implemented conservation measures.
4. Maintenance, improvement, and expansion of existing habitat for special status plants species.

Summary Goals for Rare Plants

The specific objectives developed in the next section have been partitioned among several strategic management approaches: Project Action Objectives, Compensation Measure Objectives, and Enhancement Measure Objectives. These collectively provide for the maintenance, introduction and establishment, or improvement of plant populations and habitats for the rare species potentially affected by direct Project impacts or Project-related alterations to existing habitat.

Summary goals for the four rare plant species considered at risk for direct Project-related impacts incorporate all the specific objectives formulated under the various strategic approaches. We expect that each management action will contribute to the overall success of the following summary goals:

1. Maintain, introduce and establish, and enhance the Preserve population of *Abronia umbellata* ssp. *breviflora* (pink sand-verbena) in suitable habitat, to achieve an increase of at least 400% greater than the number of individuals lost as a direct result of Project implementation.
2. Maintain, introduce and establish, and extend or improve existing habitat for *Chorizanthe howellii* (Howell's spineflower) in the Preserve to a total area equaling at least 800% of the habitat lost as a direct result of Project implementation.
3. Maintain, introduce and establish, and extend or improve existing habitat for *Erysimum menziesii* ssp. *menziesii* (Menzies's wallflower) to increase its habitat in the Preserve by at least 800% above the habitat area at potential risk for impacts as a result of Project implementation.
4. Maintain, introduce and establish, and extend or improve existing habitat for *Oenothera wolfii* (Wolf's evening-primrose) to increase by at least 400% the number of plants lost as a result of Project implementation.

Mitigation and Restoration Objectives

The proposed dune rehabilitation project (the Project) and this mitigation, monitoring, and restoration plan are unified in philosophy and in practice towards the common goal of restoring ecological function and structure to the Ten Mile Dunes ecosystem. To that end, the project itself is, in a sense, "self-mitigating," as it aspires to remove constraints on the natural, dynamic processes of the ecosystem in order to achieve management goals. In order to demonstrate the mitigating effects of the Project, the results of its proposed actions will be monitored within the same conceptual framework as are the measures appended to the Project, in this mitigation plan, to "compensate" for Project-related impacts. In total, all Project components (removals of road, culverts, European beachgrass) and attendant mitigation or compensation measures can be considered management actions, and the desired results of those actions called management objectives.

The primary elements in designing management objectives for this project can be summarized as follows (from Elzinga et al. 1998):

1. An <u>indicator species</u> or <u>habitat</u> identifying what entity will be monitored;
2. The specific <u>location</u> or <u>geographical area</u> of monitoring;
3. The <u>attribute</u> of the species or habitat that will be measured or otherwise quantified;
4. The nature of <u>action</u> for the attribute, *e.g.*, increase, maintain, decrease;
5. The <u>quantity</u> or <u>status of change</u> desired for the attribute (*e.g.*, number of individuals, area of habitat, density of individuals, *etc*.);
6. The <u>time period</u> during which monitoring and evaluation will take place.

Each management objective will be predicated upon a management action, and designed to evaluate the relative success or failure of that action towards goal achievement. Achievement of any single objective will not necessarily reflect success in achieving any one goal, however, fulfillment of the tenets of the adaptive management process provide for regular review of objective designs in order to maintain consistency with broader management goals.

In general, we propose monitoring to evaluate objectives formulated according to the following suites of management actions:

1. <u>Project Actions</u>: Removals of 1) road, 2) culverts, and 3) European beachgrass. Project-related objectives are designed to contribute to the achievement of the goals articulated in the previous section of this plan. Those goals are intended to be commensurate with overall Preserve management goals, which, in turn, provide the impetus for proposing and completing the Project. Since both Project actions and mitigation (compensation, enhancement) measures introduced in this plan are designed to achieve the same ecological and Preserve goals, we feel that incorporating the monitoring of the results of Project actions on native vegetation and rare plants, as provided below, is appropriate.

   In addition, based upon data compiled during Project area monitoring, the status of additional remedial measures implemented during or after Project completion to address impacts in Project-affected areas or habitats will also be subject to monitoring.

2. Compensation measures: these will be implemented to attempt replacement of individual plants lost or otherwise damaged (as numbers thereof) due to Project implementation, or to attempt replacement of habitat damaged or lost (as area units) during Project implementation. These measures will apply specifically to attempts to introduce and establish rare plant species into habitats where they do not currently grow.

3. Enhancement measures: these measures will apply to areas outside the Project area where rare plants or vegetation types of special concern currently grow. Monitoring will incorporate assessments of management actions such as removal of non-native plants, introduction of native plants or propagules, and increase in numbers or habitat (spatial area) of rare plant species already present within these areas.

4. Maintenance: Activities related to the retention of the quality and quantity of native vegetation, and to oversight of the general ecological quality of all Project, compensation, and enhancement areas, will be required to achieve management objectives. Essentially, these might collectively be considered adaptive responses. One such activity will likely be the augmentation of wetland vegetation through the planting of seeds, divisions, and cuttings in suitable habitats that are recovering slowly.

   Most such maintenance actions will be monitored qualitatively and responses standardized (such as pulling iceplant seedlings at random or from rare-plant introduction plots, or picking up trash from the Project area), unless they are related directly to broader actions implemented as Project, compensation, or enhancement measures, in which case quantitative monitoring and specific adaptive responses will be required.

Where appropriate and consistent with formulated objectives, existing CSP spatial and quantitative data will serve as "baselines" (*i.e.*, starting points) in relation to which the effects of implemented management actions will be measured. In some circumstances, pre-management (-mitigation) action plant inventories and monitoring will be necessary in order to establish qualitative or quantitative baselines. In other situations, direct counts of plants lost or damaged, or calculations of habitat damaged or destroyed, during Project implementation, will be required in order to fulfill management objectives.

The "Monitoring" section below summarizes our approach to the methods and protocols for data compilation associated with all Project-related vegetation and plant poulation monitoring.

1. Project Action Objectives
   A. Road removal

Objective 1 title: Native Vegetation Cover – Road Removal Corridor

- Indicator: all native plant-dominated vegetation types (alliances)
- Location/Area: haul road removal project corridor: MND Appendix A.1 Dune Rehabilitation Project Overview Map
- Attribute: cover by all native plant-dominated vegetation types (alliances as identified in Sawyer et al. 2009, or other types as described and quantified through application of CNPS vegetation sampling protocols)
- Action: increase
- Quantity: 50%
- Time period: by December 31, 2015

Objective 1 summary: By December 31, 2015, the total cover, in acres, of native plant dominated vegetation types within the haul road removal portion of the Project area, currently estimated at __ acres, shall increase by at least 50%, or at least 1.5 times the area currently occupied by native plant vegetation types.

Objective 2 title: Non-native Plant Cover – Road Removal Corridor

- Indicator: all species of vascular plants not native to the Ten Mile Dunes ecosystem
- Location/Area: a total area of not less than 1% of the haul road removal project corridor, constituted by a minimum of 20 randomly located plots within the original project area
- Attribute: Absolute cover (%)
- Action: maintain
- Quantity: less than 1%
- Time period: by December 31, 2013; bi-annually thereafter

Objective 2 summary: By December 31, 2013, the absolute cover by all non-native plant species within the original boundaries of the haul road removal portion of the Project shall be maintained at or less than 1% absolute cover, as measured on randomly located plots constituting at least 1% of the original road removal project area; this quantity shall be maintained indefinitely, as measured at 2-year intervals.

Objective 3 title: Maintenance of *Chorizanthe howellii* population

- Indicator: *Chorizanthe howelli*
- Location/Area: haul road removal project corridor
- Attribute: Habitat Area (to nearest square meter)
- Action: Maintain
- Quantity: At least 50% of the mean mapped *Chorizanthe* habitat area for years 2001, 2011, and 2012
- Time period: by June 30, 2014

Objective 3 summary: The habitat area of *Chorizanthe howellii*, defined by a density of least 1 plant per square meter, shall be maintained at no less than

50% of the mean habitat areas mapped in years 2001, 2011, and 2012, as of June 30, 2014.

Objective 4 title: Maintenance of *Erysimum menziesii* population

- Indicator: *Erysimum menziesii* ssp. *menziesii*
- Location/Area: haul road removal Project corridor
- Attribute: area of occupied habitat (defined as a mean density of >1 plant/ m^2)
- Action: Maintain
- Quantity: *Erysimum*-occupied habitat within the road removal corridor (Project area) in 2011
- Time period: by June 30, 2014

Objective 4 summary: As of June 30, 2014, the occupied habitat area of *Erysimum menziesii* (as defined above) within the road removal corridor shall be maintained at 100% of the occupied area as mapped in 2011.

B. Culvert Removal

Objective 5 title: Native Vegetation Cover – Culvert Removal Sites
Site 3a: Fen Creek culvert
Site 3b: Inglenook Creek culvert

- Indicator: all native plant-dominated vegetation types (alliances)
- Location/Area: within a 20-meter radius of a point centered on the mid-point along the length of the culvert
- Attribute: cover by all native plant-dominated vegetation types (alliances as identified in Sawyer et al. 2009, or other types as described and quantified through application of CNPS vegetation sampling protocols)
- Action: increase
- Quantity: 50%
- Time period: by December 31, 2015

Objective 5 summary: By December 31, 2015, the total absolute cover, in square meters, of native plant-dominated vegetation types within a 20-meter radius of each (sites 3a, 3b) culvert removal area (as defined under Location/Area above), shall increase by at least 50%, or at least 1.5 times the area currently occupied in this area by native plant vegetation types.

Objective 6 title: Non-native Plant Cover – Culvert Removal Sites
Site 4a: Fen Creek culvert
Site 4b: Inglenook Creek culvert

- Indicator: all species of vascular plants not native to the Ten Mile Dunes ecosystem
- Location/Area: within a 20-meter radius of a point centered on the mid-point along the length of the culvert
- Attribute: Absolute cover (%)
- Action: maintain
- Quantity: less than 1%

- Time period: by December 31, 2013; bi-annually thereafter

Objective 6 summary: By December 31, 2013, the absolute cover by all non-native plant species within a 20-meter radius of a point centered on the mid-point along the length of the culvert shall be maintained at or less than 1% of the total area within the 20-meter radius; this quantity shall be maintained indefinitely, as measured at 2-year intervals.

C. European Beachgrass Removal

Objective 7 title: European Beachgrass Alliance Area – Preserve-wide

Indicator vegetation: *Ammophila arenaria* Alliance (as defined in Sawyer et al. 2009) inclusive of all stands covering 10 square meters or more

Location/Area: Entire Inglenook Fen – Ten Mile Dunes Preserve

Attribute: Area (acres or hectares)

Action: Reduce

Quantity: 75%

Time Period: by December 31, 2015

Objective 7 summary: By December 31, 2015, the total area of *Ammophila arenaria*, defined as stands of at least 10 square meters in area with at least 80% relative cover by *Ammophila*, Preserve-wide, shall be reduced to an area covering not more than 25% of the current (as mapped: July 2012) beachgrass alliance area.

Objective 8 title: Rehabilitation of Native Vegetation – European Beachgrass Removal Areas

Indicator vegetation: any native-plant dominated vegetation alliance, or other native plant-dominated cover type as described and quantified through application of CNPS vegetation sampling protocols

Location/Area: Current (as mapped: July 2012) European beachgrass-dominated area, Preserve-wide

Attribute: Area (acres or hectares) of native vegetation cover

Action: establish and maintain

Quantity: 50% of currently mapped *Ammophila arenaria* Alliance area

Time Period: by December 31, 2015

Objective 8 summary: By December 31, 2015, at least one-half of the area currently mapped in the Preserve and classified as *Ammophila arenaria* Alliance shall become established and maintained as native plant-dominated alliances, *e.g.*, as in Sawyer et al. 2009, or as identified and described through application of the CNPS vegetation sampling protocols.

2. Compensation Measure Objectives

These objectives are specifically proposed to compensate, in part, for potential Project-related impacts on rare plant species and habitats, through the introduction of propagules (primarily seeds) or plants to novel (currently unoccupied and potential) habitat as a means to establish viable, reproducing sub-populations therein. Any natural recruitment into selected compensation areas during the monitoring period will be incorporated into data compilation.

Because road, culvert, and European beachgrass removal will take place primarily north of Fen Creek in the Preserve, Project-related impacts on rare plants and habitats are much more likely in the northern half of the Preserve. We will strive to apportion compensation and enhancement actions commensurately, if possible, although we intend to diversify compensation and enhancement measures throughout and immediately south of the Preserve in order to provide some buffer for unforeseen environmental events or impacts that could confound the implementation or results of those measures.

A. <u>Introduction and Establishment of *Chorizanthe howelli*</u>

Objective 9 title: Introduction and Establishment of Howell's Spineflower
Indicator: *Chorizanthe howellii*
Location/Area: Preserve-wide
Attribute: Occupied novel habitat (defined as a mean density of at least 1 plant/m^2 in areas not occupied in 2012)
Action: Establish
Quantity: 400% (estimated to be 4 acres)
Time Period: by June 30, 2017
Objective 9 summary: By June 30, 2017, Howell's spineflower will be established in novel habitat (as defined under Attribute) covering an area at least 4 times the amount of habitat lost as a direct result of Project-related impacts (estimated at 1.0 acres, as mapped in 2011).

B. <u>Introduction and Establishment of *Erysimum menziesii* ssp. *menziesii*</u>

Objective 10 title: Introduction and Establishment of Menzies's Wallflower
Indicator: *Erysimum menziesii* ssp. *menziesii*
Location/Area: Preserve-wide
Attribute: Occupied novel habitat (defined as a mean density of at least 1 plant/m^2 in areas not occupied in 2012)
Action: Establish
Quantity: 200% (estimated to be 0.5 acres)
Time Period: by June 30, 2017
Objective 10 summary: By June 30, 2017, Menzies's wallflower will be established in novel habitata (as defined under Attribute) to cover an area at least 2 times the area of wallflower habitat affected as a result of Project-related activities (estimated at 0.23 acres, as mapped in 2011).

C. <u>Introduction and Establishment of *Abronia umbellata* ssp. *breviflora*</u>

Objective 11 title: Introduction and Establishment of Pink Sand-Verbena
Indicator: *Abronia umbellata* ssp. *breviflora*
Location/Area: Preserve-wide
Attribute: number of individual plants
Action: increase
Quantity: 400%
Time Period: by August 31, 2017

Objective 11 summary: No later than August 31, 2017, at least 4 times the number of pink sand-verbena plants lost or damaged as a result of Project implementation will be introduced and established in suitable habitat in the Preserve.

D. <u>Introduction and Establishment of *Oenothera wolfii*</u>

Objective 12 title: Introductino and Establishment of Wolf's Evening-Primrose
Indicator: *Oenothera wolfii*
Location/Area: Preserve-wide
Attribute: number of individual plants
Action: increase
Quantity: 400%
Time Period: by August 31, 2017
Objective 12 summary: No later than August 31, 2017, at least 4 times the number of Wolf's evening-primrose plants losts or damaged as a result of Project activities will be introduced and established within suitable habitat in the Preserve.

3. <u>Enhancement Measure Objectives</u>

These objectives propose to enhance or extend existing habitat for rare plant species that may be negatively affected by Project activities.

<u>Extension of Habitat Objectives</u>

These objectives are based on management actions that may include 1) removal of non-native plants adjacent to habitat currently occupied by the plant species of concern, or 2) as a response measure for a failed objective, introduction of propagules or individual plants into unoccupied areas adjacent to existing, occupied habitat. Please note that the objectives below, as applied to management actions and monitoring for *Chorizanthe* and *Erysimum*, may be applied, in part, to suitable habitat areas outside and immediately south of the Preserve in MacKerricher State Park, not to extend south of the Lake Cleone – Laguna Point area.

A. Extension of Habitat: *Chorizanthe howellii*

Objective 13 title: Extension of Existing Howell's Spineflower Habitat
Indicator: *Chorizanthe howellii*
Location/Area: Entire Preserve and appropriate sites in northern MacKerricher State Park
Attribute: area of occupied habitat (defined as a mean density of at least 1 plant/ m^2)
Action: Increase (extend)
Quantity: 200%
Time Period: by June 30, 2017
Objective 13 summary: As of June 30, 2017, existing Howell's spineflower habitat (as defined above under Attribute) shall be extended, Preserve-wide, to incorporate adjacent, new habitat (also as defined above), into an

area totaling at least twice the habitat area projected to sustain direct Project impacts during its implementation (estimated at 1.0 acres, as mapped in 2011).

B. Extension of Habitat: *Erysimum menziesii* ssp. *menziesii*
Objective 14 title: Extension of Existing Menzies's Wallflower Habitat
Indicator: *Erysimum menziesii* ssp. *menziesii*
Location/Area: Entire Preserve and appropriate sites in northern MacKerricher State Park
Attribute: area of occupied habitat (defined as a mean density of at least 1 plant/ m^2)
Action: Increase
Quantity: 400%
Time Period: by June 30, 2017
Objective 14 summary: No later than June 30, 2017, existing habitat for Menzies's wallflower (as defined above) shall be extended into adjacent, currently unoccupied habitat that will cover an area at least 4 times the wallflower habitat area expected to sustain Project-related impacts (estimated at 0.23 acres, as mapped in 2011).

<u>Improvement of Habitat Objectives</u>
The primary management action implemented for these objectives will likely be removal of non-native plants, specifically on plots established to evaluate results, or in general, within rare plant habitats, and otherwise at large to promote increases in cover by native plants.

A. Improvement of Habitat: *Chorizanthe howellii*
Objective 15 title: Enhancement of Existing Howell's Spineflower Habitat
Indicator: *Chorizanthe howellii*
Location/Area: on plots covering a minimum of 2.5 acres (an area corresponding to 200% of existing spineflower habitat in the Project area) established in existing (2012) spineflower habitat across the entire Preserve and northern MacKerricher State Park
Attribute: mean density of plants across all plots
Action: increase
Quantity: 200%
Time Period: by June 30, 2017
Objective 15 summary: No later than June 30, 2017, the mean density of Howell's spineflower plants, measured on plots that collectively incorporate at least 2.5 acres of established spineflower habitat, shall be at least twice the density estimated on those plots immediately prior to the start of the management action.

B. Improvement of Habitat: *Erysimum menziesii* ssp. *menziesii*
Objective 16 title: Enhancement of Existing Menzies's Wallflower Habitat
Indicator: *Erysimum menziesii* ssp. *menziesii*

Location/Area: on plots covering a minimum of 0.5 acres (an area corresponding to about 200% of existing wallflower habitat in the Project area) established in existing (2012) wallflower habitat across the entire Preserve and northern MacKerricher State Park
Attribute: mean density of plants across all plots
Action: increase
Quantity: 200%
Time Period: by June 30, 2017
Objective 16 summary: No later than June 30, 2017, the mean density of Menzies's wallflower plants, measured on plots that collectively incorporate at least 0.5 acres of established wallflower habitat, shall be at least twice the density estimated on those plots immediately prior to the start of the management action.

C. Improvement of Habitat: *Abronia umbellata* ssp. *breviflora*
Objective 17 title: Habitat Improvement for Pink Sand-Verbena
Indicator: Non-native plant species (all)
Location/Area: within 10 m of all pink sand-verbena plants or 25 patches of plants, whichever is less (patches must be at least 20 m apart)
Attribute: cover
Action: maintain
Quantity: less than 1%
Time Period: by 31 August 2014 (bi-annually thereafter)
Objective 17 summary: Cover of non-native plants within 10 meters of pink sand-verbena plants or patches (as specified above in Location/Area) shall be maintained at less than 1% absolute cover.

D. Improvement of Habitat: *Oenothera wolfii*
Objective 18 title: Habitat Improvement for Wolf's Evening-Primrose
Indicator: Non-native plant species (all)
Location/Area: within 10 m of all evening-primrose plants or 25 patches of plants, whichever is less (patches must be at least 20 m apart)
Attribute: cover
Action: maintain
Quantity: less than 1%
Time Period: by 31 August 2014 (bi-annually thereafter)
Objective 18 summary: Cover of non-native plants within 10 meters of Wolf's evening-primrose plants or patches (as specified above in Location/Area) shall be maintained at less than 1% absolute cover.

4. <u>Maintenance Objectives</u>
Objective 19 title: General Maintenance of All Management Areas
Indicator: Non-native plant species (all) and abiotic debris
Location/Area: in all Project areas (other than beachgrass removal areas) subject to management actions associated with the objectives specified in this plan

Attribute: cover
Action: maintain
Quantity: less than 1%
Time Period: by 31 August 2014 (bi-annually thereafter)
Objective 19 summary: Cover of non-native plants in 1) Project areas (other than designated beachgrass removal areas), 2) compensation and habitat extension or improvement sites, and 3) all other sites designated through implementation of this plan, shall be maintained at less than 1% absolute cover.

Objective 19 title: General Maintenance of Stream Corridors
Objective 19A site: Fen Creek
Objective 19B site: Inglenook Creek
Indicator: Non-native plant species (all) and abiotic debris
Location/Area: Within 50 meters, upstream and downstream from either end of the existing culvert placements, and along adjoining streambanks or slopes within 5 meters of the channel bottom
Attribute: cover
Action: maintain
Quantity: less than 1%
Time Period: by December 31, 2014 (annually thereafter)
Objective 19 summary: Cover of non-native plants within 50 meters of current culvert placements, and within 5 meters of the stream channel bottoms of Fen and Inglenook Creeks, shall be maintained at less than 1% by December 31, 2014, and annually thereafter.

Objective 20 title: Rehabilitation of Vegetation Along Stream Corridors
Objective 19A site: Fen Creek
Objective 19B site: Inglenook Creek
Indicator: Plant species native to the stream channel
Location/Area: Within 50 meters, upstream and downstream from either end of the existing culvert placements, and along adjoining streambanks or slopes within 5 meters of the channel bottom
Attribute: cover
Action: increase or maintain
Quantity: at least 75%
Time Period: by June 30, 2015 (annually thereafter)
Objective 20 summary: Cover of native plants within 50 meters of current culvert placements, and within 5 meters of the stream channel bottoms of Fen and Inglenook Creeks, shall be increased to or maintained at no less than 75% cover by June 30, 2015, and maintained annually thereafter.

<u>Additional remedial measures</u>

1. Additional collection of native seeds, divisions, or other propagules from within the Preserve, in order to re-populate habitat or to increase the cover of native plant-dominated vegetation types, may be implemented at any time. Appropriate planning,

design, articulation of objectives, monitoring and data compilation, maintenance, etc. for all such measures shall be formulated prior to their initiation.

2. Removal on non-native plants within the Preserve, in order to improve habitat for native plants and animals, may be implemented at any time. Regular or sustained non-native plant removals in any specified area, or implemented in order to achieve a management objective, will include appropriate applications of the adaptive management process. In all cases, some manner of data compilation is recommended.

Adaptive Response Strategies

None of the objectives listed above include specifically designated responses to potential failures of objectives. Nevertheless, all objectives, as implemented within an adaptive management framework, implicitly include allowances for the development of appropriately designed, situated, and implemented response measures, according to the specific nature of the shortfalls and observed or hypothesized impediments to success.

Any of several, broad approaches may be pursued in response to failed management objectives. Augmentation of previously implemented measures may be appropriate, such as by sowing more seeds into rare plant introduction sites if habitat areas or population levels indicate some positive response to the original management actions, or by removing non-native species more (or less) frequently. Re-location of management action sites, spatially or ecologically, will be appropriate in many cases of complete or partial failure to achieve objectives. Alterations of management action methods may improve results, for example, as in the amount of organic litter removed from the mineral substrate surface in plots established for rare plant habitat enhancement. Under some circumstances, continuing prescribed management actions for longer periods of time than originally specified may be appropriate in order to achieve objectives. Deliberate consideration of responses, based upon reviews of essential monitoring data and their subsequent analyses, with review by as many knowledgeable observers as possible, will improve the chances that management responses are not implemented haphazardly.

Plan Implementation

Propagule Collection

All plant propagules – seeds, cuttings, divisions – shall be from native plants growing within the Preserve. Other than for rare plant individuals growing in the Project area, collections of seeds will be limited to no more than 20% from any single plant or from any sub-population. For plants growing in the Project area, up to 50% of available seeds for any single species may be collected.

Cuttings or divisions of living native plant material are to be made immediately prior to planting, and these activities should be closely coordinated to avoid inefficiency and loss of propagules to dessication or rot. Wherever possible, plans to introduce or augment native vegetation should promote collecting propagules in the immediate area.

Other seed and propagule collection guidelines are provided in the appended "Seed Collection Protocols." All propagule collections shall include compiling the following data: species collected, location, date, number of plants/cuttings/divisions, and disposition (hence, closely tied to data compiled for planting those propagules).

If possible, seed collection will include developing estimates, for each species, of average seed weights (#seeds/unit weight), in order to estimate harvest rates (labor estimates) and to calibrate seed dispersal rates in restoration sites.

Monitoring

Monitoring, or tracking changes or conditions over time, will be conducted extensively during implementation of this mitigation plan. The following general types of monitoring are critical for achieving Project and other management objective success:

- Inventory – a complete inventory of all plants and vegetation types within the Project area shall be a continual process throughout planning, implementation, and post-Project mitigation, compensation, enhancement, maintenance and other Project phases;
- Baseline – Associated with some objectives, a baseline quantity or condition may be critical for evaluating relative success of Project actions, mitigation measures, and so on. Baseline data may include mapping and spatial area computations for habitat types or rare plant distributions, or direct counts of the numbers of plants in a Project impact area or proposed mitigation site. All Project activities and post-Project management actions are to be preceded by some type of baseline inventory or monitoring.
- In-Project – This type of monitoring includes overseeing, advising, consulting, and otherwise managing activities and personnel associated with Project implementation, in order to avoid sensitive natural or cultural resources, to reduce potential impacts to resources, or to conform to specific elements of the Project design, notably project requirements as stated in the MND. In-project monitoring may also compiling quantitative data, such as counts of the number of rare plant individuals lost, by keeping a daily tally of such events.
- Objectives – Monitoring of objectives should be coordinated with baseline monitoring, since success criteria for objectives are generally formulated as a comparison with an original quantity or condition. Under the objectives developed for this plan, the parameters to be measured or assessed during monitoring, methods, schedules, and other details can generally be inferred from the elements of each objective.
- Spatial Documentation – All management sites, in the Project Area and in mitigation areas, will be spatially referenced by Universal Transverse Mercator System coordinates. This documentation will be a standard data field for all Project and mitigation activities, as well as a complement of all photographic documentation.
- Photographic Documentation – All management activities and sites will be documented photographically, in the Project area and in all mitigation areas. A systematic approach to positioning of photography points, scheduling, and other details will be developed in collaboration with CSP staff.

We will work closely with CSP personnel and other interested parties towards the development of customized protocols, monitoring methods and schedules, data forms, and data analysis methods for all monitoring needs associated with the Project and the listed mitigation measures. Tasks related to developing data infrastructure and personnel needs will be incorporated into the selection of mitigation sites and the implementation of management actions pertinent to each objective.

All data compiled on-site will be replicated and stored digitally within 3 days on computers or other digital storage media designated for this purpose by CSP personnel. Field notes, photographs, maps, drawings or other data shall be reproduced digitally, if possible, and archived with other Project records and information.

<u>Mitigation Site Selection</u>
In selecting potential mitigation sites, several factors will be taken into consideration. Geographically, most of the Project area is located north of Fen Creek, and objectives have been formulated specifically with the intention to implement mitigation measures to the extent practical in this area. Mitigation sites could include the Project area itself, however, most compensation and enhancement mitigation objectives, as designed, must be located outside that area in order to avoid the potential for confounding effects, such as substantial alterations of dune morphology and of ecosystem surface hydrology, and ongoing European beachgrass removals. The opportunities for establishing mitigation sites within the Project area, including as response alternatives to sites selected earlier, may increase over time, prompted by monitoring results or observations of appropriate environmental conditions, or by the successful recovery of extant rare plant populations and habitats.

Ecological considerations, including the distributions of the rare plant populations in the Preserve and the environmental conditions conducive to their growth and reproductive success, must be incorporated into site selections. Our selection of novel sites into which to introduce rare plant seeds must be reasonable with regard to each species' known ecological tolerances and ranges. Objectives specifying habitat enhancement for rare plants are predicated upon the spatial coincidence of non-native plants that potentially compete with rare plants for resources, so proximity to, or co-occurrence of rare plants with non-native plants will be an essential condition in the selection of some mitigation sites. To optimize the potential for natural seed dispersal and germination of soil-banked seeds, we will prioritize the selection of sites within or immediately adjacent to existing rare plant populations. Augmenting natural seed dispersal or seed-bank activation with additions of harvested seeds is an option to consider for enhancement mitigation sites, although we intend to prioritize the dispersal of harvested seeds into truly novel habitats for *Chorizanthe* and *Erysimum*.

The following constitutes an incomplete, and provisionally prioritized, list of geographical areas, habitat types, and other vegetation types to consider in the selection of sites for compensation and enhancement measures specified for *Chorizanthe* and *Erysimum* (* asterisks denote sites of high to moderate priority for site selection purposes):

- North of Fen Creek*
    - Outside Project Area*
        - Dune mat vegetation*
        - Low vegetation-cover, somewhat stable dune slopes and swales*
        - Substantial stands of non-native plant cover (> $10m^2$)
            - Iceplant*
            - Annual grasses and herbs*
            - Perennial grasses (low priority due to need for sustained, intensive management activies)
    - Inside Project Area
        - On retained road base lacking rare plants
        - Non-native plant (except *Ammophila*) removal sites
        - *Ammophila* removal areas where dune mat has been or becomes established (more likely as secondary or adaptive response mitigation sites)
- South of Fen Creek, inside Preserve boundaries
    - Outside Project Area*
        - Dune mat vegetation with low non-native plant cover*
        - Low-cover, somewhat stable dune slopes and swales*
        - Substantial stands of non-native plant cover (> $10m^2$)*
            - Iceplant*
            - Annual grasses and herbs*
            - Perennial grasses*
    - Inside Project Area
        - On retained road base lacking rare plants
        - Non-native plant (except *Ammophila*) removal sites
        - *Ammophila* removal areas where dune mat has been or becomes established
- South of the Preserve, in MacKerricher State Park north of Lake Cleone
        - Substantial stands of non-native plant cover (> $10m^2$)*
            - Iceplant*
            - Annual grasses and other herbs*
            - Perennial grasses*

The selection of compensation and enhancement mitigation sites will be completed by October 1, 2012. Potential mitigation site information will be compiled as follows: existing site conditions (substrate type and characteristics, vegetation, hydrology, non-native plant cover) and by management objectives, and will include geospatial data and estimates of area available at each location. Where possible, smaller plots nested within broader potential compensation areas designated for monitoring and data compilation will be defined in the field and geospatially referenced. A map will be prepared to display the array of mitigation sites selected and provisional locations of nested plots.

<u>Preparatory Management Activities and Treatments</u>
Management actions necessary to prepare sites for compensation, enhancement, or maintenance-related actions will primarily involve removal of non-native plant species.

This generic management action will also apply to other areas of existing or potential rare plant habitat, and to all sites selected for post-Project establishment of native vegetation. Baseline and objective monitoring must accompany all such preparations and treatments.

The following preparatory management actions and site treatments may be incorporated formally, as experimental treatments for rare plant introductions or habitat enhancement, or more generally to improve the quality of native plant habitat:

1. Removal of any non-native plant species, with special attention to
    - *Carpobrotus* spp. (iceplant)
    - annual grasses
    - perennial grasses
    - *Eucalyptus globulus* (Tasmanian bluegum)
    - *Rubus armeniacus* Armenian blackberry)
    - *Cytisus scoparius* (Scotch broom)
    - Brassicaceae taxa (e.g, *Raphanus*, *Brassica*, *Hirschfeldia*, *Cakile*)
    - Any taxon designated as a high-priority ecological concern;
2. Removal of organic litter, especially excessive volumes that characterize some non-native plant stands;
3. Incorporation of litter into mineral substrates;
4. Establishment and maintenance of reference points and boundaries and field markers for areas subject to compensation, enhancement, and maintenance-related measures and objectives;
5. Removal of human-generate trash or debris.

Methods for Propagule Introductions

Specific methods and techniques for promoting seed germination, preparing seedbeds, and dispersing and incorporating seeds into substrates, and for other methods pertinent to propagule collections and introductions into planting sites, have not been fully developed. We will compile information on this topic over the next several months, and specific methods for each species, or for suites of species, will be appended to this plan.

Maintenance

All mitigation areas and sites will be maintained in order to optimize the chances for achievement of objectives. Maintenance tasks will include those noted above under "Preparatory Management Activities and Treatments" and others considered important towards fulfilling objectives. Maintenance activities must not, however, interfere with site objectives, so actions like removing non-native plants in active mitigation sites must be conducted with care in order to avoid significant impacts to rare and other native plants.

Project Management and Personnel

The primary contact person for implementation of this mitigation plan and management of Project-related monitoring, through April 30, 2014, will be Peter Warner, consulting botanist and plant ecologist. Warner reserves the right to sub-contract any component of his contracted responsibilities (through agreement for services with the Mendocino

County Resource Conservation District, and subject to approval by California State Parks) to other qualified biologists. His contact information is provided below.

Warner will coordinate all monitoring and mitigation implementation activities with Renee Pasquinelli, Senior Environmental Scientist, California State Parks, Mendocino District, in order to address labor and other personnel allocation needs and responsibilities associated with implementation of this mitigation plan, through April 30, 2014.

Proposed Schedule

A complete schedule for the implementation of this plan has not been completed. Preparatory activities, including propagule collections and pre-Project monitoring, have started as of July 1, 2012. Upon completion of this plan, we will assemble a provisional schedule in coordination with CSP.

Provisionally identified milestones and due dates are as follows:

- Baseline inventory and monitoring in Project area completed: Aug. 31, 2012
- In-project monitoring for project requirements: as of Project start
- Completion of Years 1 and 2 mitigation plan implementation budget: Oct. 1, 2012
- Mitigation site selections: October 1, 2012
- Development of customized protocols for the monitoring of mitigation measure objectives: initial versions by November 1, 2012
- Completion of standardized photographic monitoring protocols: Nov. 1, 2012
- Establishment of monitoring areas, sites, and plots for compensation and enhancement mitigation measures: November 1, 2012
- Initiation of mitigation site preparatory treatments: no later than November 1, 2012
- Development of guidelines for propagule treatments, seedbed preparations, and dispersal methods and techniques: November 15, 2012
- Introduction of *Chorizanthe* and *Erysimum* seeds into compensation sites: Dec. 1 or upon a minimum of 5 inches of precipitation recorded in Fort Bragg after October 1, 2012, whichever is later.

Mitigation Budget

Table 1 (below) provides an estimate of current and anticipated expenditures, through March 2014, for professional consulting and management services related to the development and implementation of this mitigation plan. Table 2 provides estimated expenditures, through December 2013, for California State Parks natural resources and other staff support for implementing the mitigation plan. The consulting service providers will prepare budget revisions, in coordination with CSP staff within 2 weeks of the end of each quarter-year.

Table 1: Professional consulting and management services: mitigation planning and implementation budget (time periods in 3-month increments).

	Budget by Year-Quarter ($US)								
Task/	**2012-02**	**2012-03**	**2012-04**	**2013-01**	**2013-02**	**2013-03**	**2013-04**	**2014-01**	**Total**

Item									
Labor	5000	5000	3000	1000	3000	1500	500	500	19,500
Material	50	50	100	50	50	50	100	50	500
Travel	500	1000	500	500	1000	1000	300	260	5,060
Total – All Items	5,550	6,050	3,600	1,550	3,150	2,550	900	810	25, 560

Table 2: California State Parks, Mendocino District: Cost estimate for District natural resources staff associated with mitigation and monitoring plan implementation

	Budget by Year-Quarter ($US)								
Task/ Item	**2012-02**	**2012-03**	**2012-04**	**2013-01**	**2013-02**	**2013-03**	**2013-04**	**2014-01**	**Total**
Labor	2000	10,000	5000	3000	3000	2000	2000	1000	28,000
Material	100	500	300	100	200	100	100	100	1,500
Travel	100	200	200	200	200	200	100	100	1,300
Total – All Items	2,200	10, 700	5,500	3,300	3,500	2,300	2200	1200	30, 800

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Plan Preparation by:

- *Peter J. Warner*, Consulting Botanist and Plant Ecologist, Santa Rosa, CA
- *Teresa A. Sholars*, Professor of Biology and Botanical Consultant, Mendocino, CA
- *Dr. Peter Baye*, Coastal Ecologist and Consultant, Annapolis, CA

Contact:

Peter J. Warner
phytopagan@sonic.net
(707) 978-3155

Seed Collection Protocols
for Ten Mile Dunes Rehabilitation Project
Appendix to
A Mitigation, Monitoring, and Restoration Plan for Vegetation and Rare Plants

General Guidelines

1. For each plant species, for each day, initially write the following information in a collection log (notebook or data sheet):
    a. Date
    b. Species collected
    c. Collectors' names
    d. Location of collection (be as specific as possible, e.g., along haul road at bend near Ten Mile River); record GPS point
2. Maintain an electronic version of this data.
3. At end of each collecting day, write in total number of hours spent collecting (# persons X hours).
4. Focus on collecting one species at a time.
5. Use only small to medium sized <u>paper</u> bags (lunch bag size) for each individual collecting.
6. Fill bags to about 1/2 full, then fold and secure across fold (masking tape) just to keep fold in place – don't seal the bag; start a new bag, if needed to continue collecting.
7. Mark each individual collection bag with the date, species, & collector's name Retain individual bags and place in a larger paper bag (shopping bag), marked with the date, species, and location where seeds/fruits were collected.

<u>Storage</u>:

1. Make sure seeds are dry. (They should not be green or succulent). If the seeds are not completely dry they will mold.
2. Store in an insect proof container such as a glass jar.
3. Store in a cool place. (A refrigerator is perfect).

The cooler and dryer the seeds are, the longer they can be stored. Dry seeds can be frozen for maximum longevity

<u>*Chorizanthe howellii* guidelines</u>

1. Preferentially collect fruits (seeds) from plants within haul road removal area first.
2. Estimate area of each spineflower patch to nearest square meter – this data will be used in establishing spineflower recovery sites.
3. For all patches of Howell's spineflower within proposed road removal area, aim to collect at least 50% of available fruits (seeds) – aim to leave some plants behind.
4. Wearing light but puncture-resistant gloves is advised --- *Chorizanthe* fruits have sharp spines.
5. Spiny fruits should drop readily from plants with a gentle brush of fingers – hold plants over bag opening and gently brush and flick fruits into bag (this may be done more easily with one person holding a bag, the other separating fruits from plants).

6. Preferentially, separate spiny fruits from each plant as they're collected into bags, but don't spend time on deliberately cleaning each plant – if fruits don't separate readily, dropping an entire plant into a bag is OK.
7. Discard plants in place – leaving some seed behind is a goal.
8. Don't pack material into bags; allow fruits & plant parts to sit loosely in the bags; don't overfill bags.
9. Fill each individual collection bag to about 1/2 full, close with one fold, then deposit in one larger bag also marked with date, species, and location.
10. Store bags in a dry location – the Resources office at Russian Gulch is NOT ideal, due to mice and dampness.

Erysimum menziesii guidelines

1. Preferentially collect fruits (seeds) from plants within haul road removal area first; aim to collect at least 50% of fruits/seeds from within project area.
2. Estimate numbers of wallflower plants observed within haul road removal project area.
3. Collect as many seeds from plants in project area as practical.
4. Once collections within project area are completed, collect from other locations across Ten Mile Dunes population.
5. Outside project area, collect at a lower rate: about 10 to 15% (maximum) of the fruits/seeds from any plant or population of plants.
6. Aim to collect either
    a. Entire drying fruits, or
    b. Individual seeds from fruits.
7. Seeds are ready for harvest if fruits are relatively dry, and can be opened manually without damaging seeds – however, seeds may readily eject or spill out when fruits are ripe.
8. Collect in small paper bags, labeled with species name, date, location, and person collecting.
9. Fill bags up to 1//2 full, then fold once and place in larger paper bag also labeled as in #7 (with all collectors' names).
10. Store bags in dry location (as under spineflower protocols, #10).

For long term storage of seeds:

1. Make sure seeds are dry. (They should not be green or succulent.) If the seeds are not completely dry, they will mold.
2. Store in an insect-proof container such as a glass jar.
3. Store in a cool place, such as a refigerator.

The cooler and drier the seeds are, the longer they can be stored. Dry seeds can be frozen for maximum longevity.

Appendix E.3

Delineation of Potential Jurisdictional Wetlands under Section 404 of the Clean Water Act & California Coastal Act

Inglenook Fen – Ten Mile Dunes Natural Preserve
MacKerricher State Park
Dune Rehabilitation Project

2012

California State Parks, Mendocino District

APPENDICES

Appendix A. Wetland Delineation Maps
Appendix B. Photographs of Selected Wetland Sample Pits
Appendix C. Wetland Data Sheets

Report and field delineations prepared by Bill Maslach, California State Parks.

1.0 Introduction

A wetland delineation study to describe the location and extent of waters, including wetlands, which may be considered jurisdictional by the U.S. Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act and the California Coastal Act, was conducted in the project site for the MacKerricher State Park Dune Rehabilitation Project within MacKerricher State Park in Fort Bragg, Mendocino County, California. Wetland vegetation, hydrology, and soils were examined to determine the presence of potential wetlands as defined by the Corps of Engineers and the California Coastal Act. Approximately 28 acres (11 ha) of Section 404 jurisdictional wetland and 73 acres (29 ha) of California Coastal Act wetland were documented in the study area.

The Clean Water Act gives the Corps jurisdiction over "Waters of the United States," which include, in part: lakes, rivers, streams (including intermittent streams) and wetlands. Under the Clean Water Act, the term "wetlands" means:

> … *those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.* (33 CFR § 328.3)

The Corps has published a wetland delineation manual including data sheets to use in the determination of the presence or absence of wetlands. These procedures and delineation results are presented in this report.

2.0 Methods

This delineation study has been conducted in accordance with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (ACOE 2010). This study evaluated the presence or absence of indicators of three wetlands parameters described in the Corps Manual. The three parameters used to determine the presence of wetlands are (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. One positive indicator from each parameter must by found to make a positive wetland delineation for the ACOE criteria; however only positive indicators from only one parameter is required to make a positive wetland determination under the California Coastal Act.

Prior to conducting field studies, available reference materials were reviewed, including the 2010 NAIP (National Agricultural Imagery Program) aerial photograph, the Mendocino County Soil Survey, Western Part (Natural Resource Conservation Service, 2001), State Park vegetation maps . The delineation was completed by Bill Maslach July 21, 2011 for the areas that had the potential to meet wetland definitions.

Throughout the project area, the vegetation, hydrology, and soil were notably uniform in similar topographic positions on the landscape. For instance, nearly all the convex dune swales had salt rush (*Juncus lescurii*) as a dominant plant, and had similar soil and hydrology. The same was noted for the creeks and associated vegetation. Sample pits were therefore taken at representative points in the project area to capture the soil and hydrology associated with the vegetation.

2.1 Vegetation

The indicator status assigned to a species designates the probability of that species occurring in a wetland. A species with an indicator of OBL, FACW, or FAC (excluding FAC-) is considered to be typically adapted for life in a wetland (hydrophytic vegetation). A species indicator of FAC-, FACU and NL determines an upland species. The wetland occurrence probability and abbreviations utilized in the lists are presented below.

Indicator Status	Description	Occurrence in Wetlands
OBL	obligate wetland plants	>99%
FACW	facultative wetland plants	67-99%
FAC	facultative plants	34-66%
FACU	facultative upland plants	1-33%
UPL	obligate upland plants	<1%
NI	no indicator (insufficient information) for the region (rated neutral)	-
NL	not listed (rated upland)	-
plus sign (+)	frequency toward higher end of a category	-
minus sign (-)	frequency toward lower end of a category	-
asterisk (*)	indicates tentative assignment based on limited information	-

The dominant vegetation at each sample point was noted and evaluated for prevalence of hydrophytes. Indicator status follows Reed (1988).

2.2 Hydrology

Wetland hydrology is a term which encompasses hydrologic characteristics of areas that are periodically inundated or saturated within 12 inches of the surface at some time during the growing season. Recorded data can be used when available to determine wetland hydrology. Recorded data showing inundation or saturation within 12 inches of the surface for a minimum of five percent of the growing season (18 days coastal Mendocino County) is considered evidence of wetland hydrology.

When studies are conducted at a time of year when surface water, ground water, or saturated soils can not be observed, evidence of wetland hydrology is based on observation of the hydrologic indicators described in the wetland delineation manual. Evidence of wetland hydrology can include direct evidence (primary indicators), such as visible inundation or saturation, surface sediment deposits, and drift lines, or indirect indicators (secondary indicators), such as oxidized root channels and algal mats. If indirect or secondary indicators are used, at least two secondary indicators must be present to conclude that an area has wetland hydrology. The drainage in the study area was examined for these hydrologic indicators. The presence of any primary or secondary wetland hydrologic indicators was noted at each sample point.

2.3 Soils

The Natural Resource Conservation Service defines a hydric soil as:

> "*A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.*"
> (Federal Register July 13, 1994, US Department of Agriculture,
> Natural Resource Conservation Service.)

Soils formed over long periods of time under wetland (anaerobic) conditions sometimes possess characteristics that indicate that they meet the definition of hydric soils.

At each sample point a soil pit was dug to a minimum of a 18-inch depth where possible. In each pit distinct soil layer depths were noted and their matrix and mottle colors (if present) were compared to the Munsell soil color chart (GretagMacbeth 2000) for color appearance (hue), intensity (value), and shade (chroma). Redoximorphic features and soil texture were noted.

3.0 Results

The results were taken from sample pits and recorded on data sheets (Appendix C). Locations of sample points are depicted on the delineation maps (Appendix A). General locations of most sample points are also depicted on photographs of the study area (Appendix B).

The wetland hydrology, hydric soils, and hydrophytic vegetation indicators used to make wetland determinations are summarized below. Potential jurisdictional areas described below are shown on the delineation maps (Appendix A). A total of 28.2 acres (11.4 ha) were mapped as ACOE wetlands and a total of 72.8 acres (29.5 ha) were mapped as Coastal Act wetlands.

Only two areas of wetland will be directly affected by this project - the removal of culverts in Fen and Inglenook Creeks. This work will require operation within the creekbed near the culverts where there is standing water. The goal of the restoration project is to improve natural stream and dune processes and remove nonnative species and features (road, culverts) from the Natural Preserve.

Approximately 0.68 acres (0.28 ha) of wetland vegetation may be temporarily disturbed due to construction activities. These temporary impacts will be offset through the removal of culverts and road berm, which will open up more wetland habitat.

SAMPLE PIT	PLANT COMMUNITY	SOIL	HYDROLOGY	VEGETATION	CA COASTAL ACT	US CLEAN WATER ACT
1	Rush Swale	No	No	Yes	Yes	No
2	Dune Mat	No	No	No	No	No
3	Marshy Creekside Vegetation	Yes	Yes	Yes	Yes	Yes
4	Dune Mat with Hydrophytes	No	No	Yes	Yes	No
5	Dune Mat	No	No	No	No	No
6	Estuary / Creek Bed	Yes	Yes	Yes	Yes	Yes
7	Estuary / Creek Bank	Yes	Yes	Yes	Yes	Yes
8	Dune Mat	No	No	No	No	No

4.0 References

Federal Register February 24, 1995. US Department of Agriculture, Natural Resource Conservation Service.

Federal Register July 13, 1994. US Department of Agriculture, Natural Resource Conservation Service

GretagMacbeth. 2000. Munsell Soil Color Charts. New Windsor, New York.

Natural Resource Conservation Service. 2001. Mendocino County Soil Survey, Western Part.

Reed, Jr., Porter B. 1988. National List of Plant Species That Occur in Wetlands: National Summary. U.S. Fish & Wildlife Service. Biological Report 88 (24). 244 pp.

Natural Resources Conservation Service. August 11, 2005. National Hydric Soils List by State, California Portion of the National Hydric Soil List. http://soils.usda.gov/use/hydric/lists/state.html

US Army Corps of Engineers (ACOE). May 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0). Environmental Laboratory, Vicksburg.

US Department of Agriculture (USDA) 2010. Farm Service Agency, Aerial Photography Field Office. Accessed on line: http://atlas.ca.gov/casil/imageryBaseMapsLandCover/imagery/naip/naip_2010/usda_file_archive/39120/

Appendix A.

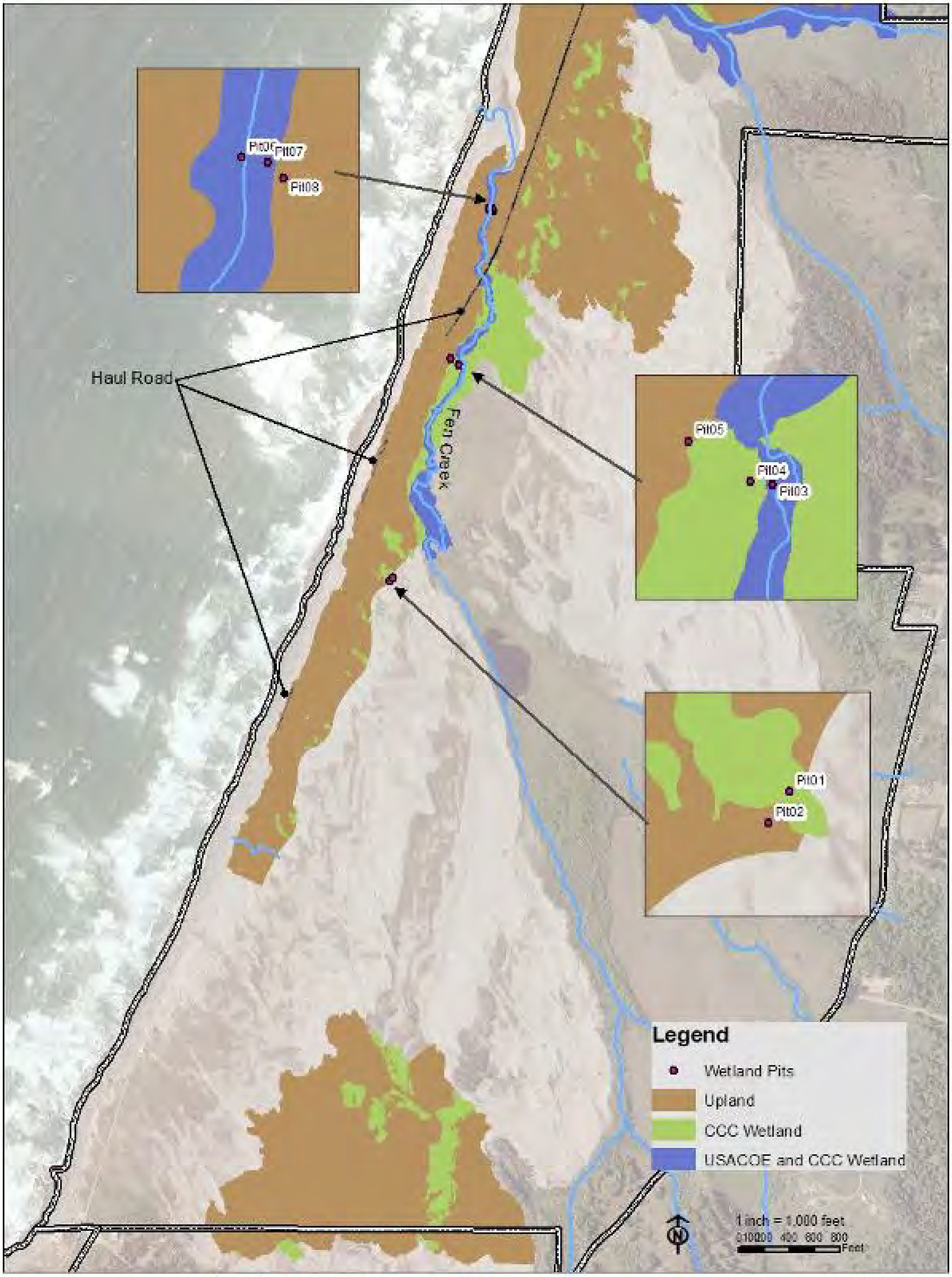

Figure 1 Wetland Delineation Map, Ten Mile Dunes Natural Preserve, Southern Half, 2011.

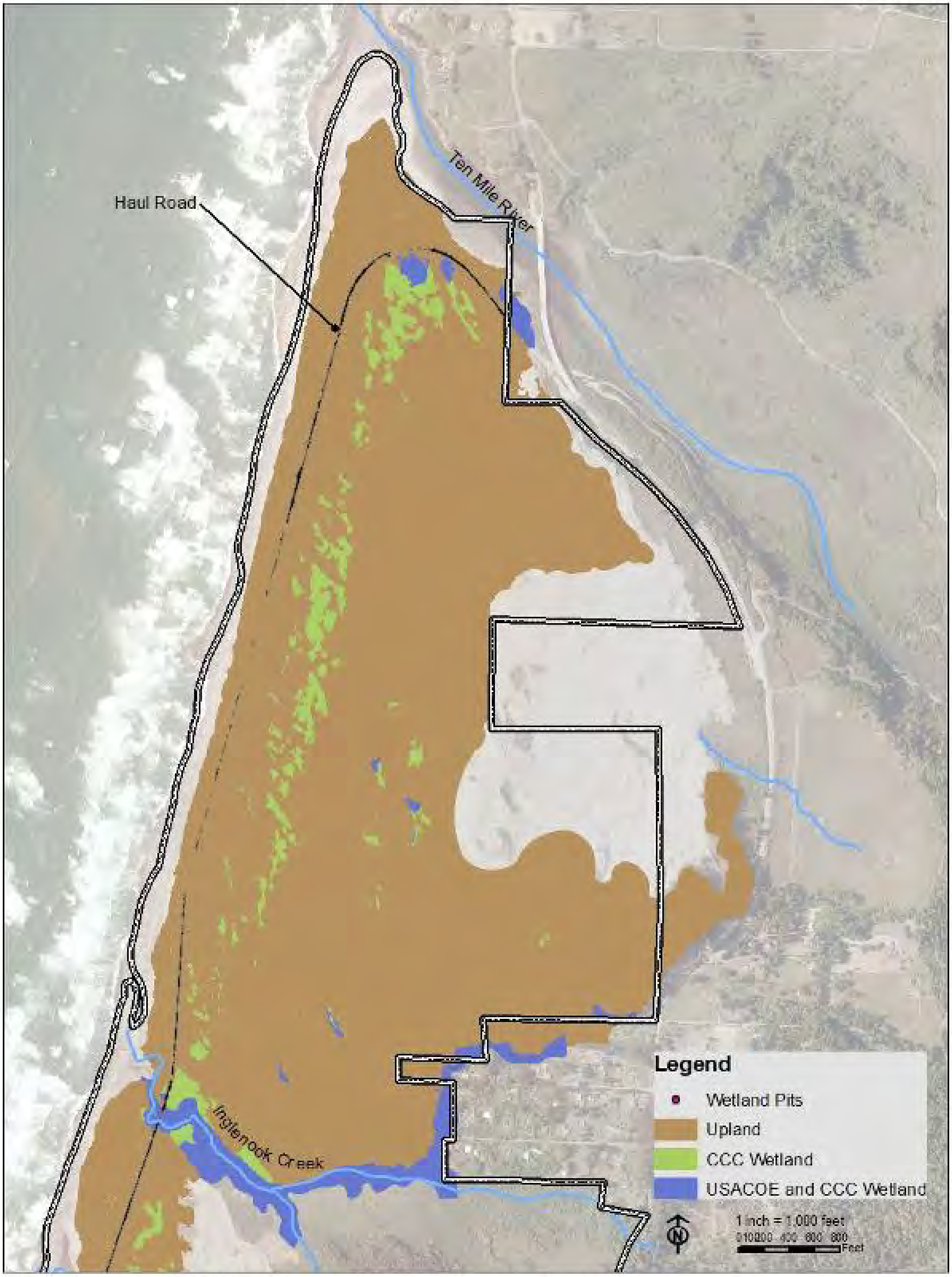

Figure 2 Wetland Delineation Map, Ten Mile Dunes Natural Preserve, Northern Half, 2011.

Appendix C. Photographs of Selected Wetland Sample Pits

Figure 1. General Area of Sample Pit #1-2. Typical vegetation is shown in the photograph: dune mat (sample pit 2) is in the foreground and salt rush dune swale (sample pit 1) is in the back.

Figure 2. Sample Pit #2. Site is typical of upland dune with dune sage (*Artemisia pycnocephala*).

Figure 3. Sample Pit #3. Site is typical of marshy vegetation adjacent to Fen Creek and east of the culvert. Circled number represents sample pit.

Figure 4. Vicinity of Sample Pit #4. Site is typical of dune mat vegetation with hydrophytes (*Equisetum hyemale ssp. affine*).

Figure 5. Sample Pits #6-8. Photo taken in May 2011, showing water in Inglenook Creek as it becomes estuarine. Circled numbers represent approximate locations of sample pits.

Figure 6. Soil of Sample Pit #6. Soil of the creekbed in the estuary was very dark and mucky with a slight sulfur odor – typical of hydric soils.

Appendix C. Wetland Data Sheets

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region (DRAFT)

Project/Site: Ten Mile Dunes - Inglenook Fen Natural Preserve City/County: Fort Brag/Mendocino County Sampling Date: 07/21/2011

Applicant/Owner: California State Parks State: CA Sampling Point: 1

Investigator(s): Bill Maslach Section, Township, Range: T 19N R 17W Sec 17

Landform (hillslope, terrace, etc.): dune swale Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): ____ Lat: 123° 46' 43.2375" W Long: 39° 30' 59.137" N Datum: NAD83

Soil Map Unit Name: Duneland NWI classification: seasonal Palustrine/Emerg

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ☐ (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ☐

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ✓
Hydric Soil Present?	Yes ☐ No ✓	
Wetland Hydrology Present?	Yes ✓ No ☐	

Remarks:

The wetland in this sampling point is very typical of rush-dominated wetlands throughout the Ten Mile dunes. Some of the shallow swales have standing water for long periods after rains. Algal mats sometimes form in these swales.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	0		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	0		
Herb Stratum			
1. *Juncus lescurii*	15	Yes	FACW
2. *Polypogon monspeliensis*	10	Yes	FACW
3. *Hypocharis radicata*	10	Yes	UPL
4. *Trifolium wormskioldii*	5	No	FACW
5. *Grindelia stricta*	2	No	UPL
6. *Gnaphalium palustre*	2	No	FACW
7. *Mimulus guttatus*	2	No	OBL
8. *Epilobium ciliatum*	1	No	FACW
Total Cover:	47		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 50			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	2	x 1 = 2
FACW species	33	x 2 = 66
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	12	x 5 = 60
Column Totals:	47 (A)	128 (B)

Prevalence Index = B/A = 2.7

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ☐

Remarks:

Wetland vegetation is defined by J. lescurii in shallow swales throughout the dune system. This herbaceous vegetation is typical of nearly all vegetated dune swales in the Ten Mile Dunes. Wax myrtle (Morella californica) and coyote bush (Baccharis pilularis) may sometimes be present in the shrub layer.

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 -24	10YR 4/3	100					sand	fine-med sand; 0-3", many fine roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes [ ] No [✓]

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
✓ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Water-Stained Leaves (B9) (**except NW coast**)
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**NW coast**)
__ Sparsely Vegetated Concave Surface (B8)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
✓ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ Frost-Heave Hummocks (D4)
✓ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)

Field Observations:

Surface Water Present? Yes [ ] No [✓] Depth (inches): 24
Water Table Present? Yes [ ] No [✓] Depth (inches): 24
Saturation Present? (includes capillary fringe) Yes [ ] No [✓] Depth (inches): 24

Wetland Hydrology Present? Yes [✓] No [ ]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Sand becomes moist and cool at 6". Obvious signs of some inundation during wet season. Many of these rush swales hold standing water during and after rain events.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region (DRAFT)

Project/Site: Ten Mile Dunes - Inglenook Fen Natural Preserve City/County: Fort Bragg/Mendocino County Sampling Date: 07/21/2011

Applicant/Owner: California State Parks State: CA Sampling Point: 2

Investigator(s): Bill Maslach Section, Township, Range: T 19N R 17W Sec 4-5, 8, 17; T 20N R 17W Sec 32-33

Landform (hillslope, terrace, etc.): flat above estuary Local relief (concave, convex, none): slightly convex Slope (%): 0

Subregion (LRR): ______ Lat: 123° 46' 43.4711" W Long: 39° 30' 58.8572" N Datum: NAD83

Soil Map Unit Name: Duneland NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ☐ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ☐

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ✓	Is the Sampled Area within a Wetland? Yes ☐ No ✓
Hydric Soil Present?	Yes ☐	No ✓	
Wetland Hydrology Present?	Yes ☐	No ✓	

Remarks:
This sample point is typical of upland dune mat vegetation.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	0		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	0		
Herb Stratum			
1. *Artemisia pycnocephala*	12	Yes	UPL
2. *Juncus lescurii*	2	No	FACW
3. *Camissonia cheiranthifolia*	1	No	UPL
4. *Hypochaeris radicata*	1	No	UPL
5. *Juncus bufonius*	1	No	FACW+
6. *Grindelia stricta*	1	No	UPL
7.			
8.			
Total Cover:	18		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 80

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	3	x 2 = 6
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	15	x 5 = 75
Column Totals:	18 (A)	81 (B)

Prevalence Index = B/A = 4.5

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ☐ No ✓

Remarks:
Juncus lescurii, a FACW plant, often moves into the upland dune.

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0 -24	10YR 4/4	100					sand	fine-med sand; 0-5", few med. roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: __________

Depth (inches): __________

Hydric Soil Present? Yes ☐ No ☑

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Water-Stained Leaves (B9) (**except NW coast**)
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**NW coast**)
__ Sparsely Vegetated Concave Surface (B8)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ Frost-Heave Hummocks (D4)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): 24
Water Table Present? Yes ☐ No ☑ Depth (inches): 24
Saturation Present? (includes capillary fringe) Yes ☐ No ☑ Depth (inches): 24

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Sandy convex dune with little to no capacity for holding water.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region (DRAFT)

Project/Site: Ten Mile Dunes - Inglenook Fen Natural Preserve City/County: Fort Bragg/Mendocino County Sampling Date: 07/21/2011

Applicant/Owner: California State Parks State: CA Sampling Point: 03

Investigator(s): Bill Maslach Section, Township, Range: T 19N R 17W Sec 08

Landform (hillslope, terrace, etc.): dune swale Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): ______ Lat: 123° 46' 36.3525" W Long: 39° 31' 15.915" N Datum: NAD83

Soil Map Unit Name: Duneland NWI classification: Palustrine/Emergent

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ☐ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ☐

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ☐
Hydric Soil Present?	Yes ✓	No ☐
Wetland Hydrology Present?	Yes ✓	No ☐

Is the Sampled Area within a Wetland? Yes ✓ No ☐

Remarks:

The wetland in this sampling point is typical of sedge meadows adjacent to the Fen and Inglenooks Creeks in the Ten Mile dunes.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	0		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	0		
Herb Stratum			
1. *Carex obnupta*	60	Yes	OBL
2. *Eleocharis macrostachya*	25	Yes	OBL
3. *Equisetum hyemale ssp. affine*	20	No	FACW
4. *Holcus lanatus*	10	No	FAC
5. *Argentina egedii*	10	No	OBL
6. *Oenanthe sarmentosa*	5	No	OBL
7. *Sonchus asper*	2	No	FAC
8. *Mentha arvensis*	2	No	FACW
Total Cover:	134		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	85	x 1 = 85
FACW species	22	x 2 = 44
FAC species	12	x 3 = 36
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	119 (A)	165 (B)

Prevalence Index = B/A = 1.4

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ☐

Remarks:

SOIL

Sampling Point: 03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 6	10YR 3/1	100					sand	fine-med sand
6 - 22	10YR 3/2	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ✓ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ___

Remarks:

Soil with faint odor of sulphur.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9) **(except NW coast)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(NW coast)**
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Frost-Heave Hummocks (D4)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		✓	24
Water Table Present?		✓	24
Saturation Present? (includes capillary fringe)	✓		21

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region (DRAFT)

Project/Site: Ten Mile Dunes - Inglenook Fen Natural Preserve City/County: Fort Bragg/Mendocino County Sampling Date: 07/21/2011

Applicant/Owner: California State Parks State: CA Sampling Point: 04

Investigator(s): Bill Maslach Section, Township, Range: T 19N R 17W Sec 08

Landform (hillslope, terrace, etc.): dune adjacent to wetland Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): ______ Lat: 123° 46' 36.6282" W Long: 39° 31' 15.9505" N Datum: NAD83

Soil Map Unit Name: Duneland NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ☐ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ☐

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	✓	
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ☐ No ✓

Remarks:
Sample site it adjacent to a wetland (Sample Pit 03) and has hydrophytic vegetation but no supporting soil or hydrology.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	0		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	0		
Herb Stratum			
1. *Equisetum hyemale ssp. affine*	30	Yes	FACW
2. *Juncus lescurii*	20	Yes	FACW
3. *Poa unilateralis*	20	Yes	FACU
4. *Artemisia pycnocephala*	10	No	UPL
5. *Trifolium wormskioldii*	1	No	FACW
6.			
7.			
8.			
Total Cover:	81		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 20

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	51	x 2 = 102
FAC species	0	x 3 = 0
FACU species	20	x 4 = 80
UPL species	10	x 5 = 50
Column Totals:	81 (A)	232 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ☐

Remarks:

SOIL

Sampling Point: 04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 21	10YR 4/4	100					sand	fine-med sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ☐ **No** ☑

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9) (**except NW coast**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**NW coast**)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Frost-Heave Hummocks (D4)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): 21

Water Table Present? Yes ☐ No ☑ Depth (inches): 21

Saturation Present? (includes capillary fringe) Yes ☐ No ☑ Depth (inches): 21

Wetland Hydrology Present? **Yes** ☐ **No** ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region (DRAFT)

Project/Site: Ten Mile Dunes - Inglenook Fen Natural Preserve City/County: Fort Bragg/Mendocino County Sampling Date: 07/21/2011

Applicant/Owner: California State Parks State: CA Sampling Point: 05

Investigator(s): Bill Maslach Section, Township, Range: T 19N R 17W Sec 08

Landform (hillslope, terrace, etc.): sand dune Local relief (concave, convex, none): convex Slope (%): 0

Subregion (LRR): ______ Lat: 123° 46' 37.4475" W Long: 39° 31' 16.3215" N Datum: NAD83

Soil Map Unit Name: Duneland NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ☐ (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ☐

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	☐	✓
Hydric Soil Present?	☐	✓
Wetland Hydrology Present?	☐	✓

Is the Sampled Area within a Wetland? Yes ☐ No ✓

Remarks:
Sample site is a typical vegetated upland sand dune.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	0		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	0		
Herb Stratum			
1. *Artemisia pycnocephala*	25	Yes	UPL
2. *Abronia latifolia*	15	Yes	UPL
3. *Equisetum hyemale ssp. affine*	2	No	FACW
4. *Camissonia cheiranthifolia*	2	No	UPL
5. *Erysimum menziesii ssp. m.*	1	No	UPL
6. *Juncus lescurii*	1	No	FACW
7.			
8.			
Total Cover:	46		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 55

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	3	x 2 = 6
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	43	x 5 = 215
Column Totals:	46 (A)	221 (B)

Prevalence Index = B/A = 4.8

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ☐ No ✓

Remarks:
Upland dune vegetation.

SOIL

Sampling Point: 05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 21	10YR 4/4	100					sand	fine-med sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ____________________

Depth (inches): ____________________

Hydric Soil Present? Yes ☐ No ☑

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9) (**except NW coast**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**NW coast**)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Frost-Heave Hummocks (D4)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): 21

Water Table Present? Yes ☐ No ☑ Depth (inches): 21

Saturation Present? (includes capillary fringe) Yes ☐ No ☑ Depth (inches): 21

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region (DRAFT)

Project/Site: Ten Mile Dunes - Inglenook Fen Natural Preserve City/County: Cleone/Mendocino County Sampling Date: 07/21/2011

Applicant/Owner: California State Parks State: CA Sampling Point: 06

Investigator(s): Bill Maslach Section, Township, Range: T 19N R 17W Sec 08

Landform (hillslope, terrace, etc.): stream bed Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): ____ Lat: 123° 46' 33.7017" W Long: 39° 31' 28.2447" N Datum: NAD83

Soil Map Unit Name: Duneland NWI classification: Mud Shore / Emergent

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ☐ (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ☐

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ☐	Is the Sampled Area within a Wetland?	Yes ✓ No ☐
Hydric Soil Present?	Yes ✓ No ☐		
Wetland Hydrology Present?	Yes ✓ No ☐		

Remarks:
Sample site is dry creek bed of Fen Creek estuary. Site is typical of vegetation and wetland characteristics of Inglenook Creek to the north.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	0		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	0		
Herb Stratum			
1. *Schoenoplectus pungens*	40	Yes	OBL
2. *Cotula coronopifolia*	15	Yes	FACW+
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	55		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 45

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	40	x 1 = 40
FACW species	15	x 2 = 30
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	55 (A)	70 (B)

Prevalence Index = B/A = 1.2

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ☐

Remarks:
Stream bed and bank dominated with S. pungens.

SOIL

Sampling Point: 06

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0 - 4	10YR 2/1	100					sand	fine-med sand
4 - 11	10YR 2/1	95	10YR 6/8	5	D	M	sand	fine-med sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ✓ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ___

Remarks:

At least 2" of redox depression within upper 6". Sulphur odor.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ✓ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ✓ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9) (**except NW coast**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**NW coast**)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Frost-Heave Hummocks (D4)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		✓	12
Water Table Present?		✓	12
Saturation Present? (includes capillary fringe)	✓		11

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region (DRAFT)

Project/Site: Ten Mile Dunes - Inglenook Fen Natural Preserve City/County: Fort Bragg/Mendocino County Sampling Date: 07/21/2011

Applicant/Owner: California State Parks State: CA Sampling Point: 07

Investigator(s): Bill Maslach Section, Township, Range: T 19N R 17W Sec 08

Landform (hillslope, terrace, etc.): stream bank/estuary Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): ______ Lat: 123° 46' 33.4398" W Long: 39° 31' 28.204" N Datum: NAD83

Soil Map Unit Name: Duneland NWI classification: Mud Shore / Emergent

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ☐ (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ☐

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ☐	Is the Sampled Area within a Wetland? Yes ✓ No ☐
Hydric Soil Present?	Yes ✓ No ☐	
Wetland Hydrology Present?	Yes ✓ No ☐	

Remarks:
Sample site is typical of vegetated areas adjacent to, and slightly upland, of the creek bed. The site is still in the estuary.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	0		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	0		
Herb Stratum			
1. *Chenopodium botrys*	15	Yes	FACU
2. *Juncus bufonius*	10	Yes	FACW*
3. *Polypogon monspeliensis*	10	Yes	FACW
4. *Rumex salicifolius*	2	No	OBL
5. *Schoenoplectus pungens*	2	No	FACW
6. *Atriplex patula*	2	No	FACW
7.			
8.			
Total Cover:	41		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 60

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	2	x 1 = 2
FACW species	24	x 2 = 48
FAC species	0	x 3 = 0
FACU species	15	x 4 = 60
UPL species	0	x 5 = 0
Column Totals:	41 (A)	110 (B)

Prevalence Index = B/A = 1.2

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ✓ No ☐

Remarks:
Estuarine stream bank.

SOIL

Sampling Point: 07

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 5	10YR 2/3	100					sand	fine-med sand
5 - 12	10YR 2/2	95	10YR 6/8	<5	D	M	sand	fine-med sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
✓ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ☐

Remarks:

At least 2" of redox depression within upper 6".

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
✓ Sediment Deposits (B2)
__ Drift Deposits (B3)
✓ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Water-Stained Leaves (B9) (**except NW coast**)
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**NW coast**)
__ Sparsely Vegetated Concave Surface (B8)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ Frost-Heave Hummocks (D4)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)

Field Observations:

Surface Water Present? Yes ☐ No ✓ Depth (inches): 12

Water Table Present? Yes ☐ No ✓ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes ✓ No ☐ Depth (inches): 12

Wetland Hydrology Present? Yes ✓ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region (DRAFT)

Project/Site: Ten Mile Dunes - Inglenook Fen Natural Preserve City/County: Fort Bragg/Mendocino County Sampling Date: 07/21/2011

Applicant/Owner: California State Parks State: CA Sampling Point: 08

Investigator(s): Bill Maslach Section, Township, Range: T 19N R 17W Sec 08

Landform (hillslope, terrace, etc.): dune Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): ______ Lat: 123° 46' 33.2802" W Long: 39° 31' 28.0825" N Datum: NAD83

Soil Map Unit Name: Duneland NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ☐ (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ☐

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	☐	✓
Hydric Soil Present?	☐	✓
Wetland Hydrology Present?	☐	✓

Is the Sampled Area within a Wetland? Yes ☐ No ✓

Remarks:
Sample site is a typical vegetated upland sand dune.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	0		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	0		
Herb Stratum			
1. *Artemisia pycnocephala*	5	Yes	UPL
2. *Gnaphalium palustre*	5	Yes	FACW
3. *Plagiobothyrs reticulatus*	2	No	FACW
4. *Melilotus indica*	1	No	FAC
5.			
6.			
7.			
8.			
Total Cover:	13		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 85

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 2
FACW species	7	x 2 = 14
FAC species	1	x 3 = 3
FACU species	0	x 4 = 60
UPL species	0	x 5 = 0
Column Totals:	8 (A)	79 (B)

Prevalence Index = B/A = 9.8

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ☐ No ✓

Remarks:
Early successional dune vegetation.

SOIL

Sampling Point: 08

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0 - 24	10YR 4/4	100					sand	fine-med sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soil Present? Yes ☐ No ☑

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Water-Stained Leaves (B9) (**except NW coast**)
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**NW coast**)
__ Sparsely Vegetated Concave Surface (B8)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ Frost-Heave Hummocks (D4)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): 24

Water Table Present? Yes ☐ No ☑ Depth (inches): 24

Saturation Present? (includes capillary fringe) Yes ☐ No ☑ Depth (inches): 24

Wetland Hydrology Present? Yes ☐ No ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Upland dune, 3-5' above estuary.

APPENDIX E.4 – Sand Analysis

STATE OF CALIFORNIA, RESOURCES AGENCY EDMUND G. BROWN, Jr., GOVERNOR

DEPARTMENT OF CONSERVATION

CALIFORNIA GEOLOGICAL SURVEY

801 K STREET • Suite 1340 • SACRAMENTO, CALIFORNIA 95814

PHONE 916 / 327-0791 • **FAX** 916 / 323-9264 • **TDD** 916 / 324-2555 • **WEBSITE** conservation.ca.gov

To: Renee Pasquinelli, Senior Environmental Scientist
California State Parks
12301 North Highway 1, Box 1
Mendocino, CA 95460

From: Trinda L. Bedrossian, CEG 1064, CPESC 393
California Geological Survey
801 K Street, Suite 1324
Sacramento, CA 95814

Date: August 17, 2011

Subject: MacKerricher State Park – Sand Grain Size and Mineral Composition Analyses, Ten Mile Dunes Road Removal and Dune Rehabilitation Project

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The California Geological Survey (CGS) has assisted California State Parks (CSP) with the geologic review and implementation of numerous restoration and rehabilitation projects within Mendocino County and other parts of the state. This report presents the findings of sand grain size and mineral composition analyses associated with the planned removal of the road and culverts within the Inglenook Fen-Ten Mile Dunes Natural Preserve of MacKerricher State Park. The mineral composition of the samples was analyzed using the electron microprobe at the University of California, Davis (UCD) Department of Geology (Roeske, 2011).

GEOLOGIC SETTING

The road and culverts to be removed within MacKerricher State Park are located within an active sequence of beach and dune sands that follow a series of marine terraces just south of the Ten Mile River (Figure 1). The dunes within the project area form three main lobes that extend south from the mouth of the river for approximately 4 miles, where they gradually become more stabilized. The dunes upon which the road was built rest on a terrace surface that slopes almost to sea level (Cooper, 1967; Barry and Schlinger, 1977; Griggs and others, 2005; Wollenberg, 2004). The dunes ascend a gentle slope directly from the beach. Emergent rocks from the surf zone indicate the original terrace surface was slightly above sea level at this location (Cooper, 1967; Kelley, 1983). Low cliffs, comprised of marine terrace deposits and underlying Franciscan sandstone bedrock, are present both north and south of the project area. Traces of the active San Andreas Fault Zone lie roughly parallel to the coast both onshore and within 0.5 to 1 mile offshore (CGS, 2010, Jennings, 1994).

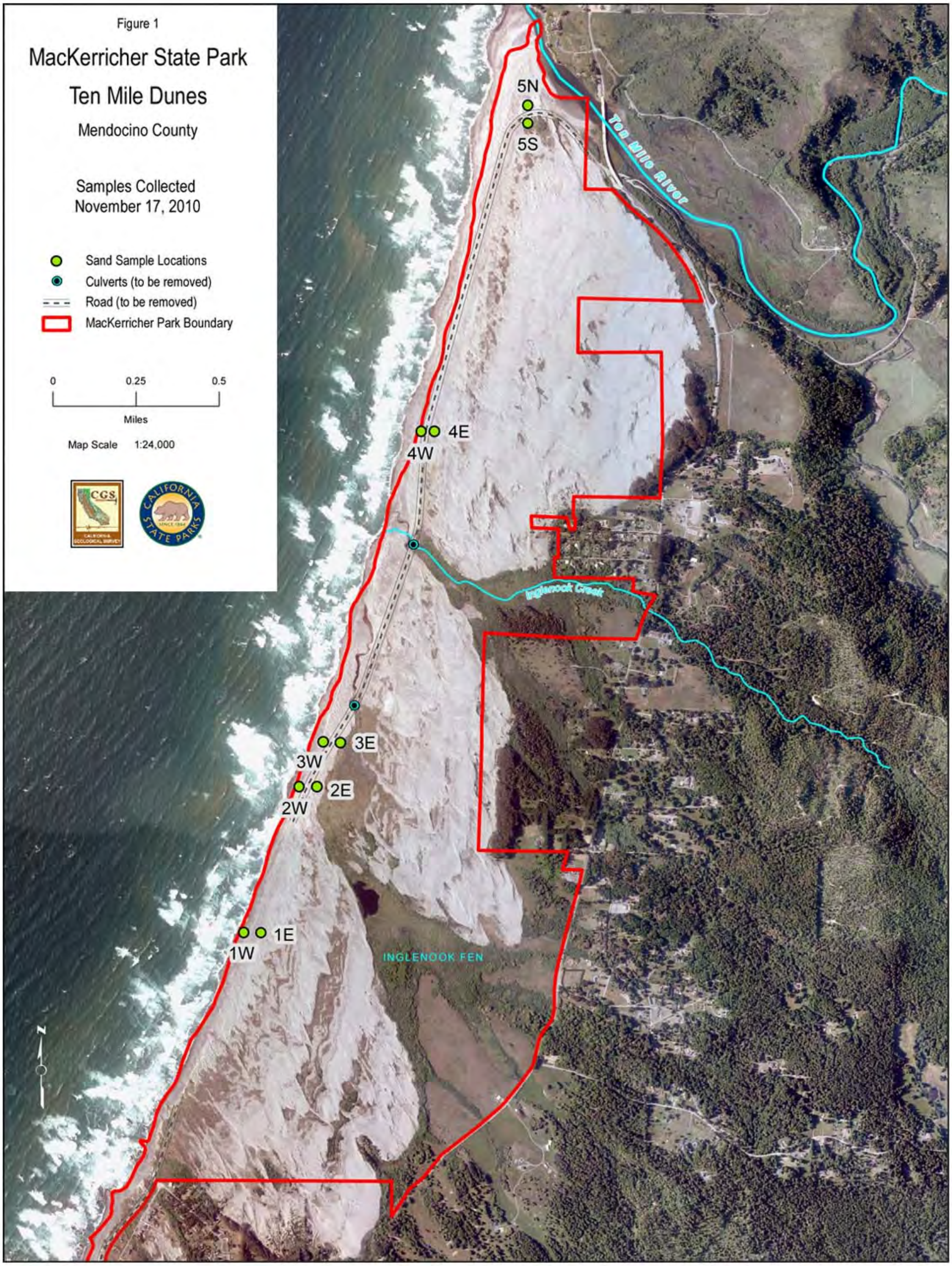


Figure 1
MacKerricher State Park
Ten Mile Dunes
Mendocino County
Samples Collected
November 17, 2010
Sand Sample Locations
Culverts (to be removed)
Road (to be removed)
MacKerricher Park Boundary
0
0.25
0.5
Miles
Map Scale 1:24,000
CGS
5N
5S
Ten Mile River
4E
4W
Inglenook Creek
3E
3W
2E
2W
1E
1W
INGLENOOK FEN
N

PURPOSE OF STUDY

The purpose of the sand analyses was: (1) to assess relative percentages of various sand grain sizes within 10 representative samples collected by CGS at different locations along the road to be removed (Figure 1); and (2) to identify the relative percent of mineral types in the10 samples. Findings of the sand sample analyses were used: (1) to compare gross similarities and differences in surface sand grain sizes as they relate to location, surface disturbance, dune type, wind direction and vegetation density along portions of the road to be removed; and (2) in conjunction with aerial photo interpretation, to identify general sand movement patterns and expected locations of future sand deposition following road removal.

SUMMARY OF FINDINGS

Sand Grain Size Analyses

- Between 61 and 99% of the grains within the samples collected were fine grained sand; i.e., between 0.125 and 0.425 millimeters (mm) in size.
- Sand samples collected in the northernmost lobe of the dunes had a larger component of fine sand, very fine sand, and silt/clay than those to the south.
- The northernmost sand samples also contained the highest percentages of coarse size particles (greater than 2 mm in size).
- Sand samples from the southern two lobes contained a greater medium sand grain fraction (between 0.425 and 2 mm) ranging between 16 and 38%.
- Samples collected from areas occupying a lower topographic position along the road had a greater medium size sand fraction than those collected at a higher elevation near the same location.

Mineral Composition Analyses

- Quartz, feldspar, and lithic (rock) fragments composed of quartz and feldspar comprised between 65 and 82% of the sand samples.
- Lithic (rock) fragments of granitoid, silicic, clastic (mudstone and sandstone), and schistose origin comprised between 43 and 62% of the samples.
- Calcite fragments, which comprised between 1 and 7% of the samples, were mostly shell material.
- Heavy minerals (i.e., minerals with higher densities than quartz and feldspar) such as epidote, amphibole, chlorite, zircon, iron and iron-titanium (Fe and Fe-Ti) oxide, and garnet comprised between 1 and 5% of most of the samples.

SAMPLE COLLECTION

A total of ten (10) representative sand samples were collected along the road and in the vicinity of the culverts to be removed (Figure 1). The samples were collected between 20 and 60 feet on each side of the road (west=W and east=E or north=N and south=S) to determine if there were any significant changes in grain size and mineral composition as sand is blown inland and/or as a result of topographical differences. All samples were collected between 12:25 p.m. and 4:30 p.m. on November 17, 2010. During this time, sustained wind speeds measured at Fort Bragg City Hall (Mendocino County, 2011) were from the northwest (271º- 311º) and ranged between 2.7 and 7.3 miles per hour (mph).

The 10 samples were collected using hand-driven 6-inch long, 2.5-inch diameter, thin-walled brass tubes, typically used in a Modified California Split Barrel Sampler. The open-ended tube ends were sealed with removable plastic caps. Upon returning to the office, sand samples were transferred to plastic bags.

While the top 6 inches of sand were sampled at all 10 locations, the sample sizes varied in weight due to the loosely consolidated nature of the sand, moisture content, and an organic and/or small shell component in some samples. In most sample areas, some degree of moisture was encountered 3 to 6 inches below the surface.

SAND GRAIN SIZE ANALYSES

Sieve Analyses: To be consistent with sand analyses previously conducted for CSP at Oceano Dunes (CGS, 2007, 2011a, and 2011b), CGS performed sieve analyses on the 10 samples per ASTM Standard D421-85 for dry preparation of soil samples for particle-size analysis. Samples collected from the dunes were removed from the plastic bags, placed under an AirFiltronix, Inc. containment hood in the CGS laboratory, and dried at room temperature for at least 24 hours until thoroughly dried.

Samples were sieved at the UCD Department of Geology laboratory, using the UCD shaker and CGS sieves. Where present, large organic material was removed prior to shaking. The loosely consolidated nature of the sand precluded the need for further break-up of aggregated materials. Each sample was then weighed using an OHAUS Triple Beam Balance, taking into consideration the tare. Next, each sample was placed into four stacked ASTM E-11 Specification, wire mesh USA Standard Testing Sieves and a receiver, with the following dimensions:

Table 1: USA Standard Sieve Size and Equivalent Size Conversions

Sieve Size	mm opening	inches
No. 10	2.000	0.0787
No. 40	0.425	0.0165
No. 100	0.150	0.0059
No. 200	0.075	0.0029

After securing the test sieve lid, the sieves were clamped onto an electric shaker and shaken for 5-10 minutes. Sand remaining on each sieve and in the receiver was weighed and the percent weight computed into five general categories:

Coarse: Sands remaining on the No. 10 sieve, greater than 2 mm
Medium: Sands remaining on the No. 40 sieve, less than 2 mm but greater than 0.425 mm
Fine: Sands remaining on the No. 100 sieve, less than 0.425 mm but greater than 0.125 mm
Very Fine: Sands remaining on the No. 200 sieve, less than 0.125 mm but greater than 0.075 mm
Silt/Clay: Material remaining in the receiver, less than 0.075 mm

Results of Sieve Analyses: Results of the sieve grain size analysis are shown by percent (Table 2) and graphically by location (Figure 2). Between 61 and 99% of the grains within the samples collected are fine grained sand; i.e., between 0.125 and 0.425 millimeters (mm) in size. Less than 3% of the grains are very fine sand (between 0.075 and 0.125 mm) and/or silt/clay (less than 0.075 mm). Medium and coarse grains (greater than 0.425 mm) ranged between 0 and 38%.

In general, sand collected along the road in the northernmost lobe of the dunes has a larger fine sand component than to the south, where it appears to gradually coarsen. Samples 4W, 4E, 5N, and 5S have a fine sand, very fine sand, and silt/clay grain size fraction that ranges between 79 and 99%. The fine sand, very fine sand, and silt/clay fraction of samples collected along the road in the middle lobe of the dunes ranges between 61 and 83%, while the same fraction in samples collected along the road in the southern lobe ranges between 62 and 71%.

The northernmost samples also contain both the highest percentages of coarse size particles (greater than 2 mm in size) and the highest percentages of very fine (between 0.075 and 0.125 mm) and silt/clay (less than 0.075 mm) size particles. Samples collected from areas occupying a lower topographic position along the road, regardless of whether it is to the west or east, appear to have a slightly greater medium size sand fraction (between 0.425 and 2 mm) than those collected at a higher elevation at the same location.

TABLE 2: Percent Sieved Grain Size, CGS Sand Samples, Ten Mile Dunes

Sample #	+10 (Coarse)	10-40 (Medium)	40-100 (Fine)	100-200 (Very Fine)	-200 (Silt/Clay)
TMD-1W (low foredune)	0.2	37.0	62.6	0.1	0.1
TMD-1E (deflated)	Trace	28.8	71.1	0.1	0.1
TMD-2W (lower side)	0.1	36.3	63.5	0.1	Trace
TMD-2E (higher side)	0	16.6	83.1	0.2	0.1
TMD-3W (higher side)	0	30.3	69.4	0.2	0.1
TMD-3E (lower side)	0	38.1	61.6	0.2	0.1
TMD-4W (higher side)	0	5.5	94.2	0.2	0.1
TMD-4E (even with road)	3.7	16.5	78.4	0.8	0.6
TMD-5N (deflated)	7.9	2.3	86.9	1.9	1.0
TMD-5S (deflated)	0	0.8	98.7	0.4	0.1

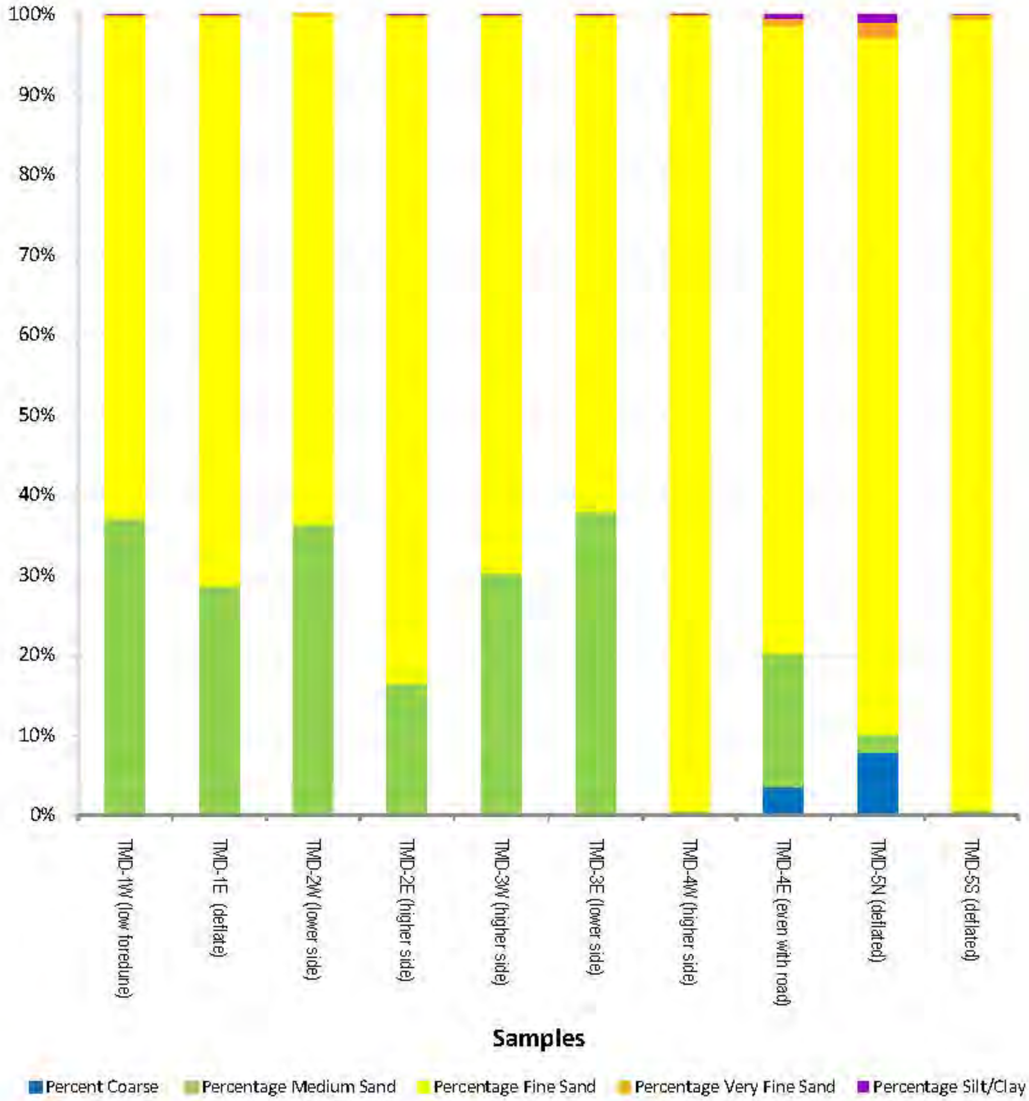


Figure 2: Percent Sieved Grain Size, CGS Sand Samples, Ten Mile Dunes

MINERAL COMPOSITION ANALYSES

Microprobe Analyses: The UCD Electron Microprobe Laboratory was used to conduct sand sample analyses using back scatter electron (BSE) imagery for percent (%) mineral composition. The BSE images show different phases of mineral development based on brightness (Figure 3). Mineral identification is done by comparing x-ray fluorescence energy-dispersive spectroscopy (EDS) from individual grains with known mineral phases (Appendix A). Unsieved sand from each of the 10 sand samples was placed on circular templates 2.5 centimeters across, using double-stick tape, to ensure all size fractions were exposed at the surface. The samples were then coated with an approximately 200 angstrom thick coating of carbon to make them conductive under the electron beam. Sample preparation was done by Greg Baxter, UCD Department of Geology Staff Research Assistant.

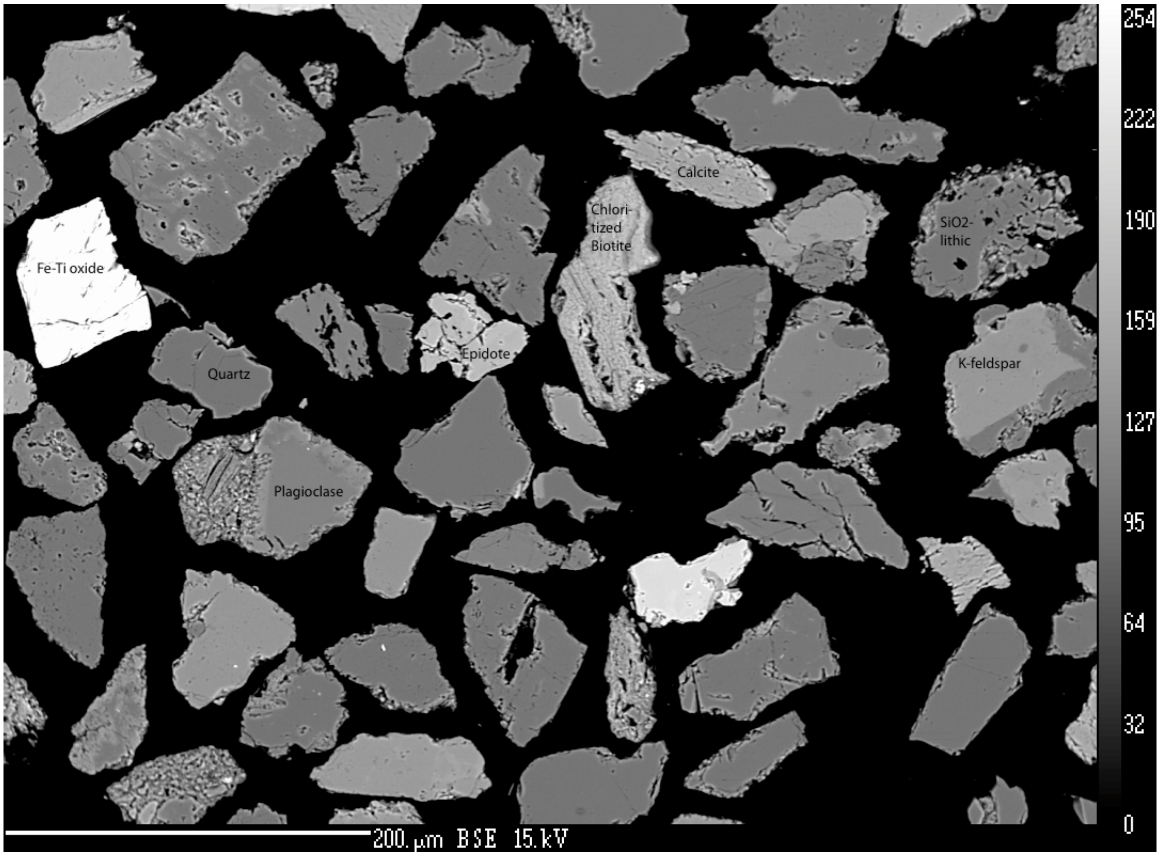


Figure 3. Example of an image used for point-counting grains. Mineral fragments have different gray scale intensities depending on total mass. Photo by S. Roeske.

<u>Mineral Composition Identification</u>: Mineral identification was done by Dr. Sarah M. Roeske, UCD Research Geologist and Electron Microprobe Lab Manager, using the 100 point count method (Figure 3). To obtain a statistical sampling of the mineral composition, all grains within 300 microns of a horizontal line were counted, noting composition, until 100 grains were counted. Mineral composition was determined by comparing EDS spectra from individual sand grains with known mineral phases (Appendices A, B, and C).

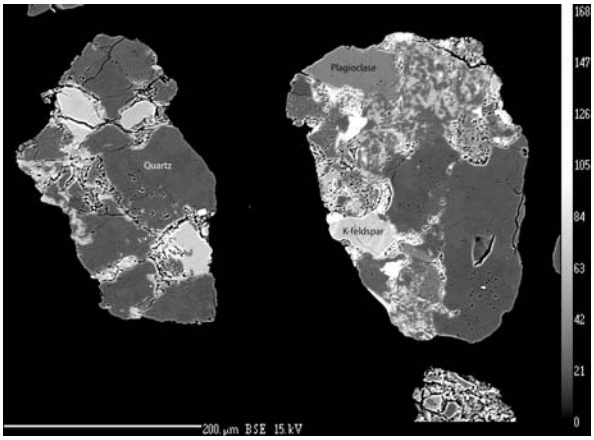
<u>Results of Mineral Analyses</u>: According to Roeske (2011, Appendix B), all of the samples are similar in mineral composition. Quartz, feldspar, and lithic (rock) fragments composed dominantly of quartz and feldspar comprised between 65 and 82% of the sand samples (Table 3, Appendix C). According to Roeske (2011, Appendix B), these minerals and lithic fragments are resistant to both physical and chemical weathering.

Lithic fragments comprised between 43 and 62% of the samples. These included granitoid, silicic, metabasite (volcanic), chert (silica-rich fine sediment), clastic (mudstone and sandstone), and schistose fragments (Figure 4, Appendix C). The granitoid and silicic fragments included particles of both intrusive (plutonic) and extrusive (volcanic) origin (Roeske, 2011). Quartz and feldspar also dominated the clastic fragments, some of which were relatively coarse and angular.

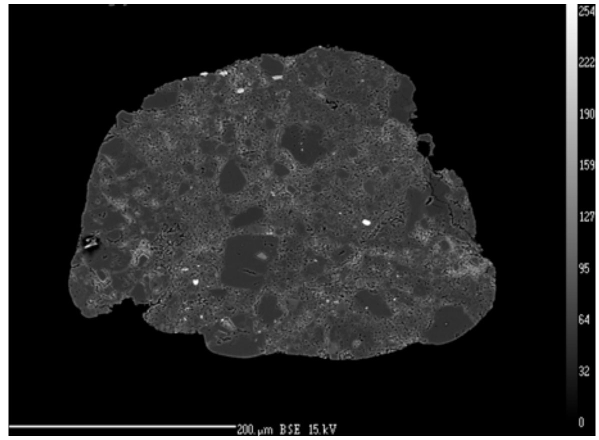
Calcite fragments, which comprised between 1 and 7% of the samples, were determined by Roeske to be, almost without exception, shell material based on their morphology. Most samples also contained between 1 and 5% heavy minerals (i.e., minerals with higher densities than quartz and feldspar) such as epidote, amphibole, chlorite, zircon, Fe and Fe-Ti oxide, and garnet.

TABLE 3: % Mineral Composition of Unsieved Sand Samples (from Roeske, 2011)

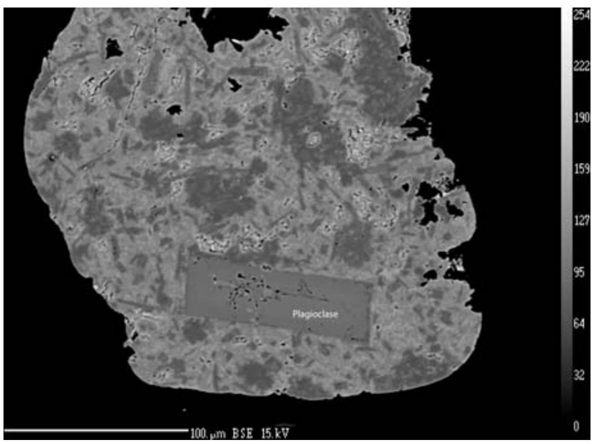
	Sample No.									
MINERAL	**1W**	**1E**	**2W**	**2E**	**3W**	**3E**	**4W**	**4E**	**5N**	**5S**
Quartz	24	30	32	35	26	27	22	25	30	25
Plagioclase (incl. albite)	10	15	13	11	12	10	6	9	5	15
Alkali feldspar	7	2	4	5	4	2	3	6	6	3
Lithic (granitoid or silicic)	36	33	29	31	24	29	34	30	29	36
Lithic (metabasite)	8	7	9	7	10	11	6	5	10	7
Lithic (chert, silicic)	8	5	3	1	2	6	7	4	1	1
Lithic (mud-sandstone)	2	2	4	4	13	12	15	15	8	11
Lithic (schist)	0	0	0	0	1	1	0	3	0	0
Calcite	4	2	4	1	5	1	7	2	6	1
Epidote	1	2	0	0	0	1	0	0	3	1
Amphibole	0	1	0	0	0	0	0	0	0	0
Chlorite	0	1	0	0	0	0	0	0	0	0
Fe- and Fe-Ti Oxide	0	0	1	1	2	0	0	0	1	0
Zircon	0	0	1	0	1	0	0	1	0	0
Garnet	0	0	0	4	0	0	0	0	1	0
Total	100	100	100	100	100	100	100	100	100	100
Composition Summary										
% quartz, feldspar, lithic silica fragments	77	80	78	82	66	68	65	70	70	79
% lithic fragments (all)	54	47	45	43	50	59	62	57	48	55



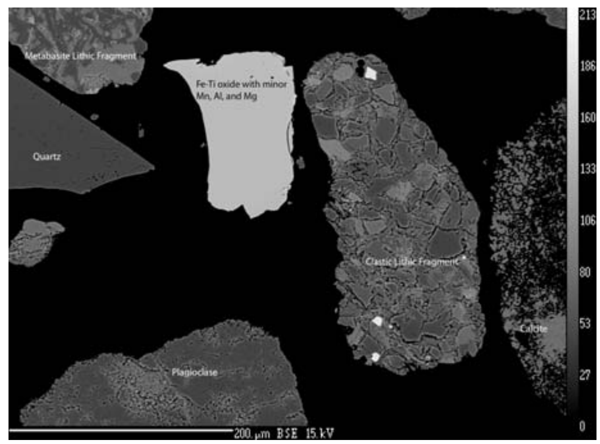
Sample 1W. Granitoid lithic fragments (silicic to intermediate composition).



Sample 1W. Mafic volcanic lithic fragment (metabasite lithic).



Sample 3W. Metabasite lithic.



Sample 5W. Clastic lithic fragment, metabasite lithic fragment, and grains composed of single minerals.

Figure 4. Examples of lithic (rock) fragments collected in sand from Ten Mile Dunes. Photos by S. Roeske.

DISCUSSION

The deposition of sand along the Ten Miles Dunes is largely a result of sand supply, shoreline topography, moisture content, wind currents, and sand grain size.

Sand Supply: Results of the microprobe analyses indicate all of the sand samples collected along the road within the Ten Mile Dunes are predominantly quartz, granitoid (igneous) or silica-rich lithic (rock) fragments, and feldspar. Quartz and feldspar also dominate the clastic (mudstone and fine sandstone) fragments, some of which were relatively coarse and angular. According to Roeske (2011), this suggests that some of the particles may have not been reworked extensively and may have been derived from nearby volcanic and/or plutonic sources (Roeske, 2011). However, the relatively low percentages of zircon and relatively high percentages of mudstones and other lithic fragments found within the sands also indicate the grains may have been reworked from nearby marine terrace deposits and/or surrounding sandstones typical of Franciscan coastal belt rocks east of the dunes.

Recent studies have confirmed that high rates of sedimentation occur immediately north of the dunes at the mouth of the Ten Mile River (Griggs and others, 2005; Hapke and others, 2006; Matthews, 2000). Other sources of sediment are eroded soils and rock from the smaller drainages within the dunes, including Inglenook Creek and Fen Creek (Figure 1), as well as offshore sands carried in from the north and south during large storm events.

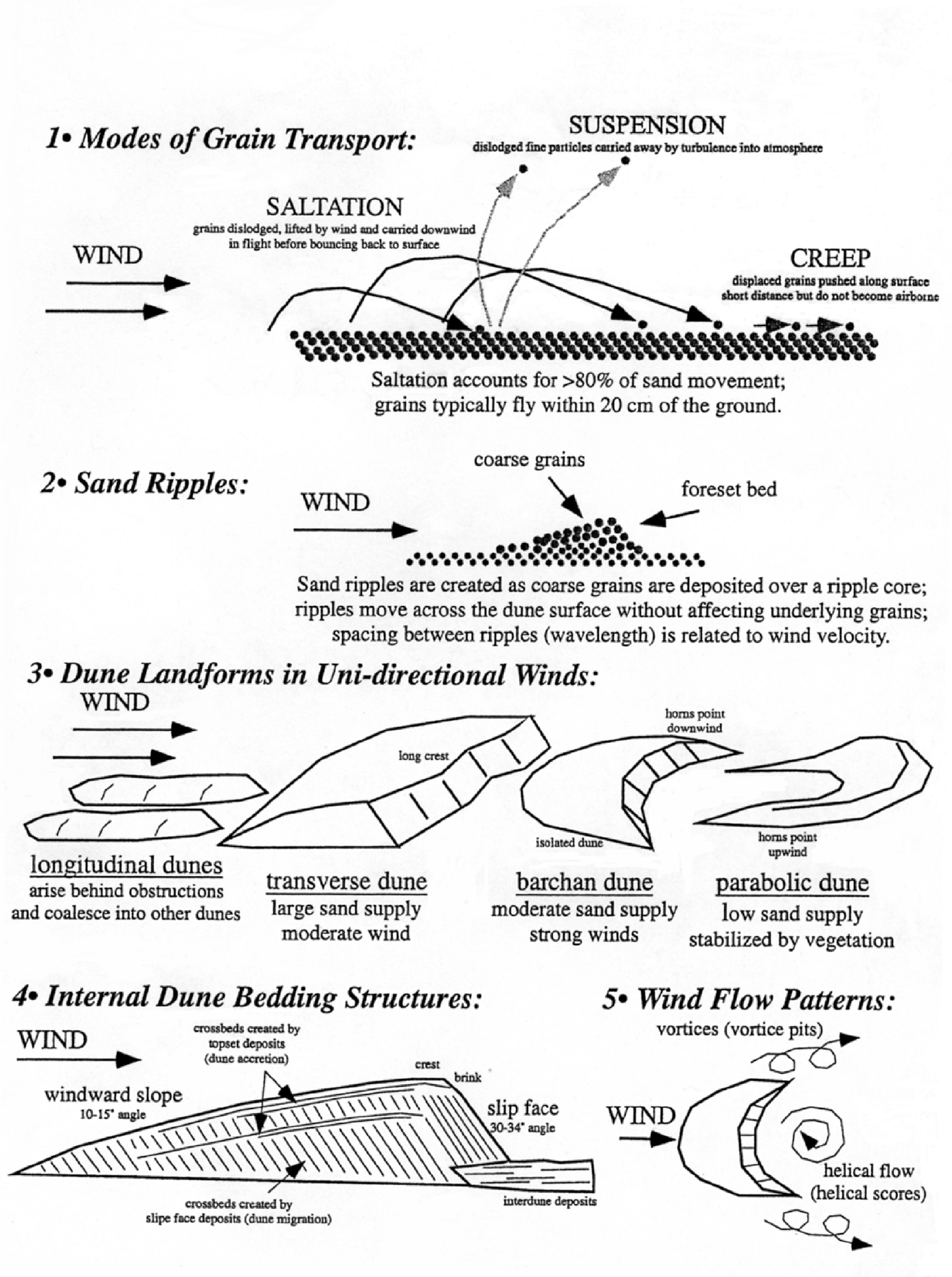
According to Hapke and others (2006), the average long-term (200 yr) and short-term (50 yr) rates of change (accretion and erosion) in the shoreline in this area have been much lower than in other areas along the coast. The average long-term rate of shoreline change in California was accretion at 0.2 m/yr; while the average short-term rate of change in California was erosion at -0.2 m/yr. In the vicinity of Ten Mile Dunes, the net shoreline change was accretion that averaged 0.1 m/yr; i.e., the average accretion rate was 0.6 m/yr, while the average erosion rate was -0.5 m/yr (measured at DeHaven Creek Beach, north of Westport). The long-term maximum accretion rate of 0.7 m/yr was measured along Ten Mile Beach just south of the Ten Mile River, while the short-term maximum accretion rate of 3.3 m/yr occurred just north of the mouth of the Ten Mile River. These numbers are likely related to the large volumes of sand discharged by the Ten Mile River and are consistent with the geomorphological findings of Wollenberg (2004), i.e., that more sand is accreting at the northernmost lobe of the Ten Mile Dunes than along the southernmost lobes.

Topography and Coastal Dune Formation: The shoreline near the mouth of the Ten Mile River shifts from its general northwest-southeast trend to a general northeast-southwest direction at the northern end of the Ten Mile Dunes (Figure 1). This change allows for the deposition of sand and, combined with the low gently sloping terraced terrain adjacent to the shoreline, provides a surface over which wind-propelled sand can move to form dunes (Barry and Schlinger, 1977; Cooper, 1976).

During the natural process of coastal dune formation (Figure 5), longitudinal-shaped foredunes will form perpendicular to the coastline, usually around small clumps of vegetation (Bagnold, 1941; Cooper, 1967; Gallant, 1997). The small dunes will collect more sand and continue to grow until some threshold size, dependent upon local physical conditions, is reached (Bagnold, 1941). The foredunes will grow in height as the vegetation expands.

East of the foredunes, a series of predominantly unvegetated transverse dunes will form nearly parallel to the coastline. The transverse dunes tend to migrate downwind (eastward) as sand is eroded from the windward (west) side of the dunes and deposited on the leeward (east) side. The transverse dunes may form several steep (60-62%), sometimes crescent-shaped (barchanoid), slip faces up to 100 feet or more in height. In general the windward side of the transverse dunes is less steep (generally 15-20%) than the leeward slip face. Smaller, more rapidly advancing dunes gradually encroach in an en echelon fashion onto the more gentle windward sides of the older dunes with higher slip faces, eventually adding height to the older dunes.

Figure 5. Dune Processes and Landforms. Excerpted from Parsons, 2002.



Moisture Content and Vegetation: As noted during sample collection, considerable moisture is found close below the surface of the Ten Mile Dunes. Bagnold (1941) attributes this subsurface moisture to periodic storms and the uniformity of temperature in the dunes below a depth of about 8 inches; i.e., because sand is a poor conductor of heat, most diurnal temperature changes are inappreciable at a depth of 8 inches below the surface. Therefore, as long as the saturated air between sand grains remains unchanged, appreciable quantities of water are not lost.

Moisture is also more common where vegetation is present. The depressed areas on the leeward side of the dunes are often moist and may be favorable places for vegetation. Both vegetated areas and those under which moisture is present consist of soft sand, whereas naturally barren areas are more firm underfoot.

In addition, deposits of windblown sand consist of thin stratified layers or laminae (Figure 5), a few millimeters thick, in which the grading varies slightly as result of the proportion of fine materials present (Bagnold, 1941). Coarser grains rise to the top while finer grains sink through material to the bottom of each depositional sequence. Firmness occurs when the relatively angular sand grains fit together. In some dune sands, this layering may be undetected or may collapse rapidly when disturbed. Studies by Bagnold (1941) showed that both vegetated and moist areas were built up of steeply encroaching laminae, while barren areas were underlain by accretion laminae that run nearly parallel to the surface (Figure 5). This is because, in the encroachment laminae, the water runs down the old shear planes of the laminae and almost immediately reaches a depth where subsequent evaporation is negligible. In contrast, in areas underlain by accretion laminae, water runs rapidly sideways along the surface layers that contain fine material, and is prevented from sinking downward by the relatively non-conducting layers from which finer sand material is absent. The moisture in these deposits remains close to the surface and soon evaporates.

Wind Speed and Sand Movement: Within the Ten Mile Dunes project area, the three lobes of transverse dunes have formed perpendicular to the coastline. This indicates that sand within the dunes moves in the direction of the prevailing winds, which are generally from the north-northwest during the summer and from south-southeast during winter (Barry and Schlinger, 1977; Cooper, 1967; Mendocino County, 2011; Wallenberg, 2004). However, irregular sand ripple patterns along the tops of the dunes and at the bottoms of the steep advancing slip faces represent localized pockets of changing wind velocities, wind eddies, and wind reversals.

Records collected from Fort Bragg between July 2009 and July 2011 (Mendocino County, 2011) indicate there were several periods between March and early June of 2010 where winds blew from the north-northwest for 8 to 12 consecutive days, and for up to 54 hours, with gusts of more than 10 mph. Wind speeds of 16.3 and 19.1 mph were recorded on April 2 and April 30, respectively. Two periods of 8 or more days of wind with gusts over 10 mph occurred in early November of 2009 and 2010, from both the northwest and southeast. Winds of over 10 mph and up to 20.5 mph also occurred from north-northwest for a duration of 45 hours between April 1 and 3, 2011. The highest wind speeds recorded were 25.6 mph on April 21, 2010 from the north-northwest and 25.6 mph on December 17, 2010 from the south-southeast.

Bagnold (1941) determined that the wind speed needed to start grains moving depends upon the size of the sand grains. He found that a minimum wind speed of 10 mph is needed to move very fine grained desert sands between 0.08 and 0.150 mm in size (Bagnold, 1941; Welland, 2009). This sand grain size range is finer than the predominant grain size at Ten Mile Dunes, which is between 0.125 and 0.425 mm in size. Additional field studies by Bagnold predicted a grain of sand 0.4 mm should require an initial wind speed of 31 mph to be lifted from the ground. Based on these findings, threshold wind speeds in the Ten Mile Dunes are expected to be between 10 and 20 mph. Actual variations in threshold wind speed as related to grain size would need to be verified. Although threshold velocity of natural sediment cannot be represented by a single value (Nickling, 1988), erosion thresholds observed in both natural and wind tunnel experiments were found to be higher on rough surfaces than on smooth surfaces (Musick and Gillete, 1990; Gillette and others, 1982); i.e., sand will move more slowly over rougher surfaces.

Sand Grain Size and Sand Movement: Sand grain size analyses within Ten Mile Dunes indicate between 61 and 99% of the grains within the samples collected are fine grained sand between 0.125 and 0.425 mm in size (Table 2 and Figure 2). In general, sand collected along the road in the northernmost lobe of the dunes has a larger fine sand component than to the south, where it contains a greater percentage of medium size sand grains. The larger component of fine sand collected in samples from the northernmost lobe of dunes may be related to their proximity to the floodplain of Ten Mile River and/or to the northward sorting of finer sand materials over the less well-vegetated surfaces of the dunes at the northern end of the Ten Mile Dunes. The coarser, more bimodal nature of the samples collected in the southernmost lobes may also be related to the deflated, more well-vegetated areas in which they were collected and/or their proximity to the less well-sorted nature of sediments deposited at the mouths of Inglenook Creek and Fen Creek.

According to Bagnold (1941), most sand movement is by the process of saltation, where grains skip along the ground surface as they are dislodged, lifted by the wind, and carried downwind before bouncing back to the surface (Figure 5). Sand grains normally move only a short horizontal distance while in the air, generally on the order of a few inches to a few feet, and to a height of several inches to approximately 2 feet above the ground (Bagnold, 1941; Welland, 2009; Zheng, 2009). Although extremely strong winds can raise smaller sized sand particles higher than 6 feet, the wind will not keep sand particles suspended in the air for long periods of time such as it may do with silt-sized and smaller particles (Bagnold, 1941). As a result of continued bombardment of the surface, a slow forward creep of the surface grains takes place.

Studies by Bagnold (1941) indicate there will be more mass movement if the sand is composed of different grain sizes (poorly sorted) than if it is more uniform in size. Bagnold also showed that smaller, or shrinking dunes, will move more quickly than those with higher slip faces, or that are growing in size. This is likely to affect the rate of dune advancement. For example, more poorly sorted sands deposited on the beach, and within unvegetated, lower-lying dunes closest to the shoreline, will migrate more quickly downwind as sand is eroded from the windward side of the dunes and is deposited on the leeward side of the dunes (Bagnold, 1941; Welland, 2009; Zheng, 2009). As they move inland, sands in the smaller encroaching dunes travel up and over the higher slip faces, eventually adding height to the larger dunes and slowing them down. Sand movement along the slip face will also generally slow down where vegetation is present. Sand within the unimpeded portions of the encroaching dune will, however, continue to move faster, often forming longitudinal or lobate ridges that wrap around the vegetation (Figure 5). The side ridges commonly enclose small flat valleys, hollows, or dune swales.

Grain size is also responsible for dune shapes; i.e., transverse dunes are generally composed of well sorted fine sand while interdune and/or flat areas in the dunes tend to be more bimodal in size composition (White and Tsoar, 1998). In addition, studies of sand movement on inclined dunes surfaces show that, as wind speed increases with the height of the dune, sand grains left at the base of the slope are generally coarser than those near the dune crest (White and Tsoar, 1998). Seasonal variations in grain size distribution may also occur as a result of heating and cooling, which alter turbulence and control sand transport at each location on the surface of the dune.

General Observations: The presence of the road (including the Ten Mile Railroad) and culverts within the project area has prevented the natural formation of foredunes along Ten Mile Dunes for more than 100 years. As documented in detail by Maslach (2004) and Wollenberg (2004), sand has continued to build up along the majority of the west side of the road. This, in effect, has created one long transverse dune on the windward side of the road, and an equally long deflated area east of the road, except where disrupted by the drainages of Inglenook Creek and Fen Creek.

A review of aerial photographs taken between 1981 and 2010 (CDF, 1981; WAC, 1996 and 2000; USDA, 2010) indicates relatively minor changes have occurred in vegetation cover and drainage patterns along the road during the past 30 years. Vegetation appears to be more well-established farther inland within the northernmost dune lobe than it was in 1981. However, there appears to be less vegetation immediately adjacent to the road than in 1996, both in the northern and southern lobes of the dunes. This may be related to: (1) the accretion of sand and/or the recent removal of non-native vegetation on the west side of road in the northern lobe of the dunes, and (2) the partial removal of the road itself due to wave action in the two southernmost lobes, particularly during the 1998 El Nino storm events (Lewis, 1998). Minor changes in drainage patterns west of the road near the culvert outlets at Inglenook Creek and Fen Creek may be related to the over- topping of wood debris from storm-generated waves and high tides as documented by Wallenberg (2004).

The removal of the road and culverts will restore natural sand movement within the dunes. The removal of non-native vegetation will also continue to increase sand movement inland until new vegetation is re-established. Heavy seasonal storms will also continue to modify the coastal topography once the road and culverts are removed. High tides and large storm surges could result in localized erosion and modification of the beach and dunes, particularly any foredunes that develop. The re-establishment of natural hydrological conditions near the mouths of Inglenook Creek and Fen Creek is also likely to alter drainage patterns, both along the watercourses and within the wetlands of the adjacent dunes.

CONCLUSIONS

- Removal of the road and culverts, in conjunction with the removal of non-native vegetation on the windward side of the road, will eliminate the barriers to natural sand movement within the Ten Mile Dunes.
- Natural coastal dune formation processes are likely to be re-established, including the formation of foredunes perpendicular to the shoreline along the west side of the three main dune lobes.
- As a result of these natural processes, more sand is likely to blow inland (nearshore) over the short-term, especially in the northern lobe.
- The addition of sand will change the configuration of the dunes as they migrate to the east (i.e., additional transverse dunes could develop and/or grow in height farther inland), the nature of the vegetation, and the drainage patterns throughout the dunes.

Respecfully submitted:

original signed by:

Trinda L. Bedrossian, PG 3363, CEG 1064, CPESC 393
Senior Engineering Geologist, Specialist
California Geological Survey

Concur:

original signed by:

William R. Short, PG 4576, CEG 1429, CHG 61
Supervising Engineering Geologist
California Geological Survey

Attachments:

Appendix A. BSE and EDS Examples
Appendix B: UC Davis Microprobe Analyses Report
Appendix C: Comparison of Sand Samples

Cc: Syd Brown, California State Parks
Adam Hutchinson, California State Parks
Michael Huyette, California Geological Survey

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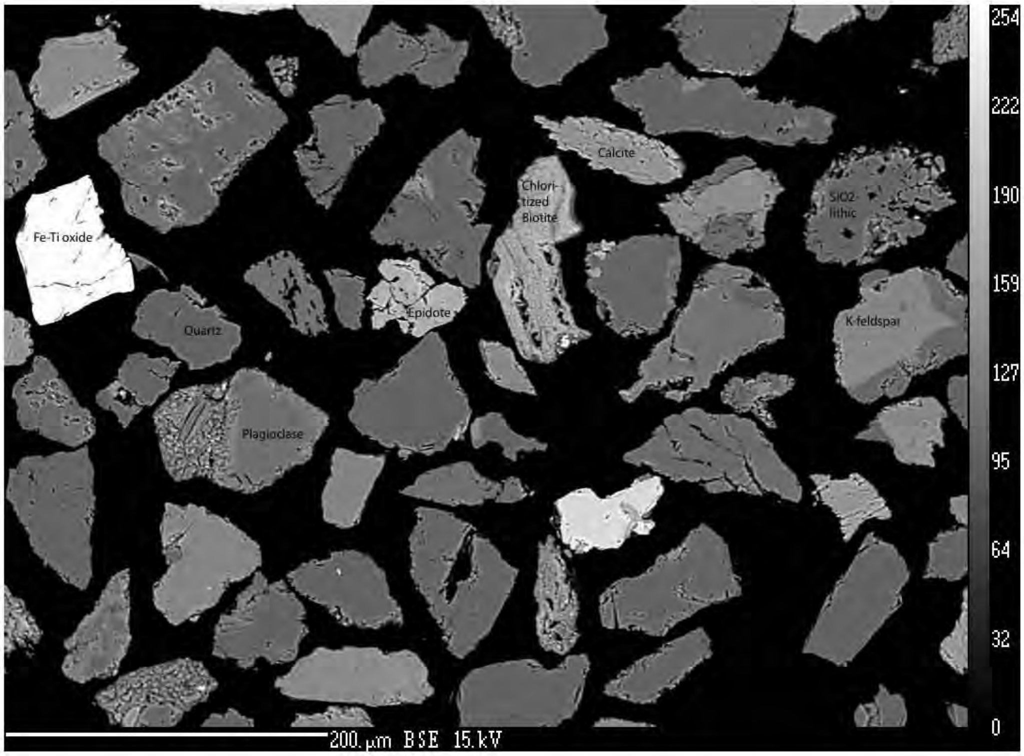
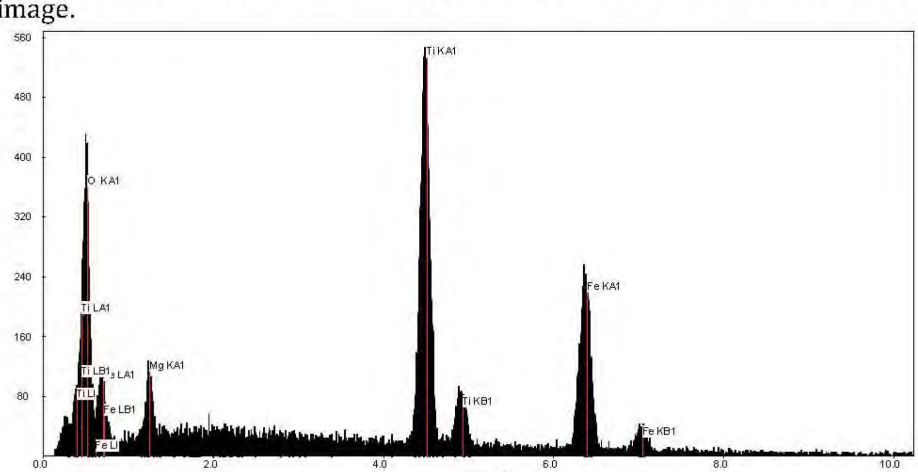
APPENDIX A: BSE AND EDS EXAMPLES

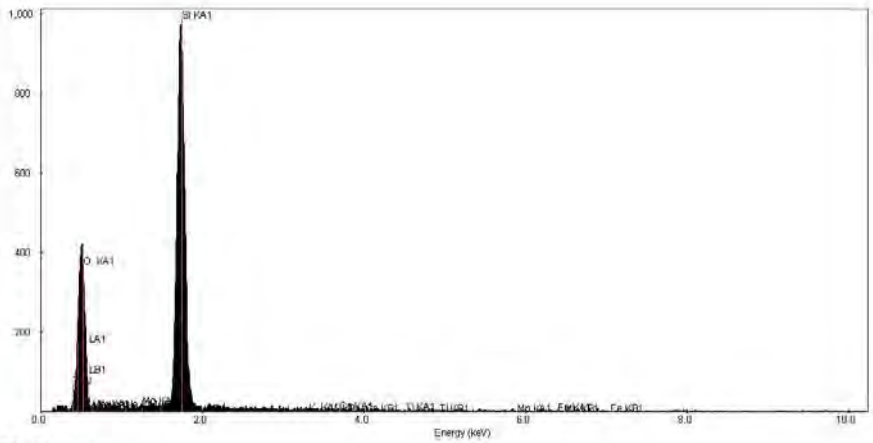


Example of an image used for point-counting grains in the less than 325 micron fraction. Mineral fragments have different gray scale intensity depending on their total mass.

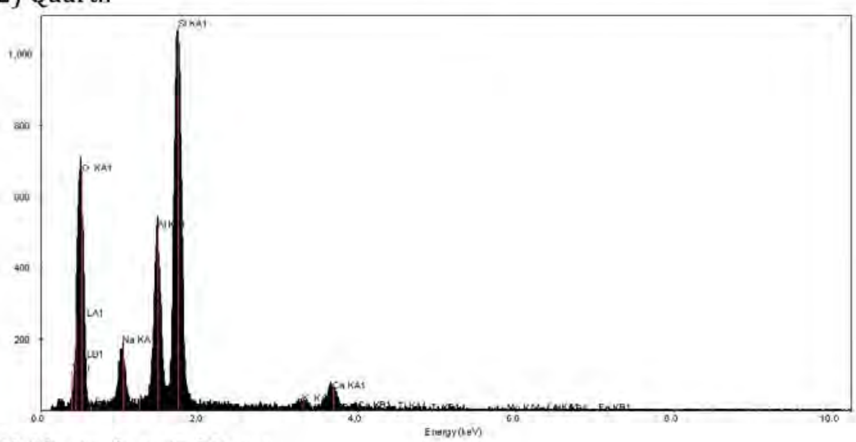
Below are EDS (energy-dispersive spectrometry files) generated from the above image.



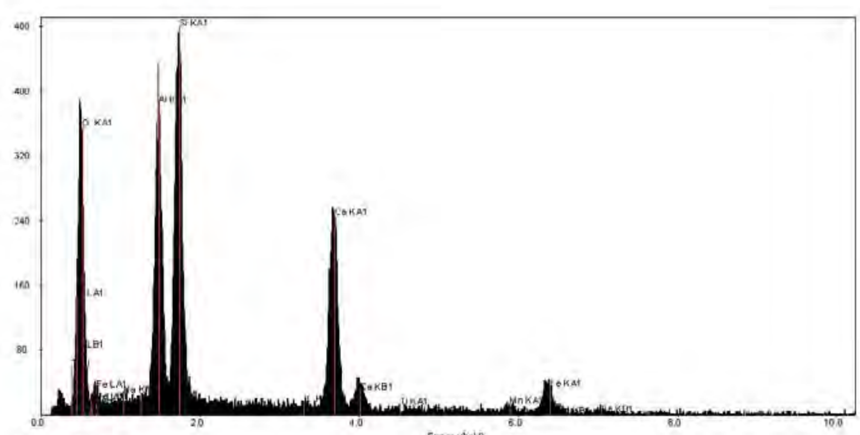
1) Fe-Ti oxide with some magnesium (typical of solid solution in the Fe-Ti oxides).



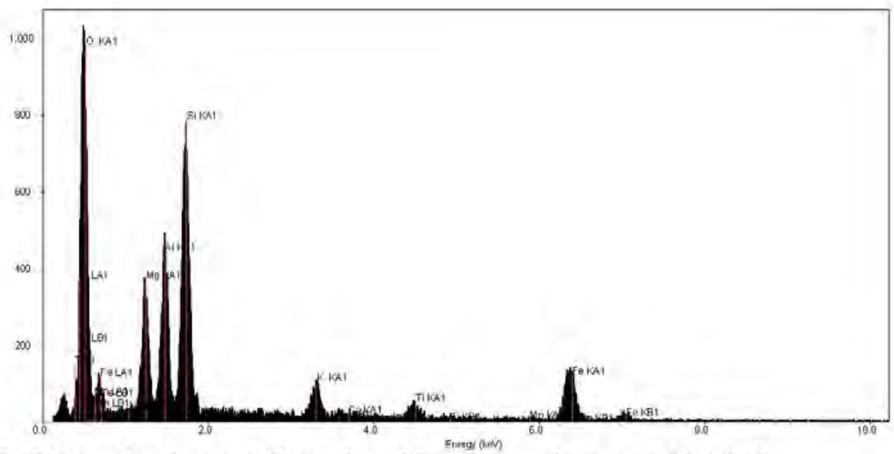
2) Quartz



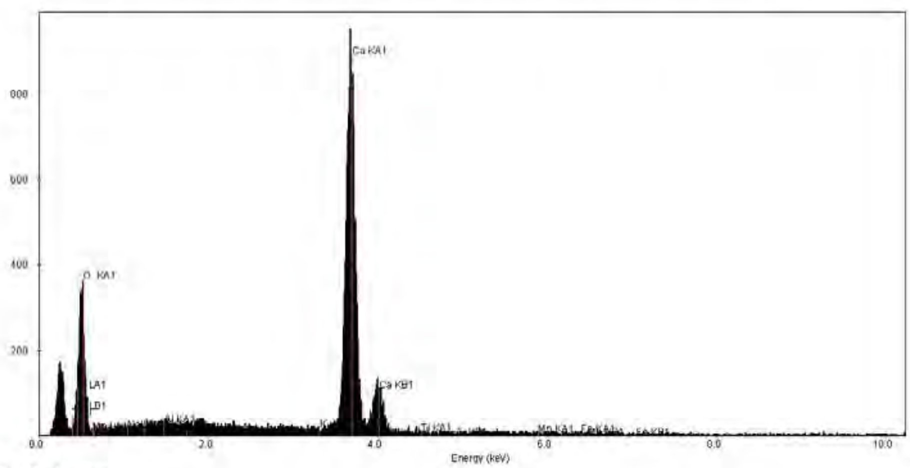
3) Plagioclase Feldspar



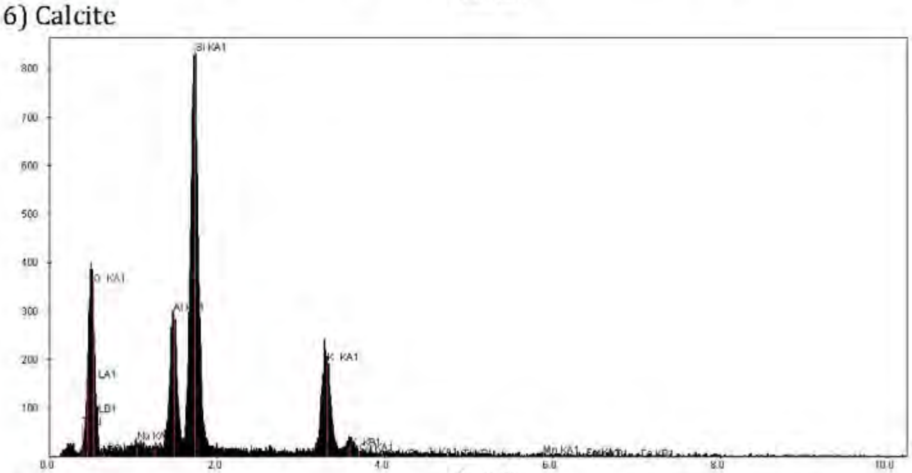
4) Epidote



5) Biotite that is partially replaced by chlorite (count as bioitite).



6) Calcite



7) K-feldspar

APPENDIX B: UCD MICROPROBE ANALYSES REPORT

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DEPARTMENT OF GEOLOGY
UNIVERSITY OF CALIFORNIA
ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616

PHONE (530) 752-0350
FAX (530) 752-0951

Mineral identification of sand samples from 10 Mile Dunes

Introduction and General Methods

This report summarizes observations and data from sand samples collected by Trinda Bedrossian, California Geological Survey. The goal of this report is to identify mineral compositions in the whole sand material collected from different sites. The electron microprobe is an ideal tool for such analyses because it has imaging, energy-dispersive, and wavelength dispersive capabilities. The latter two methods yield quantitative analyses of 1-micron size regions, which allow for identification of what minerals are present. The Geology Department at University of California, Davis has a Cameca SX-100 5-spectrometer electron microprobe. Images obtained from this machine can be made at a wide range of magnifications, resolving items as small as a few microns. The images presented here are back-scattered electron images (BSE). The density of a phase controls the brightness in a BSE image, such that denser phases (Fe-oxide, for instance) are bright. BSE images also show whether individual grains are composed of a single phase (uniform grey scale) vs. multiple phases (range of grey scales). The latter are described as lithic fragments in the data table.

Mineral identification is done by the operator comparing energy-dispersive spectra (EDS) from individual grains with known mineral phases. Analytical conditions for the energy-dispersive spectrometer were accelerating voltage of 15 Kev, 20 nampere beam current, and a beam size of 1 micron. The beam was on each point for ~ 5-10 seconds minimum, to allow for peak and background separation to become clear. In almost all cases the relative heights of the various elemental peaks, which indicates abundance of an element in the phase, allows for unique mineral identification.

Sample Preparation

All samples were prepared by Greg Baxter (Geology Department Staff Research Associate). He received the dried whole samples from Trinda Bedrossian and did not do any sieving or other methods of separation. He placed the grains on double-stick tape, to ensure that all size fractions would be exposed on the surface, in a circular template 2.5 cm across, then poured epoxy over them, allowed it to harden and polished them.

All samples were coated with an approximately 200 angstrom thick coating of carbon to make them conductive under the electron beam. This allows for imaging and quantitative analysis.

Point Count Methods

To obtain a statistical sampling of the composition, I moved the stage in a straight line such that the scanning image moved across the sample. I counted any grain that was within ~300 microns of this horizontal line, noting its composition, until 100 grains were counted.

The type of lithic fragment can be a slightly subjective decision, because rocks display a continuum of compositions and the categories used in this report are end members. For instance, the distinction between an intermediate and mafic (metabasite) composition igneous rock is not precisely defined. For the purposes of this point count I labeled lithic fragments as mafic if the fragment contained a substantial (~>20%) amount of Mg and Fe bearing phases and contained little or no quartz. Textural distinctions also display a continuum, such that the difference between a chert (SiO2-rich very fine grained sediment) and a mudstone is a qualitative assessment. For lithic fragments that display distinct rounded clasts within a finer matrix, I categorized the rock as clastic. For those that were uniformly very fine grained quartz, I categorized the rock as chert.

Images of the samples were taken at a constant scale (2 mm field of view) such that variation in average grain size can be seen easily. Some images were taken at closer view to emphasize the fine-grained textures visible in the back-scattered electron images.

Summary of Data

The samples are overall very similar in composition. Minerals and lithic fragments that are resistant to both physical and chemical weathering dominate them: quartz, feldspar, and rock fragments that are composed of dominantly these minerals. The silicic to intermediate composition igneous rock fragments include both intrusive (plutonic) and extrusive (volcanic) types. Quartz and feldspar grains also dominate the clastic sediment lithic fragments. Some of these clastic sediments are relatively coarse and angular, suggesting they have not been reworked extensively and were derived from proximal volcanic and/or plutonic sources.

The calcite fragments are almost without exception shell material, based on their morphology. Rare calcite that was angular may be derived from calcite veins.

All of the samples had only a few "heavy" (dense) minerals, which include epidote, amphibole, chlorite, zircon, Fe-Ti oxide, and garnet. The sample that contained 4% garnet stands out from the others and suggests some "lag" deposit was sampled here.

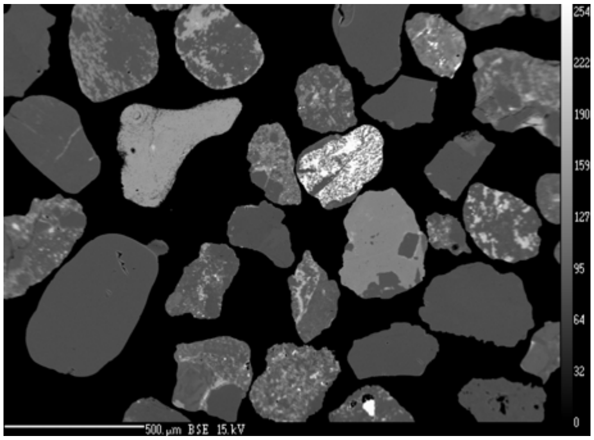
Report prepared by Dr. Sarah M. Roeske
Research Geologist and Electron Microprobe Lab Manager
Geology Department
University of California, Davis
Davis, CA 95616

(530) 752-4933
smroeske@ucdavis.edu

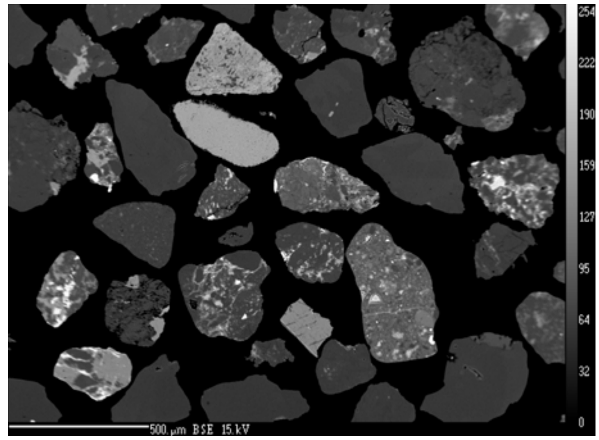
July 28, 2011

APPENDIX C: COMPARISON OF SAND SAMPLES

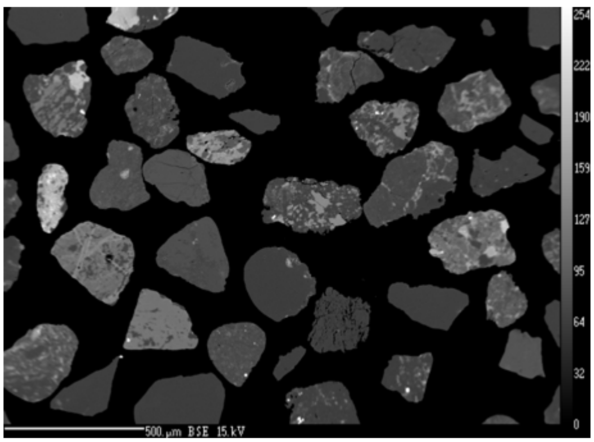
Mineral	Sample no. 1W	1E	2W	2E	3W	3E	4W	4E	5N	5S
Quartz	24	30	32	35	26	27	22	25	30	25
Plagioclase (includes albite)	10	15	13	11	12	10	6	9	5	15
Alkali feldspar	7	2	4	5	4	2	3	6	6	3
Lithic fragment (granitoid or silicic to intermediate volcanic)	36	33	29	31	24	29	34	30	29	36
Lithic fragment (metabasite)	8	7	9	7	10	11	6	5	10	7
Lithic fragment (chert or silicic sediment)	8	5	3	1	2	6	7	4	1	1
Lithic fragment (clastic sed - mudstone to sandstone)	2	2	4	4	13	12	15	15	8	11
Lithic fragment (schist)					1	1		3		
Calcite	4	2	4	1	5	1	7	2	6	1
Epidote	1	2				1			3	1
Amphitoble		1								
Chlorite		1								
Fe-oxide and Fe-Ti oxide			1	1	2				1	
Zircon			1		1			1		
Garnet				4					1	
Total	100	100	100	100	100	100	100	100	100	100
Summary of compositions:										
Percent quartz, feldspar, and lithic fragments from silicic to intermediate composition	77	80	78	82	66	68	65	70	70	79
Percent lithic fragments (all lithics)	54	47	45	43	50	59	62	57	48	55



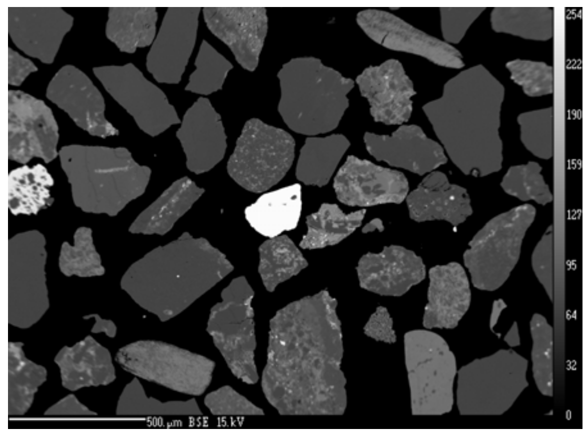
Sample 1W. 500 micron field of view.



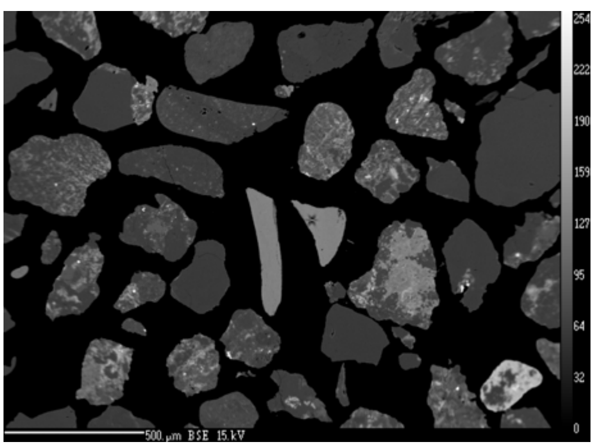
Sample 1E. 500 micron field of view.



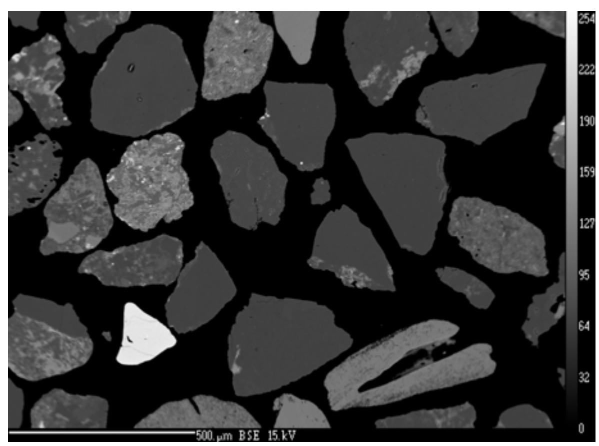
Sample 2W. 500 micron field of view.



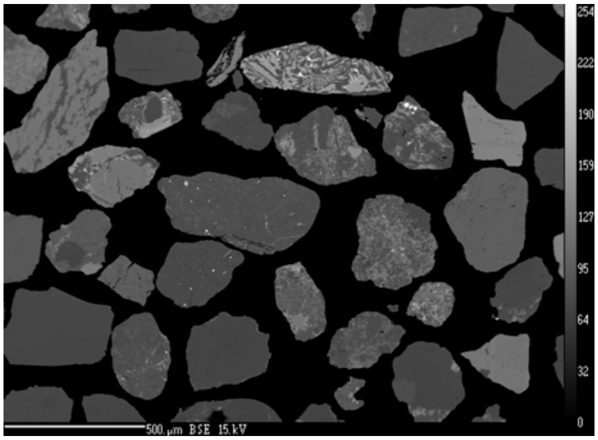
Sample 2E. 500 micron field of view.



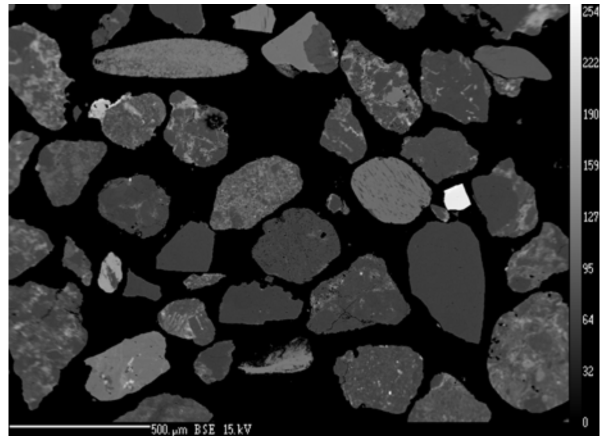
Sample 3W. 500 micron field of view.



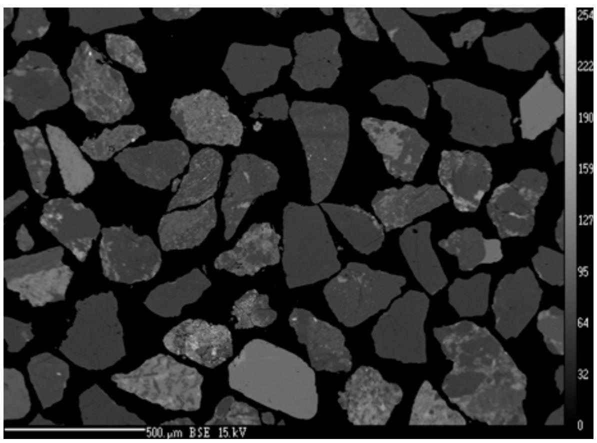
Sample 3E. 500 micron field of view.



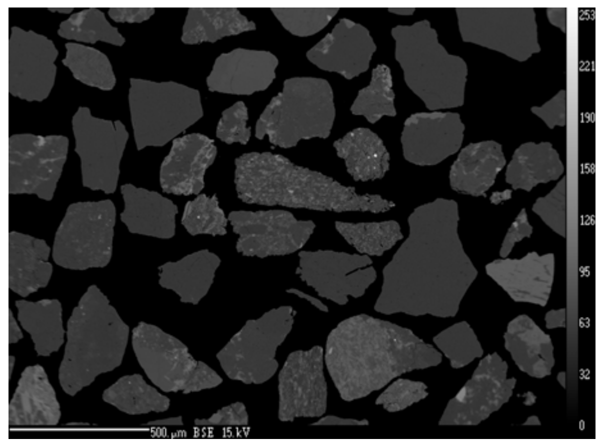
Sample 4W. 500 micron field of view.



Sample 4E. 500 micron field of view.



Sample 5N. 500 micron field of view.



Sample 5S. 500 micron field of view.

Appendix E.5
Tidewater Goby Avoidance Measures

The following measures were recommended during consultation with the U.S. Fish and Wildlife Service and will be incorporated into the project to avoid or minimize potential adverse effects:

- Construction activities at stream crossings will only occur between June 15 and October 31 (or as authorized by the California Department of Fish and Game (DFG) Streambed Alteration Agreement) to avoid or minimize adversely affecting fish, bird, and plant species of concern and to minimize soil compaction and sediment transport.
- Equipment will not be operated directly within tidal waters or stream channels of flowing streams.
- Prior to culvert removal activities at Fen Creek and Inglenook Creek, surveys will be conducted by USFWS permitted biologists for tidewater gobies. If water is present in the stream channel, the work area will be seined and a fish barrier installed to isolate the work area and to temporarily prevent fish species of concern gaining access to the vicinity of the work area. Gobies are susceptible to being injured or crushed by workers while they are entangled in, or being removed from, seines and netting. In order to minimize potentially adverse effects to gobies, all translocation/removal of tidewater gobies will be conducted by qualified biologists under a scientific recovery permit pursuant to section10(a)(1)(A)of the federal Endangered Species Act.
- The temporary fish barrier will be removed after work is completed.
- Silt fences will be deployed at culvert removal areas to prevent any sediment from flowing downstream into the stream or wetted channels. If the silt fences are not adequately containing sediment, construction activity will cease until remedial measures (such as the placement of additional silt fences or straw wattles) are implemented that prevent sediment from entering the waters below. Park staff will consult with DFG biologists and follow all recommendations regarding water quality issues during project activities.
- All exposed surfaces will be slash-packed with native vegetation and/or revegetated with willow sprigging when the work has been completed.
- Construction materials, debris, or waste, will not be placed or stored where it may be allowed to enter into or be placed where it may be washed by rainfall into waters of the U.S./State.
- Turbid water will be contained and prevented from being transported in amounts that are deleterious to fish, or in amounts that could violate state pollution laws. Turbid water will be pumped through a sediment bag prior to discharge back into the channel (see section IX Hydrology Discussion “a” for explanation of sediment bags). Park staff will consult with DFG biologists and follow all recommendations regarding water quality issues during project activities.
- CSP staff or a designated representative will be on site to ensure that the culvert area is recontoured as per approved specifications.
- Designated areas will be used for equipment refueling. If equipment must be washed, washing will occur where wash water cannot flow into wetlands or waters of the U.S./State.
- Best Management Practices (BMPs) and Project Requirements will be implemented to prevent entry of storm water runoff into the excavation site and to prevent the entry of polluted storm water runoff into coastal waters during the transportation and storage of excavated materials (see pertinent sections in Project Requirements: Hydrology and Water Quality, and Appendix E: Best Management Practices).