

A Mitigation Plan for the
Inglenook Fen – Ten Mile Dunes Natural Preserve
MacKerricher State Park
Dune Rehabilitation Project

2012

Note: This mitigation plan is currently in draft form and represents a minimum level of suggested mitigation. The Plan will be subject to editing and modification through further review by botanical consultants with expertise in dune ecology and through additional consultation with the regulatory agency personnel.

Summary

The purpose of this report is to provide a mitigation plan for the protection of special status plants that will be unavoidably impacted by the removal of two culverts and the paved haul road in the Inglenook Fen-Ten Mile Dunes Natural Preserve (Preserve). California State Parks (CSP) proposes to remove two watercourse crossings along the haul road in the Preserve and remove the asphalt and portions of underlying rock ballast of the haul road. The road prisms over the streams are constructed with significant volumes of earthen fill and act as a barrier to tidal surges and natural stream processes. In addition, non-native European beachgrass will be retreated and removed in sensitive habitat areas.

The special status plants growing near the culvert removal and along the haul road are in locations where they can be crushed, removed, buried by sand, or otherwise destroyed, or be susceptible to weed invasion. Because addressing the larger ecological problem of removing unnatural features on the landscape poses an unavoidable impact to these plants, mitigation of the impacts is proposed.

Impacts

A 50 ft (15 m) buffer was placed around the haul road to account for direct and indirect impacts from road removal activities, such as excavating individuals of plants with heavy equipment, having plants and vegetation become buried from mobilized sand, or exposing existing plants and vegetation to threats of weed invasions after the asphalt and road ballast are removed. To lessen the potential impacts to special status plants, "Sand Storage Exclusion Zones" were created around rare plants and their supporting natural communities. These zones will also be areas where work will not be conducted, e.g. no heavy equipment, excavation, sand storage, etc. will occur within these zones, which are indicated on subsequent maps as "Sand_Storage_Exclusion_Zone".

METHODS

All special status plants potentially impacted by the project were inventoried in 2011. Prior to transplanting, seeding, and habitat enhancement, the areas will be surveyed by CSP-approved personnel to accurately assess if boundaries or locations of these features have changed and to delineate and document these locations on a scaled map. For example, if a survey and removal of iceplant (*Carpobrotus edulis*, *C. chilensis*) was conducted, and a new infestation was found, a map would be referenced and updated to indicate the new location. The purpose is to document the success of the mitigation project while documenting changes that may occur as a result of the dune rehabilitation project, including special status plants and animals occupying new habitat.

To offset unforeseen reasons for poor success rate of direct seeding and transplanting, this mitigation plan will provide documentation for the long-term monitoring of a project aimed at the continued success of establishing and enhancing viable populations of the special status plants and natural communities in a restored dune system.

The proposed management period would be in effect for 3 years after the transplanting and direct seeding, and each phase is overseen by a biological monitor. The habitat enhancement through weed removal would occur for 5 years. Details of the mitigation methodology for each species and habitat are described below.

General Habitat Enhancement / Weed Removal

Prior to transplanting and direct seeding, CSP personnel will survey and inventory the site for the presence of exotic weeds, noting the general abundance of each. Exotic plants that are determined to pose a significant threat of affecting the establishment of special status plants and communities will be identified and removed. Such plants would include, but not be limited to, European beach grass (*Ammophila arenaria*), pampas, or jubata, grass (*Cortaderia jubata*), Himalaya blackberry (*Rubus armeniacus*), and iceplant. Removal of the exotic weeds will increase the likelihood of establishment of plants that are seeded directly into the ground. European beachgrass will be chemically treated with a 2% glyphosate and 1% imazapyr solution and iceplant will be treated with a 2% glyphosate solution.

Infestations of pampas grass occur throughout the Preserve; however, usually only several individuals are found in a localized infestation area and they will be pulled by hand or dug out with a shovel. Focused weed removal will occur within the 50 ft (15) road buffer.

***Abronia umbellata* ssp. *breviflora* – Pink Sand-Verbena Mitigation**

Pink sand-verbena is an annual or short-lived perennial. Seeds will be collected and scattered in suitable adjacent habitat and monitored to ensure that at least 42 plants germinate and flower to establish a mitigation ratio of 3:1. Pink sand-verbena seeds will be collected August – September. All seeded locations will be documented and monitored for weeds and weeds will be removed. Additional directing seeding will occur until a total of 42 plants have germinated and flowered.

***Chorizanthe howellii* – Howell's Spineflower (spineflower, CHHO) Mitigation**

Impacts to spineflower were closely analyzed given the rarity of the species. It is a narrow endemic found in semi-stabilized bluff and dune areas between the Ten Mile River and south to Glass Beach.

Approximately 0.3 acres (0.12 ha) of spineflower can be directly impacted and another 0.7 acre (0.28 ha) potentially impacted. It is assumed that the different methods of mitigation: iceplant treatment, European beachgrass treatment, habitat creation, and direct seeding, will effect the establishment of spineflower with varying degrees. For example, treating European beachgrass alone will likely not recruit as many spineflower into a new area as would direct seeding. Also, within the different weed treatments, recruitment of spineflower is expected to be lower the further away the weed treatment site is from a source of spineflower seed. Because of this assumed variability in the effectiveness of mitigation measures, a minimum 3:1 ratio based on individual plants is adopted.

Direct seeding and habitat enhancement are the primary methods of mitigation. Suitable habitat that currently does not have spineflower has been selected for seeding within the Preserve. Seed collection of spineflower will occur late June-July, and seeds will be stored in a cool, dry location. Seeds will be raked into selected sites after the first fall rains. Sample quadrats will be established to monitor colonization into new areas in a method previously used by CSP and US Fish and Wildlife Service (USFWS), (3 x 0.125 m quadrats, with a 95% confidence interval). All seeded locations will be monitored for weeds and weeds will be removed. In the southern portion of the Preserve, approximately 1.5 acres (0.61 ha) of iceplant within 35 acres (14 ha) of spineflower habitat will be treated with glyphosate and later pulled by hand as the iceplant cover is reduced. Treatments will occur twice annually for three years to ensure that no more than 10% iceplant cover remains. After which point, iceplant will be pulled by hand for 2 years with the goal of eradication. All areas within 50 ft (15 m) of the road will be searched for weeds, specifically iceplant, and will be removed.

Spineflower Impact Analysis:

Spineflower Occupied Habitat and Impact Analysis		
	Entire Preserve	Northern Portion of Preserve (north of Inglenook Cr.)
Spineflower mapped in Preserve 2011	8.9 acres (3.6 ha)	1.3 acres (0.5 ha)
Road Fill Removal Direct Impact	0.29 acres (0.12 ha)	0.28 acres (0.11 ha)
Road Surface Removal Direct Impact	0.012 acres (0.005 ha)	0.012 acres (0.005 ha)
Total Direct Impact	0.30 acres (0.12 ha)	0.29 acres (0.11 ha)
Percent of Spineflower Directly Impacted	3.4%	22.3%
Spineflower Potentially Impacted (spineflower within a 50 ft, 15m buffer, not including the area directly impacted)	0.70 acres (0.28 ha)	0.65 acres (0.26 ha)
Total Direct and Potential Impact	1.0 acres (0.40 ha)	0.94 acres (0.38 ha)
Percent of Spineflower Directly and Potentially Impacted	11.2%	72.3%

Spineflower Avoidance

- 1) Northern curve and segment paralleling the Ten Mile River
Removal of only the road surface along a 1150 ft (350 m) segment, from the park boundary westward to the curve in the road. This avoidance minimizes impacts to the spineflower present on the fill and ballast exposed on either side of the road surface. Please see "CHHO Mitigations Map" legend item: *CHHO_Northern_Rd_Mitigation_Site*.

Spineflower Mitigation

Suitable habitat selected for spineflower mitigation includes areas of semi-stabilized sandy soils. Spineflower stands mapped in 2011 are within 50 ft (15 m) of nearly all mitigation sties with the exception of an area proposed for introduction along the eastern boundary of the Preserve, west of the CalTrans mixing table along Hwy. 1. The proximity of the mitigation sites to the existing stands helps ensure that there will be a nearby source of viable seed. Methods for mitigation follow.

- 1) Spineflower Habitat Creation
 - a. 2.60 acres (1.1 ha) in the northern lobe of suitable spineflower habitat will be created in sections of the road where the road surface and fill material is to be removed. Spineflower grows adjacent to these road sections and can then expand into these areas. Some seed-laden sand from the spineflower stands will be scattered into these areas as well. Please see "CHHO Mitigations Map" legend items:

- i. *CHHO_Northern_Rd_Mitigation_Site*
 - ii. *CHHO_Inglenook_Rd_Mitigation_Site*
 - iii. *CHHO_Suitable_Removal_15m_Proximity*
- 2) Spineflower Habitat Enhancement

European beach grass and iceplant will be treated in areas adjacent to existing spineflower.

 - a. In the northern lobe, 3.29 acres (1.3 ha) of EBG adjacent to existing spineflower will be retreated as part of the Project. Please see “CHHO Mitigations Map” legend item:
 - i. *CHHO_EBG_Treatment*
 - b. An introduction of spineflower seed in retreated areas of EBG north of the remnant haul road and west of the Ten Mile River bridge will increase occupied habitat within the Preserve by 1.07 acre (0.4 ha). Please see “CHHO Mitigations Map” legend item:
 - i. *CHHO_EGB_Retreatment_N_Introduction*
 - c. Iceplant treatment of 1.5 acres (0.61 ha) within occupied spineflower habitat will enhance 35 acres (14 ha) of habitat. Please see map, “Iceplant Treatment Site for Spineflower and Wallflower Mitigation.” CSP (Warner 2006) in an ice plant hand-removal experiment, showed that by removing most of the iceplant duff, spineflower was able to colonize the newly created habitat. For cost-savings and work efficiency, glyphosate will be used to initially treat iceplant. After the plants are killed and easily dislodged from the soil, enough duff will be removed to discourage the establishment of exotic annuals and encourage the establishment of spineflower.
- 3) Spineflower Introduction
 - a. Spineflower seed will be introduced into areas of suitable habitat adjacent to existing spineflower stands. This ensures that there is a nearby seed source and that the introduced seeds will germinate in a similar microhabitat. Please see “CHHO Mitigations Map” legend items:
 - i. *CHHO_Northern_Rd_Mitigation_Site*
 - ii. *CHHO_Inglenook_Rd_Mitigation_Site*
 - iii. *CHHO_Suitable_Removal_15m_Proximity*
 - b. In addition to the spineflower reseeding in EBG areas mentioned in #2, seeding of 4.5 acres (1.8 ha) will take place in suitable habitat outside the project footprint near the northern lobe. Please see “CHHO Mitigations Map” legend items:
 - i. *CHHO_EGB_Retreatment_N_Introduction*
 - ii. *CHHO_Introduction_Areas*
- 4) Public Education
 - a. Landowners adjacent to the Preserve near Ward Avenue will be contacted by mail or in person. The CSP brochure, Silent Threats, Non-Native Species Invading Our Wildlands will be handed out.

CHHO Mitigations Map

MacKerricher SP Dune Restoration Project
Chorizanthe howellii Mitigation Plan
Northern Lobe Area



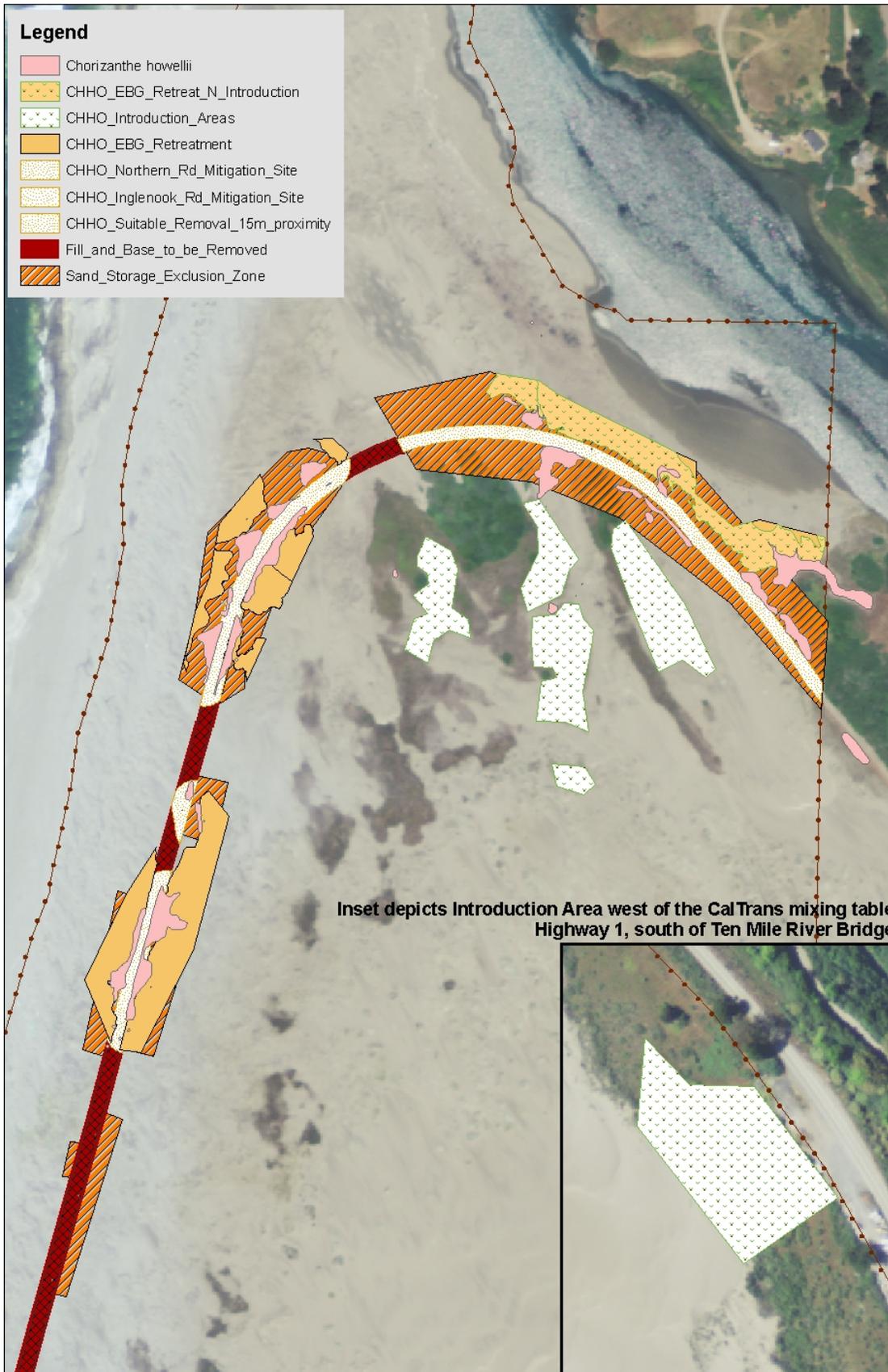
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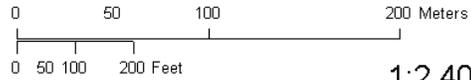
Legend

- Chorizanthe howellii
- CHHO_EBG_Retreat_N_Introduction
- CHHO_Introduction_Areas
- CHHO_EBG_Retreatment
- CHHO_Northern_Rd_Mitigation_Site
- CHHO_Inglenook_Rd_Mitigation_Site
- CHHO_Suitable_Removal_15m_proximity
- Fill_and_Base_to_be_Removed
- Sand_Storage_Exclusion_Zone



Inset depicts Introduction Area west of the CalTrans mixing table
Highway 1, south of Ten Mile River Bridge

MacKerricher SP Dune Restoration Project
Chorizanthe howellii Mitigation Plan
Inglenook Creek Area

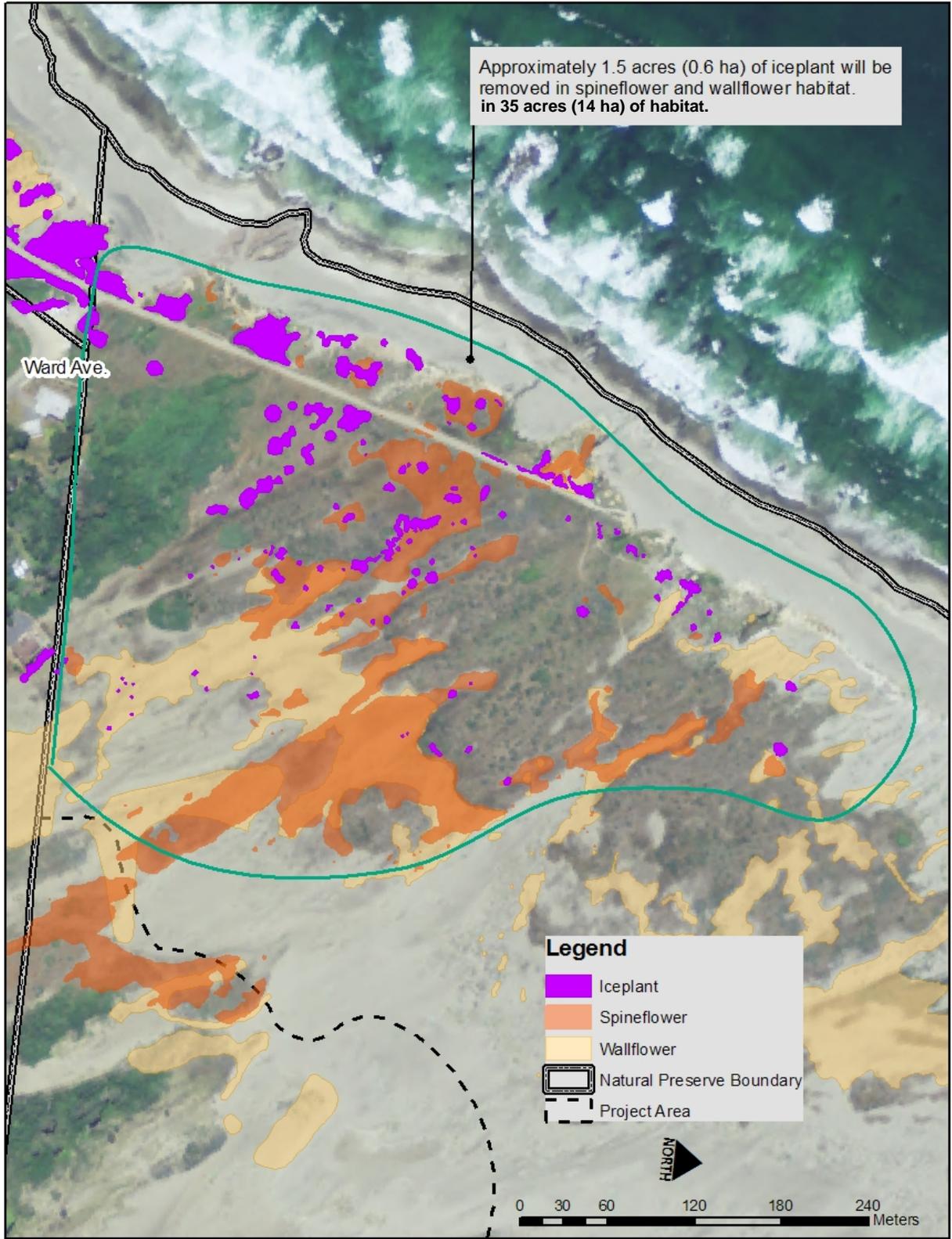


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Legend

- Chorizanthe howellii
- CHHO_EBG_Retreat_N_Introduction
- CHHO_Introduction_Areas
- CHHO_EBG_Retreatment
- CHHO_Northern_Rd_Mitigation_Site
- CHHO_Inglenook_Rd_Mitigation_Site
- CHHO_Suitable_Removal_15m_proximity
- Fill_and_Base_to_be_Removed
- Sand_Storage_Exclusion_Zone



Iceplant Treatment Site for Spineflower and Wallflower Mitigation.

***Erysimum menziesii ssp. menziesii* – Menzies' Wallflower (wallflower) Mitigation**

The road removal corridor, including a 33 ft (10 m) buffer from the edge of equipment operations was surveyed for numbers of wallflower. Approximately 1,170 plants occurred within this survey area and have the potential to be directly impacted. To assess potential impacts, a 50' (15 m) buffer was overlaid on the mapped wallflower polygons and area of occupied habitat was estimated.

Direct seeding into appropriate areas and habitat enhancement are the primary methods of mitigation.

Before seeding, all locations to be seeded will be monitored for weeds and weeds will be removed. Seed will then be scattered and raked into the reintroduction areas after the first fall rains. Two methods of assessing the numbers of germinated wallflower will be employed. It is reasonable to assume that a complete census of wallflower in the planted area can be completed because the area is narrow and linear and currently without many wallflower. In the unlikely event that wallflower are too numerous to count, sample quadrats (1 x 20 m) using the same methodology as the population estimation study will be established to monitor success.

Wolfe's Evening Primrose Mitigation

Two small patches of evening-primrose, one at the northern bend in the haul road and another north of Fen Creek, are within the 50 ft (15 m) potential impact buffer. Both will be flagged and avoided. Most of the other evening-primrose are on the banks of Inglenook Creek downstream of the culvert and can be avoided. However, there is the potential that some plants will be destroyed during construction. Seed will be collected and scattered in suitable adjacent habitat and monitored to ensure at least 100 new plants germinate and flower. Seeds will be collected August – September. All seeded locations will be monitored for weeds and weeds will be removed. More direct seeding will occur until a total of 100 plants have germinated and flowered.

Documentation and Reporting

Documentation of tasks will be summarized and presented in an annual report and final report to the US Fish and Wildlife Service, California Department of Fish and Game, US Army Corps of Engineers and any other pertinent regulatory agency.

Reporting will include scaled maps of areas identified for mitigation and the pre-implementation survey results indicating potential change in boundaries or locations of natural communities or plants, both invasive weeds and special status plants. All work will be documented, showing number of person-hours and mitigation areas located on scaled maps. Photopoints for key mitigation areas will be established and photos included in the reporting. A discussion of methods and results used for mitigation, including all areas and numbers of plants used to reach the mitigation goals, will also be included.

References

Report. California Department of Parks and Recreation. Mendocino District.

Warner, P. J. Development of a Restoration Strategy for Howell's Spineflower, Progress Mendocino, California: 2006.

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