Draft

ENVIRONMENTAL ASSESSMENT

for the

Humboldt Bay National Wildlife Refuge
Ma-le'l Dunes Restoration

U.S. FISH AND WILDLIFE SERVICE

and

CALIFORNIA DEPARTMENT OF CORRECTIONS

May 5, 2005

EDAW

Draft

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Humboldt Bay National Wildlife Refuge
Ma-le'l Dunes Restoration

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PURPOSE AND NEED FOR THE ACTION

INTRODUCTION

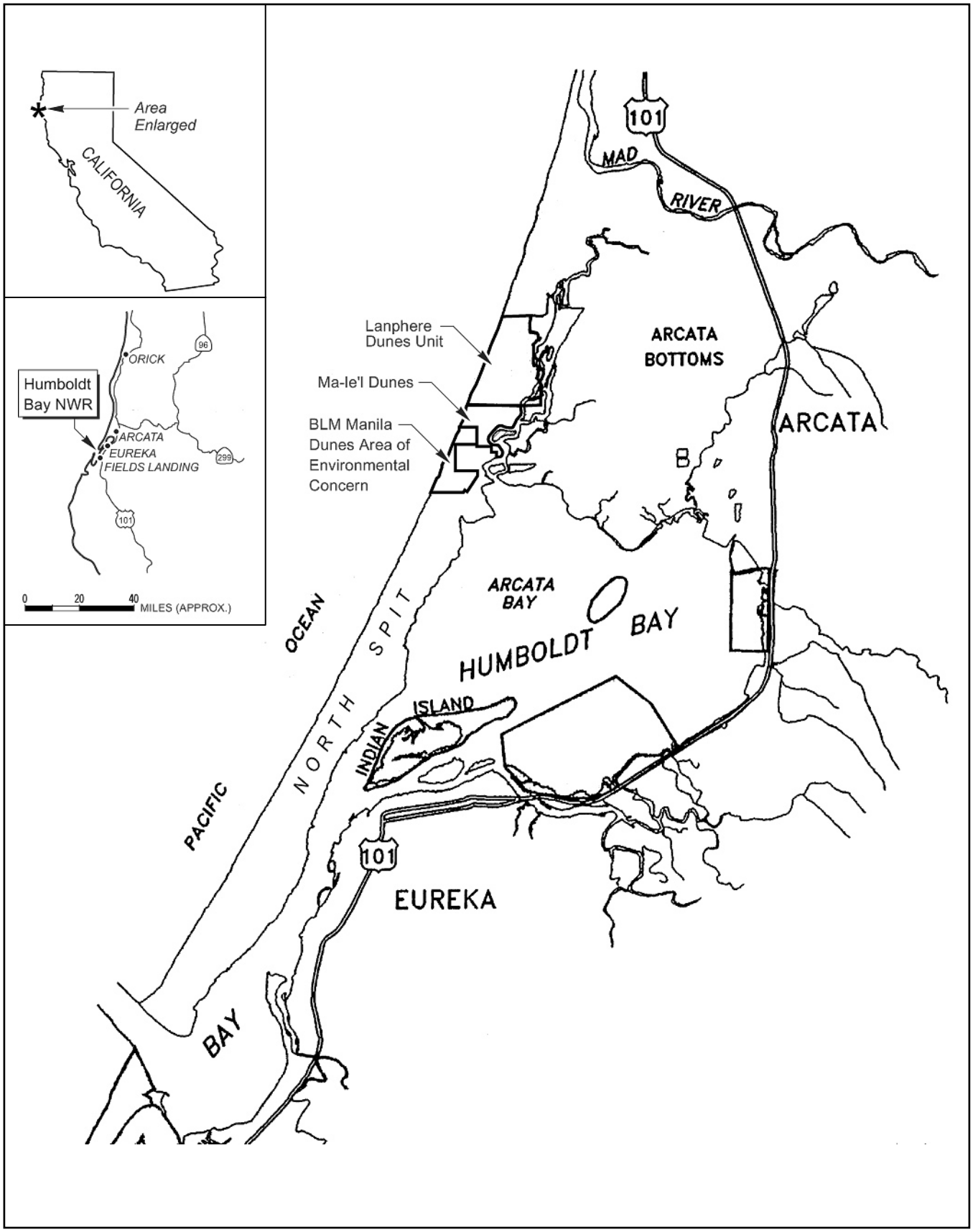
Preparation of this Environmental Assessment (EA) has been funded by the California Department of Corrections (CDC), which is also providing funding for the proposed action. The U.S. Fish and Wildlife Service (USFWS) would implement the proposed action and is the lead agency under the National Environmental Policy Act (NEPA). The purpose of this EA is to address NEPA compliance at the project level by providing a site-specific analysis of potential environmental impacts that could result from implementation of a proposed action or alternative. This EA has been prepared for the proposed restoration of endangered plant habitat on nearshore dunes and restoration of coastal forest habitat at Ma-le'l Dunes. The restoration is a component of the Habitat Conservation Plan (HCP) developed by CDC for its Statewide Electrified Fence Project (EDAW 1999). Ma-le'l Dunes consists of approximately 160 acres of dunes, coastal forest, and estuary on the Mad River Slough south of and adjacent to Lanphere Dunes Unit, Humboldt Bay National Wildlife Refuge (HBNWR) and north of the Bureau of Land Management's (BLM) Manila Dunes Area of Critical Environmental Concern (Exhibit 1).

The property was acquired by the Center for Natural Lands Management (CNLM) in 2003 with funding from the State Coastal Conservancy. CNLM is expected to transfer ownership of Ma-le'l Dunes to the USFWS in 2005. This parcel will become part of the HBNWR system and be managed in perpetuity under the Refuge Recreation Act, with emphasis on conservation of threatened and endangered species. CNLM received a grant from the USFWS's Private Stewardship Land Grant program to restore endangered plant habitat in the nearshore dunes on the site, and restoration activities were initiated in 2004. The currently proposed restoration project would be funded by CDC and implemented by HBNWR. It would facilitate continuation of restoration activities initiated in 2004 and include additional enhancement and restoration of dune and coastal forest habitats.

NEED FOR AND PURPOSE OF THE ACTION

The proposed restoration is necessary to fulfill requirements of CDC's Statewide Electrified Fence Project HCP. The restoration and enhancement actions constitute one component of the compensatory mitigation requirements described in Chapter 5 of the HCP. Although the HCP indicates that restoration and enhancement will occur at two parcels other than Ma-le'l Dunes (Bair and Woll parcels), it became infeasible to implement the mitigation at either of those sites. Therefore, it was agreed during consultations with USFWS and DFG that Ma-le'l Dunes is an appropriate alternative location.

The primary purpose of the proposed action, in addition to satisfying requirements of the CDC HCP, is restoration of native dune ecosystem processes at Ma-le'l Dunes. These processes are crucial to allowing natural succession of native dune and coastal forest habitat. The near-shore dune habitats at Ma-le'l Dunes have been degraded by the invasion of nonnative plant species that pose a threat to two endangered plant species, Humboldt Bay wallflower (*Erysimum menziesii* ssp. *eurekense*) and beach layia (*Layia carnosa*), and two unlisted sensitive plant species, dark-eyed gilia (*Gilia millefoliata*) and pink sand-verbena (*Abronia umbellata* ssp. *breviflora*). Endangered plant distribution on the North Spit of Humboldt Bay has been fragmented by the spread of invasive plants, including European



Site Location

EXHIBIT 1

Humboldt Bay National Wildlife Refuge
Ma-le'l Dunes Restoration Plan
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beachgrass (*Ammophila arenaria*), yellow bush lupine (*Lupinus arboreus*), iceplant (*Carpobrotus* spp.), pampas grass (*Cortaderia jubata*), and jubata grass (*Cortaderia jubata*). Arresting and reversing the effects of these invasions is needed to accomplish the recovery of these endangered plants. Recovery plans for both species call for restoration of habitat degraded by invasive plants. Restoration will also enhance and increase the extent of the rare dune mat plant community, which has been eliminated throughout much of its range. The proposed action also includes restoration of coastal forest that has been degraded by past land uses, primarily off-road vehicle use and spread of invasive plant species, such as English ivy (*Hedera helix*).

Decision to Be Made

USFWS anticipates that a Finding of No Significant Impact (FONSI) will be made, based on the EA and public comments. Comments on the EA may be submitted to USFWS at the addressed listed on the cover. Comments must be postmarked no later than 30 days after publication. After evaluating substantive comments received, USFWS will revise the EA or prepare an Environmental Impact Statement, if necessary. If no substantive comments are received during the comment period or if substantive comments are received and the environmental impacts are still determined to be non-significant, a FONSI will be issued.

Issues Identified During Project Planning

The resource issues summarized below were identified during the restoration planning process and are addressed under Environmental Consequences section of this EA.

- Endangered plant and animal species: There are two species of federally listed endangered plants found in the project area, Humboldt Bay wallflower and beach layia. The threatened western snowy plover (*Charadrius alexandrinus nivosus*) nests to the north, and although nesting habitat or behavior has not been observed on the site, there is the possibility for use of the site for feeding or resting.

- Rare plant communities: Near-shore dune plant and animal communities found on the site are degraded, but remnants of high quality dune mat remain, supporting diverse plants and animals as well as endangered species.

- Wetlands: Dune swales provide breeding habitat for Pacific tree frogs, Northern red-legged frogs, Rough-skinned newts, and numerous invertebrates. Swales are used for feeding by wading birds and provide habitat for neotropical migrants.

- Invertebrates: The site contains habitat for nesting aggregates of solitary bees such as silver bee (*Habropoda miserabilis*) and leaf cutter bee (*Megachile wheeleri*). These bees are important pollinators of the dune plants, some oligolectic (specialist) on particular plant species, and are an important part of ecosystem functions.

- Biotic soil crusts: Associations of cryptogams including mosses, lichens, and fungi occur in some relatively stabilized dune ridges in the project area. The role of biotic soil crusts in ecosystem function is just beginning to be studied. They are known to provide preferred

nesting substrate for the solitary bee Megachile and may play a role in primary and/or secondary plant succession.

- Public access: The site was formerly open to the public as part of the Mad River Slough and Dunes Cooperative Management Area in the early 1990s, but was subsequently acquired by and operated as an off-highway vehicle club. There is great public interest in having public access to the site re-established.

- Cultural resources: The project site was used by the ancestral Wiyot tribe for fishing, implement making, and food gathering. There are several culturally sensitive areas. The Tribe is interested in continued access and in protecting cultural artifacts.

ALTERNATIVES INCLUDING THE PROPOSED ACTION

ALTERNATIVE A – NO ACTION

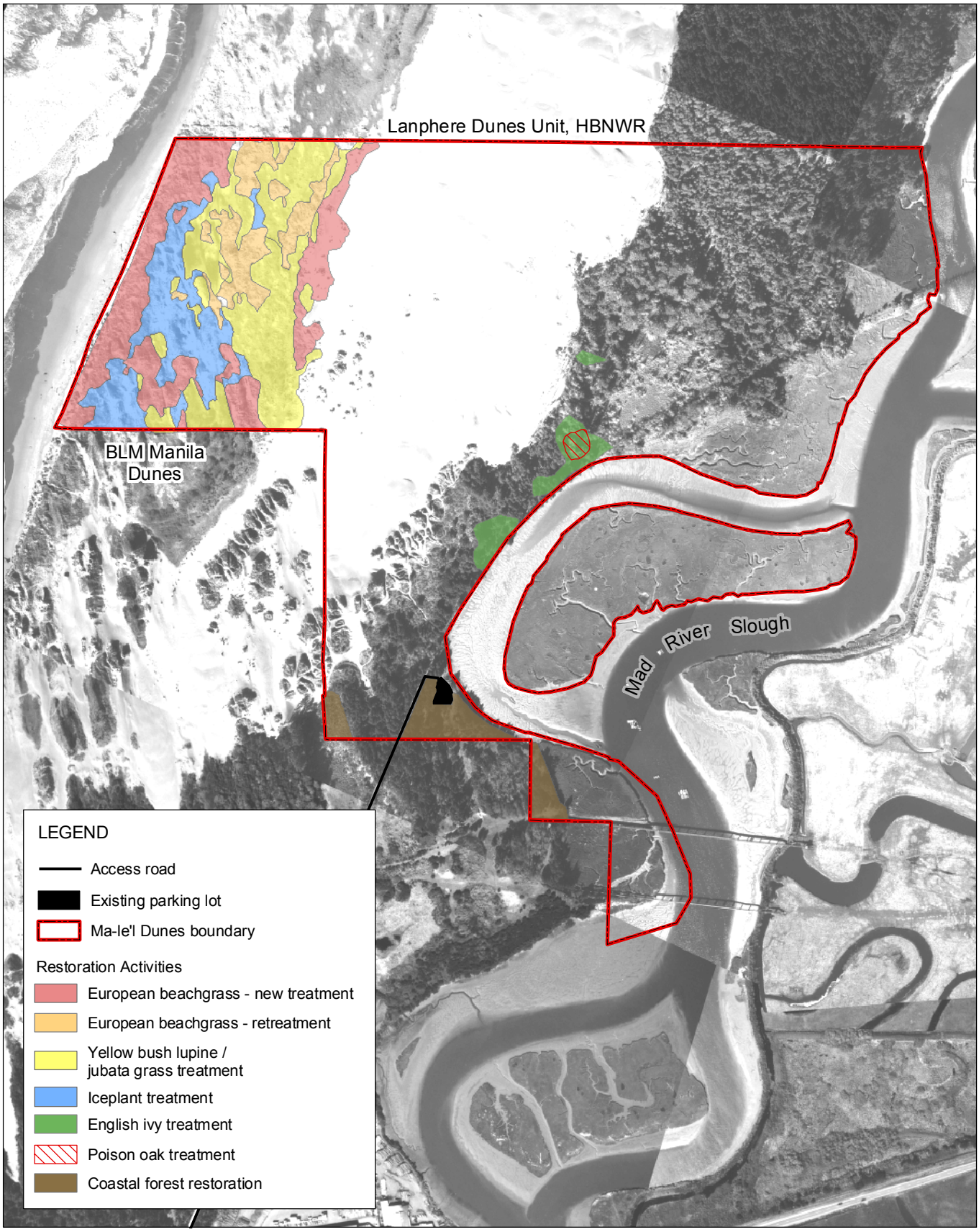
The No Action alternative would mean that no CDC-funded management would be undertaken to either stop the continued spread of invasive plants species or restore degraded areas. In addition, compensatory mitigation requirements of the Statewide Electrified Fence Project HCP would not be fulfilled. Therefore, the No Action Alternative would not address the project purpose and needs.

ALTERNATIVE B – PROPOSED ACTION

The proposed action includes the following CDC-funded restoration components: (a) retreatment of approximately 13.7 acres of invasive plants previously treated by CNLM and HBNWR staff in 2004; (b) treatment of 17 acres of previously untreated invasive plant infestations; and (c) restoration of approximately 3 acres of degraded coastal forest. Restoration components are depicted in Exhibit 2 and summarized in Table 1. Specific restoration activities that would be conducted throughout the 129 acres of coastal dunes and forest on the 160-acre Ma-le'l Dunes site are described below.

Table 1
Components of CDC-funded Restoration Activities at Ma-le'l Dunes

Vegetation/ Habitat Type	Characterization	Acres	Objective	
			Activity	Acres
Coastal dune and forest	Dynamic coastal dune and forest system consisting of open sand, Dune mat, Dune swale, Freshwater marsh, Deciduous swamp, and Coniferous forest	129	**Control of:**	
			European beachgrass	12.7
			Yellow bush lupine/jubata grass	10.0
			Iceplant	6.0
			English ivy	2.0
			Total Control:	**30.7**
			Restoration of:	
			Degraded Forest	3.0
			Total Restoration:	**3.0**
	Total	**129**		**33.7**



Source: USFWS 2004a

CDC-Funded Restoration Activities at Ma-le'l Dunes

EXHIBIT 2

California Department of Corrections
Statewide E-Fence Project Ma-le'l Dunes Restoration
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Restoration and Monitoring Activities

CDC-funded restoration and monitoring activities are planned as a 5-year program scheduled to begin in 2005. Manual labor for these activities will be provided by CDC inmates supervised by the California Department of Forestry (CDF). CDC-funded monitoring will be conducted during the 5-year duration of the program, and subsequent long-term monitoring will be continued by HBNWR staff. An outline of scheduled restoration and monitoring activities to be conducted at Ma-le'l Dunes as part of this plan is provided as Appendix A. This schedule may be modified by the Restoration Manager during implementation, depending on the availability of CDF labor and the success or failure of restoration efforts over time, as determined through monitoring. The schedule indicates the window of time in each year during which specific activities may be carried out, but does not always reflect the duration of the activity. Depending on the start date, some activities scheduled to begin in Year 1 may need to be postponed to a subsequent year.

Access to the site will be furnished by the existing road and trail system on the eastern side of the property, as well as from the beach. Access to the beach for 4-wheel-drive vehicles to remove debris will begin at the Mad River Beach parking area, approximately 6 miles north of Ma-le'l Dunes. A county special use permit that allows USFWS to operate vehicles on the beach is already on file at HBNWR. If any ongoing surveys note the presence of breeding western snowy plover, beach access will be discontinued until approved by the Arcata Ecological Services Office of USFWS. Off- trail access within the site would be restricted to areas outside of any flagged sensitive biological or cultural resources.

European Beachgrass Removal

Approximately 12.7 acres of European beachgrass will be removed manually from the foredune ridges and transitional swales. Methods will follow Pickart and Sawyer (1998), using repeated digs of both above ground stems and rhizomes to a depth of approximately 10 to 12 inches. Digging will begin as close as possible to when plants emerge from dormancy, which is usually no earlier than February, but may be as late as March. The first dig is the most labor intensive. Subsequent digs will be conducted at decreasing frequencies until the end of the growing season in October. It is difficult to predict the required frequency of digs because it varies based on location (e.g., foredune areas require more frequent digs), when digging is initiated, idiosyncrasies of individual crews, and weather. It is estimated that repeated digs will initially occur twice per month. Digging will begin at the south end of the site and proceed northward. Previous work has shown that instability of treated areas will not be a problem (Pickart and Sawyer 1998). As the grass is dug, it will be gathered into piles. Grass piles will be burned as soon as they are dry, as the piles can become partially buried by sand if left in place too long, and alteration of dune topography could occur. Piles will be placed in areas of open sand. If piles are too large, they will be broken into smaller piles for increased burning efficiency and to reduce the risk of an uncontrolled fire. Burning will be conducted in accordance with appropriate permits and weather conditions.

Yellow Bush Lupine/Jubata grass Removal

Approximately 10 acres of Yellow bush lupine, jubata grass, associated nonnative species, and duff will be manually treated in the nearshore dunes and swales. The area of Yellow bush lupine treatment

shown in Exhibit 2 was initially treated by CNLM and HBNWR staff in 2004. During this treatment, only individuals of Yellow bush lupine were removed. Restoration under this action would include removal of other nonnatives, removal of any regrowth or new seedlings, duff removal, and grass flaming (using a propane torch), as needed. To achieve full native vegetation recovery, it is often necessary to remove the nutrient-rich duff layer. In addition, removal of duff results in at least partial removal of the surface weedy seed bank. Duff removal will be achieved by raking up surface litter using hand tools (e.g., McLeods or rakes), placing the litter on tarps, and removing it from the site. Burnable vegetative debris removed during restoration will be placed in piles and burned. Flaming of annual grasses will take place before they set seed in June. Continued emergence of Yellow bush lupine from the seed bank is expected for up to 10 years (Pickart 2004). HBNWR will continue to remove new lupine seedlings in the restored area until the seedbank is depleted.

Jubata grass will be removed from the site using manual methods. Detection of jubata grass will be by annual searches of potential habitat. Emphasis will be placed on areas surrounding the flowering individuals that were removed during the CNLM restoration effort. Smaller vegetative individuals can be pulled by hand, while larger individuals will be removed with shovels and pickaxes. No jubata grass individuals will be allowed to flower on the site. However, seeds will continue to disperse onto the site from infestations on the adjacent BLM and Redwood Gun Club properties. HBNWR staff will work with these land owners/managers to carry out a coordinated removal project in the first year. Because jubata grass does not have a seed bank, this should greatly reduce the need for follow-up treatments.

Iceplant Removal

Iceplant will be removed manually using standard pulling methods (Pickart and Sawyer 1998). Six acres of iceplant-infested Dune mat will be treated. Repeated removal will continue over the 5-year period of active restoration to deplete iceplant rhizomes and the seedbank. Piles of removed iceplant will be transported using garbage bags to the beach, following marked routes, and placed in four-wheel-drive pickups. Pulled iceplant will be disposed of at the composting facility in Arcata.

English Ivy Removal

Infestations of English ivy will be removed from approximately 2 acres of Coniferous forest. English ivy infestations will be treated manually by hand pulling methods. Treatments will follow the protocol established in the Restoration, Management, and Monitoring Plan for Beach Pine/Sitka Spruce Forest and Red Alder Riparian Forest at the Lanphere Dunes Unit (Clifford 2003). Pulled ivy will be piled and removed from the site by dragging it on tarps along trails and transporting it to a composting facility. Re-treatment of English ivy infestations will continue over the five-year period of active restoration. In one of the ivy infestations, poison oak (*Toxicodendron diversilobum*) occurs intermingled with the ivy, making manual removal unsafe and impractical. In this area, poison oak will be treated with glyphosate (Razor®) in the first and/or second year (2% Razor with 1% MOC formulated from agriculturally derived oil), so that hand crews can access the ivy in the following year. Glyphosate will be applied with a backpack sprayer in May, soon after plants leaf out or just prior to dormancy (the recommended timing for poison oak control). A USFWS Pesticide Use Permit will be obtained before spraying, and if an outside contractor is used, the contractor will file a pesticide use report with

Humboldt County Agricultural Commissioner. If sites still contain remnant poison oak after two treatments with glyphosate, ivy removal in the vicinity of poison oak will be conducted manually by HBNWR staff using proper precautions.

Degraded Coastal Forest Restoration

Because coniferous dune forest revegetation has not yet been undertaken, pre-restoration characterization of the community will be required to develop prescriptions for planting. Areas to be restored will be sampled to determine species composition and structure, as will representative areas of similar canopy dominance in undisturbed areas. Based on the results of this analysis, prescriptions for species cover and composition and structural composition (ground, shrub, and canopy layers) will be developed to match densities found in reference areas. If it is determined that tree species should be planted, seeds will be collected on-site and started at a native plant nursery in local, native soil collected from around existing individuals of the same species (to ensure presence of symbionts). Alternatively, if young (e.g., 1-3 year old) trees can be located in an area of dense occurrences they may be directly transplanted. Shrubs and understory plants will be collected as cuttings on-site, following guidelines developed by the Restoration Manager to minimize impacts. Cuttings or divisions/rootings will be grown for a period at a greenhouse until roots have developed. They will be hardened outside on the site and then transplanted during the rainy season. In the case of easily propagated species, plants may be directly transplanted as cuttings or rootings, and if dense areas of shrubs are found with young individuals, they may be directly transplanted.

Invasive annual grasses and other weeds will be removed from degraded forest areas beginning in the year before any ground, shrub, and tree planting. Grasses will be removed manually or with radiant heat before seed set, as flaming is too risky in forested areas. However, if the project starts mid year, weed control will begin the following year to remove weed species before seed set. Duff removal is not necessary. Weed control will be repeated annually through the end of the project.

Unofficial trails that have established in degraded forest areas will be rehabilitated through native plant revegetation, as outlined above, and by placing brush, downed trees, and other natural materials in trails to reduce their visibility and accessibility. This will prevent their continued use and allow for further expansion of native vegetation.

Conservation Measures

The following specific methods will be utilized to avoid and minimize disturbance of endangered plant populations:

- Areas subject to disturbance during implementation of restoration activities will be surveyed by the Restoration Manager, and any endangered plant populations encountered will be flagged before the commencement of any restoration work.
- Any digging in areas occupied by endangered plants will be directly overseen by the Restoration Manager to avoid the disturbance or removal of endangered plant species.
- Work crews will be trained to avoid endangered plants.

- Piles of removed plants will be placed outside of all the flagged endangered plant areas.
- Grass flaming and duff removal methods will not be utilized in areas occupied by endangered plants.
- Removal of Yellow bush lupine in endangered plant areas will take place following seed dispersal for beach layia (after June 30). However, if mature lupine pods are present in these areas the Restoration Manager will carefully remove them before dispersal.
- Any adversely affected wallflower individual will be documented by the Restoration Manager.
- Any jubata grass found in endangered plant areas will be removed by the Restoration Manager, after the beach layia seed set.
- Routes to the removal areas will be established to avoid endangered plant areas and will be clearly marked.

The following specific methods will be utilized to avoid disturbance of cultural resource sites:

- Known cultural resource sites in the vicinity of restoration activities will be fenced, or otherwise delineated, and avoided during project implementation.
- Before initiation of ground-disturbing activities, the Restoration Manager will alert all crew members to the possibility of the presence of buried cultural resources.
- In the unlikely event previously unknown cultural resource sites are encountered during restoration activities, all work in the immediate vicinity of the find shall stop until a qualified archaeologist can review the find and determine the appropriate course of action.

ALTERNATIVES CONSIDERED BUT DETERMINED TO BE INFEASIBLE

Alternative Sites

As mentioned previously, the CDC HCP indicated restoration and enhancement would occur at the Bair and Woll parcels. However, problems related to acquisition of these sites developed, and they are no longer feasible sites for implementing the restoration. A number of additional sites were evaluated but were also determined to be infeasible because acquisition would be difficult or they did not provide adequate restoration opportunities. During this site evaluation process, Ma-le'l Dunes was identified as the only feasible site for CDC-funded restoration due to acquisition and habitat constraints.

Alternative Methods

Restoration of native dune ecosystem processes and degraded coastal forest habitat at Ma-le'l Dunes could be implemented by mechanical and/or chemical means, including use of mechanical equipment to remove invasive plants and chemical treatment of invasive plant infestations. This alternative would address the project purpose and needs by undertaking measures to control to

spread of invasive plants and remove such plants from areas in which they are currently established. It would also fulfill the HCP compensatory mitigation requirements. However, use of chemical and/or mechanical methods was rejected for several reasons. First of all, there is a high degree of controversy associated with major spraying, as demonstrated in past proposals. In addition, mechanical methods, although appropriate in areas without substantial native vegetation, would be very invasive and require substantial revegetation efforts and a much longer period to attain success in the areas proposed for CDC-funded restoration. Therefore, this alternative was determined to be infeasible, given the potential controversy and limitations posed by the five-year time frame and funding available for project implementation.

AFFECTED ENVIRONMENT

The affected environment is primarily limited to Ma-le'l Dunes, which is part of the larger Humboldt Bay Dunes system that includes the North and South Spits of Humboldt Bay. The property was operated as a private Off-Highway Vehicle (OHV) Club, known as the "Buggy Club," during the mid 1990s, until it was closed because of enforcement of a Humboldt County Ordinance resulting from citizen pressure. Before ownership by the OHV club, the property was owned by Louisiana-Pacific Corporation, which allowed public OHV use of the open dunes. As a result of these past land uses, there has been significant degradation of the natural communities present on the site. Additionally, the dunes have been subjected to several introductions of invasive nonnative plant species in an effort to stabilize moving sand. These and other invasives that have dispersed onto the property from adjacent areas have spread significantly and now dominate nearshore dune vegetation.

BIOPHYSICAL PROCESSES

The present day North Spit dunes, including Ma-le'l Dunes, were formed by at least two episodes of dune advancement, separated by a period of stabilization by vegetation cover. The older dunes, located on the eastern side of the spit, consist of stabilized parabolas and ridges that support coniferous forest on the uplands and broad-leaved, primarily deciduous forests in low-lying wetlands. These dunes have been partially buried by a large volume of moving sand in the form of parabolic dunes, initiated by a major tectonic event approximately 300 years ago. As the dune sheet moved west, it first buried and then partially uncovered the older forested dunes, leaving exposed soil strata. To the west of the mobile dunes a series of dune ridges has formed parallel with prevailing winds; these are truncated by a continuous foredune parallel to the beach. The smaller parabolic features that make up the dune ridges are partially stabilized by vegetation.

Dune conditions, including low fertility, seasonal drought, high salinity, and substrate instability, are harsh for plant life. Mycorrhizal and other symbiotic/facilitative processes are important to ecosystem functioning. Many of the larger parabolas have stabilized at their leading edge, and vegetative cover has increased rapidly over the past 20 years on newer, semi-stable ridges and on older parabolas. Some, but not all of the increase in stabilization rates is due to the spread of invasive plants.

The beach is narrow during the winter months, when foredunes generally develop a steep, eroded face. During summer months, sand stored in offshore bars migrates to and widens the beach, blowing up onto the foredune and producing a gentler slope that becomes seasonally vegetated.

VEGETATION AND SPECIAL-STATUS PLANTS

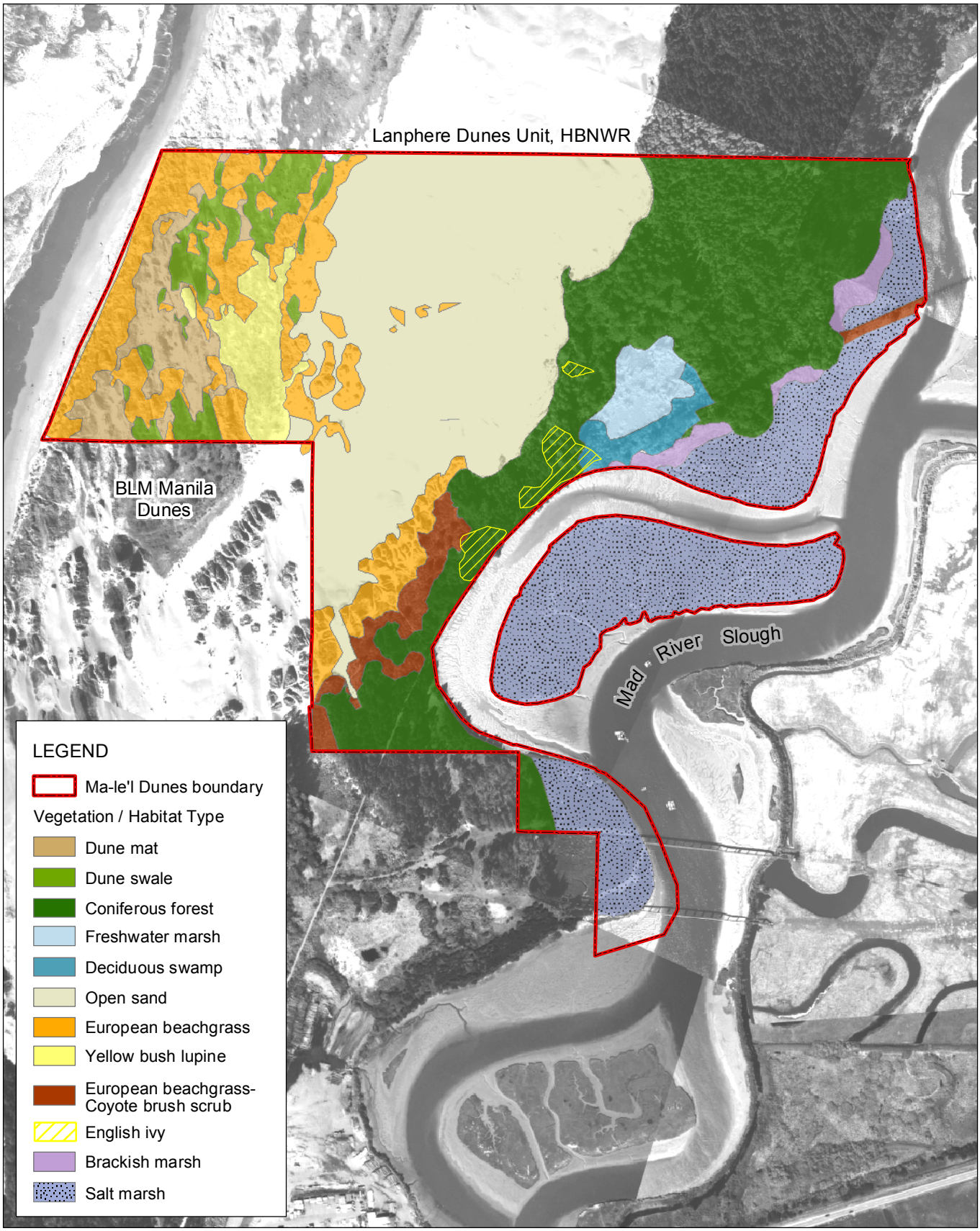
Vegetation and Habitat Types

Ma-le'l Dunes is characterized by a complex of dune, coastal forest, and wetland communities dominated by both native and non-native vegetation. Vegetation and habitat types at Ma-le'l Dunes are depicted in Exhibit 3 and listed and quantified in Table 2. Dune mat and Dune swale vegetation occurs on dune ridges and locally elevated areas of interdune swales and the deflation plain. East of the moving dunes are stabilized dunes characterized by Coniferous forest, Deciduous swamp, and Freshwater marsh. Brackish marsh and salt marsh are present along the eastern edge of the site.

The nearshore dunes of Humboldt Bay typically also support Foredune grassland, which is characterized by native grasses, including dune grass (*Leymus mollis*) and beach bluegrass (*Poa macrantha*). This community is currently absent from Ma-le'l Dunes, because the foredunes only support dense stands of the invasive European beachgrass. Other invasive plants at Ma-le'l Dunes include Yellow bush lupine, English ivy, iceplant and jubata grass. European beachgrass and Yellow bush lupine are described as distinct vegetation types because of their extensive distribution and displacement of native vegetation on the coast of Northern California. Since their introduction in the early 1900s, European beachgrass and Yellow bush lupine have become dominant in 83% of the 2,661 acres of vegetated upland, nearshore dunes in Humboldt County (Pickart and Sawyer 1998). In addition, English ivy has displaced substantial portions of native vegetation where it has become established at Ma-le'l Dunes. The remaining two invasive plant species of concern, iceplant and jubata grass, are established in the Ma-le'l Dunes property, but have not yet become the dominant species in the vegetation types that they have infested.

In addition to vascular plants, there is a diverse flora of non-vascular plants and fungi on the near-shore dunes. Biotic soil crusts found interspersed with dune mat are dominated by the moss *Didymodon vinealis*, but lichens, including *Cladonia pyxidata*, are also common (Galvich 2000). Macrofungi found on the near-shore dunes are generally mycorrhizal, and are usually found near woody swales. However, the drier ridges are home to the Ascomycete cup fungi (*Sarcosphaera ammophilum*) and the Basidiomycete inky cap (*Coprinus* sp.).

Vegetation and habitat types at Ma-le'l Dunes are described further below. Because restoration activities will focus on the coastal forest/dune communities, not all of the habitats and vegetation types depicted in Exhibit 3 occur within the restoration area (i.e., Brackish and Salt marsh). Therefore, these habitat types are not discussed further.



Source: USFWS 2004a

Existing Vegetation and Habitat Types at Ma-le'l Dunes

EXHIBIT 3

California Department of Corrections
Statewide E-Fence Project Ma-le'l Dunes Restoration

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Table 2 Vegetation and Habitat Types at Ma-le'l Dunes	
Coastal Forest/Dune	**Acreage**
Dune mat	6
Dune swale	5.5
Coniferous forest	38.5
Deciduous swamp	2.2
Freshwater marsh	2.7
Open sand	46
European beachgrass*	18.4
Yellow bush lupine*	4.4
English ivy*	2
European beachgrass-coyote brush scrub*	3.5
Total	**129.2**
Estuary	
Brackish marsh	2.3
Salt marsh	28.5
Total	**30.8**
Total	**160**
* Nonnative vegetation	

Open Sand

The windblown, moving dunes are primarily unvegetated open sand. Approximately 46 acres of Ma-le'l Dunes are comprised of Open sand. This habitat type is occasionally colonized by nonnative sea rocket (*Cakile maritima*), invasive European beachgrass, or native sand verbena. Colonization by European beachgrass leads to the creation of very high, stable dune fronts in an area that is naturally unstable and shifting (Wiedmann 1998). Once established, such areas are identified as European beachgrass.

Dune Mat

Approximately 6 acres of Ma-le'l Dunes support Dune mat, which is characterized by native low-growing, mat-like herbaceous species. Cover is generally low, and open sand is a significant component of the community. At Humboldt Bay, Dune mat is known to have two distinct associations: the dune sagebrush (*Artemisia pycnocephala*) phase and the beach pea (*Lathyrus littoralis*) phase (Sawyer and Keeler-Wolf 1995). Other dominant species in Dune mat generally include dune goldenrod (*Solidago spathulata* ssp. *spathulata*), dune buckwheat (*Eriogonum latifolium*), seashore bluegrass (*Poa macrantha*), sand-verbena (*Abronia latifolia*), beach strawberry (*Fragaria chiloensis*), and seaside daisy (*Erigeron glaucus*). Dune mat is threatened by several invasive species and has been reduced to 17% of its original, potential extent on Humboldt Bay by the encroachment of European beachgrass, yellow bush lupine (*Lupinus arboreus*), and iceplant (*Carpobrotus edulis* x *C. chilensis*) (Pickart and Sawyer 1998).

Dune Swale

Dune swales occupy approximately 5.5 acres of Ma-le'l Dunes. Dune swales, also known as dune hollows, are seasonal, freshwater wetlands that form between the foredune and the moving dune system, in the depressions between dune ridges and on the deflation plain. During strong prevailing winds (spring–summer), the sand surface in these areas erodes down to the summer water table. The water table rises in winter, creating ephemeral pools. There are two types of vegetation in Dune swales, herbaceous and woody. Swales initially become colonized by algae or cyanobacteria and/or herbaceous plants, primarily dune sedge (*Carex obnupta*) or dune rush (*Juncus breweri*), but can succeed to woody vegetation dominated by Hooker willow (*Salix hookeriana*) and beach pine (*Pinus contorta* ssp. *contorta*). Associated species in this habitat include Pacific silverweed (*Potentilla anserina*), springbank clover (*Trifolium wormskioldii*) and bird's-foot trefoil (*Lotus purshianus*) (USFWS 1998). The swales on the site are primarily herbaceous, and approximately half of the swales are drier, transitional areas that have been encroached upon by, and are mapped as, Yellow bush lupine.

Coniferous Forest

Approximately 38.5 acres of Coniferous forest are present at Ma-le'l Dunes. Coniferous forest occurs on the older, stabilized dunes inland of the moving dune system. The forest canopy at Ma-le'l Dunes is dominated by beach pine (*Pinus contorta* ssp. *contorta*), but also includes lesser amounts of Sitka spruce (*Picea sitchensis*) and scattered Douglas fir (*Pseudotsuga menzeisii*), grand fir (*Abies grandis*), and madrone (*Arbutus menziesii*). The understory can be fairly open with a groundcover of bearberry (*Arctostaphylos uva-ursi*), but in some areas there is a dense shrub layer composed of salal (*Gaultheria shallon*), California huckleberry (*Vaccinium ovatum*), and silk tassel (*Garrya elliptica*) (USFWS 1998). The branches and trunks of shrubs and trees, as well as the forest floor, support a wide variety of lichens and mosses. The Coniferous forest has infestations of the invasive nonnative species English ivy (shown as a separate vegetation type in Exhibit 3), cotoneaster (*Cotoneaster franchettii*), English holly (*Ilex aquifolium*), and pittosporum (*Pittosporum tenuifolium*).

Deciduous Swamp

Approximately 2.2 acres of Deciduous swamp occur at Ma-le'l Dunes. Deciduous swamp is a native plant community dominated by woody species occurring in wet depressions in the stabilized older dunes. The dominant species in the overstory is red alder (*Alnus rubra*), but occasional associates include Hooker willow and Pacific willow (*Salix lucida* ssp. *lasiandra*). Common shrubs include wax myrtle (*Myrica californica*), California blackberry (*Rubus ursinus*), and salmonberry (*Rubus spectabilis*). When present, the herbaceous understory includes skunk cabbage (*Lystichiton americanum*), hedge nettle (*Stachys chamissonis*), sedges (including *Carex obnupta*), and rushes (*Juncus* spp.) (Clifford 2003). This community is largely un-infested by invasive plant species.

Freshwater Marsh

Approximately 2.7 acres of Freshwater marsh occur at Ma-le'l Dunes. This habitat is a permanently to semipermanently flooded wetland dominated by native emergent vegetation. The dominant emergent species is broad-leaved cattail (*Typha latifolia*), and associates include marsh pennywort (*Hydrocotyle ranunculoides*), water parsley (*Oenanthe sarmentosa*), slough sedge (*Carex obnupta*), and mosquito

fern (*Azolla filiculoides*). Freshwater marsh at Ma-le'l Dunes has high vegetated cover with localized openings of open water. Shrubs and trees such as Sitka spruce, Hooker willow, and red alder have begun to colonize the marsh. With continued growth and establishment of these shrub and tree species, this marsh will eventually become freshwater swamp.

European Beachgrass

Approximately 18.4 acres of European beachgrass occur at Ma-le'l Dunes. Native to coastal dunes of Europe, this species was planted extensively on the West Coast of the U.S. beginning in the late 1800s to stabilize moving sand (Barbour and Major 1988). European beachgrass was first introduced to the North Spit of Humboldt Bay in 1901 by the Vance Redwood Company (Pickart and Sawyer 1998). It did not occur at the Ma-le'l Dunes site until the 1960s, when it was likely planted to prevent sand from encroaching on the railroad then present on the site (Buell 1992). It is believed that European beachgrass has altered natural dune morphology in northern California and Oregon. Before European beachgrass establishment, foredunes were primarily low with gradually sloping faces, and the dominant species was dunegrass (Wiedemann 1998). The foredunes transitioned inland to a series of dune ridges alternating with swales that were generally oriented perpendicular to the shore and parallel with the prevailing onshore winds. Following European beachgrass establishment, the dunes became characterized by a continuous face of nearly vertical foredunes (Barbour and Major 1988, Wiedemann 1998).

Yellow Bush Lupine

Approximately 4.4 acres of the Ma-le'l Dunes are dominated by Yellow bush lupine, with at least 50% to 75% cover by this species. Yellow bush lupine occurs less extensively (i.e., less than 50% cover) throughout the areas mapped as Dune swale and Dune mat. This vegetation type can include native herbaceous species such as figwort (*Scrophularia californica*), and nonnative species, including jubata grass, European hairgrass (*Aira caryophylla* and *A. praecox*), ripgut brome (*Bromus diandrus*), and rattail fescue (*Vulpia bromoides*). Yellow bush lupine was introduced on the North Spit of Humboldt Bay in 1908. Before invasion by Yellow bush lupine, the nearshore dunes of northern California were lacking in shrub species and had very low concentrations of nitrogen and other macronutrients (Barbour et al. 1985, Pickart 2002). Following its introduction, Yellow bush lupine has replaced native dune species and altered dune ecosystem processes such as productivity, nutrient cycling, and soil characteristics (Pickart et al. 1998). As the species proliferates, it releases nitrogen to the surrounding substrate. Higher nitrogen concentrations, as well as increased organic matter, support the secondary establishment of invasive nonnative annual grasses typically associated with this vegetation type. The altered substrate diminishes the competitive advantage native species have on the otherwise low-nutrient sand dunes (Pickart et al. 1998).

European Beachgrass–Coyote Brush Scrub

Approximately 3.5 acres of European beachgrass–coyote brush scrub are present at Ma-le'l Dunes. This vegetation type occurs in a small area between the open, moving dunes and the Coniferous forest. It is characterized by vegetation dominated by native coyote brush (*Baccharis pilularis*) and European beachgrass. Twinberry (*Lonicera involucrata*), another native woody species, inhabits this vegetation type.

Iceplant

Approximately 5.9 acres of Dune mat at Ma-le'l Dunes are infested by iceplant. Hottentot fig (*Carpobrotus edulis*) and sea fig (*C. chilensis*) are known collectively as iceplant. The hybrid of these two species has become prevalent in the Dune mat vegetation of Ma-le'l Dunes. Hottentot fig is a succulent perennial plant native to South Africa that was introduced to stabilize dunes, forming dense clonal mats, or monotypic stands, that can grow directly over native plant species. Although sea fig is not invasive and is believed by some ecologists to be native (Gallagher et al. 1997) the iceplant hybrid exhibits some of the invasive tendencies of Hottentot fig. At Ma-le'l Dunes, the hybrid iceplant generally occurs on the foredune and foredune ridges where it outcompetes native Dune mat vegetation. Most iceplant-infested areas at Ma-le'l Dunes are characterized by relatively low cover of the hybrid type rather than the large, dense mats typically associated with Hottentot fig. The nonhybridized sea fig could also occur on-site.

Jubata Grass

Jubata grass occurs as individuals and in small clumps throughout areas mapped as Yellow bush lupine and Dune swale. The species is a large fountain-like ornamental grass that has been widely used in landscaped settings. It produces copious amounts of seed by asexual means and also reproduces vegetatively by root fragments. It appears that the seeds do not survive long enough in the soil to form seed banks (Bossard et al. 2000). Jubata grass is native to South America and occurs in northern Argentina and the mountains of Bolivia, Peru, Chile, and Ecuador (Bossard et al. 2000). It is highly invasive along the central and southern coast of California, where it outcompetes and displaces native vegetation (US Department of Interior 1994).

Special-status Plants

Two federally and state-listed endangered plants, Humboldt Bay wallflower and beach layia, occur at Ma-le'l Dunes. Both species occur primarily in the Dune mat community and are discussed further below. Other sensitive plants that could occur at Ma-le'l Dunes include dark-eyed gilia and pink sand verbena. Gilia, an annual, occurs relatively abundantly in the same habitat as beach layia, while pink sand verbena, a perennial, is occasionally encountered in this habitat. Both of these species are on the California Native Plant Society's List 2, which includes species that are rare, threatened, or endangered in California, but more common elsewhere.

Three of the four subspecies of Menzies' wallflower (*Erysimum menziesii*) are listed as endangered under the federal Endangered Species Act (ESA) and California Endangered Species Act, including the local endemic Humboldt Bay wallflower. This perennial species is a member of the mustard family (Brassicaceae) and is restricted to the Humboldt Bay dunes (Hickman 1993). Wallflower emerges after the first prolonged winter rains. The plants remain as a vegetative rosette for up to 8 years, flowering when they reach a critical size (Pickart 2004a). After setting seed, individuals die. There is no soil seedbank, but seeds occasionally persist in the fruit clusters above ground. Although this species produces numerous seeds, survivorship is very low (less than 1%) (Pickart et al. 2000). The local subspecies of wallflower is characterized by high rates of the disease crucifer white rust (*Albugo canadensis*). Disease symptoms are greatest near reproduction, and may reduce or prevent seedset (Pickart 2004a).

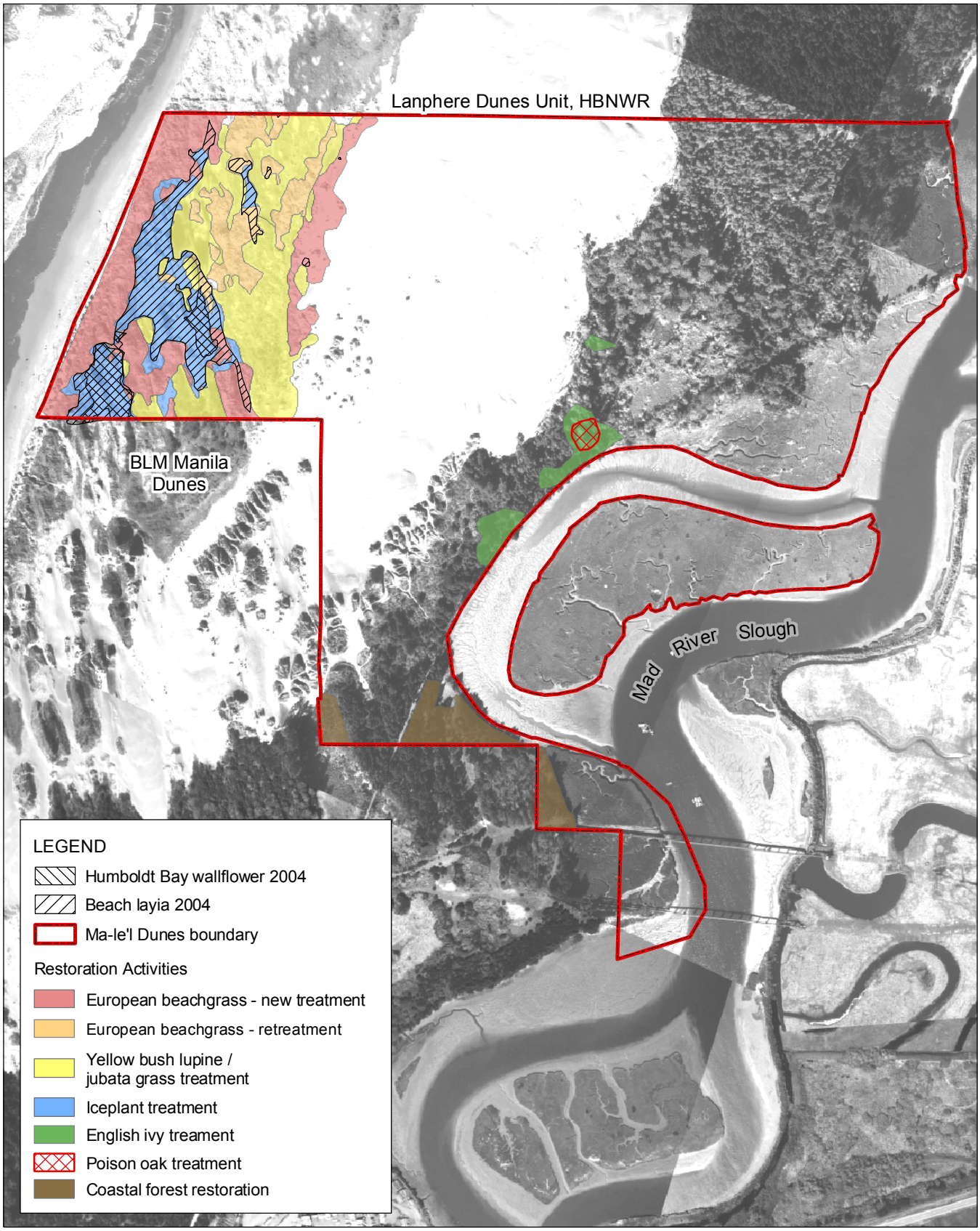
Beach layia reaches the northernmost limit of its present range at Freshwater Spit north of the Ma-le'l dunes. Beach layia is a small annual in the sunflower family (Asteraceae), occurring in widely scattered locations on coastal sand dunes between Humboldt County and Point Conception in Santa Barbara County (CNPS 2004). The plant's primary habitat is Dune mat, which occurs throughout the North Spit of Humboldt Bay. This plant also occurs in dry areas of Dune swales, protected open sand, and along the margins of Yellow bush lupine vegetation (Duebendorfer 1992). Annual monitoring at Lanphere Dunes indicates population densities of beach layia have generally declined between 1989 and 1997, with a relatively small increase in 1998 (Pickart 1998). Densities were significantly higher in restored areas where European beachgrass had been removed and cover of open sand was higher.

Populations of both endangered plants are present at Ma-le'l Dunes and were mapped by CNLM in May 2004 (Exhibit 4). Occurrences of Humboldt Bay wallflower were observed in an approximately 1.6-acre area and occurrences of beach layia were observed in an approximately 6.4-acre area. During these surveys, macroplots were established to estimate the density and total number of rare plants. The two wallflower macroplots totaled 1.6 acres, representing close to the total population. In the two macroplots, a total population size of 1,040 wallflowers was estimated; with a 95% confidence interval of $\pm$ 297 individuals (USFWS unpublished data). Of the total, 34% were reproductive in 2004. A single, 0.6-acre beach layia macroplot was established and sampled in May 2004. The density estimate was 3.8 individuals/m^2 $\pm$ 1.3 (95% confidence intervals) (USFWS unpublished data). These results will serve as a baseline against which to measure changes following restoration.

Wildlife and Special-status Animals

Unlike the distinct and sometimes endemic flora of dune systems, the vertebrate fauna tends to reflect that of the larger region. Large mammals, however, are absent from the Humboldt Bay area, because of the small size and isolation of the coniferous forest. The largest mammal resident to Humboldt Bay dunes is gray fox (*Urocyon cinereoargenteus*), which, like many of the mammals, breeds in the coniferous forest and hunts on the near-shore dunes. Medium-sized mammals that occur in the area include striped skunk (*Mephitis mephitis*) and raccoon (*Procyon lotor*). The dunes are utilized by many rodents, and small mammals, such as the black-tailed jackrabbit (*Lepus californicus*) are an important source of herbivory and contribute to vegetation dynamics. Amphibians that occur in the local area include the rough-skinned newt (*Taricha granulosa*), pacific tree frog (*Hyla regilla*), and northern red-legged frog (*Rana aurora aurora*). Reptiles are more rarely observed, but those that occur include common garter snake (*Thamnophis sirtalis*) and northern alligator lizard (*Gerrhonotus coeruleus*).

Invertebrates are abundant and diverse in the near-shore dunes, particularly in the swales. A unique assemblage of solitary nesting bees, including silver bee and leaf cutter bee, serve as crucial pollinators for dune mat plants (Nyoka 2004). The solitary bee nesting season occurs from approximately March through September. Seasonal nesting patterns of silver bee on dunes of the adjacent Lanphere Dunes have been mapped and those at Ma-le'l Dunes will be mapped in May 2005. Seasonal nesting patterns of leaf cutter bee will also be mapped at Lanphere Dunes and Ma-le'l Dunes in summer 2005. Biotic soil crusts have been found to be a preferred nesting habitat for leaf cutter bee, which nests in late summer (Gordon 2000).



Source: USFWS 2004a Base Photo: USFWS 2000

Existing Endangered Plant Distribution at Ma-le'l Dunes

EXHIBIT 4

California Department of Corrections
Statewide E-Fence Project Ma-le'l Dunes Restoration
X 04110065.01 4/05

0 300 600 1,200
FEET

NORTH

EDAW

The rich invertebrate fauna contributes to the abundance and diversity of bird life on the dunes. Passerine bird use and nesting is concentrated in the forest, with lesser use of the swales. The dune ridges are frequented by red-tailed hawks, short-eared owls, white-tailed kites, and other raptors, because of the many rodents that occur there and provide a primary source of prey. The upper beach is an important habitat for migratory and resident shorebirds, including the federally threatened western snowy plover.

The Pacific coast breeding population of the western snowy plover, a small shorebird, is federally listed as a threatened subspecies. A petition to remove this population from the Federal List of Threatened and Endangered Wildlife and Plants was recently submitted. On March 22, 2004, the USFWS found that the petition presents substantial information that delisting may be warranted and initiated status reviews (USFWS 2004b). This population of snowy plovers occurs along coastal beaches and primarily nests on sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries. Their current breeding range includes coastal areas from southern Washington to southern Baja California, Mexico. In California, most breeding occurs from southern San Francisco Bay southward. The breeding season for the western snowy plover extends from early March to late September, though birds at more southerly locations begin to nest earlier in the season than those at more northerly locations (USFWS 1999).

Locally, recent snowy plover nesting has been concentrated at Clam Beach, eight miles north of Ma-le'l Dunes. No breeding or non-breeding snowy plovers have been detected at Ma-le'l Dunes during recent annual surveys. The only recent sighting of a snowy plover in the vicinity of Ma-le'l Dunes was of a non-breeding individual in late summer 1996 on a nearby BLM property (LeValley, pers. comm., 2004). There are also no historical records of breeding snowy plovers at Ma-le'l Dunes, and the most recent occurrence of nesting nearby is of two nests at the adjacent Lanphere Dunes in 1977 (LeValley, pers. comm., 2004).

Snowy plovers require open, relatively flat, unvegetated areas for nesting. The beach at Ma-le'l Dunes is thought to be too narrow for nesting, with high tides reaching the base of the foredune even during summer months. In addition, the dunes no longer provide suitable nesting habitat. The back dunes are currently comprised of moving sand and densely vegetated hollows, neither of which is suitable for nesting. In addition, corridors of open sand from the beach to the back dunes formerly existed, when plovers historically nested in dunes in the area (LeValley, pers. comm., 2005). These corridors have been eliminated by the expansion of nonnative vegetation.

CULTURAL RESOURCES

Humboldt Bay was the ancestral territory of the Wiyot Tribe of Native Americans. Estimates of the Wiyot population range from 1,000 to 3,000 individuals. This tribe occupied approximately 35 miles along the Pacific coast, extending 15 miles inland. Approximately 32 Wiyot settlements were located along river terraces, the Humboldt Bay margin, and tidewater sloughs. These settlements are estimated to have supported average populations of 30 inhabitants that occupied four to nine houses (Angeloff et al. 2004).

A cultural resource survey of Ma-le'l and nearby areas was completed in early 2004 (Angeloff et al. 2004). Cultural resources discovered during the surveys were generally found in Dune swale areas in the deflation plain, where the movement of large sand masses continually exposes cultural resource materials. Three cultural resource sites were identified and recorded at Ma-le'l Dunes and a previously known site (CA-HUM-34) was re-recorded. Two of the new sites are located near the northern boundary of Ma-le'l Dunes and the third is near the southern boundary. The sites range in size from approximately 400 square feet to 1,500 square feet. Artifacts and other objects observed at the sites include lithic scatter, shell fragments, chert cores and debitage, hammerstones, assayed cobbles, and fire-affected rock. An isolated chert cobble artifact was also identified near one of the sites (Angeloff et al. 2004).

CA-HUM-34 is a habitation area that includes anthropogenic soils, shellfish remains, animal bones, fire-affected rocks, and chert debitage. Human remains have been previously documented at the site, but none were observed during the 2004 survey. The site is currently in poor condition. It is transected by several trails and has been subject to heavy looting. The site encompasses approximately 15,000 square feet, although the boundaries are difficult to define, because of dense vegetation (Angeloff et al. 2004).

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE A – NO ACTION

Under the No Action Alternative, biophysical processes that shape the nearshore dune formations at Ma-le'l Dunes could be further disrupted by expansion of invasive nonnative vegetation. It has been suggested that nearshore dune vegetation is in a state of relative non-equilibrium (Pickart and Sawyer 1998). Under this scenario, fluctuations in environmental conditions (disturbances) are the dominant force in determining community composition, thus vegetation co-evolves with disturbances (Diamond and Case 1986). The primary vegetation type on the foredunes at Ma-le'l dunes is Dune mat, which is maintained as long as the processes of disturbance (erosion, blowouts, coseismic shifts in sea level) persist. Many of the larger parabolas at Ma-le'l Dunes have stabilized at their leading edge, and vegetative cover has increased rapidly over the past 20 years on newer, semi-stable ridges and on older parabolas. Some of this increased stabilization is due to the spread of invasive plants. Over-stabilization of dunes by invasive nonnative species disrupts this process and can lead to dramatic changes in successional processes, potentially resulting in a greatly altered ecosystem.

Invasive plant species present on the site would continue to expand their range, ultimately crowding out and displacing native plant species. The Dune mat plant community remnants still present would also become dominated by invasive plants, reducing plant species diversity and causing the extirpation of biotic soil crusts. Invasive plants on the site would become an increasing problem to managers of pristine dunes to the south and north as additional dispersal from the site occurs. Dune swale habitat would also be degraded and eventually reduced in acreage as the rapidly accumulating duff from invasive species elevated topography above the height of the seasonal water table. Vegetation in these swales would shift from willows and other wetland species to coyote brush, beachgrass, yellow bush lupine, and other non-wetland species. Several special-status plants, including federally endangered Humboldt Bay wallflower and beach layia, would be adversely

affected by continued expansion of invasive plants that would occur under this alternative. Ultimately, populations of these two species at Ma-le'l Dunes would be extirpated.

Impacts to wildlife under the No Action Alternative would vary depending on the species. Native pollinators and other invertebrates that inhabit the open sand areas would be displaced as a result of continued expansion of invasive pants. Mammals that feed on the roots of native dune mat species and scavenge buried invertebrate larvae are also likely to be adversely affected. Loss of Dune swale habitat resulting from elevated typography would reduce habitat for amphibians such as rough-skinned newt and northern red-legged frog. Conversely, populations of rodents that thrive in the cover associated with beachgrass would likely increase as a result of further beachgrass expansion, which would benefit raptors that prey on these rodents. No impacts to any special-status wildlife species would occur under the No Action Alternative.

No impacts to cultural resources would occur under the No Action alternative. Public access is not currently offered on the site (although plans to increase public access are being developed separately). Therefore, the No Action Alternative would also have no impact on public access or recreation, social or economic issues.

ALTERNATIVE B – PROPOSED ACTION

Under the Proposed Action, the functioning of biophysical processes and overall habitat quality would be greatly improved in areas from which invasive plants would be removed. The rare Dune mat plant community would be relieved of competitive effects of invasives species that are currently present, and the spread of nearby invaders would be prevented. The fragmentation that currently exists within the Dune mat community would be lessened and there would be a net increase in this plant community. Biotic soil crusts would also benefit. Wetland dune swales would be cleared of invasive plants, thus halting the unnaturally rapid accumulation of organic material that leads to loss of wetland conditions. The threat of spread of invasive species, especially pampas grass, to adjoining protected areas, would be lessened or eliminated.

Coniferous forest habitat quality would be improved through removal of English ivy and poison oak, revegetation, and removal of existing trails. Poison oak removal would be conducted using the herbicide glyphosate. Glyphosate application could have adverse effects to the environment, but these are anticipated to be minor. This herbicide remains unchanged in the soil for varying lengths of time, depending on soil texture and organic matter content; its half-life can range from 3 to 130 days. Glyphosate toxicity levels to non-target organisms vary, but they generally range from non-toxic to minimally toxic. Glyphosate can result in injury and death of non-target plants, but such effects would be minimized by carefully focusing application on the target poison oak plants. It has no known effect on soil microorganisms and is of minimal toxicity to aquatic invertebrates, birds, and mammals. It is slightly toxic to fish but does not bioaccumulate (buildup). Because glyphosate will not be applied in the vicinity of aquatic environments or special-status plants, potential adverse effects would be limited to common plants in the immediate vicinity of application. Despite this potential shortterm adverse effect, the longterm effect of removing poison oak would be beneficial.

Habitat for special-status plants would be greatly improved under this alternative, and populations of two endangered plants would be permitted to spread into newly restored habitat, thus increasing the population size and viability of these species. Short-term adverse effects to Humboldt Bay wallflower and beach layia could occur, however, during implementation of dune restoration activities. A total of 1.6 acres of the restoration area is occupied by Humboldt Bay wallflower. Impacts to visible wallflowers (i.e., non-seedling, juvenile or reproductive individuals) should be avoided through implementation of the "Conservation Measures" described above, although incidental take of small, unseen seedlings could occur. Because the probability of a Humboldt Bay wallflower individual surviving to reproduction is less than 1% (Pickart 2004b), incidental take of Humboldt Bay wallflower would have a small effect on the reproductive success in this population and would be greatly outweighed by the benefits of the overall restoration project. A total of 6.4 acres of the restoration area are occupied by beach layia. Given the timing of the work (as described above under "Conservation Measures"), incidental take of beach layia should be quite low relative to the total population size, although some dispersed seeds could be removed or damaged. Despite these short-term adverse effects that could occur during implementation of restoration activities, there would be an overall long-term beneficial effect to Humboldt Bay wallflower and beach layia. Therefore, the restoration would not jeopardize the continued existence of either species.

Wildlife species associated with habitats to be restored and enhanced would benefit from the proposed action. Nesting habitat for solitary bees would be increased by removal of invasive plants and subsequent expansion of Dune mat. Birds, mammals, and other animals that utilize the coniferous forest would benefit from revegetation and trail removal. Some reduction in rodent populations that thrive in invasive plant habitats could occur, potentially reducing foraging value to raptors that prey on the rodents. The overall effect on wildlife at Ma-le'l Dunes, however, would be beneficial.

Western snowy plovers are unlikely to be adversely affected by restoration activities because snowy plovers are not known to have nested at Ma-le'l or along the beach access route in recent decades, and records of non-breeding individuals are very uncommon. In the unlikely event that nesting snowy plovers become established, potential adverse effects (e.g., destruction of active nests or disturbance of nesting pairs) would be avoided through development of appropriate measures determined in consultation with the Arcata FWO. Beneficial effects to western snowy plover could result from implementation of the proposed restoration, which would improve nesting habitat suitability in the dunes.

Several cultural resource sites are known to be present at Ma-le'l Dunes. These sites would be marked and impacts to them avoided. In addition, before the initiation of ground-disturbing activities, the Restoration Manager would alert all crew members to the possibility of the presence of buried cultural resources. In the unlikely event a new cultural resource site is encountered during restoration activities, adverse effects would be avoided by stopping work in the immediate vicinity of the find until a qualified archaeologist can review the find and determine the appropriate course of action.

The Proposed Action would have no impact on public access or recreation. It would, however, contribute to the restoration economy of Humboldt County, which has recently been identified as a significant economic underpinning.

SUMMARY OF IMPACTS BY ALTERNATIVE

The proposed action is not expected to have significant adverse impacts on the environment. There would be no effect on recreation/public access and there could be a beneficial effect on social/economic resources. The proposed action could have adverse effects to cultural resources, but conservation measures are included to avoid and minimize such effects. Beneficial effects of the proposed action on the natural environment include reduction of dune stabilization and increase and enhancement of native vegetation and habitat for common and special-status plants and animals. A summary of impacts from the No Action Alternative and the Proposed Action is presented in Table 3.

Table 3
Summary of Impacts

Resource/Issue	Alternative A – No Action	Alternative B – Proposed Action
Biophysical Processes	Continued expansion of invasive nonnative vegetation could result in further dune stabilization and disruption of naturally disturbance processes that shape the nearshore dunes.	Dune stabilization would be reduced and natural disturbance processes restored.
Vegetation and Special-status Plants	Two rare dune plant communities and biotic soil crusts could be eliminated, resulting in an overall loss of biodiversity. Topography in wetlands would be raised by bioaccumulation from invasives, altering wetland hydrology and vegetation. Mortality and possible extirpation of two endangered plants could occur.	Native dune habitats would be enhanced and increased, increasing biodiversity and reducing fragmentation. Wetland hydrology would be retained in areas where it currently exists and restored it areas currently degraded. Coniferous forest habitat would be enhanced and increased. Loss of a small number of individuals of endangered plants could occur, but an overall increase in the population of both species would result.
Wildlife and Special-status Animals	Invertebrate, and possibly some mammal, reptile, and amphibian populations, would be reduced and could be extirpated. Rodent populations could increase, with subsequent beneficial effects on raptors. There would be no effect on western snowy plover populations.	There could be a reduction in rodent populations and an increase in other mammal, reptile, amphibian, and invertebrate populations. Potential adverse effects on western snowy plover would be avoided and beneficial effects could result.
Cultural Resources	No effect	Potential adverse effects to cultural resource sites would be avoided.
Recreation/public Access	No effect	No effect
Social/economic Issues	No effect	The action would contribute to the local restoration economy and provide social benefits through community investment in natural lands.

COMPLIANCE, CONSULTATION AND COORDINATION WITH OTHERS

PARTIES CONTACTED DURING THE PLANNING PROCESS

The following agencies, stakeholder groups, and adjacent land owners were contacted during the restoration planning process.

- Humboldt County Department of Planning: Because the land is still held by CNLM, a request for modification of the 2004 coastal development permit was submitted.
- Friends of the Dunes: This is a community group dedicated to conserving the natural diversity of coastal bay and dune environments. The group has been regularly updated on the project, will be provided a copy of the Draft EA, and will participate in restoration activities through a volunteer program.
- Dunes Forum: This is a collaboration of dune managers and stakeholders that conduct monthly meetings for information exchange. The forum will be notified about the Draft EA and provided information on where to obtain a copy.
- Wiyot Tribe: The Table Bluff Reservation has been consulted and will be provided a copy of the Draft EA.
- BLM: This federal agency is an adjacent land owner. They have been contacted and will be provided with a copy of the Draft EA.
- Redwood Gun Club. This private club is an adjacent land owner. They have been contacted and will be provided with a copy of the Draft EA.
- Sierra Pacific. This private lumber company is an adjacent land owner. They have been contacted and will be provided with a copy of the Draft EA.

ENVIRONMENTAL COMPLIANCE AND CONSULTATION

Specific permits, authorizations, and notifications anticipated to be obtained prior to implementation of the proposed action are summarized below.

- Pursuant to Section 7 of ESA, a Biological Assessment (EDAW 2004) was prepared and consultation initiated with the Arcata Ecological Services Office. A biological opinion and no-jeopardy conclusion have been prepared and are anticipated to be issued in early May.
- Pursuant to Section 2080.1 of CESA, a consistency determination will be obtained from the California Department of Fish and Game.
- A Pesticide Use Permit will be prepared by USFWS.
- A request for modification of the Coastal Development Permit issued for the 2004 restoration has been submitted to Humboldt County. Humboldt County anticipates issuing an Amended

Negative Declaration for California Environmental Quality Act compliance before issuance of the Modified Coastal Development Permit.

- A Special Use Permit for operation of vehicles on the beach is on file at HBNWR.
- A permit from the Arcata Fire Protection District for burning of piles is on file at HBNWR; notification of and authorization from the North Coast Unified Air Quality Management District will be obtained.
- A Pesticide Use Report will be provided to the Humboldt County Agricultural Commissioner.

REFERENCES

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APPENDIX A

MA-LE'L DUNES RESTORATION AND MONITORING SCHEDULE

Ma-le'l Dunes Restoration and Monitoring Schedule			
Year	**Task**	**Month**	**Notation**
1	Survey for special-status plants	May	Conduct pre-project survey
	European beachgrass retreatment	Start date through November	
	Removal of untreated European beachgrass	Start date through November	Preferred start date March, otherwise by June
	Contact adjacent land owners/managers to initiate coordinated jubata grass removal project	January	
	Yellow bush lupine and jubata grass removal	January–May	June in endangered plant areas
	Grass flaming in Yellow bush lupine treatment areas	April–May	Dependent on phenology, before seed maturation, after baseline monitoring; not in endangered plant areas
	Duff removal in Yellow bush lupine treatment areas	June–September	
	Iceplant removal	June–September	Cover entire area in first year
	Baseline (pretreatment) iceplant sampling	May	
	Spray poison oak in English ivy treatment areas	August	
	English ivy removal	January–May, August–December	Begin the year following spraying in poison oak areas; removal in June and July impractical because of mosquitoes
	Sample English ivy plots	November	Establish third plot in November 2004
	Sample to characterize degraded and undisturbed forest; establish and sample baseline conditions in forest revegetation plots	August	After mosquitoes abate, before planting
	Collect forest species seeds, if needed, and start in greenhouse	September	
	Collect forest species propagules for propagation in greenhouse, if needed	October	
	Grow forest species propagules, if used	November–December	
	Rehabilitate trails in degraded forest	October–December	Plant during rainy season; brush placement can occur at other times
	Plant forest species in degraded forest	October–December	Plant during rainy season
	Weed annual grasses in degraded forest	April–May	Before seed set of annual grasses
	Establish and sample new beachgrass plots, and sample existing beachgrass plots	May	Before treatments (if treatments begin before May establish in Year 1 and sample in Year 2)
	Sample existing lupine plots	May	Before retreatment

Ma-le'l Dunes Restoration and Monitoring Schedule			
Year	Task	Month	Notation
	Establish and sample new lupine plots to monitor duff removal and flaming treatment effectiveness	March–April	Before treatment
	Sample English ivy plots	November	Establish plot in November 2004
	Reporting	Progress report in December, annual report in June	If project begins mid-year, only annual report due.
2	European beachgrass retreatment	February–October, as needed	
	Removal of untreated European beachgrass	February–November	Begin when emerges from dormancy
	Yellow bush lupine retreatment	January–May	June in endangered plant areas
	Grass flaming	April–May	
	Duff removal	June–September	
	Iceplant sampling	May	
	Iceplant removal	June–September	Follow-up only
	English ivy removal and retreatment	January–May, August–December	By second year, all populations treated at least once
	Continue to grow propagules at greenhouse	January–September	
	Plant trees/shrubs in degraded forest	October–December	Plant during rainy season if compensation for mortality is required
	Weed around planted trees/shrubs	April–May	Before seed set of annual grasses
	Sample all European beachgrass plots	May	
	Sample original Yellow bush lupine plots	May	
	Sample new Yellow bush lupine plots to monitor duff removal and flaming treatment effectiveness	March–April	Before treatment
	Sample forest revegetation plots	August	
	Sample English ivy plots	November	
	Reporting	Progress report in December, annual report in June	
3	Survey for special-status plants	May	Repeat pre-project survey
	European beachgrass retreatment	February–October	As needed
	Removal of untreated European beachgrass	February–November	Begin when emerges from dormancy; treat all remaining untreated areas
	Yellow bush lupine retreatment	January–May	
	Grass flaming	April–May	Dependent on phenology, conduct before seed maturation
	Duff removal	June–September	
	Iceplant sampling	May	
	Iceplant retreatment	June–September	Follow-up only
	English ivy retreatment	January–May, August–December	By third year, all populations treated at least three times

Ma-le'l Dunes Restoration and Monitoring Schedule			
Year	Task	Month	Notation
	Plant trees in degraded forest	January–March, October–December	Plant during rainy season, if compensation for mortality is required
	Sample all European beachgrass plots	February	
	Sample original Yellow bush lupine plots	May	
	Sample new Yellow bush lupine plots to monitor duff removal and flaming treatment effectiveness	March–April	
	Sample forest revegetation plots	August	
	Sample English ivy plots	November	
	Reporting	Progress report in December, annual report in June	
4	European beachgrass retreatment	February–October	
	Yellow bush lupine retreatment	January–May	June in endangered plant areas
	Grass flaming	April–May	Dependent on phenology, conduct before seed maturation
	Sample iceplant plots	May	
	Iceplant retreatment	June–September	Follow-up only
	English ivy retreatment	January–May, August–December	By fourth year, all areas in maintenance condition
	Sample all European beachgrass plots	May	
	Sample original lupine plots	May	
	Sample new Yellow bush lupine plots to monitor duff removal and flaming treatment effectiveness	March–April	
	Sample forest revegetation plots	August	
	Sample English ivy plots	November	
	Reporting	Progress report in December, annual report in June	
5	Survey for special-status plants	May	Repeat pre-project survey
	European beachgrass retreatment	February–October	
	Yellow bush lupine retreatment	January–May	June in endangered plant areas
	Grass flaming	April–May	If needed
	Iceplant sampling	May	
	Iceplant retreatment	June–September	Follow up only
	English ivy retreatment	August–December	Maintenance treatment
	Sample all European beachgrass plots	May	
	Sample original Yellow bush lupine plots	May	
	Sample new Yellow bush lupine plots to monitor duff removal and flaming treatment effectiveness	March–April	
	Sample forest revegetation plots	August	
	Sample English ivy plots	November	
	Final reporting	Final report in June	