

July 12, 2012

California Coastal Commission  
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RECEIVED  
JUL 13 2012  
CALIFORNIA  
COASTAL COMMISSION

Dear Ms. Faust:

In support of our coastal development permit application 1-12-007, attached please find an updated Lake Earl Wildlife Area Coastal Dune Restoration Plan dated July 11, 2012 including the supplemental Executive Note on page iv and supplemental Appendix G, to govern the proposed restoration work within the project boundaries shown on the site plan/project boundary map in the attached updated Figure 2. We have also updated Figure 5 to show the redefined southern boundary for the mechanical work.

We confirm that CDFG is revising the limits of the proposed project to match those shown in the new figures 2 and 5, because that is a change from what is discussed in the Restoration Plan. The new figures represent the outermost boundaries of the proposed project, revised from the earlier scope of the Restoration Plan itself. Although the Restoration Plan envisions a broader project area including adjacent land (and provides survey data for an adjacent portion of Tolowa Dunes State Park), *coastal development permit application 1-12-007* only proposes the restoration activities described in the plan *within the project boundaries shown in the updated attached figures 2 and 5.*

With regard to the new figure 5 showing the European beachgrass mechanical (heavy equipment) removal areas, that is only meant to show the approximate locations for mechanical removal. Where delineated wetlands, dune mat vegetation, rare plants, plover sites, etc. occur within or overlap the mechanical removal areas shown, the setbacks and other protective measures identified in the Restoration Plan will prevail. In those areas, where feasible without disturbing the sensitive resources, manual beachgrass removal methods will be used. It is the previously *identified sensitive resources, and additional resources that may be identified prior to commencement, that determine the more precise limits of mechanical removal – not the map – though the mechanical removal would not extend beyond areas shown in the map.*

EXHIBIT NO. 9
APPLICATION NO. 1-12-007 CALIF. DEPT. OF FISH & GAME PROPOSED PROJECT: LAKE EARL WILDLIFE AREA COASTAL DUNE RESTORATION PLAN, REVISED 7/12/12, INCLUDING LETTER OF CDFG DATED 7/12/12 (1 of 53)

Thank you for your consideration.

Sincerely,

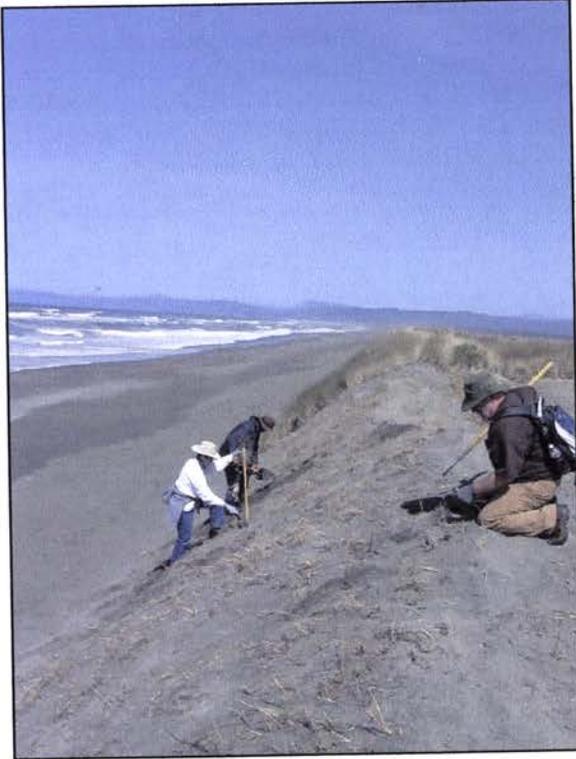


Steve Burton  
Senior Environmental Scientist Supervisor  
Northern Region Lands Program  
California Department of Fish & Game

Attachments:

Lake Earl Wildlife Area Coastal Dune Restoration Plan July 11, 2012  
Figures 1-6  
Appendix G

# Lake Earl Wildlife Area Coastal Dune Restoration Plan



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Prepared by  
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May 2011 / Updated July 11, 2012

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## Acknowledgements

Planning for the Lake Earl Wildlife Area coastal dunes restoration project was funded by the California State Coastal Conservancy. Contract administration was performed by Patricia McCleary, Smith River Alliance. We thank the California Department of Fish and Game for the opportunity to partner on this project. We are grateful to the many people who have contributed ideas and content for this document, including Alan Barron, Tanya Beck, Charles Bartolotta, Jim Baskin, Jennifer Burns, Kiera Freeman, Valerie Gizinski, Deborah Hirst, Rick Hiser, Laura Julian, Karen Kovacs, Nicholas Kraus, Tom Leroy, Bradford Norman, Andrea Pickart, Bill Rich, Amber Transou, Jim Watkins, Bill Weaver, Lori Wisehart, and Kip Wright. Karen Kovacs, Steve Burton, and Ray-Bob Smith (CDFG) provided review and editorial comments on this document.



**Lake Earl Wildlife Area  
Coastal Dune Restoration Plan**  
*updated July 11, 2012*

**Executive Note**

**Appendix G** (attached) is a new appendix which contains the most complete summary of the environmental commitments made in this Restoration Plan. These are not new commitments but rather have been summarized from the May 2011 Restoration Plan, USFWS technical assistance letter, and subsequent California Department of Fish & Game CEQA document (Mitigated Negative Declaration certified complete by the State Clearinghouse August 2011). Also included in Appendix G are the monitoring plan commitments and discussion of adaptive management options.

Should there be any minor inconsistencies these Appendix G requirements will prevail.

We have also refined the original **Figures 2 and 5**.

Otherwise no changes have been made to the Restoration Plan document dated May 2011.

## Executive Summary

The goal of the Lake Earl Wildlife Area coastal dune restoration project is to restore natural ecological processes to benefit native plant and animal species by removing invasive European beachgrass (*Ammophila arenaria*) from the area around the mouth of Lake Tolowa. The project specifically proposes to remove European beachgrass from approximately 14 ha (34 ac) of foredune on either side of the lagoon mouth, using a combination of manual and mechanical removal techniques. Restoration is expected to have measurable positive impacts on native dune mat plant communities and rare species such as the sanddune phacelia (*Phacelia argentea*), other species which may benefit as well include dune (silver) bees, foraging grassland birds and raptors and possibly snowy plover (*Charadrius alexandrinus nivosus*) which has used Lake Earl Wildlife Area for nesting in the recent past

## Lead Agency

The California Department of Fish and Game (CDFG) is the lead agency for this proposed coastal restoration project at the CDFG Lake Earl Wildlife Area (LEWA). The project will be managed by staff at the Shasta Valley Wildlife Area, with assistance from staff at the Eureka field office and Lake Earl Wildlife Area. A grant to plan the project was awarded to the Tolowa Dunes Stewards (TDS), a project of Smith River Alliance, by the California State Coastal Conservancy. The TDS is a non-profit association that has been instrumental in the design of the project and will share responsibility for implementation and monitoring of the restoration effort.

## Regulatory Guidance

The LEWA habitat restoration project is subject to approval by the California Coastal Commission and is subject to review under the California Environmental Quality Act (CEQA). Removal of European beachgrass from coastal dunes, regardless of technique, requires a Coastal Development Permit. Beachgrass removal constitutes "development" in the form "removing, dredging, mining, or extraction of any materials," that is not otherwise excluded by statute or the Commission's administrative guidelines as permit-exempt "repair and maintenance." The project does not qualify for exemption status primarily because such removal has been determined to comprise a form of "extraordinary methods of repair and maintenance involving a risk of substantial adverse environmental impact" due to its setting in sand dunes, an environmentally sensitive habitat area (see PRC § 30610(d) and 14 CCR §13252(a)(3)(A)). (Jim Baskin, California Coastal Commission, pers. comm.)

The CEQA requires government agencies to consider environmental impacts of projects and to avoid or mitigate them where possible. Coastal Act Section 30244 provides protection of archaeological and paleontological resources and requires reasonable mitigation where development would adversely impact such resources.

In addition, the CDFG oversees the potential taking of any state listed rare plants. The State of California's rare plant protection program is composed of legislation from the California Endangered Species Act (CESA), the Native Plant Protection Act (NPPA), CEQA, and the Natural Communities Conservation Planning Act (NCCPA). Under NPPA and CESA, state-listed

rare, threatened, endangered or candidate species cannot be taken or possessed except for scientific, educational, or management purposes without the permission of the CDFG.

The United States Fish and Wildlife Service (USFWS) has management jurisdiction over any federally listed wildlife species that may be affected by the project. When no take of federally listed species is expected to occur, project approval can be obtained through Technical Assistance with the Service.

## Project Introduction

Coastal dune habitat has been identified as the habitat type most in need of restoration and management at the LEWA (CDFG 2003). This habitat type represents 2.3% of the total habitat within the Wildlife Area, and nearly all of it has been invaded by non-native European beachgrass. European beachgrass was introduced to California in the late 1800's to stabilize coastal dune environments and facilitate coastal development (Barbour et al. 1976, Weidemann 1984). This fast spreading, highly invasive species has altered shoreline physiography and had many negative impacts on native plant and animal communities on the west coast (Weidemann and Pickart 1996), including the western snowy plover *Charadrius alexandrinus nivosus* (USFWS 2007a).

The goal of the project is to restore coastal dune habitat and associated natural physical processes at the LEWA by removing invasive European beachgrass from the region around the mouth of Lake Tolowa. The project specifically proposes to remove European beachgrass from approximately 14 ha (34 ac) of foredune on either side of the lagoon mouth, using a combination of manual and mechanical removal techniques. The project site was selected based on its particular importance to native plant and animal species as well as enhanced restoration effectiveness expected due to association with adjacent wetlands and restoration efforts at Tolowa Dunes State Park (TDSP). The mouth of Lake Tolowa was an historic breeding site for the western snowy plover and is the only site designated as critical habitat for the species in Del Norte County (USFWS 2005a). Non-breeding western snowy plovers still visit the mouth of the lagoon, but potential nesting habitat has been severely reduced by continuing European beachgrass invasion and other factors. The project site also supports remnant native plant communities and sensitive plant species, including the rare sand dune phacelia. Wetlands surrounding the project site and beachgrass removal efforts at TDSP will create a defensible boundary against re-invasion by European beachgrass following initial removal. Ocean overwash and lagoon breach scouring will also maintain open coastal strand habitat in the project area.

The proposed restoration is consistent with the overall management plan for LEWA which includes a biological management goal "to optimize ecological and habitat productivity for all species in balance with the needs of the public" and is consistent with the long range goals of managing coastal dune habitat (CDFG 2003). Sensitive plant surveys, wetland delineation, cultural resources investigations, and geomorphic analysis were conducted as precursors to the development of this restoration plan. All sensitive resources have been identified and will be protected from potential harm from project actions. Native coastal dune and existing wetland plant assemblages will be buffered and encouraged to spread as part of this project.

## Project Location

The project area is located in the northwestern corner of California, approximately 16 km (10 miles) north of Crescent City in Del Norte County (T 17N R 1W, Sections 30 and 31, Humboldt Base and Meridian; Fig. 1). The proposed project area is a 45 ha (111 acres) region on the western edge of the CDFG managed LEWA (Fig. 2). The project is focused on the vegetated coastal dunes bordering the ocean and the typical outlet of the coastal lagoon known as Lake Tolowa. The area proposed for treatment consists of about 14 ha (34 ac) of European beachgrass on the foredunes on either side of the lagoon mouth as well as smaller infested dunes and hummocks fringing the lagoon (Fig. 3). The project is adjacent to California Department of Parks and Recreation (CDPR) managed, Tolowa Dunes State Park (TDSP) to the south.

## Area Description

The LEWA is a 2,486 ha (6,144 ac) Wildlife Area managed by the CDFG, including and surrounding the Lake Earl coastal lagoon (CDFG 2003). The area consists of pastures managed for the Aleutian cackling goose (*Branta hutchinsii leucopareia*), freshwater and estuarine wetlands, coastal forests, and dunes. The LEWA encompasses a peninsula that was historically an important Native American village site. This peninsula separates the bodies of water known as Lakes Earl and Tolowa, which have a hydrologic connection via a relatively narrow channel at the peninsula tip. Lakes Earl and Tolowa represent the largest coastal lagoon system in the western United States. Water levels in the lagoon fluctuate, due to a combination of freshwater rainfall and surface runoff, lagoon breaching, and tidal flux when the estuary is open to the sea. The sand berm separating the lagoon from the ocean is typically mechanically breached at least once each year to prevent flooding of roads outside the LEWA boundaries.

The dunes in the project area are part of the larger Lake Earl Dune System that extends several miles north and south of Lake Earl and as much as two miles inland. The area is composed of dense European beachgrass stands, open sand, native dune mat, herbaceous deflation plain wetlands and some coastal scrub habitat. The foredune averages 10 m (33 ft) in height with peaks as high as 12 m (39 ft) (Vaughan and Van Dyke 2009). This foredune is thought to have vertically accreted about 3+ m (10 ft) due to the presence of European beachgrass (Vaughan and Van Dyke 2009). Lidar surveys in 2002 indicated that the existing sand berm at the mouth of Lake Tolowa was approximately 4 m (13.1 ft) above msl (T. Beck, pers. comm.).

The LEWA project area contains no facilities and is bounded by largely undeveloped lands. The site is contiguous with coastal dune habitat in the TDSP along its southern boundary. To the north, the project is bordered by the undeveloped Pacific Shores Subdivision. This subdivision, laid out in 1963, consists of platted parcels of coastal dune and wetland habitats, which have never received permits allowing development. More than half of these parcels are also owned and managed by CDFG. The project is bounded to the west by sandy Pacific Ocean beach habitat, and the eastern boundary of the project is the basin and wetlands of Lake Tolowa. An arm of Lake Tolowa drains southward through project area, creating a gradient of seasonal and permanently inundated wetlands. This slough channel, locally known as "Shorebird Slough," extends south into TDSP during high water.

## Background and Need for Project

European beachgrass was introduced to California in the late 1800's to stabilize coastal dune environments in order to facilitate development and agriculture (Barbour et al. 1976). European beachgrass has built a steep continuous foredune parallel to the shore over much of its west coast range, replacing original low hummocky transverse dunes (Weidemann 1984, Pickart and Barbour 2007). European beachgrass has essentially frozen some previously mobile dune systems by stopping or reducing sand movement. Sand movement is an important component for natural maintenance of ecologically intact dune environments.

In addition to altering shoreline topography, European beachgrass-dominated foredunes have had negative impacts on native plant and animal communities on the west coast (Pickart and Barbour 2007). This invasive species decreases invertebrate abundance and diversity, impacts native pollinators by reducing native plants (Nyoka 2004), and destroys nesting habitat of some bird species, including the western snowy plover (USFWS 2007a). Replacement of low growing native dune mat plant species with this tall dense grass also exacerbates predation pressure on the western snowy plover by providing increased cover to mammalian predators on eggs, chicks, and adults. Removal of European beachgrass is critical to the conservation of native dune habitat, including dune mat plant communities, a habitat that is considered globally rare (CDFG 2009). Beachgrass removal in the project area is expected to have immediate positive impacts on vigor and extent of native dune mat habitat within the LEWA.

Pickart and Sawyer (1998) recognized the Lake Earl dunes as a priority for restoration despite significant natural resource impacts resulting from European beachgrass invasion. Among the factors contributing to the prioritization are the surviving populations of native plants and regional diversity represented. European beachgrass control and reestablishment of native dune habitat is a resource management priority at the LEWA (CDFG 2003). The CDPR has already initiated dune restoration adjacent to the proposed LEWA project within TDSP due to the high ecological value and restoration potential of the area (Transou, pers. comm.).

Numerous successful projects have been implemented on the U.S. West Coast to restore native dune and snowy plover breeding habitat using a wide variety of methods, including manual, mechanical, and chemical methods (Pickart and Sawyer 1988, Lauten et al. 2009, USDI 2009). The use of herbicides and an entirely manual removal project were considered and rejected prior to development of the preferred restoration alternatives presented herein.

## Project Objectives

The objectives of the Lake Earl Coastal Dune Restoration Project are:

- To restore natural coastal dune processes and self maintaining open sand spit habitat at the LEWA.
- To promote re-colonization by native dune mat and native dune grass vegetation.
- To provide increased benefits for sensitive wildlife species that depend on these habitat types.

## Project Description

This project proposes the removal of European beachgrass from a 14 hectare (~ 34 acre) area of coastal dune habitat at the mouth of Lake Tolowa in the LEWA (Fig. 2). A combination of manual and mechanical removal techniques will be used to remove European beachgrass from the project area. Use of heavy equipment in areas of low environmental sensitivity will result in major cost efficiencies and increased effectiveness (see Transou et al. 2007). The project would likely not be feasible without the use of heavy equipment. The project is designed to complement and support a CDPR restoration effort on adjacent lands to the south in TDSP. Conditions have been included in the project design to ensure no significant adverse impacts to resources.

## Project Implementation

All work will be supervised by CDFG and/or TDS personnel as required. It is anticipated that crews from the California Department of Forestry (CDF) and the California Conservation Corps (CCCs) will be employed to carry out most of the manual removal work and burning of beachgrass piles. Local crews may also be employed if available. Local contractors will be hired to perform mechanical removal with heavy equipment. Tolowa Dunes Stewards volunteers, the Smith River Rancheria's summer youth employment program, students and others will assist in maintenance pulling of beachgrass resprouts.

## Restoration Action

Restoration work will ideally take place in two distinct phases over 3 to 4 years. If adequate funding is not available for the entire project, restoration will be a multi-year project beginning at the southern end of Area 1 next to the TDSP restoration area, and progressing north as work is completed.

The goal of Phase I will be to remove beachgrass from approximately 8.5 ha (~ 21 ac), from the south spit of the lagoon mouth to the TDSP border (Area 1, Fig. 4) and inland. In Phase II, beachgrass will be removed from about 5.3 ha (13 acres) on the north spit of the lagoon up to the road's end in Pacific Shores (Area 2, Fig. 4). Maintenance hand-pulling of resprouts will ideally take place at monthly intervals following initial beachgrass removal. During the spring and early summer maintenance pulling is recommended every two to three weeks if possible, to prevent the resprouts from sending energy to the root system. One year of maintenance pulling at this pace following initial extraction has proven to nearly eradicate European beachgrass in some settings (A. Pickart, pers. comm.). Others have found that beachgrass removal efforts require some degree of perpetual maintenance (K. Wright, pers. comm.).

Phasing of work will take place so that beachgrass in the lee of the foredune will be removed in concert with removal on the windward face. This is important because fresh blowing sand from the foredune will stimulate the growth and vigor of any beachgrass in its path (L. Wisheart pers. comm.).

Effort will be made to remove other invasive exotic plants encountered during the beachgrass eradication process (Area 1: Klamath weed; Area 2: bull thistle, Klamath weed, and tansy ragwort. T. Gedik 2009a). In all areas infested by beachgrass, coyote brush (*Baccharis pilularis*) will also be removed. Dense beachgrass allows coyote brush to begin forming an

artificial dune scrub community, which will eventually interfere with restoration of native dune mat (A. Pickart, pers. comm.).

Nearby remnant patches of native dune mat are expected to spread naturally to the newly cleared areas, so care will be taken to leave native plants in place, and to work around significant patches when using heavy equipment. The winter winds from the southeast will help spread seeds from the inland area, where dune mat is relatively healthy, in a northeasterly direction to the foredunes (A. Pickart, pers. comm.).

### ***Phase I***

Work completed during Phase I will be restricted to the south side of the lagoon breach site (Area 1; Fig. 4). The majority of the beachgrass removal activities in Area 1 will be accomplished using hand removal techniques to protect existing native dune mat vegetation and reduce sand movement into the Shorebird Slough wetland area. Heavy equipment will be used to extract beachgrass from the western edge of the foredune in Area 1 (Fig. 5, Table 1) and possibly also to scrape and grade lower the northern tip of the foredune at the mouth of the lagoon. In all sensitive areas, such as areas where beachgrass is interspersed with native plants and transition zones between monotypic beachgrass stands and adjacent native habitats, hand removal techniques will be employed.

Manual removal will include hand digging and pulling using shovels or other hand tools. European beachgrass will be dug to a depth of 0.6 meters (2 ft) to remove living rhizomes which will minimize the amount of resprouting. Regular spade shovels, scalping tools, rakes, and short trenching shovels may be used in dense monotypic stands of European beachgrass. Narrow-bladed shovels (such as a trenching shovel) would be used when hand removal occurs adjacent to native plants. The use of a narrow blade will minimize impacts to the roots of adjacent plants and make it easier to insert the blade deeply into the soil to sever beachgrass roots.

Disposal of beachgrass will take place primarily by pile-burning and burial. Manually removed plants will be consolidated into brush piles that will be burned individually. A smoke management plan will be filed with the North Coast Unified Air Quality Management District (NCUAQMD) and all burning will take place under the guidelines established in the burn permit for the project. Care will be taken to ensure that burn piles do not exceed 2m<sup>3</sup> (6 cubic ft) in size. No burning will take place within five meters of sensitive plant species.

Mechanically extracted beachgrass will be buried in trenches dug by heavy equipment. These trenches will be dug immediately adjacent to each area of beachgrass removal. As beachgrass is removed it will be placed in the associated trench. Clean sand dug from the trenches will be used to cap the buried beachgrass and contaminated sand (i.e. sand with rhizomes and other beachgrass material) to a depth of at least 1.5 m (5 ft) if the water table allows. Ideally the burial will take place to a depth of 2.5 – 3 m (8-10 ft). The capped trenches or pits will be smoothed to grade with a dozer.

Manual removal tools and techniques will be used to remove any resprouting beachgrass. Resprouts will be removed at monthly intervals if possible. The level of effort required for each follow-up treatment is expected to diminish significantly with time (particularly after one year) as resprouting rhizomes are removed from treated areas.

## **Phase II**

Phase II will consist of a combination of mechanical and manual removal of beachgrass on the north spit of the lagoon. Heavy equipment, including bulldozers and/or excavators will be used to remove beachgrass on the foredunes excluding areas occupied by sensitive plant species or intact dune mat communities (Table 1, Fig 5). In sensitive areas, hand removal techniques will be employed. Heavy equipment will not be used within five meters (~17ft) of any wetlands or sensitive plant species.

Further north along the foredune in Area 2, bulldozer and/or excavator methods will be used to remove European beachgrass while maintaining existing topography and limiting sand movement towards the wetlands (see Transou et al. 2007). Beachgrass disposal will take place by burning and burial as described in Phase I.

## **Time and Costs**

The costs of European beachgrass removal vary widely depending on methods used. Mechanical removal has been found to be one half to one fifth the cost of manual removal (Pickart, Transou, pers. comms.), and so will be used to the extent possible without potentially harming sensitive resources at LEWA. Costs of beachgrass removal using heavy equipment have varied from \$1,480/ha (\$599/ac) (Pickart and Sawyer 1998) to \$7,331-\$38,769/ha (\$2,968-\$15,696/ac) (Transou et al. 2007). We have used an estimate of \$4,000/acre for mechanical clearing to develop cost projections (Table 1). This estimate is about \$400/acre higher than found by Transou et al. (2007) at Little River Beach in order to incorporate costs associated with daily transport of equipment to and from the work site, increased fuel costs, and a more challenging work environment for equipment operators.

Pickart and Sawyer (1998) estimated the cost of beachgrass using manual removal (handpulling) techniques at \$86,000/ha (\$34,795/ac) for California Conservation Corps crews (CCCs). More recent estimates from other sources have come up with similar numbers.

The number of person hours required to clear one acre of dense European beachgrass manually over a three year period has been estimated at 2,951 hours, which includes managing and burning pulled vegetation (Pickart and Sawyer 1998.) The removal described by Pickart and Sawyer (1998) was particularly expensive because the sites were remote and it took a long time to walk between removal plots, and the beachgrass was 100% cover. The LEWA site is somewhat less remote, due to vehicle access through the Pacific Shores subdivision or DFG peninsula, and some of the manual removal areas are less densely invaded by beachgrass. On average Pickart's costs for transport/walking time were nearly 40% of total costs, so we reduced this particular cost (and people hours) to ~ 20% of the total cost. Initial investigation into the feasibility of hiring local manual removal crews in order to cut costs and employ local people indicates that this is not likely to be an option. (D. Burgess, pers. comm.). However, we will supplement resprout removal with volunteers and other donated work crews to the maximum extent possible.

The estimated *base* cost of the restoration project is \$ 628,000 (Table 1). Any necessary management, monitoring, technical expert oversight and administrative duties would represent additional costs. Some project effectiveness monitoring and pulling of resprouts will be accomplished by TDS volunteers, student crews and others to ultimately reduce costs.

Table 1. Estimated base costs for European beachgrass removal at Lake Earl Wildlife Area.

Phase	Removal Technique	Acres	People hours/ac	Total hrs required	Crew of 12	Costs/acre	Total Costs
I	Manual	14	2360	33,040 (3304 10 hr days)	276 days (35 8-day work weeks)	\$28,000	392,000
	Mechanical	7				\$ 4,000	28,000
	Total	21					420,000
II	Manual	6.5	2360	15,340 (1534 10 hr days)	128 days (16 8-day work weeks)	\$28,000	182,000
	Mechanical	6.5				\$ 4,000	26,000
	Total	13					208,000
Total acreage		34					628,000
<b>TOTAL PROJECT COSTS</b> <i>excluding</i> donated labor, monitoring, experts and some management and administration costs							<b>\$ 628,000</b>

### Project Timeline

Any project timeline is dependent upon funding and the availability of CCC work crews. The CCCs are somewhat more available in the off-season, and will work in the rain. TDS volunteer days are scheduled every month but rain cancels. This means that manual removal will occur year-round. Using CCC work crews from Fortuna and stationed at a temporary "spike" camp may be the most feasible option for procuring manual labor. We used 10 hour days and 8 day work weeks for our projections, to match their typical work routine. Mechanical work must take place in the non-rainy season, which overlaps with bird nesting seasons.

Phase 1 could be accomplished over a 2 to 3 year period. Phase II could be accomplished in Year 3 or 4. Any work that did not get accomplished in Phase 1 will be added to Phase II.

### Staging and Access

All equipment and vehicles will be typically staged on the pavement at the terminus of the county roads in the Pacific Shores subdivision north of the project area. Access to the project site will take place along designated sand trails east of the northern foredune in Area 2. To access Area 1, personnel will cross the sand berm at the breach site when the lagoon is closed to the sea. When the lagoon is open to the ocean and outflow prevents passage, access of personnel to Area 1 will take place from the LEWA peninsula east of project site. Personnel will park in a designated non-sensitive pasture area and access the foredunes on foot. If necessary heavy equipment may come in on a TDSP road (aka Sweetwater Creek trail) to the mouth of Sweetwater Creek, and from there north on the beach or the old road/trail that goes north behind the foredune. Some project-related use of ATV's may occur to transport equipment to

and from the work area. Depending on lagoon water levels, some modifications of access may be necessary. In all cases, trails will be established and flagged to designate routine passage areas for heavy equipment as well as foot traffic through sensitive portions of the project site.

## Affected Environment

### Vegetation

Native coastal dune plant community zonation and succession are driven by interdependent physical factors including sand movement, salt spray, and wind speed (Barbour et al. 2007). Sand burial may be among the most important factors influencing zonation of coastal temperate dunes (Maun 1998). Biological factors also play a role in these plant communities but have been more difficult to quantify (Nyoka 2003, 2004, Pickart and Barbour 2007). European beachgrass has altered natural processes in the coastal region of the LEWA to such an extent that only remnant native plant communities remain. Prior to establishment of European beachgrass the nearshore area was probably dominated by the native dunegrass (*Leymus mollis*) and low growing herbaceous vegetation collectively referred to as "dune mat." Wind driven sand movement was probably much greater and sustained these plant communities.

Vegetation surveys in the project region were recently conducted by Nyoka (2003) and Gedik (2009a). While most of the foredunes are dominated by European beachgrass, a diverse assemblage of plants occurs within the project area in association with wetlands and remnant dune mat habitat. The following description of the vegetative setting is largely excerpted from Gedik (2009a; Appendix A). A list of all plant species observed in the project area, including scientific names, is provided in Appendix A.

Stabilized foredunes occur parallel to the coastline, north and south of the Lake Tolowa lagoon mouth. The invasive exotic European beachgrass dominates these foredunes and forms >80% cover in most regions (Fig.3, 4). Coyote brush, yarrow, beach morning glory, fireweed, and the invasive exotic tansy ragwort, occur sporadically throughout the foredunes.

Small pockets of dune mat habitat also occur in the project region, primarily in Area 1 (Fig. 3). While these areas are becoming encroached upon by European beachgrass, intact portions are dominated by dune sagebrush, maiden clover, dune buckwheat, beach evening-primrose, and beach strawberry. The sensitive plant species, sand dune phacelia, was occasionally observed in this habitat (Fig. 4).

Smaller dunes occur between the primary foredunes and the lagoon in areas that are sometimes inundated by water. The dune wash areas are sparsely vegetated with species such as shore lupine, dune sagebrush, beach strawberry, dune knotweed, gumweed, rattail fescue, and European beachgrass.

Wetland fringes adjacent to the western portion of Tolowa Lake lagoon include species such as native dunegrass, beach-bur, brass buttons, dune tansy, yarrow, spearscale, and coyote brush. Lake Tolowa drains southward along the backside of the foredunes in Area 1, creating a slough that includes seasonal and permanently inundated wetlands. American bulrush is prevalent in shallower parts of the slough channel, along with sporadic occurrences of willow dock. A narrow drainage channel (approximately 2 meters wide) branches from the lagoon to the

southeast, and is dominated by wetland species that include slough sedge, water parsley), marsh lotus, and creeping spikerush.

Transverse dunes covered primarily with European beachgrass are interspersed within these wetland features, especially east of the slough channel. Pockets of scrub-shrub habitat occur on top of some of these hummocks, and include species such as shore pine, California wax myrtle, sword fern, twinberry, and the invasive exotic Klamath weed.

The sand spit at the lagoon mouth and the adjacent coastal shoreline are characterized as beach strand. The landscape in this habitat is primarily influenced by abiotic factors rather than stabilizing vegetation. High winds, waves and cyclic tidal inundation severely restrict vegetative growth in the beach strand zone. Pioneer plant species such as sea rocket occur in this region.

### ***Special Status Plant Species***

Special status species plant species known to occur in the project area include only one rare plant, although there is a possibility of a second species occurring. A rare plant assessment was conducted by Gedik Biological Associates (GBA) in the project area during 2009 (Appendix A). Gedik (2009a) queried the California Natural Diversity Database (CNDDB) and the California Native Plant Society (CNPS) Inventory of Rare, Threatened and Endangered Plants for the project area and surrounding 7.5 min. USGS quadrangles. It was determined that suitable habitat occurred for 19 Special Status regionally occurring plant species.

Focused field surveys were conducted during July and August, 2009 by GBA Principal Biologist Tamara Gedik. Surveys were floristically appropriate for most species and focused on an intuitive meander approach to target areas of highest habitat potential for special-status and sensitive plant species. Portions of the project area had previously been surveyed by other biologists for special status and nonnative plant species. The objective of surveys was to identify constraints for proposed activities in terms of rare plants. Only one of the 19 Special Status Species was found in the project area, although a second species may have been present but undetected.

#### **Sand dune phacelia (*Phacelia argentea*)**

Sand-dune phacelia was the only sensitive plant species observed in the project area. This species was found both in dune mat habitats and in stabilized sand within strong infestations of European beachgrass. Associates included dune sagebrush, dune buckwheat, beach bursage, and dune knotweed in more ecologically intact areas, and cheatgrass, horseweed, rattlesnake weed, and cudweed in more disturbed areas. Occurrences ranged from single individuals only 1 inch in size to single mats 2-5 feet in width. A GPS location was recorded for each sensitive plant occurrence. There were 2 occurrences of this plant in Area 2 and 6 occurrences within in Area 1 (Fig. 4). Additional occurrences were within the project area were later documented by Jerabek and Jaques (Fig. 4).

Sand dune phacelia is a perennial member of the family Hydrophyllaceae. It is a CNPS List 1B.1 species. Plants on this list are considered rare, endangered, and very threatened plants in California and elsewhere pursuant to Section 15370 of the California Environmental Quality Act (CEQA), and are Special Status Species. Sand dune phacelia occurs in coastal dune habitat, and is known only to occur exclusively in the vicinity of Lake Earl and Smith River dunes in Del Norte County, (within the entire state of California (CNPS 2001) Additional plants occur in

southwestern Oregon. It is threatened by development, vehicular activity, and encroachment by non-native plants such as European beachgrass.

Dark-eyed gilia (*Gilia millefoliata*)

Suitable habitat for the dark-eyed gilia was considered to be present in the southeast portion of Area 1, along the fringes of seasonal wetlands adjacent to dune mat habitats (Gedik 2009a). Dark-eyed gilia is a CNPS List 1B.2 species and is state listed as endangered in Oregon (Pickart 2009). It is a tiny annual herb of the family Polemoniaceae. It occurs in coastal dune habitats, and its range extends from southern Oregon to Marin County. Threats to this species include stabilization of the sand dunes by European beachgrass and other non-native species, loss of habitat to development, grazing, and vehicle and foot traffic. Dark-eyed gilia is a delicate annual that blooms from March through June. Because this species would have already withered by the time field surveys were conducted within the project area, its status remains to be confirmed there.

Table 2. Special Status Plant Species in the LEWA proposed restoration area.

Species Name	Federal Status	State Status	Preferred Habitat	Bloom Time
Sand-dune phacelia <i>Phacelia argentea</i>	None	Special Status Species CNPS: List 1B.1	Coastal dunes and strand; sand dunes less than 20 m (Hickman 1993)	June- Aug; perennial
Dark-eyed gilia <i>Gilia millefoliata</i>	None	Special Status Species CNPS: List 1B.2	Coastal dunes; 2-20m (CNPS 2001)	April-July; annual

**California Native Plant Society (CNPS) Listing Categories:**

1B.1: Plants rare, threatened, or endangered in California and elsewhere

1B.2: Plants rare, threatened, or endangered in California but more common elsewhere

**Wildlife**

Wildlife diversity and abundance at the LEWA is high (CDFG 2003). The region around the mouth of Lake Tolowa is used by aquatic mammals such as river otter (*Lutra canadensis*) and numerous coastal bird species for foraging and resting. Prominent bird species groups include migratory waterfowl, shorebirds, seabirds, and raptors. Waterfowl broods also occur within the region, particularly around Shorebird Slough, indicating possible nesting by ducks and geese in the vicinity. The California brown pelican (*Pelecanus occidentalis californicus*) roosts at the mouth of Lake Tolowa, where counts of more than 100 birds have occurred; counts of more than 300 birds have occurred in the Lake Earl lagoon (Jaques et al. 2008). The brown pelican is a previously state and federally listed recovered species; continued protection of important traditional roost sites is a management goal for this seabird (USFWS 2009).

**Special Status Wildlife Species**

Two currently federally listed threatened or endangered wildlife species occur in the project area; the western snowy plover and the tidewater goby (Table 3). A third listed species, the Oregon silverspot butterfly (*Speyeria zerene hippolyta*) occurs near the project area and could potentially spread into the habitat post-restoration. One state endangered and 2 California Species of Concern (CSC) bird species occur in the area. A third CSC bird species may occur

in the area. Three species of salmonids, including the coastal cutthroat trout (a CSC) have historically occurred in the Lake Earl lagoon and are also discussed below. The red legged frog (*Rana aroura aroura*) may also occur in the project area and is a CSC.

Table 3. Special Status species known to occur within the LEWA project area or nearby vicinity.

Species Name	Federal Status	State Status	Breeding Status Within Project Area
<b>Birds</b>			
Western Snowy Plover <i>Charadrius alexandrinus nivosus</i>	FT	None	Non-breeding (Historical breeder)
Bald Eagle <i>Haliaeetus leucocephalus</i>	FD	CE (under review)	Non-breeding
Northern Harrier <i>Circus cyaneus</i>	None	CSC	Possible breeding
Oregon Vesper Sparrow <i>Poocetes gramineus affinis</i>	None	CSC	Unknown Status, possible breeding
<b>Fish</b>			
Tidewater Goby <i>Eucyclogobius newberryi</i>	FE	CSC	Possible breeding
Coastal Cutthroat Trout <i>Oncorhynchus clarkii clarkii</i> CSC	None	CSC	Non-breeding
Steelhead trout <i>Oncorhynchus mykiss</i>	None	CSC	Historically stocked, non-breeding, presence uncertain
<b>Amphibians</b>			
Northern Red Legged Frog <i>Rana aroura aroura</i>	None	CSC	Likely to occur in area but habitat not likely to support breeding
<b>Invertebrates</b>			
Oregon Silverspot Butterfly <i>Speyeria zerene hippolyta</i>	FT	None	Non-breeding; presence not documented

**Table 3 Status Codes:** Federally Endangered (FE); Federally Threatened (FT); Federally Delisted (FD). State Endangered (SE); State Threatened (SE); California Species of Special Concern (CSC).

Western Snowy Plover (*Charadrius alexandrinus nivosus*)

The western snowy plover is a small ground-nesting shorebird that was listed as a federally threatened species in 1993 (USFWS 2007a). The most widespread form of habitat loss to coastal breeding snowy plovers has been encroachment of European beachgrass. Human disturbance, coastal development, and increased predation pressure have also had negative effects on plovers.

Western snowy plovers were first documented breeding near the mouth of Lake Tolowa and on the Smith River sandspit in 1977 (Widrig in Page and Stenzel 1981). In 1977, 5 adults and one nest were documented at Lake Tolowa. Seven pair were estimated to breed in the Smith River-Lake Tolowa area overall. Yokum and Harris (1975) suspected that snowy plover were breeding in the Lake Tolowa region prior to 1977, but did not find any nests

Western snowy plovers nested at Lake Tolowa until at least 1989. In 1989, 8 adults were found at the mouth of the lagoon during the breeding season (R. Pratt, *In Jaques and Strong 1996*) and one nest with three eggs was documented (A. Barron, pers.comm). Biologists have searched for western snowy plovers at Lake Tolowa irregularly since 1991 and every year since 2000 as part of the USFWS annual breeding window survey. No nesting plovers have been found in all of Del Norte County since these surveys were initiated (USFWS and CDPR unpubl. data).

Nesting western snowy plovers may have abandoned use of the Lake Tolowa area due to degradation of habitat caused by European beachgrass as well as increased human disturbances including off highway vehicle traffic (USFWS 2005a, Jaques and Strong 1996) and other factors. The same year that the birds were discovered nesting there, Page et al. (1977) recommended that the area within 1 km (0.6 miles) of the Lake Tolowa mouth be closed to all vehicle access to protect the species at the site. The last western snowy plover nest found in 1989 contained 3 eggs on April 22. The scrape was covered by a tire track by April 27 and no plovers were found in the area (A. Barron, unpubl. data).

Non-breeding western snowy plovers have continued to visit the region at the mouth of Lake Tolowa since 1989, however. Recorded sightings increased around 2004 (A. Barron, unpubl. data). As many as 6 plovers at a time were observed near the breach site in 2004 (D. Jaques, unpubl. data) and regular sightings of up to 3 birds have occurred both north and south of the breach area in more recent years (CDPR and A. Barron, unpubl. data).

Critical habitat was designated for the western snowy plover in 2005 (USFWS 2005a). This included a 24 ha (57 acres) unit at the mouth of Lake Tolowa, referred to as CA-1 (Fig. 6). The unit boundaries closely matches the proposed habitat restoration project area. The unit was protected for its current value as a wintering site and potential value as a breeding site. Expansion of the unit boundary further south has been proposed (USFWS 2011) due to increased plover sightings in the TDSP. Essential features of the unit for western snowy plover conservation include sandy beaches, wind blown sand in dunes inland from the beaches, and the washover area at the Lake Earl/Tolowa lagoon mouth. Current threats to the species at the site as stated by USFWS (2005a) include "degradation of the sand dune system due to encroachment of European beachgrass; destruction of habitat and loss of wintering and nesting plovers from OHV use; and, destruction of habitat from annual mechanical breaching on the Lake Earl/Lake Tolowa lagoon." With adaptive management the critical habitat unit/proposed restoration site is thought to potentially support up to 10 breeding plovers (USFWS 2005a).

Recovery objectives for the western snowy plover include providing for long-term protection of breeding and wintering snowy plovers and their habitat (USFWS 2007a). The proposed habitat restoration is consistent with recovery goals for the species.

#### Tidewater Goby (*Eucyclogobius newberryi*)

The tidewater goby (is a federally endangered fish species endemic to California (USFWS 1994). Lakes Earl and Tolowa are thought to support the largest population of tidewater goby remaining in the state, with numbers estimated at a few million (Swift et al. 1989, USFWS 2005b). The entire coastal lagoon has been designated as critical habitat for the species partly due to its importance as a source population for a genetically distinct metapopulation (USFWS 2008). Current threats identified for this population include artificial lagoon breaching and non-point source pollution from agricultural run-off.

Tidewater goby occur throughout Lakes Earl and Tolowa and appear to adjust their distribution within the lagoon system according to seasonally changing environmental conditions (Tetra Tech 2000). During a 1998-1999 study, the primary spawning areas for this species were found to be in sandy substrate along wind-sheltered shorelines of Lake Earl. Rearing occurred primarily in Lake Earl and at the narrows between Lakes Earl and Tolowa. Foraging occurred throughout the lagoon system, with the exception of shoreline areas that are seasonally anaerobic due to detritus build-up. Some spawning and rearing may take place in Lake Tolowa, where presence of widgeon grass (*Ruppia maritima*) appears to be a good indicator of goby habitat (B. Norman, pers. comm.).

The tidewater goby is adapted to living in California lagoons that intermittently breach to the sea. The major factors affecting the tidewater goby population at Lake Earl appear to be the amount of inundated habitat available (lagoon level), the timing of breaching events, and the length of time the lagoon remains open following breaching (Tetra Tech 2000). Thousands of tidewater gobies have been swept into the Pacific Ocean following artificial lagoon breaches, and stranding of fish within small pools around the perimeter of the lagoon has been documented (Tetra Tech 2000). Special Conditions outlined in the permit to breach Lake Earl have required the permittees to survey for stranded gobies following each breaching event (California Coastal Commission 1999, USFWS 2008).

The most important aspect of goby stranding is that it does not affect annual population recruitment (Tetra Tech 2000). Historic lagoon breaching during the spawning period (April through August) has likely had negative effects on population recruitment. McCraney (2009) has suggested that artificial breaching at Lake Earl may have reduced genetic heterozygosity in the population due to significant annual mortality events resulting in population bottlenecks. The lagoon has been artificially breached for about 160 years. During much of the last century the lagoon was artificially breached several times a year when it reached a level of 4 feet above msl to maximize use of adjacent cattle grazing pastures. Beginning in 1986, permitted artificial breaches of the lagoon have been conducted at high water levels (8 feet or greater) and seldom after Feb 15 (CDFG 2003), simulating a more natural winter breach regime.

#### Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*)

The Oregon silverspot butterfly lives in native coastal grasslands or prairies near the Pacific Ocean and prefers habitat with very low vegetation about 3 to 8 inches high (Tetra Tech 2000). Tall invasive grass species have crowded out native larval host and nectar plant species that these butterflies require to survive. The LEWA and TDSP support one of the most important populations of federally threatened Oregon silverspot butterfly on the west coast, however, neither the butterflies nor their larval host plant species (*Viola adunca*) have been found within the project area. Butterflies may have historically occurred in the project area prior to crowding out of low growing native plants by tall European beachgrass.

#### Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle has been federally delisted and its status is under review in California (Table 3). Bald eagles are still relatively rare breeders in Del Norte County, but one pair has nested in trees at the northern end of TDSP. Large trees in parts of LEWA provide potential nest sites for this species but there are no large trees within the project area. The species commonly flies over, but is rarely seen foraging or roosting in the project area.

#### Oregon Vesper Sparrow (*Pooecetes gramineus affinis*)

The Oregon vesper sparrow is an obligate grassland species that feeds on both invertebrates and seeds procured on the ground and in vegetation (Erickson *In* Shuford et al. 2008). The

Oregon vesper sparrow is of conservation concern in California primarily due to destruction and disturbance of natural grassland wintering grounds in central and southern California. The primary breeding range of the subspecies is in Oregon; the only breeding population in the California occurs in Del Norte County. The breeding population in California is small (10-20 pairs or so), and is apparently restricted to the area between Kellogg Road and the mouth of Lake Earl/Tolowa (A. Barron pers. comm.). Vesper sparrows have not been reported nesting within the project area (Harris 1991, Barron 2007).

#### Northern Harrier (*Circus cyaneus*)

Northern harriers breed and forage in a variety of open (treeless) habitats that provide adequate vegetative cover, an abundance of suitable prey, and scattered perches such as shrubs or fence posts (Unitt *In* Schuford et al. 2008). In California, such habitats include fresh and saltwater marshes, wet meadows, weedy borders of lakes, annual and perennial grasslands, among others. Harriers nest on the ground, mostly within patches of dense, often tall, vegetation in undisturbed areas. The northern harrier is a CSC due to diminished range, habitat destruction and human disturbance. Human disturbance is a source of nest failure throughout most of the species' range in California. People walking or recreating near nests, off-leash dogs, and off-highway vehicles are the main sources. In coastal California, another important threat is predator management aimed at protecting imperiled bird species including coastal western snowy plovers. These predator control efforts annually result in the loss of adult harriers as well as losses in their productivity (Unitt, *In* Schuford et al. 2008).

Northern harriers are observed foraging around Lake Tolowa year round and are thought to breed in the vicinity 'sparingly' (Barron 2007). A northern harrier pair could potentially nest within the project area.

#### Salmonids

Coastal cutthroat trout (*Oncorhynchus clarki clarki*) is the most abundant salmonid species in Lake Earl, although anadromous steelhead (*Oncorhynchus mykiss*) and coho salmon (*Oncorhynchus kisutch*) have been observed (CDFG 2003). Cutthroat trout are a California Species of Special Concern.

Anadromous fish stocks in Lake Earl were historically maintained through planting by the CDFG (*In* Tetra Tech 2000). The last official planting of salmonids in Lake Earl was in 1982, when approximately 100,000 steelhead were stocked. Coho salmon were periodically stocked in Lake Earl from 1969-1980. The lagoon system does not currently support coho (CDFG 2003). CDFG stream surveys in Lake Earl tributaries Yonkers Creek and Jordan Creek recorded the last official observations of coho salmon in 1983 and 1984 respectively.

Salmonid habitat in Lakes Earl and Tolowa is severely restricted during July and August (Tetra Tech 2000). Dense summer aquatic vegetation produces unsuitable pH levels and low dissolved oxygen concentrations; resulting in oversummer conditions that are marginal for salmonids. Cutthroat trout are the most adaptable to poor water quality conditions which explains their continued presence. Steelhead are less sensitive than coho salmon to the poor water quality conditions and are periodically observed in the lagoon. All potential salmonid spawning habitat occurs in the tributaries to Lake Earl (CDFG 2003). There is no potential salmonid spawning habitat within the project area. Salmonid activity within the project area is likely limited to transit from the ocean to Lake Earl and its tributaries.

### Northern Red Legged Frog (*Rana aroura aroura*)

The northern red legged frog commonly occurs in coastal Del Norte County in association with wetland, riparian, and other habitats. These frogs require fresh, still water to deposit their egg masses. Adequate water must persist in temporary ponds throughout the development of the eggs, and metamorphosis from tadpole to frog, to accommodate successful breeding. The project area does not appear to provide suitable standing water for breeding by this species, although standing water is present in the nearby vicinity on LEWA. Frogs that may occur in the project area are most likely to be associated with the shoreline of Lake Tolowa and sloughs that feed into the estuary on the southeast edge of the site.

### **Soils and Sand Movement**

Soils in the project area were described by Gedik 2009b (Appendix B) and are summarized here. The project areas consist of two taxonomic soil types: the Beaches-Samoa-Dune land complex and the Samoa-Clambeach-Dune land complex. The Beaches component occurs on the upper wave slope and open sand spit areas. The Dune land component is assigned to unvegetated dunes with somewhat excessively drained soils formed from aeolian and marine sand derived from a variety of sources. Samoa series type consists of deep highly drained soils formed in aeolian and marine sand derived from mixed sources. It occurs on recently stabilized dunes and is often associated with dune mat plant species, but can also support species indicative of more stabilized areas such as European beachgrass, yellow sand verbena, and coyote brush.

The Clambeach series type is characterized by very deep, very poorly drained aeolian and marine sand that occurs on deflation basins, depressions, and coastal plains. Frequent ponding for extended duration is common with this soil type. The Clambeach series is recognized as a hydric soil on the USDA NRCS list of hydric soils for California. This soil type was associated with wetlands within the project area where beachgrass removal will not take place.

Pacific Watershed Associates (PWA; Weaver and Leroy 2010) conducted a reconnaissance survey and geomorphic evaluation of the project area (Appendix D). The primary goal of this evaluation was to review the potential geomorphic effects of implementing the proposed *restoration*, and to provide recommendations, if needed, to minimize any adverse effects on project area resources. Vaughan and Van Dyke (2009) also conducted a geomorphic study in the region as part of restoration planning for TDSP.

Both evaluations found that generally, the foredunes are composed of fine grained sand that is prone to aeolian transport while sand deposits in the lee of the foredune contain what appears to be a sandy lag deposit containing high percentage of medium and coarse sand that is less susceptible to transport. Vaughan and Van Dyke (2009) have identified a cobble and gravel layer of rounded clasts at this same topographic elevation that forms the floor of the deflation plain/wetland immediately east of the current foredune complex. These cobble deposits have been provisionally assigned a tsunamigenic origin and are unique on North Coast beach and dune complexes. The deposits are targeted for further study as they have potential significance for the magnitude, dynamics, and timing of major tsunamis to affect the North Coast. Their extent has been mapped in TDSP south of and up to the proposed DFG project area.

Weaver and Leroy (2010) stated that "Sand movement and dune reactivation can be expected to occur, to some degree, following the removal of *Ammophila*. The degree to which aeolian processes occur and the rate at which sand erosion and dune movement proceeds, will be

dependent on eradication methods, post-project topographic conditions, wind speeds and durations, and the rate and degree of revegetation by native dune mat species.”

The project area can experience high velocity winds throughout the year. The prevailing wind direction during spring and summer is north or northwest. Winds during fall and winter are more variable with a strong southerly component in winter ([www.wrh.noaa.gov/eka/climate/northcoast](http://www.wrh.noaa.gov/eka/climate/northcoast)). Monthly wind averages in the coastal region range from 8-12 knots (9.2 – 13.8 mph) (NOAA buoy data, Pt. St. George). Lowest average wind speed occurs from July through October. Gusts of 35-45 knots (40.3 – 51.8 mph) are possible in any month. Peak wind gusts occur during the stormy season from November through March.

Substantial sand movement can be expected in the project area during the dry months. Gust speeds in excess of 12 knots (13.8 mph) are reportedly required to transport dry sand, however sand movement has been observed at winds as low as 5.2 knots (6 mph) on the Oregon coast (USDI 2009). Wet or moist southerly winds in winter are far less likely to transport sand in the Pacific Northwest than the drier northerly winds of spring and summer (Hunter et al. 1983). Sustained gust speeds are more significant than average wind speeds in assessing sand movement (Vaughan and Van Dyke 2009).

Stabilizing cover needs to be at least 40% of the bare area to successfully capture and deposit fine soil particles (*In* USDI 2009). In the near ocean environment of southern Oregon (and northern California), with very fine sands, high winds that exceed 17.4 knots (20 mph) on a regular basis and no other trapping mechanism, the amount of cover could have to be as high as 65% before deposition can successfully occur (USDI 2009). Manual beachgrass removal retains stubble that slows erosion; mechanical removal of beachgrass releases more sand to the wind

Project implementation will include a monitoring and adaptive management strategy to respond to unanticipated dune advancements that threaten significant intact native dune mat areas, listed or sensitive species, valuable or sensitive habitat (e.g., wetland, stream, estuary or slough habitat or processes), important geologic features, or sensitive archeological resources within the LEWA (see Appendix D and Monitoring and Adaptive Management sections of this document).

### **Wetlands and Water Resources**

Lakes Earl and Tolowa represent a relatively shallow coastal lagoon that is part of the Smith River drainage. Lake Earl is mostly freshwater and receives flow from creeks including Jordan Creek and Brush Creek to the east. Connected to Lake Earl by a narrow channel, Lake Tolowa varies greatly in salinity depending on whether it is open to the ocean or not. Lake Tolowa is bounded from the ocean by a sand berm of about 4 m (13.1 ft) above msl. When water levels are high, the combined surface area of Lakes Earl and Tolowa is 1,011 hectares (2,500 acres) although the entire Lake Earl wetland complex spans 2,225 hectares (5,500 acres). Water levels tend to be high during the entire rainy season. Fringing emergent wetland plants are largely regulated by the high water levels.

Gedik Biological Consultants conducted a routine wetland delineation on the 45 ha (111 ac) project area within LEWA (Gedik 2009b; Appendix B). Field work was conducted at the project site in October 2009 following assimilation of existing wetlands information. Soil observation pits were dug to assess site conditions for the presence of wetlands. Data transects running perpendicular through wetland boundaries were created. Soil pits were dug along these

transects within wetland, upland and transition zones. At each soil pit, hydrology, vegetation, and soils were examined. Wetland boundaries were mapped by walking the perimeters of three-factor wetlands and other waters and recording GPS points with a Trimble GPS unit.

The wetland delineation identified approximately 25 ha (62 ac) of Army Corps of Engineers (ACOE)-jurisdictional wetlands and Other Waters associated with Lake Tolowa estuary (Fig. 6). An additional 8 acres of ACOE-jurisdictional Navigable Tidal Waters were defined on the intertidal beachfront. Intertidal beaches fall under the jurisdiction of the California State Lands Commission and are technically not part of the LEWA. Areas along the spit where breaching of Lake Tolowa lagoon occurs may be recognized as ACOE-jurisdictional Other Waters during periods when the breach occurs and connects the lagoon with the coastal waters.

### **Lagoon Breaching Regime**

The Lake Earl lagoon is unlike other northern California coastal lagoons in that it is constrained by the development of public roads around its perimeter and is normally artificially breached to the ocean prior to flooding roads outside of the LEWA boundaries. The CDFG and County of Del Norte have a joint permit to artificially breach the Lakes Earl/Tolowa lagoon when rainfall and tributary inflow raise the lagoon water elevation to 2.4 – 3 m (8-10 ft) above msl. This typically occurs during the period November through February. Once the lagoon drains, winter storms and drifting sand again seal the lagoon from the sea within 30 days on average. Artificial breaches after 15 February are not allowed under the current permit due to concerns about failure for the lagoon to re-seal in spring conditions causing a resultant loss of wildlife habitat and deterioration of water quality in the lagoon.

Lagoon discharge rates are a management concern at LEWA due to documented mortality of birds and fish that occurs when some species near the mouth are swept out in the ocean following artificial breach events. Average discharge rates as high as 50,000 cfs has been calculated at the mouth of Lake Tolowa soon after breaching (Tetra Tech 2000). Post-breaching discharge rates are a function of the difference between the elevation of the lagoon, the height of the sand bar across the lagoon, and to some extent, the configuration of the channel. The channel through the sandbar downcuts rapidly and eventually erodes to an elevation about MLLW (-3.8 NGVD (ft below msl), at which point flow is regulated by tides. There has been some management effort to initiate artificial breaching to coincide with a rising tide, so that outflow velocities and the rate of channel downcutting will be slowed by the rising tide.

### **Cultural Resources**

The project area is located within the ethnographic territory of the Tolowa people in northwest California. The Tolowa historically used the coastal margins of the Lake Earl dunes for subsistence year round (Gould 1975, 1978). Contemporary Tolowa members continue some of these same Native American practices, such as surf fishing, shellfish collecting and fish-drying in the region in the present day.

A Cultural Resources Investigation in two phases was conducted by the Humboldt State University Cultural Resources Facility (HSU-CRF) to satisfy environmental regulations specified in CEQA for the proposed project (Burns et al 2009; Rich et al 2010, Appendix C). Surface surveys were conducted in July 2009. After some project treatment options were eliminated and heavy equipment removal became a preferred option, below surface investigations were ordered and took place in March and April 2010. The investigations were designed to: (1) identify and record significant cultural resources within the project area, (2) offer a preliminary

significance evaluation of the identified cultural resources in accordance with a Phase I investigation, (3) assess the potential impacts to cultural resources resulting from the implementation of proposed project activities, and (4) offer recommendations designed to protect resource integrity, as warranted. Background research, Native American consultation, and field surveys were used in the investigation.

One newly recorded archaeological site was discovered during the course of these studies and no previously recorded sites occur within the project area. Recommendations and protocol for ensuring that potential project impacts on inadvertently discovered cultural resources are eliminated or reduced to less than significant levels were made by HSU-CRF (Appendix C) and are included under the Environmental Protection section of this document.

### **Visitor Experience**

The California Coastal Act Section 30211 requires that development not interfere with the public's right to access gained by use or legislative authorization. Lake Earl Wildlife Area provides for fishing, wildlife/bird viewing, hiking, nature photography, and boating. Waterfowl hunting is permitted during open season. Beachcombing, surf fishing, and horseback riding take place on the outer beaches. Only commercial fisherpersons are allowed to drive along the waveslope in street-legal 4-wheel drive OHVs in adjacent TDSP. There are no facilities in the region of the project area.

The project will not have significant affects on visitor use of the LEWA. The area immediately surrounding heavy equipment in use will be roped off and closed to the public during a few weeks of the year during the 3-4 year project span. Designated project personnel will observe and enforce the public safety barrier zone. The waveslope will remain open for passage of persons and authorized vehicles on the beach throughout the project.

Potential conflicts between waterfowl hunting and beachgrass removal activities will be alleviated by differences in time of day when these activities occur and the limited area included in the project. Waterfowl hunting in Lake Tolowa typically occurs at dawn and dusk from mid-October through January, and few hunters are found at the mouth of the lagoon.

### **Neighboring Land Use**

Adjacent to Lake Earl Wildlife Area is the Tolowa Dunes State Park, a 5,000 acre area managed by the California Department of Parks and Recreation. Private lands near Lake Earl include scattered residences and large agricultural areas. In the 1960s, the Pacific Shores subdivision was planned for the area between Lake Earl's northwest shore and the ocean. A road system (43km, 27mi) was built and lots sold, but building permits have not been issued because of soil and high groundwater conditions, and numerous other issues. Many of the lots in the Pacific Shores development have been purchased by the California Coastal Conservancy and the Wildlife Conservation Board for addition to the Lake Earl Wildlife Area.

## **Environmental Protection**

### **Hazardous Materials and Air Quality**

Risk of hazardous material spills from heavy equipment operation will be minimized to the extent possible by employment of the Protective Measures outlined in the Hazardous Spill Contingency Plan (Appendix E). In the event that hazardous substances are released into the ground or water, a spill kit will be available and the contingency plan will be followed.

A smoke management plan will be filed with the North Coast Unified Air Quality Management District (NCUAQMD) and all burning will take place under the guidelines established in the NCUAQMD burn permit for the project.

### **Sensitive Habitats**

Access routes that avoid wetlands and sensitive wildlife habitat and plants will be used as much as possible. If it is necessary for manual removal crews to access the work site through sensitive habitats, pin flags will be used to mark the trail and for avoidance any sensitive plants or other sensitive features. The potential for disturbance of wildlife to and from the work area will be minimized by having work crews walk in to the sites along a designated trail. Trails will avoid traditional communal roost sites of seabirds and shorebirds. Most access points for manual removal require walking at least one mile.

### **Sensitive Plants**

Based on recommendations provided by Gedik (2009a), the following mitigation measures will take place to protect sensitive plants.

1. Prior to project implementation within an area, all known sand dune phacelia sites will be relocated using stored coordinates on GPS units, and flagged. Surveys for the rare dark-eyed gilia will take place in spring, prior to restoration activities. Any new rare plant occurrences will be documented and flagged.
2. A 5 meter buffer will be established between rare plant occurrences and any use, transport, or staging of heavy equipment. Plants will be enclosed by orange construction fencing prior to equipment activities to ensure avoidance of disturbance. Placement of stakes to support fencing will avoid disturbing root systems of sensitive plants.
3. Hand pulling activities around rare plants will avoid disturbing their root systems.
4. Burn piles will not occur within 5 meters of sensitive plants to protect them from heat damage.
5. Mechanical removal will not take place in areas of significant dune mat habitat.
6. All heavy equipment will be thoroughly washed to ensure removal of any nonnative plants and/or seeds outside the project area prior to entering the project area.
7. Any changes to project design, including but not limited to changes in treatment methods will be coordinated with appropriate state and federal agencies.

In addition, all people working in the project area will be instructed in the identification of sand dune phacelia and dark-eyed gilia. Workers will be instructed to avoid sensitive plants and/or dislodging root systems of sensitive plants while manually removing European beachgrass. Pin flags will be removed upon completion of work in an area.

### **Sensitive Wildlife**

Technical Assistance from the USFWS was requested and provided to determine whether or not implementation of the project would result in take of any federally listed species (Appendix F). The USFWS provided guidance to ensure that no take of the western snowy plover or tidewater goby would occur due to project actions.

#### Western Snowy Plover

The USFWS recommended that habitat restoration activities be scheduled outside of the snowy plover's breeding season to the extent possible. The plover's breeding season extends from February 15<sup>th</sup> to September 15<sup>th</sup> for the purposes of permitting restoration projects (J. Watkins,

pers. comm.; Appendix F). The LEWA coastal dune restoration project may not be feasible with this limited work-window. If the plover's breeding season cannot be avoided and it is determined based on surveys that nesting is occurring (occupied), habitat restoration work may occur if an authorized plover monitor is on site during work. Conditions for work in occupied habitat will include the following:

1. A minimum 100 m (323 ft) buffer zone will be maintained between the daily work area and snowy plovers. The work area includes access to and from the restoration site, activities at the site, and project related staging areas.
2. The monitor will have the authority to halt restoration work if a plover is observed within the daily work area, and have the ability to direct project related activities away from plovers to maintain a 100 m (323 ft) buffer.
3. Snowy plovers will not be flushed or hazed under any circumstances; whether accidental or intentional.

These conditions may be lifted during the breeding season by a consultation with U.S. Fish & Wildlife Service or if four consecutive surveys spaced a minimum of 4 days apart result in no plover detections (J. Watkins, pers. comm.).

#### Ground Nesting Birds

Birds such as the northern harrier, Oregon vesper sparrow, killdeer and some species of waterfowl may nest within grasslands on the project site. To reduce impacts to these species to a less than significant level, the following actions will take place.

During the breeding season (March-July), authorized personnel will survey potentially affected areas for grassland ground nesting birds prior to commencement of work in a given area. Any nests that are found during surveys, or incidentally by other project personnel, will be protected by a 100 m (323 ft) avoidance buffer for the remainder of the breeding season.

#### Tidewater Goby

Implementation of the following measures will ensure that impacts to tidewater gobies are reduced to less than significant levels.

1. Sand movement into wetland areas will be monitored as per the monitoring section of the restoration plan.
2. Adaptive management may include installation of sand fences or planting of native vegetation to reduce any undesirable deposition of sand into wetlands adjacent to the project area.

#### Red Legged Frog

Movement of large woody debris will be restricted to protect amphibian and invertebrate habitat. Measures to protect wetland habitat (see below) will also protect the red-legged frog.

In addition to the following measures to protect special status species, workers will avoid disturbing all other wildlife in the project area. By avoiding the rim of the lagoon, workers will limit flushing of roosting brown pelicans, other seabirds, shorebirds and raptors to the extent possible. Trash at the work site will be contained in predator-proof containers and transported off site at the end of each workday.

## **Wetlands**

Disturbances to wetlands and wetland buffer areas will be avoided. There will be no piling of nonnative vegetation, placement of fill material, placement of supplies or equipment, vehicle traffic, heavy equipment use or staging, cutting of wetland vegetation, and/or runoff of pollutants in wetland areas. Buffers and setback areas will be consistent with agency recommendations and the local coastal plan. The buffers will be at least 5m (about 17ft) and will be treated with manual removal.

Some wetland changes may occur due to changes in movement patterns of wind-driven sand following release from European beachgrass infestation. Persistent roots and rhizomes within portions of the southern foredune will reduce the amount of sand blowing into the wetland area at the southern end of the project area. Any increased amount of sand that may blow off the northern foredune into Lake Tolowa is expected to be scoured out to sea when the lagoon breaches.

The project will take the following specific measures to ensure that wetlands are not significantly negatively affected by the restoration activities.

1. The boundaries of delineated wetlands (including a buffer of 5 m) will be marked with flags and/ or orange construction fencing along the portion of the wetland boundary where work will occur on any given day prior to activities to ensure avoidance of these areas.
2. Heavy equipment will not be transported across or staged within wetlands. Equipment transport across the spit at the mouth of Lake Tolowa will occur without additional agency consultation when the breach site is closed up (i.e., not flowing to the ocean).
3. All heavy equipment will be thoroughly washed to ensure removal of any nonnative plants and/or seeds at an approved facility prior to and following entering the project areas.
4. No maintenance or fueling of heavy equipment will be permitted within 30 meters (100 feet) of a stream, the ocean, or a wetland.

## **Cultural Resources**

Cultural Resource protective measures were prescribed by the Humboldt State University Cultural Resources Facility (HSU-CRF) which conducted above and below ground surveys of the project area (see also Affected Environment). One newly recorded cultural site was identified (Rich et al 2010). The project will comply with the following HSU-CRF recommendations, designed to ensure that impacts are mitigated to less than significant levels.

1. The identified archaeological site CRF-TDS-01(Property Line Site), for the purposes of CEQA shall be considered a significant historic resource eligible for inclusion into the California Register of Historic Resources. A 30 m (164 ft) protective buffer will be set around the recorded site boundary to delineate an exclusion zone for all heavy equipment and burning activities. Manual removal techniques are recommended for this sensitive area.
2. A professional archaeologist will be present while project activities are implemented within 100 m (323 ft) of the protective buffer and for activities within the identified

archaeological site CRF-TDS-01 (Property Line Site) boundary. An archaeological monitoring plan will be developed between the archaeologist, tribes and Lead Agency prior to project implementation.

The HSU-CRF recommendations concluded that: If this dunes restoration project is completed as described in this report and the above recommendations can be met during project implementation, it is the finding of this report that the project will have no effect to significant cultural resources. This supports a finding of "No Adverse Effects to Historical Resources" (per Public Resource Code 5020.1) and "No Historic Properties Affected" (according to 36 CFR 800.4(d)(1)).

The Smith River and Elk Valley Rancherias will be notified about the schedule for work in the areas described in recommendation #2 above and for heavy equipment use in the project area generally, and will be invited to have cultural monitors present at their own expense. The Rancherias will also be invited to have cultural monitors present at any time during the entire span of the project at their own expense.

The HSU-CRF report provided the following protocol to be followed in the event discoveries of cultural resources are made inadvertently during project activities. If cultural resources, such as lithic materials or ground stone, historic debris, building foundations, or bone are discovered during ground-disturbance activities, work shall be stopped within 20 meters (66 feet) of the discovery, per the requirements of CEQA (January 1999 Revised Guidelines, Title 14 CCR 15064.5 (f)). Inadvertent discoveries shall be treated as outlined in 43 CFR 10.4 and 36 CFR 800.13 (b) (2). Work near the archaeological finds shall not resume until a professional archaeologist, who meets the Secretary of the Interior's Standards and Guidelines, has evaluated the materials and offered recommendations for further action. The specific instructions for compliance provided in Appendix C by Rich et al will be followed.

If human remains are discovered during project construction, work will stop at the discovery location, within 20 meters (66 feet), and any nearby area reasonably suspected to overlie adjacent to human remains (Public Resources Code, Section 7050.5). The Del Norte County coroner will be contacted to determine if the cause of death must be investigated. If the coroner determines that the remains are of Native American origin, it is necessary to comply with state laws relating to the disposition of Native American burials, which fall within the jurisdiction of the Native American Heritage Commission (Public Resources Code, Section 5097). The specific instructions for compliance provided in Appendix C by Rich et al. will be followed.

## **Health and Safety**

Health and safety measures will be practiced to ensure that work involved in the restoration action does not pose unnecessary risks to employees and volunteers. The DFG and designated project leader will be responsible for oversight of worker's safety, including the following:

*Basic Safety:* Basic first aid kits, a radio and cell phone will be present on site to contact appropriate personnel in case of emergency.

*Weather, Earthquakes and Tsunami:* All workers will be educated about coastal hazards, including high surf, rogue waves, earthquakes, liquefaction, etc., and appropriate escape routes.

Work on the outer beach will be avoided during storm events that pose risk from high surf, wind, and flooding. A NOAA weather radio will be on site to alert workers of tsunami risks.

*Hand Tool Safety:* Hand tools and mechanized equipment will be used during project implementation. Workers tasked with operating any tools will be instructed in the safe operation of those tools. Safety precautions will include wearing the appropriate protective equipment, maintaining a safe distance from others, and using caution when doing activities that could result in back injuries.

*Heavy Equipment Operations Safety:* All operators and monitors will be provided with safety glasses and ear plugs. All heavy equipment vehicles will carry fire extinguishers. Workers will be advised to wear protection for hearing around heavy equipment and protection for inhalation of sand when exposed to large amounts of windblown sand. In the event of a hazardous spill from heavy equipment, workers will be protected from harm by following the procedures established in the Hazardous Spill Contingency Plan (Appendix E).

## **Project Monitoring**

Monitoring will be incorporated into the restoration project to provide a means to evaluate project success and allow for adaptive management if negative impacts are detected. Simple monitoring will be performed during project implementation to assure that restoration methods are followed. Otherwise the objectives of the monitoring program will be tied to restoration objectives and will include measures of non-native and native vegetation cover, dune topography, sand movement, and use by western snowy plover. Data will be collected during on-the-ground field surveys, from ground photo points and standard aerial photo interpretation. Although our budget does not include aerial overflights, aerial photos that are periodically updated and publicly available will be utilized.

Ground based photo points will be carefully selected and established to generate repeatable digital images of the project area. Photo point locations will be relocated using GPS points, stable landmarks, and written location descriptions where appropriate. The photographer will carry a previous photo for reference. Images can be compared qualitatively over time.

## **Vegetation Monitoring**

To monitor basic vegetation response to European beachgrass removal, the extent of dune mat within the project area will be compared to that of pre-project conditions at various intervals post-project. Monitoring will be conducted at the same stage of the growing season each year to ensure meaningful comparison of data. The most basic techniques will be those that can be conducted by TDS volunteers, and include photo point monitoring and documentation of rare plant distribution and abundance. Rare plant surveys will be conducted annually by TDS volunteers or others to document any increase or decrease in the readily identifiable sand dune phacelia, and possibly other rare species. Surveys for dark-eyed gilia will be conducted during its bloom time April-July, and for sand dune phacelia in spring, summer or fall. Volunteers will be asked to photograph significant sightings and record each plant position with a simple GPS unit. Surveys will take place during project implementation and for at least 2 years post-project, for a total of five years of monitoring in the treatment area. Presence of sand dune phacelia at historic sites will be checked using the existing GPS points (by using the find waypoint feature) and new plants will be searched for and marked as new waypoints using the intuitive meander approach in appropriate habitat. An annual log of all sand dune phacelia and any other rare plants will be maintained and housed with CDFG.

In addition, vegetation type mapping may take place by repeating the methods used by Nyoka (2003), using aerial photo interpretation and GPS-based ground-truthing. The Nyoka data and associated GIS map (Fig. 3) will serve as the pre-project baseline. This effort will be targeted for 2 years after project completion to give native plants an opportunity to spread, and may be repeated in subsequent years.

This project will occur over a period of 3-4 years over a total area of 34 acres. Portions of the 34 acres will be treated annually and as such, project monitoring will be expanded to encompass the newly treated areas.

Monitoring will include the following:

**Year One** - Establish photo points within the project area and capture images of the landscape for later comparison. Survey for sand dune phacelia, dark-eyed gilia if any, and any other rare plants likely to be found within the project site. Establish GPS points for these locations.

**Year Two** (one full season following project implementation) – Repeat series of photo points within the treated areas. Relocate GPS locations of previously documented rare plants within the project area and determine status. Resurvey for rare plants as described in Year One.

**Year Three** – Repeat as for Year Two. Using the most recent aerial photos and ground truthing, available, create polygons of any established native vegetation types based on Nyoka (2003) including percent cover (as illustrated in Figure 3).

**Year Four** – Complete as for Year Three. Use available updated aerial photos and ground truthing to compare percent cover and size of established native plant habitats within the treated areas.

**Year Five** – Complete as for Year Four.

An **Annual Monitoring Report** will be prepared yearly through year five and will describe the results, including comparisons of photos at established locations.

### **Sand Movement Monitoring**

A range of procedures to monitor project effectiveness and impacts was provided by consulting geologists at Pacific Watershed Associates (PWA) following geomorphic analysis of the project area and proposed restoration (Appendix D; Weaver and Leroy 2010). PWA stated that “the overall response of the foredune to eradication of the *Ammophila* will be influenced by the degree to which surface sands are exposed, how much of the restored area is mechanically versus manually treated, the topographic configuration of the restored area following beachgrass removal, the rate of revegetation in the restoration area, and the frequency and magnitude of “effective” winds (winds that trigger and sustain aeolian sand transport) in the first few years following restoration. This project will incorporate the basic monitoring suggested and outlined in Appendix D. Basic effects monitoring, including photo documentation and repeated photopoint monitoring for a period consistent with Vegetation Monitoring, will also occur to document effects of the project actions.

Sand movement monitoring will include the following:

**Year One** - Establish photo points within the project area and capture images of the landscape for later comparison, including:

- o Pre-project photo documentation of various sites and areas, perhaps totaling up to 25 photo points depicting sensitive environmental areas and general scene photos where erosion is most likely to occur.
- o Post-project (immediate) photo documentation using exact reframing (using established photo points and newly set post-project photo points). GPS coordinates and scene relocation from previous photos can be used to generally relocate each photopoint. Stable landmarks such as logs will be used wherever possible.
- o Post-project (end of summer #1) photo documentation using exact reframing.

**Year Two** - Post-project (end of summer #2) photo documentation using photo points and exact reframing.

**Year Three** - Complete as for Year Two (at end of summer #3).

**Year Four** - Complete as for Year Three (at end of summer #4).

**Year Five** - Complete as for Year Four (at end of summer #5).

The results of this monitoring will be included in the **Annual Monitoring Report**.

### **Western Snowy Plover**

Monitoring for the western snowy plover is conducted by agency staff during the annual USFWS breeding and winter window surveys, and by monthly CDPR surveys. Surveys are conducted in accordance to USFWS protocols by authorized biologists.

The results of these annual surveys will be included in the **Annual Monitoring Report**.

## **Environmental Consequences**

### **Sand Movement**

The greatest environmental concern from the proposed restoration action is the changes in movement patterns of wind-driven sand following release from European beachgrass. While changes are expected to occur, they will be limited to CDFG and CDPR lands. Sand freed from binding European beachgrass is expected to drift predominantly southeast during the dry seasons. In areas that are hand-pulled, persistent deep roots, rhizomes and thatch will slow rates and extent of change. Native dune plants that will be retained will also trap sand. The potential risk to infrastructure from the project due to blowing sand is virtually nonexistent due to intervening topography and vegetation and the great distances between any structures and the project site. Removal of European beachgrass will result in changed site topography within and for some distance outside the project area. The use of heavy equipment will result in additional topographic changes and sand movement during the project.

Weaver and Leroy (2010; Appendix D) concluded that major dune reactivation and large scale sand movement should be considered a worst case scenario and generally unlikely to occur, but the foredune and the back dune areas should be expected to release sand into the adjacent deflation plain as conditions trend back to their natural condition. Further, "the erosional

responses of the current foredune to removal of *Ammophila* would likely be more limited and confined to discrete blowouts and smaller, lower volume pulses of sand that extend into the back dune area. This redistribution will be accelerated due to the excess storage on the primary foredune that has occurred over the course of decades of stabilization. Some encroachments of moving sand into sensitive back dune habitat, wetlands and perhaps the slough should be expected, but the process will take long enough that site monitoring will be able identify the locations of future incursions, and adaptive management and control could be applied if it was judged important to do so.”

Weaver and Leroy (2010) additionally stated that this type of sand movement is “a positive result as it will be due to the reestablishment of natural dune processes and the native plants and animals that depend on those processes. Some dunes may, over time, advance into the margins of Tolowa lagoon or through Shorebird Slough. This is an entirely natural phenomena and may have positive results as the complexity of habitats along the shoreline increases.” Persistent roots and rhizomes in areas where beachgrass has been manually removed will reduce the amount of sand blowing into the wetlands, particularly at the southern end of the project area.

Sand that blows off the foredunes into the main body of Lake Tolowa is expected to be transported out to sea by high velocity waters that scour the basin near the mouth when the lagoon breaches. This sand would be returned to the local marine littoral cell so that no long term erosion of the beach in the surrounding region would be expected due to project activities.

Concerns about wetland filling at a BLM coastal dune habitat restoration area around New River, Oregon, have led to plans to rebuild stabilized portions of the foredunes (USDI 2009). In the Lakes Earl and Tolowa system sand filling is not expected to cause similar negative impacts on water quality or fish species because the lagoon is very different from the New River wetland. The New River is a drainage feature that was developed and stabilized by interactions between agricultural management and colonization by European beachgrass. The New River stream channel was essentially formed by and is dependent on presence of European beachgrass. Except near breach areas, the New River lacks elevation gradients and stream energies to transport even the sand-size particles, so any sand input from overwash or wind transport tends to build up and remain in the sluggish system, resulting in warmer water temperatures less suitable for the two species of listed salmon present there. Artificial winter breaching at several sites along the New River has been planned and is expected to transport sand out of the wetland. Lake Earl is a naturally formed coastal lagoon; it does not support listed salmon, and the location of the project at the very high velocity channel (see Tetra Tech 2000), where the lagoon is artificially breached annually, minimizes concerns about significant sand build up in the estuary.

### **Lagoon Flooding and Breaching**

Mechanical removal of *Ammophila* and grading of the dune forms immediately adjacent the Lake Tolowa barrier beach is unlikely to adversely affect the breaching process, breaching location or maximum water levels of Lake Tolowa. See full discussion in Weaver and Leroy 2010; Appendix D.

### **Salmonids**

The project is not likely to have any negative effects on salmonids. The lagoon currently does not support self-sustaining populations of any listed species of anadromous salmonids.

### **Tidewater Goby**

As a result of the project reestablishing natural processes, some increased amount of sand may be transported by the wind into the Lake Tolowa portion of the Lake Earl lagoon system. There is the potential for sand to therefore fill tidewater goby habitat in the lagoon. Tidewater gobies are federally listed as endangered, and the Lake Earl lagoon is designated as critical habitat for the tidewater goby. On the other hand, there is the potential to increase tidewater goby habitat if sand moving into the lagoon creates a more complex shoreline and more edge habitat (Weaver and LeRoy 2010).

The project is not expected to cause take of tidewater goby. As per the USFWS technical assistance (Appendix F):

“The potential exists for windblown sand freed as a result of beachgrass removal, to be blown into the Lake Earl lagoon system by prevailing northwest winds. We believe that sand deposited in the lagoon would be transported out of the lagoon when a breach occurs. Tidewater goby critical habitat is designated at the lagoon below the 4-foot level. Since artificial breaching occurs between 8 and 10 feet, the likelihood of sand reaching designated critical habitat is negligible.

The Service believes that moving sand dunes are part of the dynamic processes to which snowy plovers and tidewater gobies have evolved. At certain water levels, some tidewater foraging habitat may be impacted by encroaching sand prior to a breach. Ample foraging habitat for tidewater gobies exist in the Lake Earl lagoon, especially at high water levels (i.e., before a breach) when habitat is most likely to be impacted by moving sand. Consequently, any impact to tidewater goby habitat from moving sand is not expected to result in take of gobies.”

In addition, the restoration project is not expected to result in any net increase in isolated pools where goby may become stranded post-breaching. Increased overwash and temporary increases in salinity at the mouth of Lake Tolowa are also not expected to negatively affect this species. Tidewater goby have been found in high salinity waters at Lake Tolowa (Tetra Tech 2000) and can freely move to fresher waters within the system if preferred.

### **Snowy Plover**

The project is not expected to result in any take of the western snowy plover as long as conditions outlined by the USFWS are followed. The USFWS has commended the CDFG and partners for improving conditions for natural resources at the LEWA (Appendix F).

### **Summary**

The proposed restoration action is expected to restore natural coastal dune habitat physical and biological processes. This is expected to have positive impacts on native dune mat plant and animal communities, the rare sand-dune phacelia, and potential nesting habitat of the threatened western snowy plover. Local environmental changes that may result from increased aeolian sand transport are difficult to predict, but none are thought to pose significant negative impacts on other sensitive or listed species in the project area. No negative impacts to surrounding developments or natural habitats are foreseen.

## References and Literature Cited

- Barbour, M., T.M. DeJong, and A.F. Johnson. 1976. Synecology of beach vegetation along the Pacific Coast of the United States of America: A first approximation. *J. Biogeography*. 3:55-69.
- Barbour, T. Keeler-Wolf, and A.A. Schoenerr, eds., 2007. *Terrestrial vegetation of California*, 3rd ed. University of California Press, Berkeley.
- Barron, A. 2007. *A Bird Finding Guide to Del Norte County, California*. 2<sup>nd</sup>. Edition Redwood Economic Development Institute.
- Burns, J., J. Rohde, and E. Collins. 2009. Cultural Resources Facility, Humboldt State University. Addendum Report to A Phase I Cultural Resources Investigation of the Tolowa Dunes State Park South Restoration Project Located in Del Norte County, California, California Department of Parks and Recreation. Report on file at the Cultural Resources Facility, Humboldt State University, Arcata, California. (Appended to Rich et al 2010)
- California Coastal Commission. 1999. Staff report regular calendar. Application file number: 1-97-76. San Francisco, California.
- California Department of Fish and Game. 2003. Lake Earl Wildlife Area Management Plan. SCH No. 1989013110.
- California Department of Fish and Game. 2009. Natural Diversity Data Base. Sacramento, CA.
- CNPS. 2001. Inventory of Rare and Endangered Plants of California (sixth edition). Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. California Native Plant Society. Sacramento, CA . x + 388pp.
- Gedik, T. 2009a. Biological Report for Sensitive Plant Surveys. Tolowa Dunes Stewards Restoration Project. Unpubl. Report on file at the California Dept. of Fish and Game, Eureka, CA.
- Gedik, T. 2009b. Report of Delineation of Wetlands and Other Waters of the U.S. Tolowa Dunes Stewards Restoration Project. Unpubl. Report on file at the California Dept. of Fish and Game, Eureka, CA.
- Gould, R. A. 1975. Ecology and Adaptive Response among the Tolowa Indians of Northwestern California. *Journal of California Anthropology* 2(2):148-170.
- Gould, R. A. (1978). Tolowa. In R. F. Heizer (Ed.), *Handbook of North American Indians Volume 8 California*, (pp.128-136). Washington: Smithsonian Institution.
- Harris, S.W. 1991. *Northwestern California Birds*. Humboldt State University Press.
- Hunter, R. E., Richmond, B.M., and Alpha, T.R., 1983. Storm-controlled oblique dunes of the Oregon coast, *Geological Society of America Bulletin*, v. 94, p. 1450-1465.

Jaques, D.L., H.R. Carter, and P.J. Capitolo. 2008. A Brown Pelican roost site atlas for northern and central California. Unpublished report, Pacific Eco Logic, Astoria, Oregon; and Carter Biological Consulting, Victoria, British Columbia.

Jaques, D.L. and C. Strong 1996. California coastline bird and mammal project. Final report to the CDPR Natural Heritage Section, Sacramento, CA. University of California Interagency Agreement 88-11-020. A4. UC Davis. 382 pp.

Lauten, David J., Kathleen A. Castelein, J. Daniel Farrar, Hendrik G. Herlyn, and Eleanor P. Gaines. 2009. The Distribution and Reproductive Success of the Western Snowy Plover along the Oregon Coast – 2009. Unpubl. report. Oregon Natural Heritage Information Center, Portland, Oregon.

Maun, M.A. 1998. Adaptations of plants to burial in coastal sandunes. *Canadian Journal of Botany* 76:713-738.

McCraney, W.T. 2009. Rampant drift in the endangered Tidewater goby (*Eucyclogobius newberryi*): comparing genetic variation of naturally and artificially isolated populations. Unpubl. Ms. Thesis, Humboldt State University.

Nyoka, Susan. 2003. Annual report, Tolowa Dunes mapping project. Unpublished report, Tolowa Dunes State Park, CA.

Nyoka, S.E. 2004. The effects of exotic plants on the diversity and abundance of bees in the Humboldt Bay dune system. M.A. Thesis, Humboldt State University, Arcata, CA.

Page, G.W. and L.E. Stenzel. 1981. The breeding status of the snowy plover in California. *Western Birds* 12(1):1-40.

Page, G.W., J.S. Warriner, J.C. Warriner, and R.M. Halbeisen 1977. Status of the Snowy Plover on the Northern California Coast. Unpubl. CDFG Report. Nongame Wildlife Investigations.

Pickart, A. 2009. Vegetation Types of the Lanphere & Ma-le'l Dunes Units. Unpubl. Report, USFWS, Humboldt Bay National Wildlife Refuge.

Pickart and Sawyer 1998. Ecology and Restoration of Northern California Coastal Dunes. California Native Plant Society. Global Interprint, Santa Rosa, CA.

Pickart, A.J., and M.G. Barbour. 2007. Beach and dune. Pages 155–179 *In* M.G. Skinner, M.W. and B. M. Pavlik, eds. 1994. Inventory of rare and endangered vascular plants of California. California Native Plant Society Special Publication No. 1. (Fifth Edition). Sacramento, CA. vi +338 pp

Rich, William, M.A., RPA and J. Roscoe, M.A. 2010. An Archaeological Survey Report for the Lake Earl Wildlife Area Coastal Dunes Restoration Project. Cultural Resources Facility, Humboldt State University. Unpubl. Confidential Report on file at the California Dept. of Fish and Game, Redding, CA.

Shuford, W. D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate

conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Swift, C. C., J. L. Nelson, C. Maslow, and T. Stein. 1989. Biology and distribution of the tidewater goby, *Eucyclogobius newberryi* (Pisces: Gobiidae) of California. Contributions in Science 404, Natural History Museum of Los Angeles County, Los Angeles, California

Tetra Tech 2000. Intensive Habitat Study for Lake Earl and Lake Talawa, Del Norte County, California. Final Report to the USACE, San Francisco District.

Transou, A.N., P. Vaughan, and M. Forsy. 2007. Results of a European beachgrass (*Ammophila arenaria*) removal project - A pilot study. Unpublished report prepared for California Department of Parks and Recreation, North Coast Redwoods District, Eureka, California.

United States Department of Interior. 2009. New River Foredune Management Environmental Assessment (EA-OR-128-06-01). Bureau of Land Management, Coos Bay District.

United States Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants: determination of endangered species status for the tidewater goby. Federal Register 59:5494-5498.

United States Fish and Wildlife Service. 2005a. Designation of critical habitat for the Pacific coast population of the western snowy plover. Federal Register 70(188):56970- 57119.

United States Fish and Wildlife Service. 2005b. Recovery plan for the tidewater goby (*Eucyclogobius newberryi*). United States Fish and Wildlife Service, Portland, Oregon.

United States Fish and Wildlife Service. 2007a. Recovery Plan for the Pacific coast population of the Western Snowy Plover (*Charadrius alexandrinus nivosus*). Sacramento, CA.

United States Fish and Wildlife Service. 2008. Endangered and threatened wildlife and plants: revised designation of critical habitat for the tidewater goby (*Eucyclogobius newberryi*): final rule. Federal Register 73:5920-6006

United States Fish and Wildlife Service. 2009. Removal of the Brown Pelican (*Pelecanus occidentalis*) From the Federal List of Endangered and Threatened Wildlife; Final Rule. Federal Register: November 17, 2009 (Volume 74: 59443-59472)

Vaughan, P.R. and D. Van Dyke. 2009. Geologic Characterization, Geomorphic Trends and Eolian Response Model for Proposed Exotic Species Removal Effort South From Lake Tolowa, Tolowa Dunes State Park. Unpubl. Report on file at the California State Parks District office, Eureka, CA.

Weaver, W. and T. Leroy. 2010. Reconnaissance Geologic Analysis of the Lake Earl Coastal Dunes Restoration Plan Del Norte County, California. PWA Report No. 10091701. April 2010.

Wiedemann, A.M. 1984. The ecology of Pacific Northwest coastal sand dunes: a community profile. U.S. Fish and Wildlife Service. FWS/OBS-84/04. 130 pp.

Wiedemann, A.,M. and A. Pickart. 1996. The *Ammophila* problem on the northwest coast of North America. *Landscape and Urban Planning* 34: 287-299.

Yokum, C.F. and S.W. Harris. 1975. *Birds of Northwestern California*. Humboldt State University.

### **Personal Communications**

Alan Barron, ornithologist, Crescent City, CA.

Jim Baskin, California Coastal Commission, Eureka, CA

Tanya Beck, USACE, Vicksburg, MS

Daniel Burgess, Rural Human Services, Crescent City, CA

Laura Julian, botanist, Redwood National Park

Bradford Norman, herpetologist and fisheries expert, Crescent City, CA

Andrea Pickart, ecologist, USFWS, Arcata, CA

Amber Transou, ecologist, CDPR, Eureka, CA

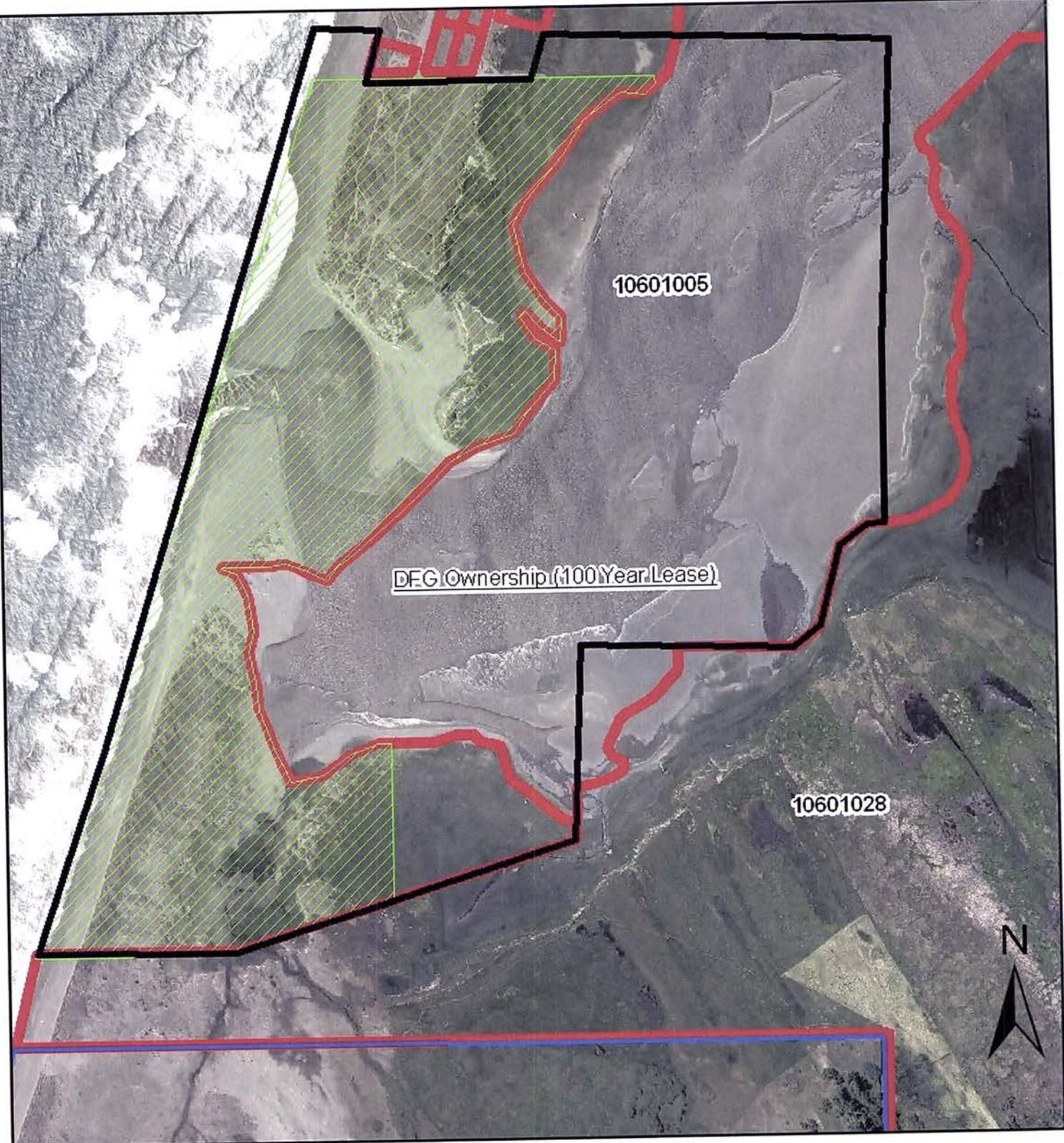
Jim Watkins, biologist, USFWS, Arcata, CA

Lori Wisheart, ecologist, CDPR, Eureka, CA

Kip Wright, biologist, BLM, Coos Bay District

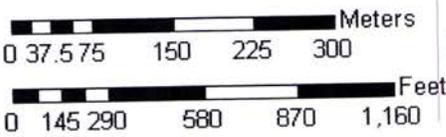


Figure 1. Location of the Lake Earl Wildlife Area Coastal Dunes Restoration Project (outlined in red) in Del Norte County, California.



**Proposed Coastal Dune Restoration Boundary**

Mouth of Lake Tolowa



**Lake Earl Wildlife Area**

- APN#\_10601005
- Coastal Dune Restoration Project Boundary
- Tolowa Dunes State Park Boundary
- DFG Lake Earl Wildlife Area Boundary

California Department of Fish & Game  
Wildlife & Lands Program  
North Coast Wildlife Area Complex



Date: 11 July 2012  
California Department of Fish & Game, Eureka  
North Coast Wildlife Area Complex  
Maps for planning purposes only  
Map developed by: Robert M. Sullivan (rsullivan@dfg.ca.gov)  
Data provided in UTM Zone 10, NAD 83, meters

Figure 2

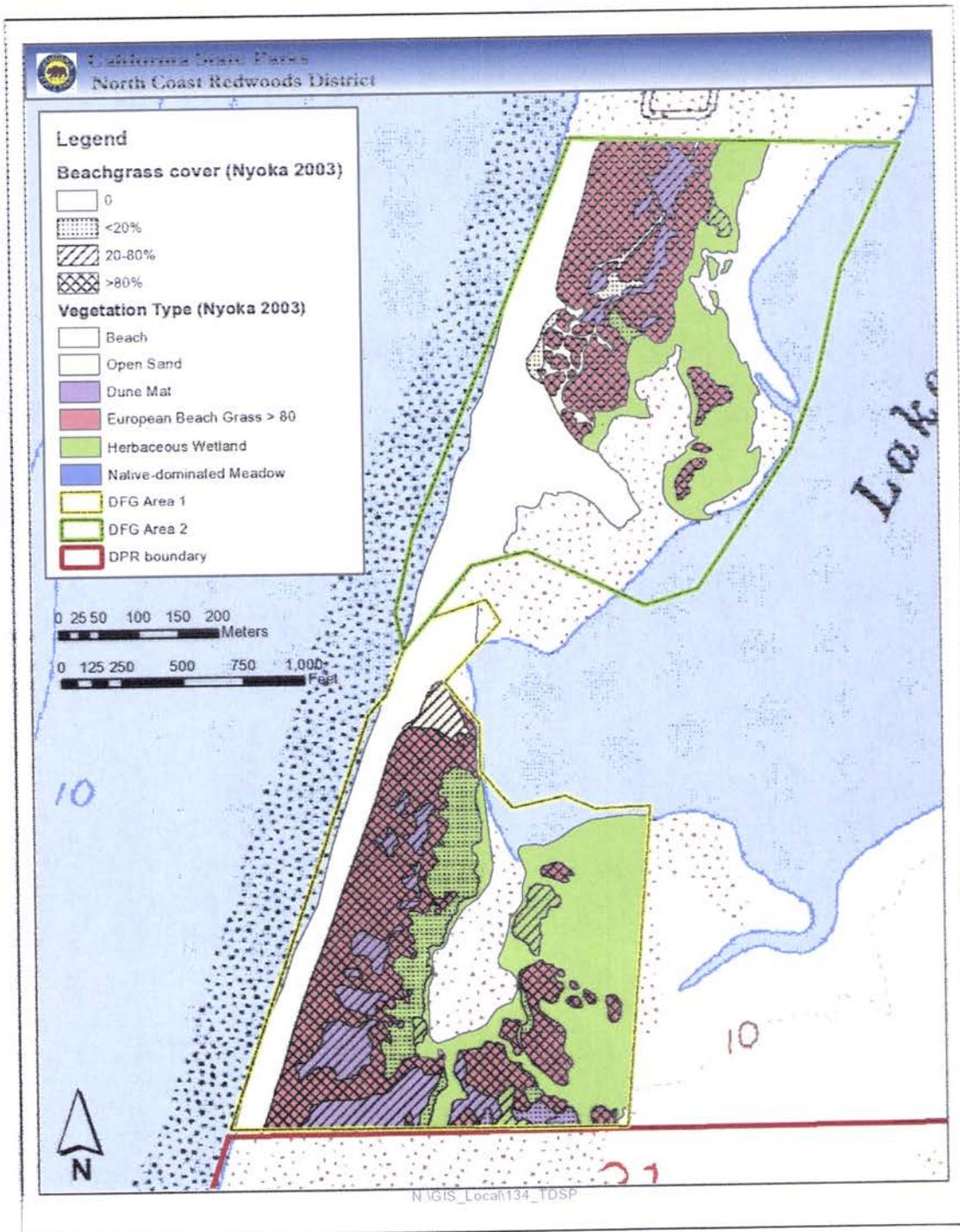


Figure 3. Major vegetation types within the Lake Earl Coastal Dunes Restoration Project Area as defined by Nyoka (2003). Map provided courtesy of California Department of Parks and Recreation.

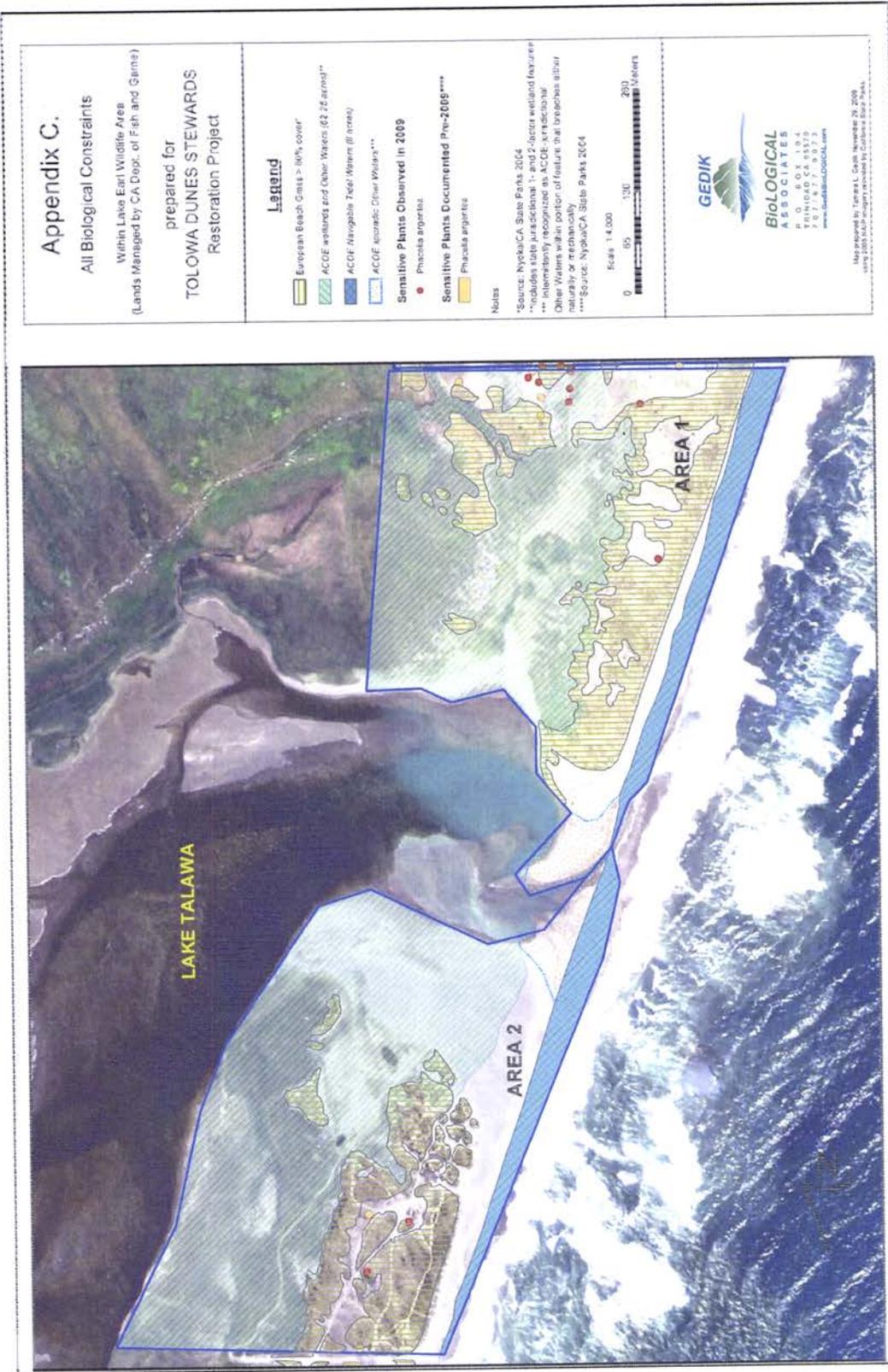
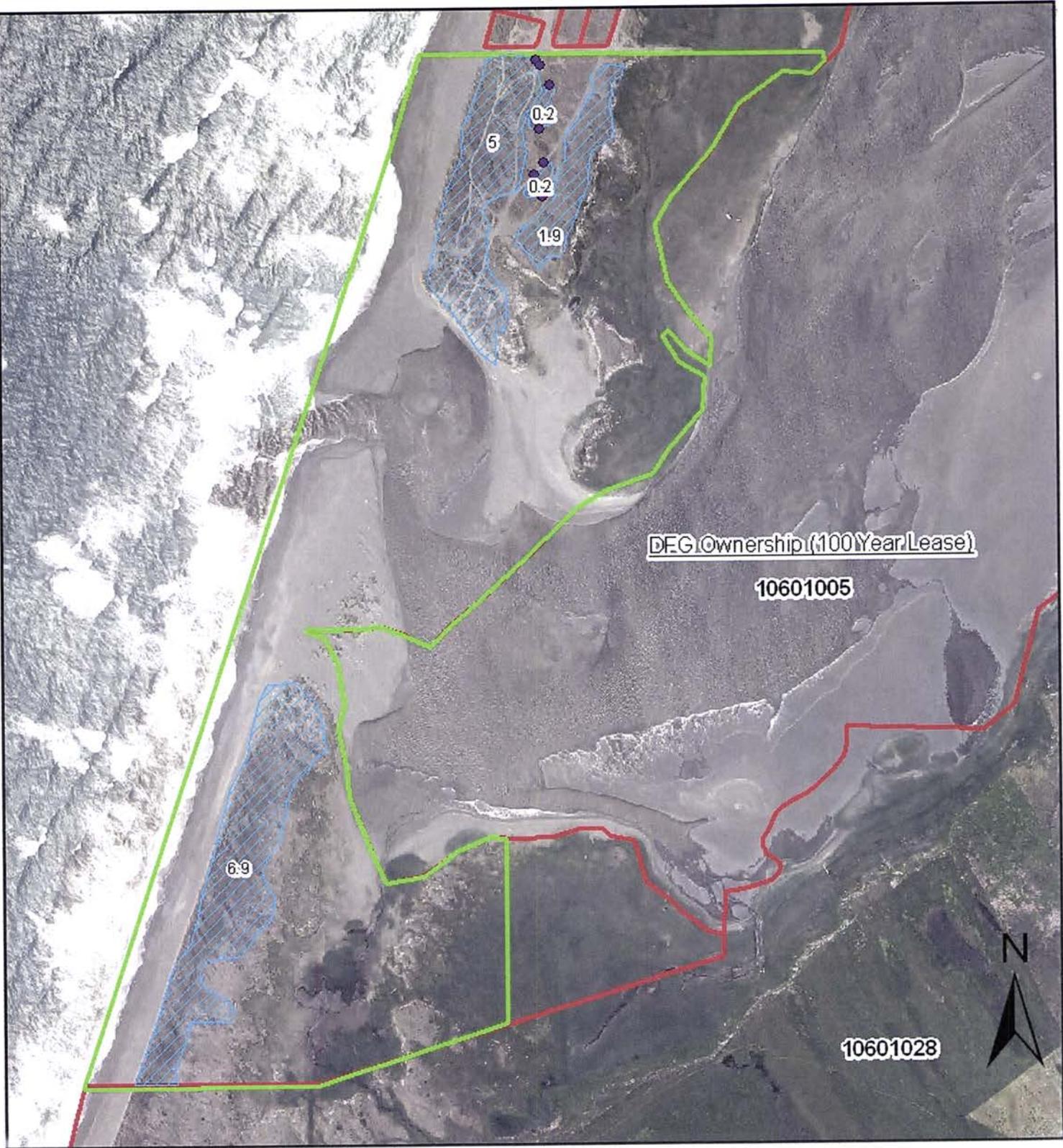
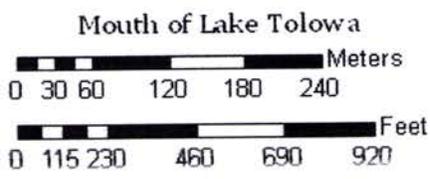


Figure 4. Map of the Lake Earl Coastal Dunes Restoration Area showing wetland delineation and locations of rare plants. Map prepared by Gedik Biological Consultants.



Approximate Location of Mechanical Beachgrass Removal Zones (Acres)



### Lake Earl Wildlife Area

- Phacelia Plants
- ▨ Mechanical Beachgrass Removal Areas
- ▭ Coastal Dune Restoration Project Boundary
- ▭ DFG Lake Earl Wildlife Area Boundary

Figure 5

California Department of Fish & Game  
Wildlife & Lands Program  
North Coast Wildlife Area Complex



Date: 11 July 2012  
California Department of Fish & Game, Eureka  
North Coast Wildlife Area Complex  
Map is for planning purposes only  
Map developed by: Robert M. Sullivan (rsullivan@dfg.ca.gov)  
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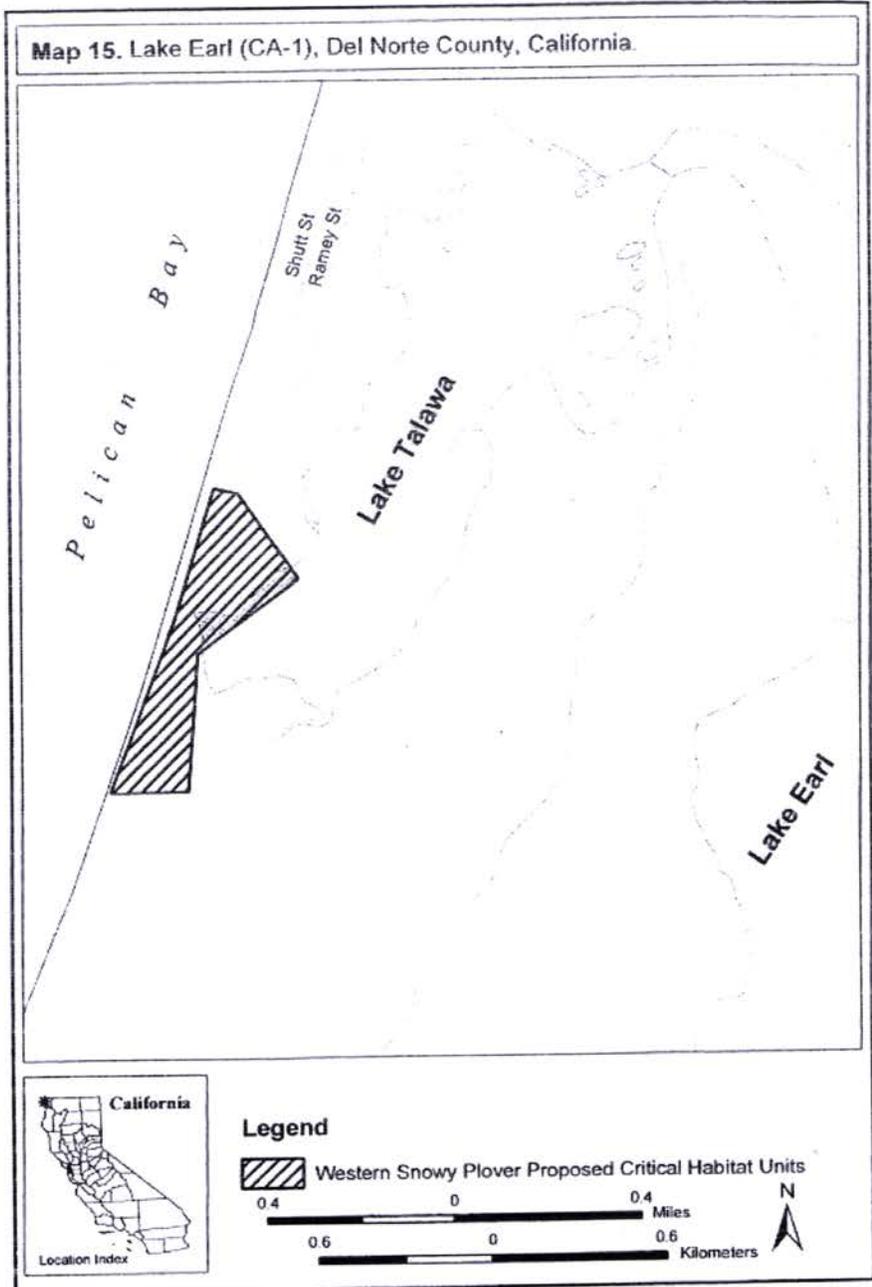


Figure 6. Critical habitat designation for the Western Snowy Plover at the mouth of Lake Tolowa, Del Norte County, CA. From USFWS 2005a.

# Lake Earl Wildlife Area Coastal Dune Restoration Plan

## Appendix G

*dated July 11, 2012*

The following environmental commitments will be implemented by California Department of Fish & Game (CDFG) or its authorized agents. These are not new commitments but rather have been summarized from the Restoration Plan and the subsequent CDFG CEQA documents.

Included at the end is the monitoring plan in detail, as well as a discussion of Adaptive Management options.

### **MITIGATION MEASURE BIOLOGICAL 1 – RARE PLANTS**

Following recommendations provided by Gedik (2009, Appendix A), the following mitigation measures will take place to protect sensitive plants.

1. Prior to project implementation within an area, all known sand dune phacelia sites will be located using stored coordinates on GPS units, and flagged (Fig. 3). Surveys for the rare dark-eyed gilia will take place in spring, prior to restoration activities. Any new rare plant occurrences will be documented and flagged.
2. A 5 m (16.4 ft) buffer will be established between rare plant occurrences and any use, transport, or staging of heavy equipment. Plants will be enclosed by orange construction fencing prior to equipment activities to ensure avoidance of disturbance. Placement of stakes to support fencing will avoid disturbing root systems of sensitive plants.
3. Hand pulling activities around rare plants will avoid disturbing their root systems.
4. Burn piles will not occur within 5 m (16.4 ft) of sensitive plants to protect them from heat damage.
5. All heavy equipment will be thoroughly washed to ensure removal of any nonnative plants and/or seeds outside the project area prior to entering the project area.
6. Any changes to project design, including but not limited to changes in treatment methods will be coordinated with appropriate state and federal agencies.

### **MITIGATION MEASURE BIOLOGICAL 2- SNOWY PLOVER**

To mitigate snowy plover impacts to a less than significant level, Mitigation Measure Biological-2 will be implemented.

1. Habitat restoration activities will be scheduled outside of the snowy plover's breeding season (February 15<sup>th</sup> to September 15<sup>th</sup>) as much as possible.
2. When the breeding season cannot be avoided and where based on snowy plover surveys

that demonstrate nesting activity (or occupancy), habitat restoration work will occur in occupied habitat if an authorized plover monitor is on site during work. A minimum 100 m (323 ft) buffer zone will be maintained between the daily work area and snowy plovers. The monitor will have the authority to halt restoration work if a plover is observed within the daily work area, and have the ability to direct project-related activities away from plovers to maintain a 100 m (323 ft) buffer. Snowy plovers will not be flushed or hazed under any circumstances; whether accidental or intentional.

3. If snowy plovers are detected during the non-breeding season or where it has been determined nesting activity is not occurring, a spatial buffer of 50 m (164 ft) will be maintained between plovers and restoration activities.
4. The burn plan, including the smoke management plan, will be designed in accordance with the USFWS May 3, 2010 technical assistance letter recommendations (Appendix F), which state in part that smoke will be managed to avoid the main roosting sites for non-breeding snowy plovers (and brown pelicans *Pelecanus occidentalis*). Broadcast burning will not occur during the snowy plover breeding season, unless surveyors determine in advance that no breeding activity is occurring in the area likely to be affected by smoke.

#### **MITIGATION MEASURE BIOLOGICAL 3- GRASSLAND NESTING BIRDS**

Mitigation measure Biological-3 will reduce impacts to grassland nesting birds, such as the northern harrier, Oregon vesper sparrow, and waterfowl to a less than significant level.

1. During the breeding season (March-August 15), CDFG staff will survey potentially affected areas for European beachgrass ground nesting birds prior to commencement of work in a given area.
2. Any nests that are found during CDFG surveys, or incidentally by other project personnel, will be protected by a 100 meter (323 ft) avoidance buffer for the remainder of the breeding season.

#### **MITIGATION MEASURE BIOLOGICAL 4- TIDEWATER GOBY**

Implementation of Mitigation Measure Biological 4 will ensure that impacts to tidewater gobies are reduced to less than significant levels.

1. Photo plots will be established to determine any sand movement into wetland areas.
2. Adaptive management will include installation of sand fences or planting of native vegetation to reduce any undesirable deposition of sand into wetlands adjacent to the project area.

#### **MITIGATION MEASURE BIOLOGICAL 5- COASTAL DUNE MAT HABITAT**

To avoid significant disturbance to native coastal dune mat habitat, beachgrass removal using heavy equipment will take place only within areas where European beachgrass comprises >80% of the plant cover (Fig. 3). In the remainder of the project area, trained work crews will

use hand shovels to selectively remove only the targeted invasive species. Removal of native plants will be avoided throughout all phases of the project whenever possible.

#### **MITIGATION MEASURE BIOLOGICAL 6 – WETLANDS**

The following mitigations will ensure any adverse impacts to wetlands resulting from project activities are less than significant:

1. CDFG will visit work sites prior to occupation by work crews, and will establish a buffer of at least 5 m (16.4 ft) of all ACOE delineated wetlands and any surface waters using exclusionary flagging (yellow and black striped) or temporary fencing within the treatment area. Only manual removal techniques will be allowed within the wetland buffer zone.
2. When crossing wetland sloughs is necessary for manual removal crews to access project lands, temporary bridges and specific paths will be established and flagged to limit impacts to the smallest area possible.
3. Wetlands will be further protected from hazardous waste by adhering to Mitigation Measures Rare Plants-1 (washing equipment) and Hazardous Materials-1.

#### **MITIGATION MEASURE CULTURAL– 1**

To reduce impacts to a level of “no adverse effects to historical resources,” project implementation will proceed in accordance to the recommendations outlined by HSU-CRF (Appendix C). These measures will include:

1. Establishment of a 30 m (98.4 ft) buffer area excluding heavy equipment from known archaeological site CRF-TDS-1.
2. Presence of a professional archaeologist when project activities occur within 100 m (323 ft) of CRF-TDS-1.
3. Following prescribed protocol if any new artifacts or human remains are discovered during project implementation (Appendix C).

#### **MITIGATION MEASURE HAZARDOUS MATERIALS-1**

The following standard operating and emergency procedures will be applied to ensure that negative impacts from accidental release of hazardous materials are reduced to less than significant levels.

1. Heavy equipment will be stored overnight in the lee (eastern) side of the foredune, away from any wave action as well as any sensitive habitats or wetlands. To address potential vandalism, a temporary closure order will be issued for the project area while heavy equipment is being used and stored.

2. Fueling will take place at least 100 ft from any wetland or the waveslope. A hazardous materials spill kit will be carried with the fuel truck and the equipment at all times in case of any leaks or spills.
3. Prior to daily operations, all equipment operators will visually inspect their machinery to identify potential sources for spills. Hoses, caps, etc. will be inspected to assess integrity. Any and all suspect situations will be remedied before the equipment is operated at the project site.
4. Equipment will be cleaned, maintained and repaired (other than emergency procedures) at an established maintenance facility. All contaminated water, sludge, or other hazardous compounds will be disposed of at a lawfully permitted or authorized destination.
5. All lubricating oils, hydraulic fluids, and emergency fuel supplies will be stored in proper, approved containers. All containers will be securely capped or sealed when in storage, and protected from the rain. Valves, caps, hoses, etc. will be routinely inspected. Any identified problems (or potential problems) will be promptly fixed. Because of the presence of residuals, all empty hydrocarbon containers, oily rags, etc. will be disposed of in accordance with existing hazardous material regulations.
6. Any leaks that develop will be repaired immediately in the field or work will be suspended until repairs can be made.
7. Absorbent materials will be placed on the ground beneath the equipment to catch any fuel or lubricants that may leak during minor maintenance or emergency fueling on-site.
8. In the event of a spill, the spill contingency plan (Appendix E) will be followed and will include stopping the spill at its source, containing the hazardous material, and notifying the appropriate authorities. A spill kit will be readily available, and appropriate materials provided in the kit will be used to contain and absorb the spill. These materials will continue to be used until such time as the hazardous material is completely removed or a HAZMAT specialist takes over the spill treatment. Spills in the sand will be quickly contained by shoveling contaminated sand into large buckets. Once the spill is treated, all material used during cleanup will be removed from the site and disposed of in accordance with proper handling guidelines for hazardous material.
  - a) The nearest schools are located >4.8 km (3 miles) away from the project area.
  - b) The project area is not included on a list of hazardous materials sites.
  - c) The nearest airport is greater than 3.2 km (2 miles) south of the southern boundary of the project area.
  - d) The project site is not located within the vicinity of a private airstrip.

- e) Project-related activities will not restrict access to or block any public road or impede emergency plans in any way.
- f) The project area is not located in an area that puts the public at high wildland fire risk. Burning piles of dry beachgrass will result in some potential for wildfire and smoke in the project area. All burning will be in compliance with the Non-Standard Burn Permit acquired prior to restoration action. A smoke management plan will be developed in compliance with the NCUAQMD. The restoration plan and burn pile management plan developed for the project provide safety precautions and project standards for reducing potential impacts to a less than significant level.

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### **MONITORING PLAN AND ADAPTIVE MANAGEMENT**

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Compliance and effectiveness monitoring will be implemented in conjunction with the activities proposed under the restoration plan. Basic monitoring, including vegetation sampling, plant distribution and abundance, photo documentation and repeated photopoint monitoring for a period of five years is included in the plan. Western snowy plover will be monitored as part of existing efforts by CDPR, USFWS, CDFG and others. Sand movement monitoring will incorporate similar monitoring proposed under the restoration plan as for vegetation including photo documentation for a period of five years.

The details of the monitoring plan are provided again below, immediately following the adaptive management discussion.

#### **Adaptive Management**

The estimated rate at which major dune features are likely to erode and reactivate following restoration should allow for sufficient time to develop and implement any adaptive management actions that are considered necessary to protect on-site resources. Adaptive management to slow dune erosion or the rate of dune movement into sensitive habitat areas, if such threats develop, would consist of a variety of potential tools and techniques. These might include revegetation and replanting measures using a suite of possible species in different habitat types, ground surface protection (mulching), artificial (temporary) sand trapping measures, or additional mechanical regrading and/or recontouring techniques. Monitoring and site observations employed with the mapping and knowledge of sensitive resources that require protection from burial and encroachment (if there are any) should provide ample time to develop an adaptive management plan and implement the approved response.

Reports will be completed annually during the restoration process and will be available on file at the LEWA headquarters. The annual report will describe the work completed for that year and

place that work in the context of previous and future work. Data obtained during effectiveness monitoring will be summarized and analyzed with respect to project goals and objectives.

## **Details of Monitoring Plan**

### **Project Monitoring**

Monitoring will be incorporated into the restoration project to provide a means to evaluate project success and allow for adaptive management if negative impacts are detected. Simple monitoring will be performed during project implementation to assure that restoration methods are followed. Otherwise the objectives of the monitoring program will be tied to restoration objectives and will include measures of non-native and native vegetation cover, dune topography, sand movement, and use by western snowy plover. Data will be collected during on-the-ground field surveys, from ground photo points and standard aerial photo interpretation. Although our budget does not include aerial overflights, aerial photos that are periodically updated and publicly available will be utilized.

Ground based photo points will be carefully selected and established to generate repeatable digital images of the project area. Photo point locations will be relocated using GPS points, stable landmarks, and written location descriptions where appropriate. The photographer will carry a previous photo for reference. Images can be compared qualitatively over time.

### **Vegetation Monitoring**

To monitor basic vegetation response to European beachgrass removal, the extent of dune mat within the project area will be compared to that of pre-project conditions at various intervals post-project. Monitoring will be conducted at the same stage of the growing season each year to ensure meaningful comparison of data. The most basic techniques will be those that can be conducted by TDS volunteers, and include photo point monitoring and documentation of rare plant distribution and abundance. Rare plant surveys will be conducted annually by TDS volunteers or others to document any increase or decrease in the readily identifiable sand dune phacelia, and possibly other rare species. Surveys for dark-eyed gilia will be conducted during its bloom time April-July, and for sand dune phacelia in spring, summer or fall. Volunteers will be asked to photograph significant sightings and record each plant position with a simple GPS unit. Surveys will take place during project implementation and for at least 2 years post-project, for a total of five years of monitoring in the treatment area. If the project takes longer to complete than anticipated, we will ensure that each completed section is monitored for 5 years after disturbance to that section ceases.

Presence of sand dune phacelia at historic sites will be checked using the existing GPS points (by using the find waypoint feature) and new plants will be searched for and marked as new waypoints using the intuitive meander approach in appropriate habitat. An annual log of all sand dune phacelia and any other rare plants will be maintained and housed with CDFG.

In addition, vegetation type mapping may take place by repeating the methods used by Nyoka (2003), using aerial photo interpretation and GPS-based ground-truthing. The Nyoka data and associated GIS map (Fig. 3) will serve as the pre-project baseline. This effort will be targeted for 2 years after project completion to give native plants an opportunity to spread, and may be repeated in subsequent years.

This project will occur over a period of 3-5 years or longer and over a total area of 34 acres. Portions of the 34 acres will be treated annually and as such, project monitoring will be expanded to encompass the newly treated areas.

Monitoring will include the following:

**Year One** - Establish photo points within the project area and capture images of the landscape for later comparison. Survey for sand dune phacelia, dark-eyed gilia if any, and any other rare plants likely to be found within the project site. Establish GPS points for these locations.

**Year Two** (one full season following project implementation) – Repeat series of photo points within the treated areas. Relocate GPS locations of previously documented rare plants within the project area and determine status. Resurvey for rare plants as described in Year One.

**Year Three** – Repeat as for Year Two. Using the most recent aerial photos and ground truthing, available, create polygons of any established native vegetation types based on Nyoka (2003) including percent cover (as illustrated in Figure 3).

**Year Four** – Complete as for Year Three. Use available updated aerial photos and ground truthing to compare percent cover and size of established native plant habitats within the treated areas.

**Year Five** – Complete as for Year Four.

An **Annual Monitoring Report** will be prepared yearly through year five and will describe the results, including comparisons of photos at established locations.

### **Sand Movement Monitoring**

A range of procedures to monitor project effectiveness and impacts was provided by consulting geologists at Pacific Watershed Associates (PWA) following geomorphic analysis of the project area and proposed restoration (Appendix D; Weaver and Leroy 2010). PWA stated that “the overall response of the foredune to eradication of the *Ammophila* will be influenced by the degree to which surface sands are exposed, how much of the restored area is mechanically versus manually treated, the topographic configuration of the restored area following beachgrass removal, the rate of revegetation in the restoration area, and the frequency and magnitude of “effective” winds (winds that trigger and sustain aeolian sand transport) in the first few years following restoration. This project will incorporate the basic monitoring suggested and outlined in Appendix D. Basic effects monitoring, including photo documentation and repeated photopoint monitoring for a period consistent with Vegetation Monitoring, will also occur to

document effects of the project actions. If the project takes longer to complete than anticipated, we will ensure that each completed section is monitored for 5 years after disturbance to that section ceases.

Sand movement monitoring will include the following:

**Year One** - Establish photo points within the project area and capture images of the landscape for later comparison, including:

- Pre-project photo documentation of various sites and areas, perhaps totaling up to 25 photo points depicting sensitive environmental areas and general scene photos where erosion is most likely to occur.
- Post-project (immediate) photo documentation using exact reframing (using established photo points and newly set post-project photo points). GPS coordinates and scene relocation from previous photos can be used to generally relocate each photopoint. Stable landmarks such as logs will be used wherever possible.
- Post-project (end of summer #1) photo documentation using exact reframing.

**Year Two** - Post-project (end of summer #2) photo documentation using photo points and exact reframing.

**Year Three** - Complete as for Year Two (at end of summer #3).

**Year Four** - Complete as for Year Three (at end of summer #4).

**Year Five** - Complete as for Year Four (at end of summer #5).

The results of this monitoring will be included in the **Annual Monitoring Report**.

### **Western Snowy Plover**

Monitoring for the western snowy plover is conducted by agency staff during the annual USFWS breeding and winter window surveys, and by monthly CDPR surveys. Surveys are conducted in accordance to USFWS protocols by authorized biologists.

The results of these annual surveys will be included in the **Annual Monitoring Report**.



# United States Department of the Interior

FISH AND WILDLIFE SERVICE

Arcata Fish and Wildlife Office

1655 Heindon Road

Arcata, California 95521

Phone: (707) 822-7201 FAX: (707) 822-8411



In Reply Refer To:  
8-14-2010-TA-3790

Ms. Deborah Jaques  
Pacific Eco Logic  
Consulting Biologist  
375 3<sup>rd</sup> Street  
Astoria, Oregon 97103

**MAY 03 2010**

**Subject:** Technical Assistance on the Proposed Coastal Dune Restoration Plan for the Lake Earl Wildlife Area, Del Norte County, California

This correspondence transmits the Fish and Wildlife Service's (Service) Technical Assistance based on our review of the proposed subject plan, and its potential effect on the federally threatened western snowy plover (*Charadrius alexandrinus nivosus*) and federally endangered tidewater goby (*Eucyclogobius newberryi*), in accordance with the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Your April 15, 2010, request for Technical Assistance was received electronically on the same day. Specifically, you requested Technical Assistance as to whether or not proposed restoration activities at the Lake Earl Wildlife Area would result in incidental take of federally listed species.

This Technical Assistance is based on information provided in the draft Lake Earl Coastal Dune Restoration Plan, your letter of request, past Technical Assistance on similar dune restoration projects, and related field monitoring and observations. An administrative file of this Technical Assistance is available at the Arcata Fish and Wildlife Office.

### General Comments:

- We commend the California Department of Fish and Game (Department) and their partners for improving conditions for natural resources at the Lake Earl Wildlife Area, and appreciate the opportunity to coordinate with you regarding federally listed species and their supporting habitat.
- We understand and appreciate the objectives of the proposed project, and the Department's efforts to balance the needs of surrounding land owners and resource management.
- At issue is whether or not implementation of the subject project would result in incidental take of the snowy plover and tidewater goby. Since there is no Federal nexus for the

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**EXHIBIT NO. 10**

**APPLICATION NO.**

1-12-007 - CALIFORNIA DEPT.  
OF FISH & GAME

TECHNICAL ASSISTANCE, U.S.  
FISH & WILDLIFE SERVICE,  
DATED 5/3/10 (1 of 3)

project, the "no take" standard applies. The Department and its contractors have determined that no take would occur through implementation of the project as described in the draft Lake Earl Coastal Dune Restoration Plan and letter requesting Technical Assistance. Our recommendations should be incorporated into the final project design to ensure take of federally listed species does not occur.

Recommendations:

- Habitat restoration activities should be scheduled outside of the snowy plover's breeding season. Because courtship behavior and pair bonding has been observed in northern California during mid-February, we consider the onset of the plover's breeding season to be February 15<sup>th</sup> for restoration and other similar projects. The last plover nests initiated in northern California have been during the 3<sup>rd</sup> week of July. Consequently, we consider the end of the local breeding season to be mid September, when the last snowy plover chicks have fledged. September 15<sup>th</sup> should be used as the end of the plover's breeding season unless additional data indicate otherwise.
- If the plover's breeding season cannot be avoided, habitat restoration work may occur in occupied habitat if an authorized plover monitor is on site during work. A minimum 100-meter buffer zone needs to be maintained between the daily work area<sup>1</sup> and snowy plovers. The monitor must have the ability to conduct snowy plover nest searches, be proficient at locating scrapes, identifying adults, juveniles and chicks, and identifying snowy plover tracks and scrapes. The monitor must also have the authority to halt restoration work if a plover is observed within the daily work area, and have the ability to direct project-related activities away from plovers to maintain a 100-meter buffer. Snowy plovers may not be flushed or hazed under any circumstances; whether accidental or intentional.
- We suggest that the burn plan for the project incorporate prescriptions that ensure smoke will be managed to avoid the main roosting sites for non-breeding snowy plovers and brown pelicans (*Pelecanus occidentalis*). Broadcast burning should not occur during the snowy plover breeding season, unless surveyors determine in advance that no breeding activity is occurring in the area likely to be affected by smoke. Breeding activity includes: (1) observed copulation or other behavior signifying pair formation; (2) signs of scraping or nest initiation; and (3) nest incubation and chick rearing. If nests are not present after July 22<sup>nd</sup>, then we anticipate nesting plovers will not be affected by smoke. However, chicks from other areas may enter smoke management areas.
- The potential exists for windblown sand freed as a result of beachgrass removal, to be blown into the Lake Earl lagoon system by prevailing northwest winds. We believe that sand deposited in the lagoon would be transported out of the lagoon when a breach occurs. Tidewater goby critical habitat is designated at the lagoon below the 4-foot level. Since artificial breaching occurs between 8 and 10 feet, the likelihood of sand reaching designated critical habitat is negligible.

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<sup>1</sup> The term "work area" includes access to and from the restoration site, activities at the restoration site, and project-related staging areas.

The Service believes that moving sand dunes are part of the dynamic processes to which snowy plovers and tidewater gobies have evolved. At certain water levels, some tidewater foraging habitat may be impacted by encroaching sand prior to a breach. Ample foraging habitat for tidewater gobies exist in the Lake Earl lagoon, especially at high water levels (i.e., before a breach) when habitat is most likely to be impacted by moving sand. Consequently, any impact to tidewater goby habitat from moving sand is not expected to result in take of gobies.

- The Hazardous Material Spill Contingency Plan should specifically state that maintenance and refueling of heavy equipment and vehicles will not occur in wetlands or active listed species habitat (i.e., habitat currently being used by a federally-listed species, including those not considered under this Technical Assistance – e.g., Oregon silverspot butterfly (*Speyeria zerene hippolyta*). Equipment and materials to implement the spill plan should be on-site, or nearby, in the event of a spill.
- We encourage establishing and maintaining a *Viola adunca* population, the host plant for the federally endangered Oregon silverspot butterfly. Establishing *Viola* populations and providing native nectar sources may contribute towards Oregon silverspot butterfly recovery.

Conclusion:

This concludes Technical Assistance on the action outlined in your April 15, 2010, request. As provided in the Act and its implementing regulations at 50 CFR §402.16, initiation of formal consultation under section 7 is required if a Federal agency becomes part of the proposed action by authorizing, permitting, or funding any aspect of the proposed action.

This Technical Assistance does not authorize take of federally listed species as defined by the Act, whether incidental or purposeful. Additional Technical Assistance may be required if: (1) new information reveals effects of the proposed action may result in take of federally listed species in a manner or to an extent not considered in this Technical Assistance; (2) the proposed action is subsequently modified in a manner that causes an effect to the listed species that was not considered in this Technical Assistance, and that effect may result in take; or (3) a new species within the action area is listed that may result in take by implementing the proposed action. If incidental take occurs, any operations causing such take must cease pending further coordination with our office.

If you have any questions regarding this Technical Assistance, please contact staff biologist, Jim Watkins at (707) 822-7201.

Sincerely,



Nancy J. Finley  
Field Supervisor

cc:

California Department of Fish and Game, Redding, CA (Attn: R-B Smith)

3 of 3