

Return of the Natives to Moss Landing Dunes Restoration Project
Project Proposal

By: Jon Detka – RON Dune Restoration Coordinator

Return of the Natives Restoration Education Project (RON) has recently acquired funding for the first of a three-year restoration project from the California Coastal Commission to initiate a restoration and monitoring project along the Salinas River State Beach Dunes. The goals, objectives, restoration methods, and monitoring procedures outlined in the following dune restoration project proposal will be reinforced by a partnership between Creative Environmental Conservation, California Coastal Commission, Moss Landing Marine Labs, and California State Parks.

The Restoration Site

The restoration sites Northern border is defined by the Salinas River State Beach boardwalk beach access trail and extends south to the boardwalk beach access trail at Portreo Road. The Eastern border is defined by a County maintained gravel/dirt emergency access road that extends the length of the entire restoration site and abruptly truncates the dune ecosystem from the banks of the Old Salinas River Channel to the East. The Eastern estuarine side of the gravel road will also be included in the restoration iceplant eradication objectives. The transition zone between the beach system and the primary foredune system defines the Western border. This border was distinguished by the existence of dune mat (perennial) vegetation and a path proximal to a trajectory for future continuation of the existing fence structures at the Northern, Southern and Eastern borders. The restoration site does not include the privately held inolding (Taggart property) as part of this restoration project.

In the past, volunteers from the Moss Landing Marine Labs (MLML) have restored native vegetation and dune site of the old lab to the North, while State Parks has conducted restoration near the Southern (Portreo Road) site border. , This restoration project will connect these two restoration sites, a long standing goal of State Parks who have just acquired an additional piece of the dunes through a transfer from the Elkhorn Slough Foundation.

Restoration Site Goals

The goals of this three-year “Community Based Restoration” project are to:

1. Initiate the restoration of a 0.7 km (~700m X 100 m ~ 16 acre) stretch of the Salinas River State Beach dunes to a more natural state by eradicating non-native invasive Iceplant (*Carpobrotus edulis* and *Carpobrotus chilensis* hybrid) and reintroducing site specific native plant populations.
2. Initiate planning and monitoring of three yearly units in the restoration site.
3. Erect interpretive/warning signs that inform the public about restoration efforts and the sensitivity of dune vegetation.
4. Involve local communities in iceplant eradication, native plant propagation, native plant revegetation, monitoring, and sign construction efforts.

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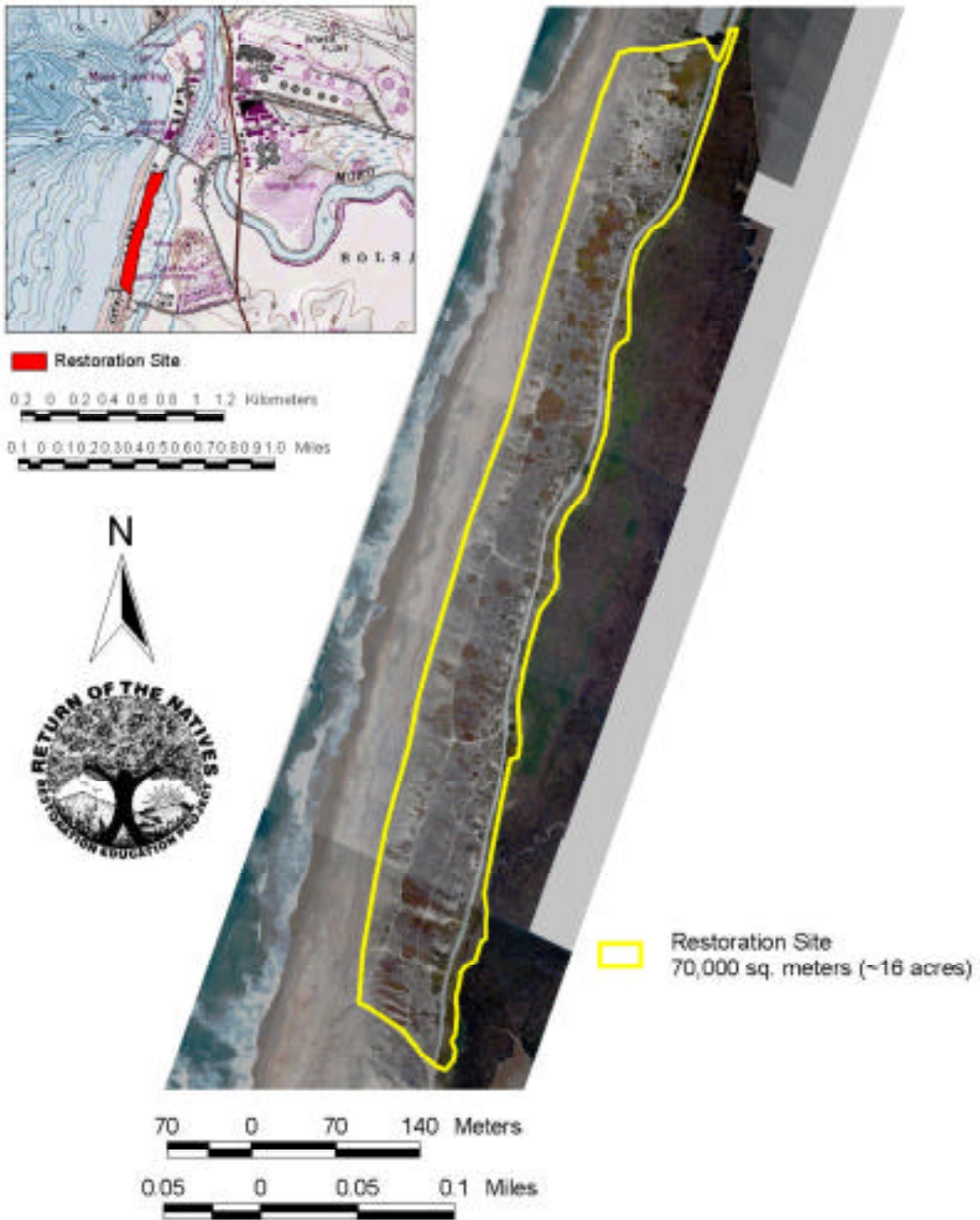


Figure 1. Restoration Site Map
Map composed from 2000 aerial photo
Courtesy of MLML
GIS compiled by Jon Detka

Goal #1: Initiate the restoration of a 0.7 km (~700m X 100 m ~ 16 acre) stretch of the Salinas River State Beach dunes to a more natural state by eradicating non-native invasive Iceplant (*C. edulis* and *C. chilensis* hybrid) and reintroducing site specific native plant populations.

Objective: Eradicate Iceplant (*C. edulis* and *C. chilensis* hybrid) using manual removal and chemical control methods.

Manual removal

Manual removal methods will consist largely of hand removal techniques with a focus on removing the entire clonal mat and root system. This method of eradication will be used in areas with relatively low slopes. Shovels may also be used to “roll” smaller (~20-30 m²) mats that are predominantly (100% covered) by *C. edulis* and *C. chilensis* hybrid. Manual removal will also consist of pulling trailing runners that are encroaching on native vegetation or in areas that are inappropriate for chemical application. Pulled biomass will remain in piles away from relict native vegetation so that the biomass can be chemically controlled at later dates.

Chemical control

A 2% solution of RoundUp © glyphosate herbicide with a 0.5% nonionic surfactant will be used for the purpose of eradicating larger, dense clonal mats of *C. edulis* and *C. chilensis* hybrid. Application will be conducted in the fall using a backpack sprayer during periods when wind velocities are less than 8km/hm (5 mi/hr). To insure the protection of native plants plastic shields will be used to reduce spray drift. To further protect native plants a 1-meter “no-spray” buffer and blue-dye indicator will be used. Appropriate manual techniques will be used to remove remaining buffer biomass without harming native relict vegetation. (Monsanto ©)

Objective: Reintroduce site-specific native plant populations.

A comprehensive survey of the restoration site was conducted and the resulting native plant species list was compiled. The following list has been amended to include those genus species that will be used in the revegetation agenda. (See Table 1. Native Plant Propagation List) It should also be noted that this list will undergo further editing as new plant species are found on the site and as restoration/monitoring efforts isolate key plant species that are more successful during propagation and planting stages.

Seed Collection and Storage

Seed, cutting, and division collection will be performed by RON staff through August and September under the supervision of Sue Shaw, from Creative Environmental Conservation, Inc. . No more than 5-10% of individual plants seed will be collected and special care will be taken to reduce any damage to existing vegetation. To reduce genetic mixing, seeds will be collected from within the restoration site boundaries

previously outlined. Seeds will then be cleaned, sorted, labeled (Species Name |Date |Location) and stored in paper bags for distribution to RON school greenhouses.

Moss Landing Dune Restoration Project Native Plant Propagation List		
Scientific Name	Common Name	Collection Method
<i>Abronia latifolia</i>	Yellow Coastal Sand Verbena	S
<i>Abronia umbellata</i>	Pink Coastal Sand Verbena	S
<i>Ambrosia psilostachya</i>	Beach-bur	S
<i>Artemisia pycnocephala</i>	Beach Sage	S
<i>Baccharis pilularis</i>	Coyote brush	S
<i>Calystegia soldanella</i>	Beach morning-glory	C/D/S
<i>Camissonia cheiranthifolia</i>	Beach Evening-primrose	S
<i>Castilleja latifolia</i>	Monterey Coast Paintbrush	S
<i>Distichlis spicata</i>	Salt Grass	C/D
<i>Dudleya caespitosa</i>	Coast Dudleya	S
<i>Ericameria ericodes</i>	Mock Heather	C/S
<i>Erigeron glaucus</i>	Seaside Daisy	S
<i>Eriogonum parvifolium</i>	Dune Buckwheat	S
<i>Eriogonum latifolium</i>	Wild Buckwheat	S
<i>Eriophyllum staechadifolium</i>	Lizard tail	S
<i>Eschscholzia californica</i>	California Poppy	S
<i>Frankenia salina</i>	Alkali Heath	
<i>Grindelia latifolia</i>	Gum plant	S
<i>Lathyrus littoralis</i>	Beach Pea	C/S
<i>Leymus mollis</i>	American dunegrass	D/C
<i>Lotus scoparius</i>	Common Deerweed	S
<i>Lupinus chamissonis</i>	Silver beach lupine	S
<i>Lupinus arboreus</i>	Yellow bush lupine	S
<i>Poa douglasii</i>	Dune bluegrass	D/S
C = Cutting D = Division S = Seed		

Table 1. Native Plant Propagation List

Propagation

Propagation of dune plants will utilize plastic "supercells" and "cones". These containers will direct plant root growth downward, which is advantageous when the plant is put into dry sand and must seek deep ground water to survive. McCalif's Sunshine Mix #3 will be used as the propagation substrate. The following soil mix will be prepared for propagation. (RON Greenhouse Procedure, 1993)

- 3 parts sunshine mix #3 with 1 part sand.
- 2 cups nutracote or osmacote pellets per wheelbarrow of soil/sand mix.

Outplanting

Propagated plants will be moved to the Moss Landing Marine Labs Greenhouse in order to acclimate to local site conditions. Moving dates will vary based on the “ease of propagation as a function of growing time and percent germination.” (Pickart, 1998)

The distribution and planting of native species will be based on two objectives. First, chemically controlled *C. edulis* and *C. chilensis* thatch will be planted with propagated native species in formations with ~ .5 m linear distance between individual plants. Secondly, selection of species to be planted in thatch areas will be based on relict native community structure that exist on similar slopes and contour features neighboring *C. edulis* and *C. chilensis* thatch.

Vegetation mapping of each yearly unit will be based on the Sawyer and Keeler-Wolf (1995) nine vegetation series occurring in active Northern California dunes. (Pickart, 1998) Qualitative field observations have isolated the existence of four distinct plant communities in the restoration site that fit this classification scheme. They are the; Native Dunegrass Community, Dune Mat Community, Iceplant Community, and Yellow-Bush Lupine Shrub Community. A fifth community, the Slough community, also exists on the fringes of the eastern borders of the restoration site. *C. edulis* and *C. chilensis* hybrid will be eradicated from these areas but there will be no revegetation effort in these areas. It is predicted that relict *Distichlis spicata* will reoccupy the eradication sites.

The Iceplant community on this restoration site is composed of entirely *C. edulis* and *C. chilensis* hybrid with sparse remnant native vegetation. This restoration project will reintroduce native vegetation relative to the existing neighboring native plant communities that border the eradicated iceplant regions.

The native dunegrass community will be characterized by the dominant presence of the following species.

- *Leymus mollis*
- *Poa douglasii*
- *Calystegia soldanella*
- *Abronia latifolia*
- *Cakile maritima*

The dune mat community, also referred to as the sand-verbena-beach bursage series, will be characterized by the dominant presence of the following species dominance. This community also has the presence of the *Artemisia* phase and this will be represented as a separate vegetation zone in mapping efforts.

- *Artemisia pycnocephala*
- *Eriogonum latifolium*
- *Camissonia cheiranthifolia*
- *Lathyrus littoralis*
- *Erigeron glaucus*

The shrub community, also referred to as the Yellow Bush Lupine series, will be characterized by the following species dominance.

- *Lupinus arboreus*
- *Ericameria ericodes*
- *Baccharius pilularis*

Goal: Initiate planning and monitoring of three yearly units in the restoration site.

Objective: Gather GPS data and create GIS sets representing the following:

1. Restoration Site boundaries
2. Establish Yearly unit boundaries
3. Yearly unit vegetation type mapping

Objective: Establish 10m X 10m monitoring quadrates as a method of yearly unit evaluation.

Monitoring quadrates will be used to evaluate and report on:

1. Native plant survivability and establishment of cover.
2. Effectiveness of *C. edulis* eradication and revegetation methods.

Objective: Establish permanent 50 m linear transects in each yearly unit for comparison to 50 m linear transect reference reach.

*Note: Reference reach is a permanent 50 linear transect located inside the old Moss Landing Marine Lab Restoration site.

1. Reference reach will provide evaluation and comparison of species diversity, richness, and % cover.

Objective: Produce a yearly unit report containing the following information:

1. Total area iceplant eradicated and methods used.
2. Total number of individual native species; propagated and planted.
3. Updated vegetation type map and photographs representing eradication sites and native community reintroduced.
4. Number of volunteers in attendance for each event
5. Photo/Video documentation of events.
6. Location and photo-points of each monitoring site and yearly data collected.
7. Collection of annual aerial photography and georeference.

A reflective evaluation of methods and procedure will also be included in the yearly unit report. This evaluation will serve to better guide future planning and restoration efforts for remaining units while creating a forum for documenting onsite experimentation and follow-up recommendations.

Goal: Involve local communities in iceplant eradication, native plant propagation, native plant revegetation, monitoring, and sign construction efforts.

Objective: Annually involve 720 school children, public volunteers, California State University Monterey Bay Weed Warriors, and Restoration Education Interns in “hands-on” participation as part of the “Cycle of Restoration”.

Community based restoration is a growing discipline bringing together the fields of Restoration Ecology and Service Learning as it implies that not only a natural community is restored, but that human communities can themselves be restored. For this project, like all others of Return of the Natives Restoration Education Project (RON), community involvement is critical. The following describes the level of involvement and participation on the part of the local community.

California State University Monterey Bay students will learn the processes involved in of Community based restoration under the guidance of RON core staff, Sue Shaw, Laura Lee Lienk, and Jon Detka. Students will conduct their own monitoring and mapping research while participating as leaders for diverse groupings of school children and general public volunteers. Foremost these university participants will engage themselves and others in reflections on how “human community” is restored through hands-on involvement in ecological restoration. Intern “Weed Warriors” and “Restoration Educators” from CSUMB’s ‘Watershed Concentration’ and the Service Learning Institute will play a vital role as onsite greenhouse and planting-event leaders during implementation and monitoring.

Three public Sunday planting days will be scheduled during the months of December and January. RON core staff and Weed Warriors will host the events and volunteers have the opportunity to engage in native plantings, iceplant pulling, and an interpretive hike around the perimeter of the restoration site.

Local schools will participate each year in the eradication of iceplant as well as the propagation and planting of site-specific native plants. The goal is to have students propagate 6,000 native dune plants in RON school greenhouses from September through November each year. Each year during the months of January and February an estimated 360 students will participate in 3 planting event days (2 planting shifts 9:30-11am and 12-130pm each day) at the Moss Landing Dune Restoration site. Students will be bussed to the Moss Landing restoration site where they will engage in Iceplant Olympics competition and the out-planting of their school propagated native plants. Each planting event will reinforce a “Cycle of Restoration” with events that demonstrate

the importance of recognizing natives and invasive weeds, removing invading weeds, restoring native plants, and returning the message to others in the community.

Site Events will include:

- Iceplant Olympics – Events: Tallest pile of Iceplant & Longest ‘Runner’.
- Recognizing & Restoring Natives: Native Plantings

Prior to site events a RON Intern or Weed Warrior will visit school locations and engage students in a discussion about the fragile dune ecosystem, field trip conduct, and safety while at the restoration event. During each event field notes and GPS data will be collected regarding the number of volunteers in attendance, areas of iceplant eradication, and number of planted natives.

Return of the Natives is dedicated to bringing nature closer to people and people closer to nature through hands-on restoration in local communities. This restoration project provides the opportunity for the Return of the Natives organization to restore a local ecosystem with the assistance of community members and agency partners. This proposal should serve as a cornerstone for what will be a developing and sustainable community based dune restoration project.

Reference:

Hickman, J.C., ed. 1993. The Jepson manual: Higher Plants of California. University of California Press, Berkeley, CA.

Monsanto Company, No publishing date. Native Habitat Restoration, Controlling Iceplant. Flyer – Treatment Strategy. Monsanto Agricultural Company, St. Louis, MO.

Pickart, A.J. and Sawyer, J.O. Ecology and Restoration of Northern California Coastal Dunes. 1998. California Native Plant Society. Sacramento CA.

Return of the Natives. 1993. RON Greenhouse Procedure. Return of the Natives Restoration Education Project, Monterey CA.

Sawyer, J.O. and T. Keeler-Wolf. 1995. A manual of California vegetation. California Native Plant Society, Sacramento, CA.

Return of the Natives to Moss Landing Dunes Restoration Project Year 1 Unit Proposal

The following is an overview of the goals and objectives proposed for the Year 1 Unit at the Return of the Natives Moss Landing Dunes Restoration Site. Refer to the *Return of the Natives to Moss Landing Dunes Restoration Project - Project Proposal* for a more detailed explanation of the restoration site goals, objectives, restoration methods, and monitoring procedures.

Year 1 Unit Description

The Year 1 Unit is comprised of the most northern end of the larger restoration site. The Year 1 Unit encompasses a ~ 17398 m² area. Its borders are defined by the beach access boardwalk trail to the North, the gravel emergency access road to the East, the beach/foredune interface to the West, and an illegal trail/disturbance area to the South. (See Figure 1: Year 1 Unit - Vegetation Type Map)

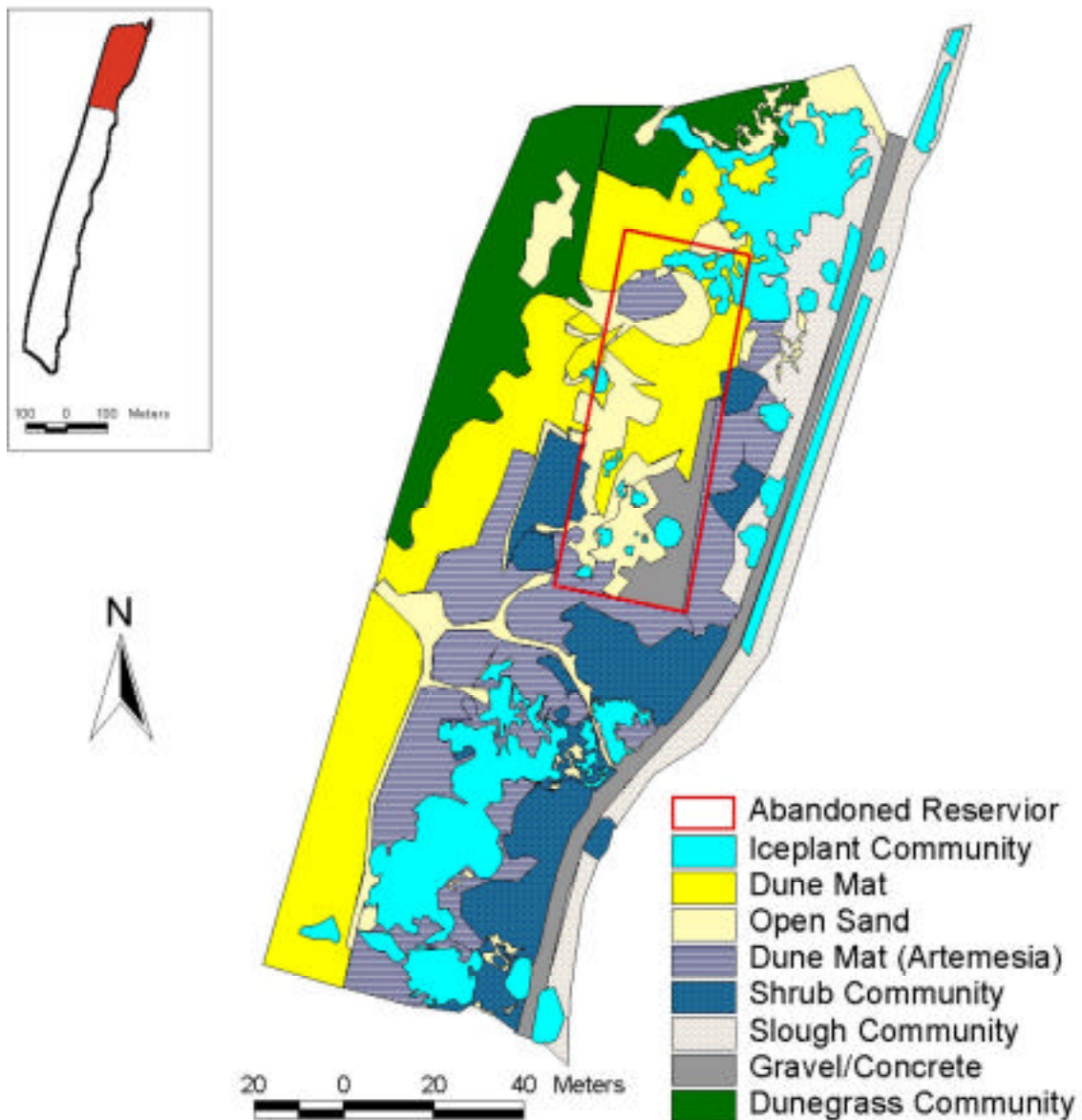
This region was outlined as the Year 1 Unit for the following reasons.

1. The area of total iceplant eradication (~ 2,872 m²) is compatible with the estimated number of propagated and planted native plants. (~ 6,000 individuals @ 1 plant per ~0.5 m)
2. The unit contains an amount of iceplant (m²) that meets with available funding for herbicide resources.
3. The unit has evidence of relatively higher levels of human related disturbance and trampling compared to the remaining restoration site.
4. The unit encompasses a backdune area containing relict dredge material and concrete debris that will require dense shrub cover planting along with monitoring and follow-up to prevent additional non-native annual grass invasions.
5. The unit's proximity to public access points will serve as an excellent opportunity for an interpretive public demonstration of ongoing restoration efforts throughout the remaining site.

The goals of the Year 1 Unit Site are:

1. Host 3 public Sunday restoration events and 6 school restoration events.
2. Eradicate 2,872 m² of *C. edulis* and *C. chilensis* hybrid.
3. Revegetation in eradicated Iceplant sites with 6,000 native plants.
4. Setup 10X10 m monitoring plots and 50m linear transect.
5. Erect interpretive/warning signs that inform the public about restoration efforts and the sensitivity of dune vegetation.

Return of the Natives to the Moss Landing Dunes Restoration Project Year 1 Unit - 2001 Vegetation Type Map



Total Area Year 1 Unit = 17,397.85 m²

Figure 1: Year 1 Unit - Vegetation Type Map

Goal: Host 3 public Sunday restoration events and 3 school restoration events.

The following dates for public Sunday restoration events and school restoration events have been scheduled. (See Table 1. Dune Restoration Event Schedule) Refer to the *Return of the Natives to Moss Landing Dunes Restoration Project - Project Proposal Local Community Involvement Goal* for a description of event agendas.

Dune Restoration Event Schedule		
Event Type	Dates	Time
Public Sunday	12/2, 12/9, 1/13	12-2p
School Events	1/30, 2/6, 2/27	930-130p

Table 1. Dune Restoration Event Schedule

Goal: Eradicate 2,872 m² of *C. edulis* and *C. chilensis* hybrid.

An estimated 2,871.96 m² Iceplant will be eradicated using the manual eradication and chemical control methods outlined in the *Return of the Natives to Moss Landing Dunes Restoration Project - Project Proposal – Iceplant Eradication Goal*. Chemical control methods will be used in 2655.35 m² and the remaining 216.61 m² will be removed using manual methods. Refer to *Year 1 Unit C. edulis Eradication Plan* for specific locations of each treatment type.

Goal: Revegetation in eradicated Iceplant sites with 6,000 native plants.

A proposed 6,000 native plants will be planted in areas previously occupied by Iceplant. A nearest neighboring community approach will be used to plan revegetation pallets. Plants will be distributed prior to events and GPS mapping of areas will include notation of number and type of species introduced to each area.

Goal: Setup 10X10 m monitoring plots and 50m linear transect.

Prior to treatments and events monitoring areas will be designated and suitable control plots marked with pin flags. A permanent 50 m transect will be designated and marked with stakes. Baseline data will be collected in accordance with methods outlined in the *Return of the Natives to Moss Landing Dunes Restoration Project - Project Proposal – Monitoring Goals*.

Goal: Erect interpretive/warning signs that inform the public about restoration efforts and the sensitivity of dune vegetation.

Signs will be erected similar to those displayed at the Old Moss Landing Marine Lab Site warning the public of site sensitivity. California State University Monterey Bay students will produce a site interpretive sign that features current restoration efforts and interpretive site ecology information. The interpretive sign will be submitted to California State Parks partners for approval prior to its erection.

Return of the Natives to Moss Landing Dunes Restoration Project

Year 1 - Unit 1 C. edulis Eradication Plan



Figure 2. Year 1 – Unit 1 Iceplant Eradication Plan