

Newport Beach Dunes Restoration Project

Dune Vegetation Monitoring Report
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Introduction

In the fall of 2005 Newport Beach residents of the seaward properties located at 7300, 7302, 7304, 7306, and 7308 West Ocean Front, just south of the Santa Ana River Mouth, leveled, re-graded, and degraded approximately 2,400 square meters ($\approx 25,800$ square feet) of sandy beach coastal habitat directly behind their residences. This work was done without permits or permission, on public beach property owned and maintained by the City of Newport Beach. The residents used mechanized equipment to dramatically reduce the height of the dunes that (according to photos and anecdotes) had been continually growing in height over the past 20 years and had begun to block viewsheds of the shoreline from their houses. The disturbed property (Assessor's Parcel Number 045-026-01) is recognized as an environmentally sensitive habitat area (ESHA).

On February 8, 2006 the California Coastal Commission (CCC) approved Consent Restoration Order No. CCC-06-RO-01 which required residents to restore the disturbed habitat. In February 2008, CCC staff approved a restoration plan submitted by the Los Cerritos Wetlands Stewards (LCWS), a 501(c)3 non-profit organization dedicated to the restoration and enhancement of natural uplands and wetlands habitats in urbanized areas of southern California. This report documents the restorative actions taken through the Spring of 2009, under the direction of LCWS staff with approval of the CCC.

Site Preparation

NON-NATIVE PLANT ERADICATION:

When work began the entirety of the vegetation on site was non-native. Hybridized *Carpobrotus* spp. (hottentot-fig/sea-fig/ice plant) were the most established species and composed the majority of the vegetation removed from site. A 200 square foot turf area was also removed. Individuals of *Drosanthemum hispidum* (rose ice plant), *Cakile maritima* (sea-rocket), *Agave americana* (century plant) and *Sonchus oleraceus* (sow thistle) were also establish on site pre-removal. All non-native vegetation was removed by hand, ensuring that steeper areas of the dunes were not destabilized, and the material was immediately disposed of off-site. The site was raked to remove any remaining roots or ice plant fragments.

IRRIGATION SYSTEM INSTALLATION:

A temporary irrigation system was installed once all non-native vegetation was removed. The irrigation system consisting of a network of 5/8" low-density polyethylene soaker hoses (in planting area 'A') and a series of sprinkler heads (in planting area 'B'). The water source was provided by the adjacent residences. The hoses, tubes, and valves were buried or covered to reduce the probability of vandalism and prohibit impact to public access. The soaker hoses in planting area 'A' worked incredibly well as they provided a thorough soaking to the sandy substrate without erosion. To saturate the soil to a depth of 18 inches the site was irrigated for four hours per day over the three days just prior to the planting. After container plant installation, irrigation continued once a week for three months to supplement natural rainfall as necessary.

PERMITTER FENCING INSTALLATION:

White Traffic delineators were installed around the entire perimeter of the site spaced 2 meters apart. A yellow nylon rope connected the delineators to complete the fence. Nine signs consistent with the project proposal design were posted along the perimeter fence.

Planting Plan

The species planted on site closely followed the plant palette originally proposed. Planting occurred over 2 days, April 4th and April 5th 2008. Due to the late planting date, no seeding was done. All plants were installed from 2 ¼" X 3" liners, 4 inch pots, or 1 gallon pots. Table 1 lists those plants that were installed at the site and their quantities, while Table 2 lists the plant species that would be appropriate to add to the site if and when propagules are available.

TABLE 1. Number of plants per species installed at Newport Dunes restoration site.
Planting Zones: A = sandier soils ; B = loamier soils.

<i>Plant species (COMMON NAME)</i>	Zone A	Zone B	Total
<i>Abronia umbellata</i> (PINK SAND VERBENA)	3	0	3
<i>Ambrosia chamissonis</i> (BEACH BUR)	20	30	50
<i>Atriplex leucophylla</i> (DUNE SALTBUSH)	5	0	5
<i>Calystegia soldanella</i> (BEACH MORNING-GLORY)	20	10	30
<i>Camissonia cheiranthifolia</i> (BEACH EVENING PRIMROSE)	35	20	55
<i>Distichlis spicata</i> (SALTGRASS)	15	10	25
<i>Encelia californica</i> (CALIFORNIA SUNFLOWER)	0	10	10
<i>Eriogonum fasciculatum</i> (CALIFORNIA BUCKWHEAT)	0	10	10
<i>Eriogonum parvifolium</i> (SEA-CLIFF BUCKWHEAT)	5	20	25
<i>Heliotropium curassavicum</i> (SEASIDE HELIOTROPE)	10	25	35
<i>Isocoma menziesii</i> (GOLDEN BUSH)	0	10	10
<i>Lotus scoparius</i> (DEERWEED)	0	10	10
<i>Lupinus chamissonis</i> (DUNE BUSH LUPINE)	10	10	20
<i>Lycium californicum</i> (CALIFORNIA BOXTHORN)	0	10	10
<i>Suaeda taxifolia</i> (WHOLLY SEA-BLITE)	0	10	10

TABLE 2. Plant species that would be appropriate to add to Newport Dunes restoration site in the future by zone.

<i>Plant species (COMMON NAME)</i>	Zone A	Zone B
<i>Eschscholzia californica</i> (CALIFORNIA POPPY)	X	X
<i>Frankenia salina</i> (ALKALI HEATH)	X	X
<i>Abronia maritima</i> (RED SAND VERBENA)	X	X
<i>Lupinus succulentus</i> (SUCCULENT LUPINE)		X
<i>Calystegia macrostegia</i> (MORNING GLORY)		X
<i>Gnaphalium californicum</i> (CALI. PEARLY EVERLASTING)		X
<i>Dudleya lanceolata</i> (LANCE-LEAF LIVEFOREVER)		X
<i>Dudleya virens</i> (BRIGHT-GREEN DUDLEYA)		X
<i>Astragalus trichopodus lonchus</i> (COAST LOCOWEED)		X
<i>Cleome isomeris</i> (BLADDERPOD)		X
<i>Eriogonum cireneum</i> (ASH-LEAF BUCKWHEAT)		X

Weed Maintenance

The site was weeded by hand periodically throughout the Fall and Winter of 2008. The dominant weeds were annual species such as *Cakile maritima* (sea rocket), *Sonchus oleraceus* (sow thistle), *Oxalis pes-caprae* (Bermuda buttercup), *Malva parviflorum* (cheeseweed), and *Chenopodium album* (lambsquarters). *Cakile maritima* was the only weed that invaded Zone 'A'. Annual weeds should continue to be controlled manually no more than twice per month during summer, fall and winter, and should be monitored regularly during the spring and controlled when necessary to protect native plants. Many annual weed species cannot be eradicated completely because of the ubiquitous seed sources from neighboring areas, however, their population will decline as native shrubs prosper and eliminate the conditions necessary for their germination. Eliminating irrigation will help tremendously with reducing the impacts of annual weeds.

Perennial weeds were of less concern. *Carpobrotus* did not regenerate from the plants that were cleared from the site in preparation for the planting. Seedlings of *Carpobrotus* did sprout throughout Zone 'B', however, these seedlings were easily controlled when annuals are weeded. Maintenance workers should pay close attention to *Carpobrotus* seedlings and be sure to remove seedlings before they begin to branch and grow prostrate across the sand. Since a large population of *Carpobrotus* had been established on site previously, it will take several years for the seed bank to be exhausted. This process will be enhanced due to the harsh condition of this habitat. Nevertheless, eliminating the possibility of future invasions by iceplant and making this site self-sustainable will prove to be difficult with the close proximity of two other large populations of *Carpobrotus* to the East and West of the restoration site. All *Carpobrotus* populations within a 200 yard radius of the restoration site should be removed and replaced with native coastal strand and dune scrub vegetation to ensure the success of this restoration project.

Vegetation Assessment

On March 3rd, 2009, twenty unique 1 meter squared (m^2) quadrats were surveyed within the project site boundaries. Ten quadrats were located in Zone 'A' and ten more were located in Zone 'B'. The quadrat locations in Zone 'B' were randomly determined along two transects running parallel to the residents retaining walls. Due to the nature of pioneer dunes to be composed mostly of bare sand, quadrat locations in Zone 'A' were randomly stratified. Percent cover of all plant species was measured for each quadrat. The cover data were then used to calculate the Shannon Diversity Index (H'), Simpson Diversity Index, Evenness, and the relative cover of native species, exotic species, and bare ground.

Though only 9 native species were surveyed within the quadrats, all native species listed in Table 1 were present on March 3rd 2009 giving the site a species richness of 15 native plants. The quadrats showed an average vegetative percent cover of 38.2% and bare ground coverage of 64.2%. Of the vegetative cover 92.7% was native species and 7.3% was non-native species. When considering vegetative cover the quadrats showed the highest percent of vegetative cover by *Camissonia cheiranthifolia* (36.5%), followed by *Ambrosia chamissonis* (18.4%), *Lupinus chamissonis* (9.8%), and *Distichlis spicata* (7.7%; Table 3). *Sonchus oleraceus* (4.0%) had the highest percent coverage for the non-native species found (Table 3).

The Shannon-Wiener Diversity Index of the vegetation (excluding weed cover) was $H' = 1.783$ with an entropy value of 2.57. Furthermore, the Simpson Diversity Index calculated the following values: $D = 0.224$; $1-D = 0.776$; $1/D = 4.46$. Both of these parameters will be calculated on a yearly basis to compare shifts in biodiversity over time. Perhaps the most telling

measure of biodiversity for a species poor plant community, like coastal dunes, is 'Evenness'. Evenness determines whether the restoration site is dominated by just a few species or if all species are evenly represented. This index is measured on a 0-1 scale with 1 being more even and 0 less even. The Evenness for this restoration site currently is 0.811.

TABLE 3. Percentage of vegetative cover composed by native versus non-native plant species at Newport Beach Dunes restoration site, March 2009.

Species Present	% Cover
Natives Plant Species	92.7
<i>Camissonia cheiranthifolia</i>	36.5
<i>Eriogonum parviflorum</i>	0.5
<i>Heliotropium curassivicum</i>	5.3
<i>Ambrosia chamissonis</i>	18.4
<i>Atriplex luycophylla</i>	3.6
<i>Calystegia soldanella</i>	6.8
<i>Abronia umbellata</i>	4.1
<i>Distichlis spicata</i>	7.7
<i>Lupinus chamissonis</i>	9.8
Non-Native Plant Species	7.3
<i>Cynadon dactylon</i>	0.1
<i>Carpobrotus edulis</i>	0.7
<i>Sonchus oleraceus</i>	4.0
<i>Oxalis pes-capre</i>	0.9
<i>Cheopodium album</i>	0.3
<i>Poa annua</i>	0.1
<i>Malva parvifolium</i>	0.3
<i>Bromus madritensis ssp. rubens</i>	0.4
<i>Cakile maritima</i>	0.5

Suggestions for Further Restorative Action

This restoration project has been successful thus far. After just one year, it has nearly met the measurements for success outlined in the project proposal. In order to completely eradicate non-native plant species, hand weeding should continue twice each month, with special attention paid to *Carpobrotus* seedlings. Furthermore, irrigation should be terminated as root systems of the native plants on site are now fully established and self-sustainable. New plantings of species listed in Table 2 should be done only between November 1st and February 1st. Light hand watering can be applied during the establishment period, otherwise planting should depend on seasonal rains for irrigation.

It is necessary to keep the perimeter fencing and signage in place for another year in order to maintain the dune morphology that has been restored. Contours on this site are now at a natural state and trampling could lead to high levels of erosion and aeolian transport out of the site. This is of even more concern during the beach replenishment project that is currently occurring adjacent to the site. In fact, since native dune habitat is so scarce regionally, it is advisable to make this site permanently off-limits to the public. Moreover, this project will only be a success in the long run and truly sustainable if the dune habitat to the north and south of this

site are restored as well. Currently they are heavily infested with *Carpobrotus*, as stated above, and pose a formidable threat to the reinvasion of this destructive plant species.

TABLE 4. Photographs of dune habitat on-site pre- and post-restorative action.



PhotoPoints

Nine photo-points were established for the site. Two photopoints will be used for reporting purposes: one looking south along the property line and a second looking seaward from in front of the residences.

TABLE 5. Photographs from fixed points at Newport Dunes restoration site, April 2007–March 2009.



Looking Seaward

Newport Beach Dunes Restoration Project



Looking South