# Managing Coastal Sand Dune Habitat on Camp Pendleton

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## Background

Camp Pendleton has ~17 miles of relatively undeveloped coastline that includes rare Southern California coastal dune habitat and a California least tern colony. In reaction to invasion of non-native plant species, special management practices have been implemented in order to conserve this sensitive community.

### Poster objectives

1. **Show progression of invasive plant control measures**
2. **Present preliminary results from dune vegetation monitoring**
3. **Address future management challenges**

## Non-native Invasive Species Control Measures

### Treatment – North & South Spit (1990's)

Dead iceplant

- Initial iceplant (*Carpobrotus* spp.) treatment: herbicide application (1.5% Roundup) or hand removal
- To address dune movement concerns, iceplant biomass was not removed
- Herbicides not used within 5 meters of rare plants
- All herbicide applications performed outside of California least tern & snowy plover nesting seasons

### Treatment –Site 2 (2004-2005)

- Removal Targets: non-native invasive plants (e.g. castor bean [*Ricinus communis*], Sea rocket [*Cakile maritima*]) and non-endemic upland plants
- Removed biomass & top 6" soil with seed bank, replaced with clean sand. Followed up with herbicides
- Lessons learned: desiccated biomass encourages organic layer development, leading to non-endemic upland plant encroachment

Site 2 (foreground)

Crews removing biomass, Site 2

### Treatment – Site 2 & North Spit (2006-2007)

- Removal targets: non-natives & upland plants
- Used $H_2O$-safe herbicide (2% Aquamaster) because close to wetlands
- Lessons learned: upland natives such as salt heliotrope (*Heliotropium curassavicum*) and Datura (*Datura wrightii*) invade beach post treatment

## Monitoring

Typical transect

### Methods

- Established 60-m permanent transects orientated perpendicular to coastline
- 14 transects in the North Spit tern colony & 7 transects in the South Spit tern colony
- Line-intercept & quadrat data collected along transects:'95, '96, '07 (Only 5 transects surveyed '07 as 2 transects destroyed by river mouth change in '05)
- Ocular cover estimated using seven 1 $m^2$ quadrats @ 10 m increments
- Qualitative % cover estimates were taken in 2006 to estimate weed coverage in Site 2 & North Spit areas

### Preliminary Results

- **Iceplant populations have shown a downward trend (Figure 1)**
- **Native dune plant populations have increased in quadrats formerly dominated by iceplant**
- **Other non-native plants, such as sea rocket, have slightly increased in iceplant removal areas (Figure 2)**
- **Qualitative measurements (October 1995) indicate presence of sea rocket on the North Spit & Site 2**
  - North Spit fore-dune: 25% cover
  - North Spit back-dune: 5% cover
  - Site 2: <5% cover

**Figure 1. Change in iceplant cover in N. Spit permanent transect quadrats**

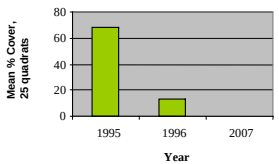
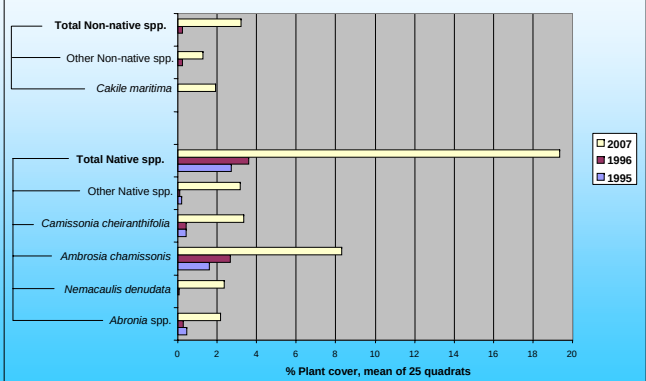



**Figure 2. Change in Vegetation Cover in iceplant-dominated quadrats**



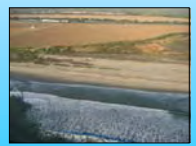

Note: Figures 1 & 2 for North Spit (Early March, Late April)

## Future Challenges

### Goal: Treat entire 17 mile coastline in segments

- Upcoming treatment area for 2008 = 56 acres
- Includes giant reed (*Arundo donax*), iceplant, sea rocket & castor bean (*Ricinus communis*)
- Intermittent wetlands restrict herbicide usage

Future treatment area, Iceplant in foreground



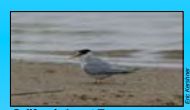
North Spit Tern Colony

### Maintaining Previously Treated Areas

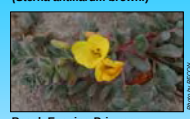
- Constant threat from non-native plant invasions.
- Persistent seed bank and shifting dunes makes it difficult to control undesirable plants
- Can never stop treatment, requires maintenance treatment schedule

### Co-managing Native Dune Plant Communities with Least Tern Colonies

- Resolve conflicts with native vegetation management and CA least tern management
- By removing non-natives, native dune plant cover increases, conflicting with reduced plant cover needs of terns (10-20% cover)
- Sea rocket grows and seeds during peak CA least tern breeding time



California Least Tern *(Sterna antillarum browni)*



Beach Evening Primrose *(Camissonia cheiranthifolia)*

### Protecting at Risk Plants in Beach Communities

Brand's phacelia *(Phacelia stellaris)*

Must coordinate plant protection with. . .

- Herbicide treatments
- Vegetation clearing operations for tern habitat

Nuttall's Lotus (*Lotus nuttallianus*)

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**TIMELINE**

- **1980** "Permanent" tern fence erected
- **1990** '92-'93 Winter: Santa Margarita River winter storm floods eliminate portion of dune landforms
- '93: Brand's Phacelia (Federal Species @ Risk) discovered in tern colony
- '93-'94: Studies determine iceplant to be greatest threat to native dune plant communities
- '95-'96: 1st treatments of iceplant in tern colony
- 1st (late March '95) & 2nd (early April '96) vegetation transect surveys conducted
- **2000** Early '05: Santa Margarita flooded; Manually removed all vegetation from south central 2/3 of North Spit for tern mgmt.
- '07: 3rd (early April) & 4th (Late May) vegetation transect surveys
- **2010**
- '04- Present: Invasive species removal w/in tern colonies (spits) & on "Site 2"