Restoring Critical Coastal Dune Habitat at Point Reyes for Threatened and Endangered Species

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Why are Dunes Important?

- May appear barren and inhospitable, but serve important functions
  - Protect inland areas from tide, wind, and waves
  - Improve quality of water flowing into the ocean
  - Provide habitat for common and rare plants and animals

Experience Your America
Point Reyes National Seashore

- Undeveloped, but not undiminished.
- 1940’s: European beachgrass and iceplant planted to protect adjacent ranches, roads, and homes.
By 2009, 60% of 2,200 acres of coastal dune, bluff, and scrub habitat
Listed species that depend on native coastal dune habitat

- Western snowy plover (threatened)
- Myrtle’s Silverspot butterfly (endangered)
- Tidestrom’s lupine (endangered)
- Beach layia (endangered)
How Do Invasive Plants Impact Dunes?

- Direct Impacts: Encroach and take over habitat for native dune plant species
How Do Invasive Species Impact Dunes?

- Indirect impacts on listed species:
  - Eliminates habitat for nectar species for Myrtle’s silverspot butterfly
How Do Invasive Species Impact Dunes?

- Indirect impacts on listed species:
  - Provides potential cover for predators of Western snowy plover
  - Reduces open areas for nesting
How Do Invasive Species Impact Dunes?

- Indirect impacts on listed species:
  - Provides habitat for native deer mice that consume seeds of Tidestrom’s lupine
  - Seeds near beachgrass 70% more likely to get eaten (Dangremond Pardini and Knight 2010)
Early Restoration Efforts

2001-2003

- 30 gross acres
- European beachgrass
- Hand removal

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European Beachgrass

- Deep rhizomes (3- to 12 feet)
- Fast lateral growth (~6.6 feet in 6 mos)
- Sprouts from smallest rhizome fragments
Some areas required as much as 15-20 treatments to reach control.
Mechanical Removal – Horizon Flipping

“Dirty” sand with rhizomes

2 – 9 ft (or more!)

“Clean” sand

Minimum 3 ft “clean” sand cap

“Dirty” sand with rhizomes
Abbotts Lagoon Restoration Project

- **Phase I**
  - Spring/Summer 2011
  - Project scope reduced due to costs
  - $25,000 - $30,000/acre
  - 133 acres reduced to 80 acres of mechanical removal
Abbotts Lagoon Restoration Project

- **Phases II - IV**
  - **2011 - 2015**
  - ~71 acres of beachgrass
  - Chemical treatment
  - $2,500 - $3,000/acre
Restoration Results
Vegetation Monitoring – Mechanical

Average Species Richness

<table>
<thead>
<tr>
<th>Year</th>
<th>Treatment</th>
<th>2010</th>
<th>2011</th>
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Treatment

EXPERIENCE YOUR AMERICA
Mechanical Treatment - Efficacy

2010 - Before

2011 - After
Mechanical Treatment – Sand Movement

- Impact to existing habitats and adjacent land use
  - Existing native dune, wetlands
  - Adjacent ranchlands
  - Rare species
Tidestrom’s Lupine – April 2012

- First to colonize restored areas
Vegetation Monitoring – Mechanical

Graph showing Mean Percent Cover from 2010 to 2017 for different treatments and species richness. The treatments include PRIM INV, DET, BG, SEC INV, and NATIVE. The graph indicates an increase in mean percent cover from 2010 to 2017, with a significant rise in 2017.
Mechanical Treatment – Native establishment

- Both “good” .........
Mechanical Treatment – Secondary Invaders

- And “bad” .........
Restoration Results - Herbicide
Vegetation Monitoring – Herbicide

Average Species Richness

Mean Percent Cover

Treatment

Experiece Your America
Herbicide Treatment - Efficacy

- Very effective
- European beachgrass decomposes very slowly
- Fewer rare plants than mechanical
Herbicide Treatment – Native Establishment

- Backpack technique fosters survival of existing plants – and establishment of new ones
Vegetation Monitoring – Herbicide

Average Species Richness

- PRIM INV
- DET
- BG
- NON-NATIVE
- NATIVE

Mean Percent Cover

Treatment

EXPERIENCE YOUR AMERICA
Herbicide Treatment – Secondary Invaders
Vegetation Communities – Pre-Restoration
Current Restoration Efforts
Conclusions

- Both techniques very good at eradicating European beachgrass and iceplant
  - Re-treatment is absolutely critical in both cases
- Neither technique has – yet – resulted in vegetation communities that resemble native dune ones
  - Mechanical restoration too intensive
  - Herbicide perhaps not intensive enough
Conclusions

- Restoration Fallacy

  - “Kill it, and native vegetation will come ……”

- Disturbance history and system instability makes restoration areas vulnerable to invasion/re-invasion
  - Even potentially to species not normally considered highly invasive such as European searocket
  - Secondary invader abundance twice that of native plants (Pearson et al. 2016)
Conclusions

- Take Home Message
  - Unless we can find and potentially “fix” some of the underlying problems, we could be doomed like Sisyphus to be rolling the invasives boulder constantly uphill........
Conclusions

- Take Home Message
  - Some long-term maintenance may be inevitable....
But There’s Hope!

- Resiliency of the Rare

Number of nests by survey sector

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But There’s Hope!
But There’s Hope!

- In restored areas in 2017:
  - >290,000 lupine
  - >880,000 beach layia
  - >20,000 curly-leaf monardella
Project Staff:

- Lorraine Parsons
- Sarah Minnick
- Will Johnson
- Amelia Ryan
- and many great interns!

Funding support:

- National Park Service
- Natural Resource Damage Assessment,
- USFWS
- CA - OSPR
Herbicide Treated Communities

Treatment
- Control
- Mechanical
- Herbicide
Beachgrass Impacts Lupines

- Study by Washington University, St. Louis, Missouri

- Up to 82% of seed eaten

- Seeds close to beachgrass 70% more likely to get eaten.

Courtesy of Washington University
Beachgrass Impacts Lupine

- Study by Washington University, St. Louis, Missouri
- Lupine numbers are decreasing drastically in many park populations
- Some populations could go extinct within a few decades