Give Native Plants a Chance:  
Restoring a coastal oak woodland on Santa Cruz Island by removing invasive eucalyptus (*Eucalyptus* spp.)

Paula Power, Clark Cowan, Rocky Rudolph, Derrek Hartman, Joel Wagner, Mike Martin, Laura Kirn, Jade Blennau, and Dirk Rodriguez.
Channel Islands National Park
Collection of five islands
20 miles off the southern CA coast
Supporting over 100 Endemic Island Species
Santa Cruz Island

Provides 96 square miles of habitat for protected, endemic and rare species.

Only single island endemic in North America!

Aphelocoma insularis

Urocyon littoralis santacruzae

Ceanothus megacarpus ssp insularis

Dudleya nesiotica

Haliaeetus leucocephalus

Aphelocoma insularis

Urocyon littoralis santacruzae

Ceanothus megacarpus ssp insularis

Dudleya nesiotica

Haliaeetus leucocephalus

Photo by Callie Bowdish

Photo by Dan Richards
Ranching Era: 1800’s

Drastic landscape changes included the introduction of eucalyptus

Main Ranch, Santa Cruz Island 1869
Larger Restoration Plan:

Prisoners Harbor coastal wetland and associated riparian corridor

- Hydrologically connected
- Environmental impact statement: 2010
- Section 106 consultation with SHPO: 2015
- **Fire-hazards**: Litter depths reaching 42cm
- **Reduced habitat quality** for native animal species: Island Scrub Jay, Fox, Black-bellied Salamander
- **Intensify competition with natives** for limited:
  - Light: shade out native species
  - Nutrients: change nutrient cycling
  - Water: divert groundwater

NPS/TNC Removal began in 2011
Active Restoration

1. NPS Hotshot Crews at work

2. Time of last disturbance (t=0)

3.

4.

5.
Six months post fire at La Selva ($t = 0.5$)

Intact invasive eucalyptus grove at Bosque Mano ($t = -1$)
Long Term Vegetation Protocol

Objectives:
- Organize transect data by assigned time-value in relation to time since last disturbance (t=0)
- Categorize data “hits” as native vegetation, invasive vegetation, or no vegetation hit
time (years), where t=0 represents time of last disturbance.

No Veg Hit | Invasive Hit | Native Hit
---|---|---
-1 (n=2) | 85% | 9%
-0.5 (n=8) | 68% | 26%
0 (n=3) | 64% | 14%
0.5 (n=1) | 34% | 23%
1 (n=2) | 47% | 19%
1.5 (n=4) | 52% | 22%
2 | 27% |
Represented by Bosque Mano: Original state of Eucalyptus Grove

Represented by Groves A & B: Recovering Oak Woodland

Percent of Hits

<table>
<thead>
<tr>
<th>Time (years)</th>
<th>No Veg Hit</th>
<th>Invasive Hit</th>
<th>Native Hit</th>
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<tbody>
<tr>
<td>-1</td>
<td>6%</td>
<td>85%</td>
<td>9%</td>
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<tr>
<td>0</td>
<td>9%</td>
<td>68%</td>
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<td>0.5</td>
<td>23%</td>
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<td>1</td>
<td>14%</td>
<td>43%</td>
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<td>2</td>
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<td>47%</td>
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<td>4</td>
<td>22%</td>
<td>52%</td>
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<td>5</td>
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<td>6</td>
<td>22%</td>
<td>52%</td>
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<tr>
<td>7</td>
<td>27%</td>
<td>34%</td>
<td>43%</td>
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</tbody>
</table>

(n=2) (n=8) (n=3) (n=1) (n=2) (n=4)
Percent of Hits

(time (years), where t=0 represents time of last disturbance)

- No Veg Hit
- Invasive Hit
- Native Hit

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<td>1 (n=1)</td>
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<tr>
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<td>47%</td>
<td>34%</td>
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<tr>
<td>5 (n=4)</td>
<td>19%</td>
<td>52%</td>
<td>22%</td>
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<tr>
<td>6.5 (n=4)</td>
<td>19%</td>
<td>52%</td>
<td>22%</td>
</tr>
<tr>
<td>7 (n=6)</td>
<td>27%</td>
<td>52%</td>
<td>22%</td>
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</table>

0%  25%  50%  75%  100%
No Veg Hit | Invasive Hit | Native Hit
---|---|---
-1 (n=2) | 9% | 85% |
-0.5 (n=8) | 21% | 68% |
0 (n=3) | 23% | 64% |
0.5 (n=1) | 14% | 34% |
1 (n=2) | 19% | 43% |
1.5 (n=1) | 27% | 47% |
2 (n=4) | 22% | 52% |
2.5 |
3 |
3.5 |
4 |
4.5 (n=2) |
5 |
5.5 (n=2) |
6 |
6.5 |
7 (n=4) |

Percent of Hits

time (years), where t=0 represents time of last disturbance
North Grove
Site-specific features:
Not a burn site
Roses present prior to disturbance
Increased water availability

Middle Grove
Site-specific features:
Burn pile site
Less water availability

Percent of Hits
time (years), where t=0 represents time of last disturbance
time (years), where t=0 represents time of last disturbance

- **No Veg Hit**: Site-specific quick recovery
- **Invasive Hit**: Site-specific slower recovery
- **Native Hit**: Site-specific slower recovery

Percent of Hits

- **11%**: 0% (n=2)
- **85%**: 0% (n=8)
- **64%**: 0% (n=3)
- **6%**: 0% (n=1)
- **22%**: 0% (n=4)
Removal efforts release native plants from competition with Eucalyptus for light, nutrients and water.
Preliminary Hydrologic Data

Groundwater observation wells:
- Installed 18 wells in 2004 **before** the wetland restoration
- Installed 5 wells in 2012 in Canada del Puerto
- Monthly hand reading
- Data recorders in 9 wells
*Continuous eucalyptus cutting

Federal standard for a wetland= Hydric Soils= water level be within 1ft of ground surface for 14 consecutive days for 5 out 10 years.

End of a good rainfall year

Drought years

Good rainfall year
Water levels drop off

*Continuous eucalyptus cutting

Federal standard for a wetland = Hydric Soils = water level be within 1ft of ground surface for 14 consecutive days for 5 out 10 years.

Met standards:

- Nov-Dec 2011 = 32 days
- Jan-Sept 2017 = almost 8 months = 237 days

King tide event, flooded site

Water level (m above sensor)

Drought years

Good rainfall year

Good rainfall year
Location: Between two Euc. Groves
Well 20 - Willow

- Precipitation
- Water Level

Response to 3.44 inch precip event: 1/22/2017

Euc. Removal: North Grove, Feb 2015
Euc. Removal: Middle Grove, Feb 2013
Large Euc. Removal: Middle Grove, Feb 2013

Water level (m above sensor)
Precipitation (in)

End of dry year
Drought years
Good rainfall year

Does not drop off by August
Conclusions

• Eucalyptus groves dominate native vegetation

• Removing Eucalyptus provides opportunity for native plant recovery

• Recovery follows a general path, but there is site specific variation

• Different community types emerging:
  - Thicket forming plants (Roses, sticky baccharis)
  - Willows
  - Oak woodland

• Continued data collection will provide
  – Better understanding of successional changes following eucalyptus removal
  – Better understanding of the effect of eucalyptus on hydrologic function
Acknowledgements

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MEDN Fire
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Channel Islands National Park Staff
Thank you!
+Questions?

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- Arrowhead Hotshots
- Whiskeytown Hotshots
- Joshua Tree Hotshots
- Yosemite Falling Crew
- SAMO Fire

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NPS Hotshot Crews