USDA Orange County Invasive Plant Management (OCIM)

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Core Goals

- Assess the effectiveness of restoration across orange county and compare across natural and anthropogenic gradients.
- Develop a web based tool that predicts likelihood of restoration success based on site environmental and historical land use variables and economical constraints.
- Assess the current viability of the native seed bank in areas of restoration.





Distribution of Lands Sampled

131 Sites Sampled

Land Ownership	Percent of Sites
Orange County Parks	38
City of Irvine	25
California State Parks	18
UC Irvine Reserve	5
The Irvine Company	4
The County of Orange	4
TCA	4
City of Newport Beach	2

Four Management Levels (Treatments)

	No Action	Passive Restoration	Intermediate Restoration	Active Restoration
Exotic plant management		Х	Х	Х
Seeding/planting			х	X
Soil amendment/ inoculation	the state of the second		X	BLUFF RESTORATION IN PROGRESS
Irrigation may have been used				KEEP OUT X
Monitored and maintained for a period of years				×
Mitigation requirements				X

Methods

5m

Vegetation sampling

- Line point intercept
 - Plant species frequency
- 1m² Quadrats

0m

 Plant species percent cover and richness





Soil sampling

Chemical analysis:

Soil cores of 10 cm depth

10m

• C,N, pH, soil texture

Seed bank:

• Soil core of 5 cm

- The average restoration was 6 acres.
 - Ranged in size from 0.25 to 31 acres.
- The reasoning for restoration varied.
 - General management
 - Enhancement
 - Mitigation



- 35% of restoration had a goal vegetation type of CSS and 22% grasslands.
- 21% had the goal of increasing California Gnatcatcher habitat.
- 39% of the restorations were in house and 44% were contracted out.



More Management = More Recovery



Salvage and relocation of top soil



Mychorrizae inoculation



Soil discing





Top Soil Application and Inoculations

- Top soil application reduced exotic grass cover and increased native shrub cover.
- Mycorrhizae inoculation increased native shrub cover.



Exotic Plant Control

Control Method	Percent of Sites
Herbicide	72
Mowing/weed whipping	30
Weeding	24
Prescribed fire	5
Grazing	2
Grow kill cycles	2
Solarization	2







Herbicide Reduces Exotics



Reintroduction of Natives

Most commonly planted species:

- Artemisia californica
- Encielia californica
- Opuntia littoralis
- Salvia mellifera
- Nassella pulchra





- 43% were seeded
- 5% were re-seeded
- 37% were planted
- 15% were re-planted



Does seeding increase native richness and cover?

- Seeding increased native shrub cover.
- More diverse seed mixes do not increase species richness.





Does planting increase native richness and cover?

Planting increased native shrub cover only.

The combination of Transplant and Container grown local seed led to greatest increases in species richness.



Conclusions

- Greater management efforts = greater restoration success.
- Top soil and mycorrhizae application increased native shrub cover.
- Top soil application reduced exotic grass cover.
- Herbicide reduced target exotics and increases native shrub cover, but not native forb and grass species.
- Seeding and planting increased native shrubs.

Preliminary Conclusions

- High, medium and low concern exotics and introduced and naturally re-establishing natives respond to differing environmental and management variables.
- Native seed bank viability is low except for a small number of natives









Future Directions

- Further analysis of interactions between restoration methods and environmental conditions.
- Land history effects on restoration efforts.
- Further assessment of soil seed bank.
- Assess cost and public valuation of restoration.
- Web/GIS based tool to assist land managers in restoration site and method selection.

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Thank you!

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