

The effectiveness of island planting, mulching, and mowing in California coastal prairie restoration

Josephine Lesage and Karen Holl November 8<sup>th</sup>, 2018

## Acknowledgements

## Project sampling by UCSC undergraduates:

#### **UCSC Greenhouses**

Jim Velzy



Mickie Tang TJ Adams Andrew Heaston Anna Godhino Tina Fay Eileen Arneson Richard Schreiber Jack Rusk Joia Fishman And many more Younger Lagoon Interns!

### Younger Lagoon Reserve Staff

E. Howard

T. Brown

W. Spangler





Prescribed burn at Año Nuevo State Park (Photo: California State Parks)

Mission San Juan Bautista (Photo: Flickr – user HarshLight) Cattle grazing at Point Reyes National Seashore

### California's grasslands have been heavily altered over the last 300 years



Widespread invasion of exotic species



## 'Younger Lagoon Reserve' – 1972 and early 2010's

## Island Planting

• Based on the nucleation model of succession (Yarranton & Morrison 1974)

 Small clumps of planted species would expand outward over time



Corbin and Holl 2012

## Mulching

- Mulch could suppress weed cover, allowing planted plugs to establish
- Established plants can better compete with exotic species (Corbin and D'Antonio 2004)



Photos: youngerlagoonreserve.ucsc.edu

## Mowing

- Properly timed mowing can reduce dominance of exotic annual grasses (DiTomaso 2000)
- Reducing dominant exotic annual grasses may benefit planted native species



Photos: Wikimedia/Pixabay

## Research Questions

- Will islands spread outside of their planted areas?
- 2. Will island plots have the same native cover as full plots?
- 3. Does mowing benefit native species cover?
- 4. Does initial mulching benefit native cover?





## **Experimental timeline**

- Site preparation occurred in 2011
- Planted in January 2012
- Mowed annually in late spring/early summer
- Data collected in April/May 2018

## **Island Planting**



## **Island Planting**



## **Island Planting**





Not Mowed

Mowed

Not Mowed

Mowed

(mulched and unmulched)



Not Mowed

Mowed

## **Island Planting**



Not Mowed

Mowed



(mulched and unmulched)



Island Planting (mulched)



## Planted species

## **Grasses & graminoids**

## **Forbs**

Grindelia stricta

*Trifolium willdenovii* 



#### Clarkia davyi



Achillea millefolium



Symphyotrichum (Aster) chilense



#### Stipa (Nassella) pulchra



Bromus carinatus

#### Juncus patens



#### Hordeum brachyantherum



Photos from CalFlora/CalPhotos

## Planted species

## **Grasses & graminoids**

## Forbs

Grindelia stricta

2.2%

Trifolium willdenovii



Clarkia davyi



#### Achillea millefolium



Symphyotrichum (Aster) chilense



#### Stipa (Nassella) pulchra



Bromus carinatus

0.4%

## Juncus patens



#### Hordeum brachyantherum



% values are average cover across all plots \*\* denotes rhizomatous forb

Photos from CalFlora/CalPhotos

# 1. Will islands spread outside of their planted areas?

- Forb cover is not significantly different between inside, edge, and outside of planted areas
  - Forbs spread outside of planted 'islands'
  - ANOVA: p = 0.605
- Grass cover is significantly different between planted interior areas and outside of planted islands
  - Grasses are less likely to spread outside of 'islands'
  - ANOVA: p = 0.029

2018 Island Planted Plots Comparison of interior, edge, and outside





Planting Style

2018 Cover of Planted Species

2. Will island-planted plots have the same native cover as full-planted plots?

- For forbs, island planting results in the same cover as full planting after 6 years
  - ANOVA: p = 0.575
- For grasses, island planting results in the same cover as full planting after 6 years
  - ANOVA: p = 0.525
  - But that cover is very low: 5-10%



Planting Style

## 3. Does mowing benefit native species cover?

- For forbs, mowed and unmowed plots have the same cover
  - ANOVA: p = 0.774
- For grasses, For forbs, mowed plots have higher native cover than unmowed plots
  - ANOVA: p = 0.049
  - But the cover improvement is small: 2-6%

# 4. Does mulching benefit native cover 6 years after implementation?

- For forbs, mulching has no significant effect on cover after 6 years
  - ANOVA: p = 0.171
- For grasses, mulched areas have lower native cover after 6 years
  - ANOVA: p = 0.032
  - But cover is very low: 5-10%

Effects of mulching on forb and grass cover in 2018



## Forb Conclusions

- Island planting is an effective technique for rhizomatous native forbs
  - Rhizomatous forbs maintained ~40% cover six years after planting
- No long-term effect of mowing on forb cover
- No long-term effect of mulching on forb cover



## Grass conclusions

- Perennial grasses cover was low across all plots
  - ~5-10% cover six years after planting
- Did not expand in island-planted plots
- Did worse in mulched plots
- Benefited from mowing, though the improvement was small

## Questions?

