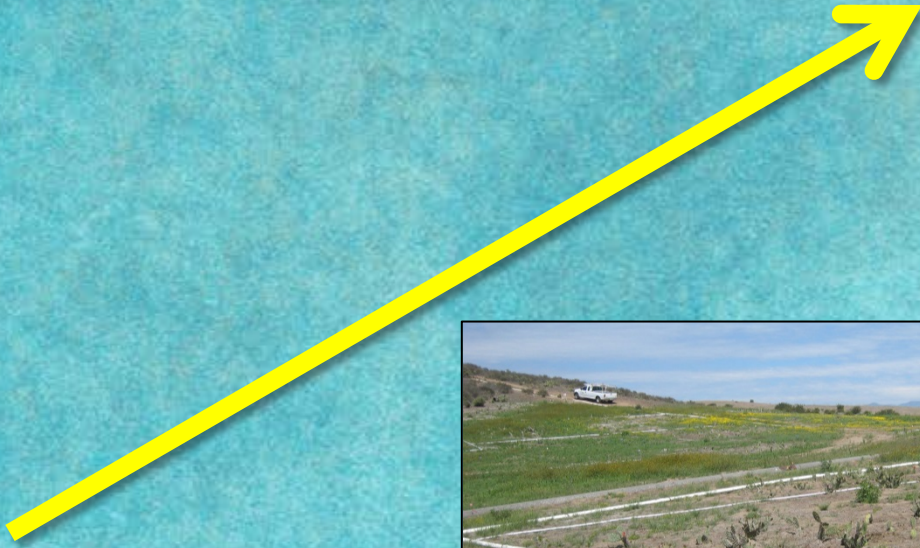


# Assessing Effectiveness of Management Actions on Recovery of CSS Plant Communities Over-Time

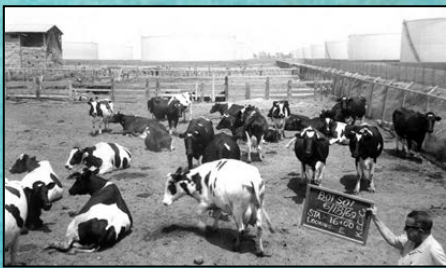


**Sara Jo Dickens and Katharine Suding**

# Recovery of Native CSS Always Begins with Weed Control



And often feels like an impossible war, but small battles are won often without knowing it.



Orange Public Library Collection



110 sites within the 150 km<sup>2</sup> Nature Reserve of Orange County (NROC)

Grazed from early 1700 to early 1990's

Conventional agriculture and dry land wheat and barley farming 1870's

# Assessing the Community After 15 years of Artichoke Thistle (CYCA) Control.

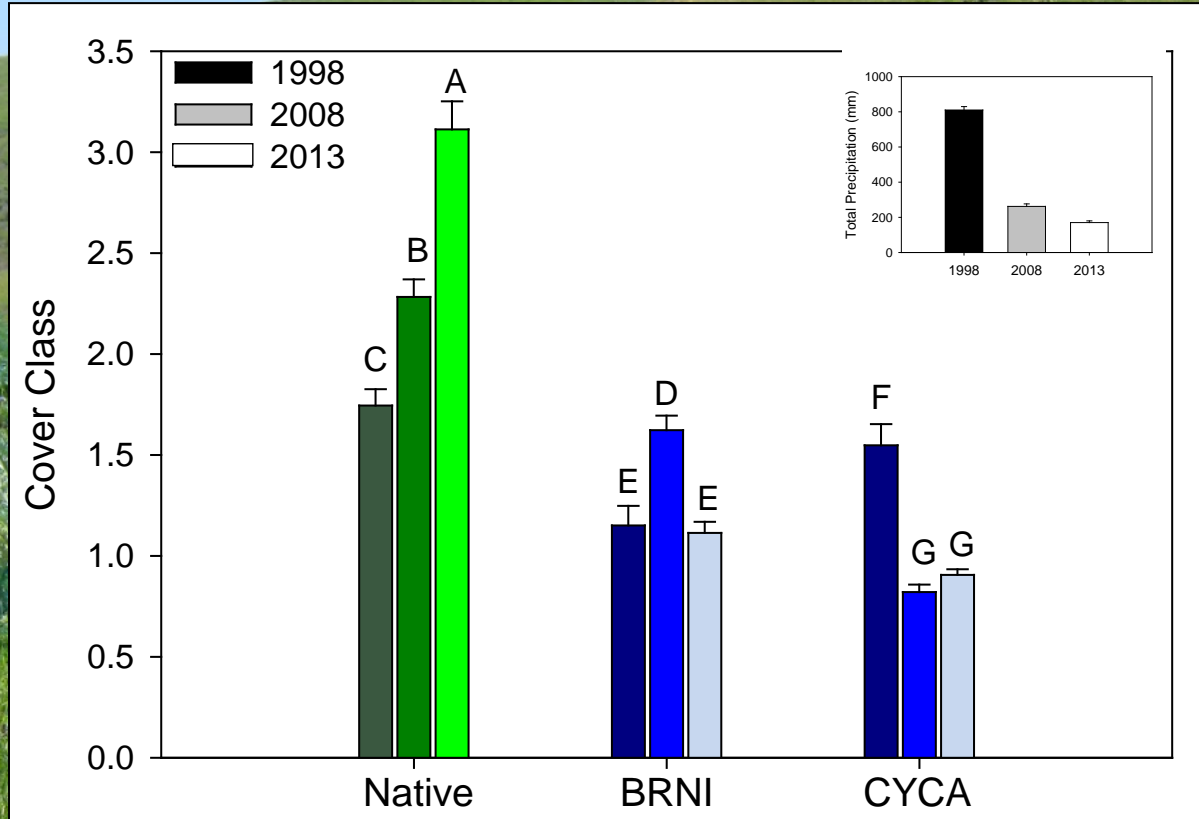


William McPherson Collection

## Our objectives:

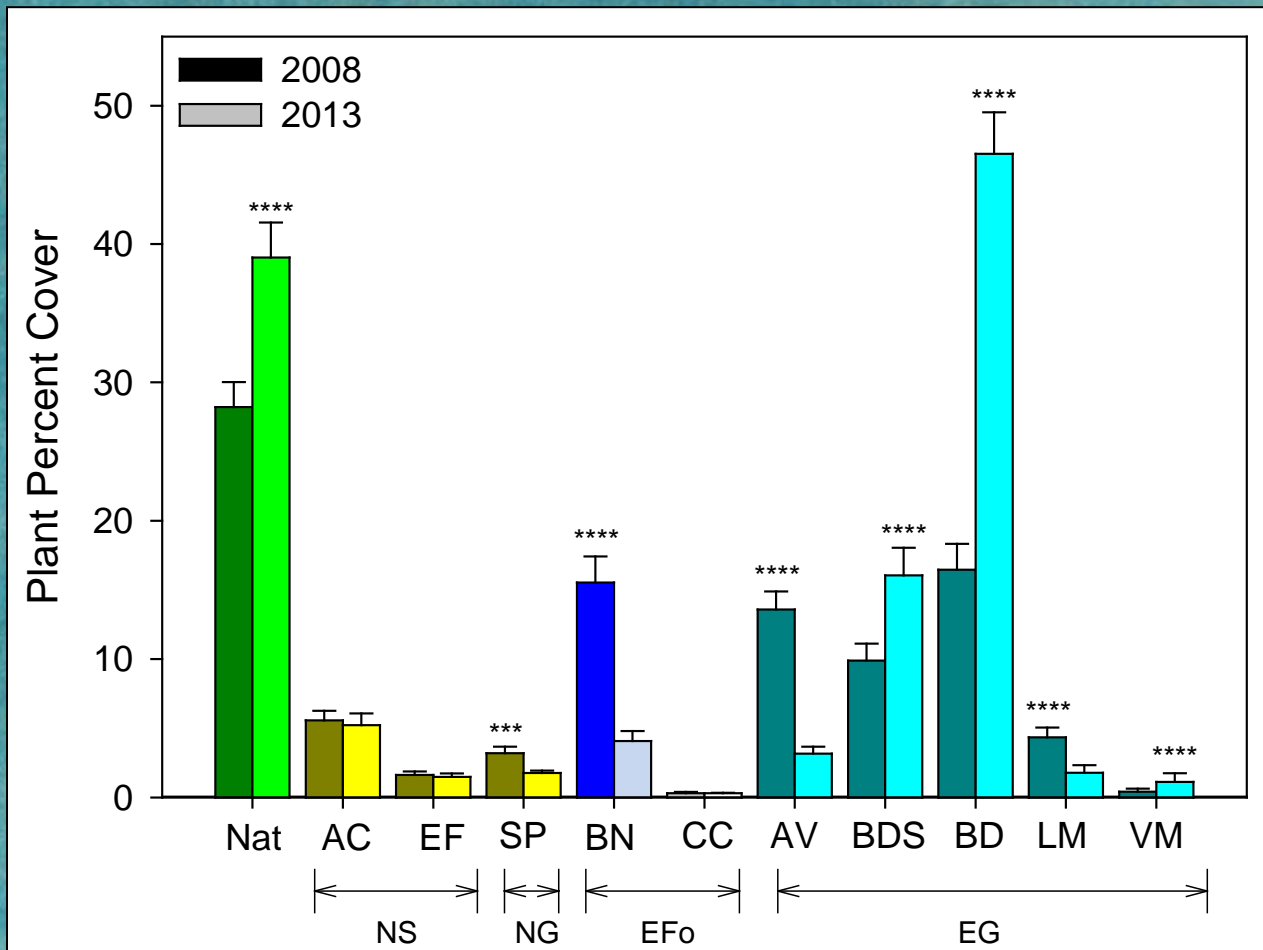
1. Describe the current vegetation community.
2. Tease apart trends due to management efforts, environmental conditions and land use/disturbance legacies.
3. Identify “stuck” sites.





**Substantial increases in native cover class, a pulse in Mustard (BRNI) cover class and reduced CYCA cover class in 2008.**

# Subordinate Natives Dominate the Increase in Natives and Exotic Grasses Dominate Exotics



**Nat = Total native cover**

**Native Shrubs - NS**  
 AC = *Artemisia californica*  
 EF = *Eriogonum fasciculatum*

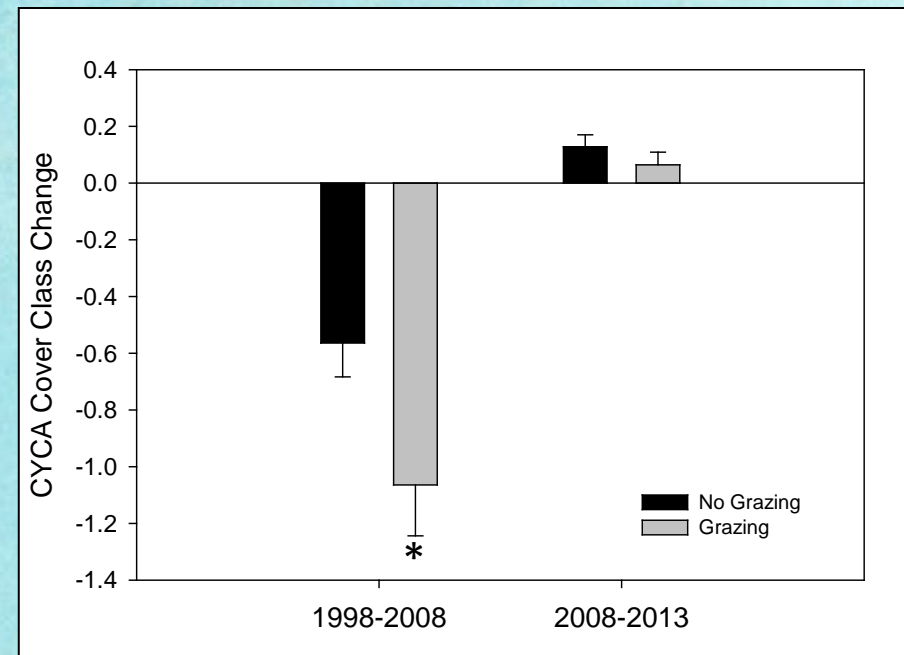
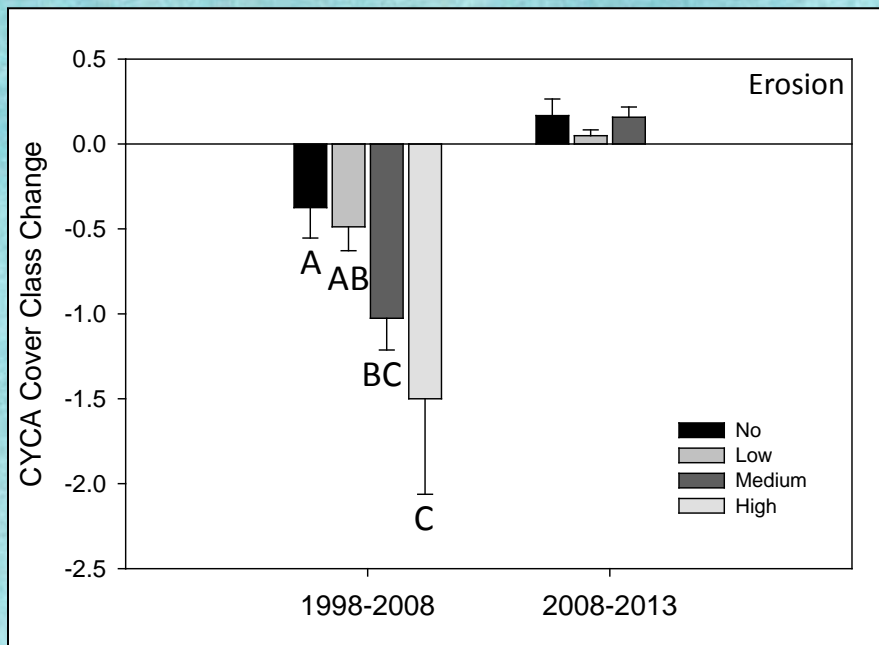
**Native Grasslands - NG**  
 SA = *Stipa pulchra*

**Exotic Forbs - EFo**  
 BN = *Brassica nigra*  
 CC = *Cynara cardunculus*

**Exotic Grasses - EG**  
 AV = *Avena species*  
 BDS = *Brachypodium distachyon*  
 BD = *Bromus diandrus*  
 LM = *Lolium multiflorum*  
 VM = *Vulpia myuros*

# Disturbance History Influenced Artichoke Thistle (CYCA) 1998-2008???

Greatest decreases in cover class at sites with a history of grazing and erosion. However, initial cover was greatest at sites with greater disturbance

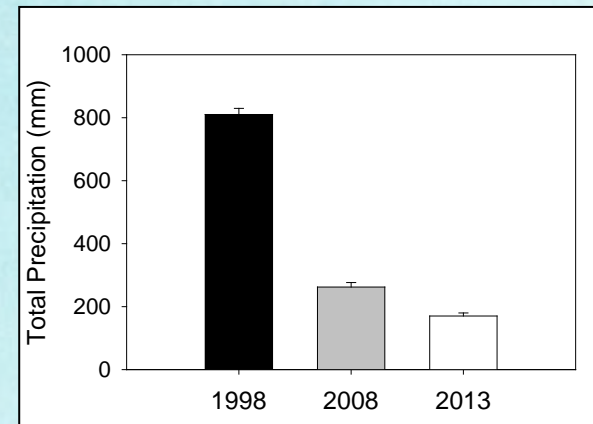
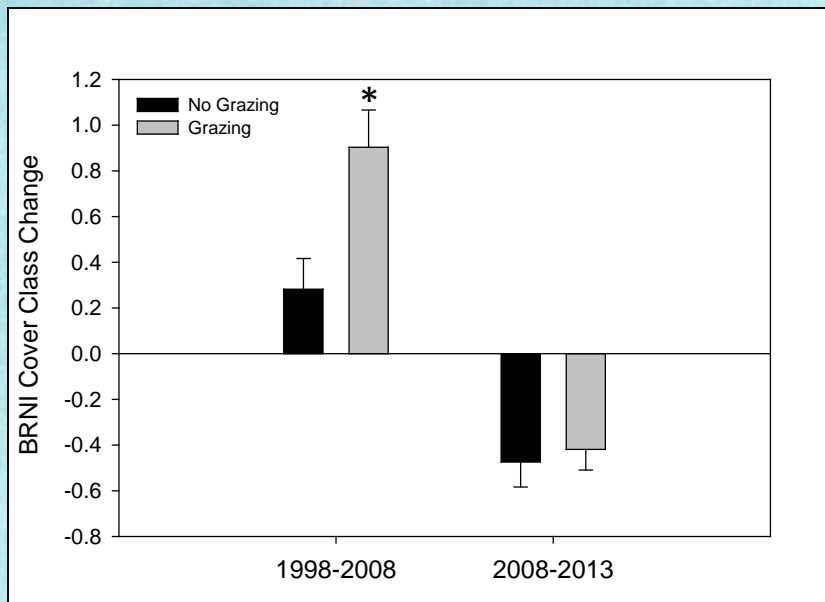
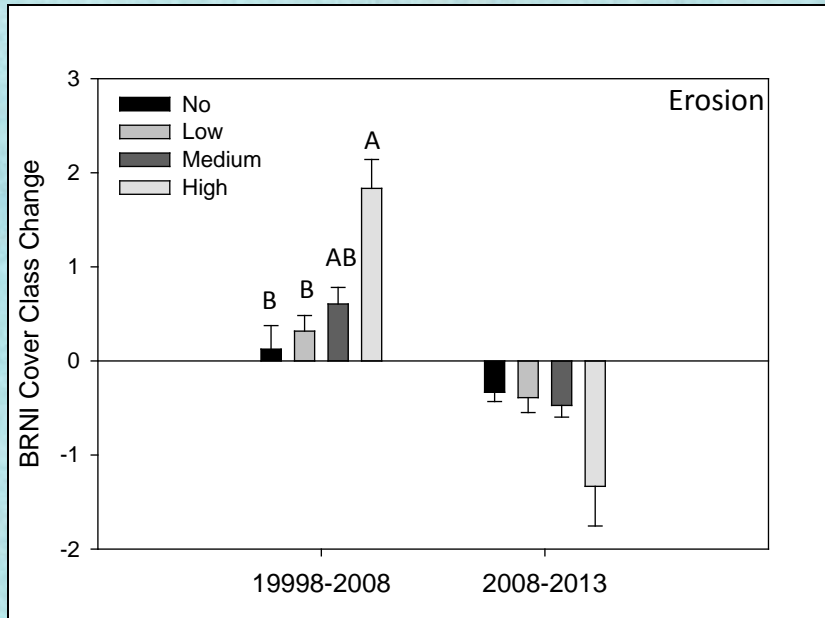


# Disturbance History Influenced Mustard (BRNI) 1998-2008

Greatest increases in cover class at sites with a history of grazing and erosion

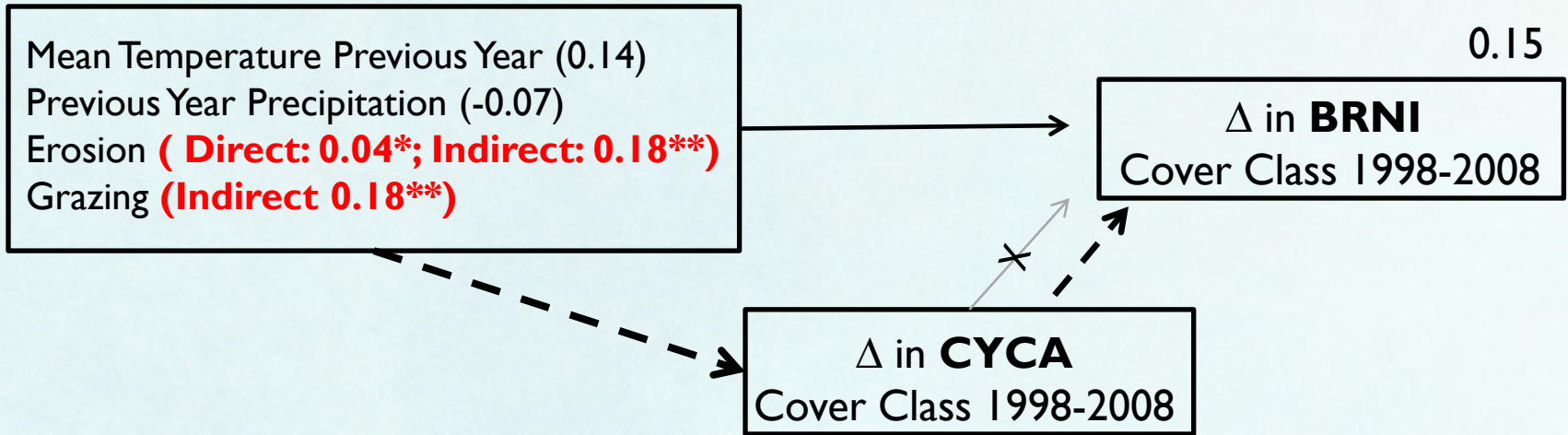
Pulse event potentially caused by:

- 1998-2008 release from CYCA competition within areas of disturbance.
- 2008-2013 reduction due to less favorable growing conditions in 2013



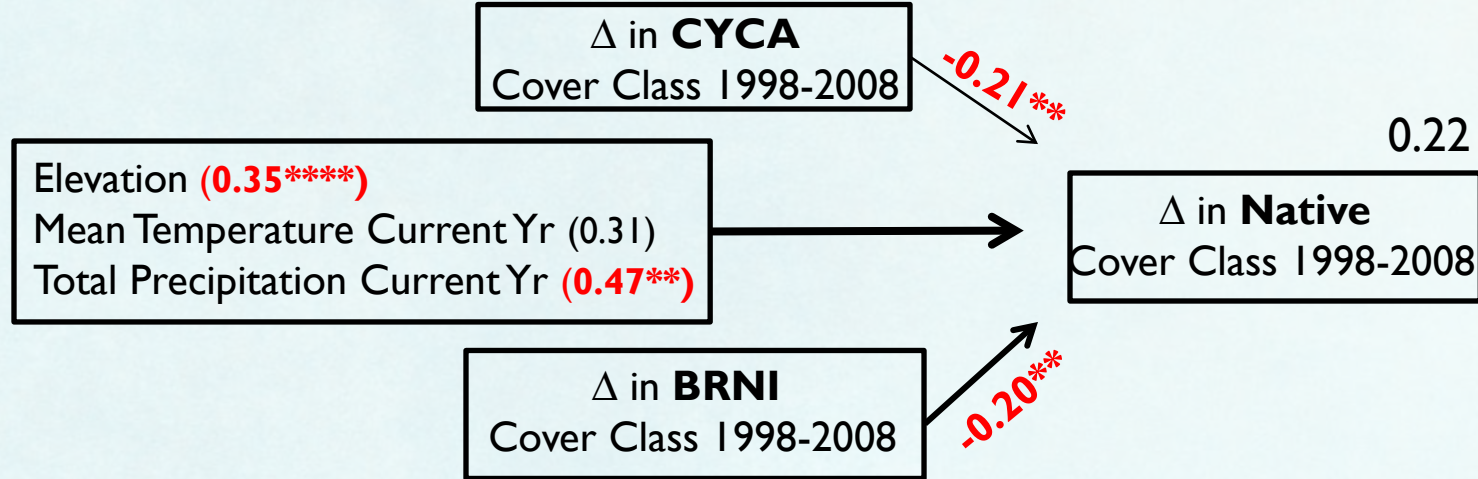


# How has the Removal of CYCA Effected BRNI?



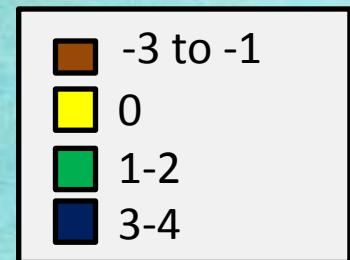
**1998-2008:** Bollen P = 0.404, RMEAS = 0,  $p = 0.478$

# How has CYCA Removal Affected Native Cover?



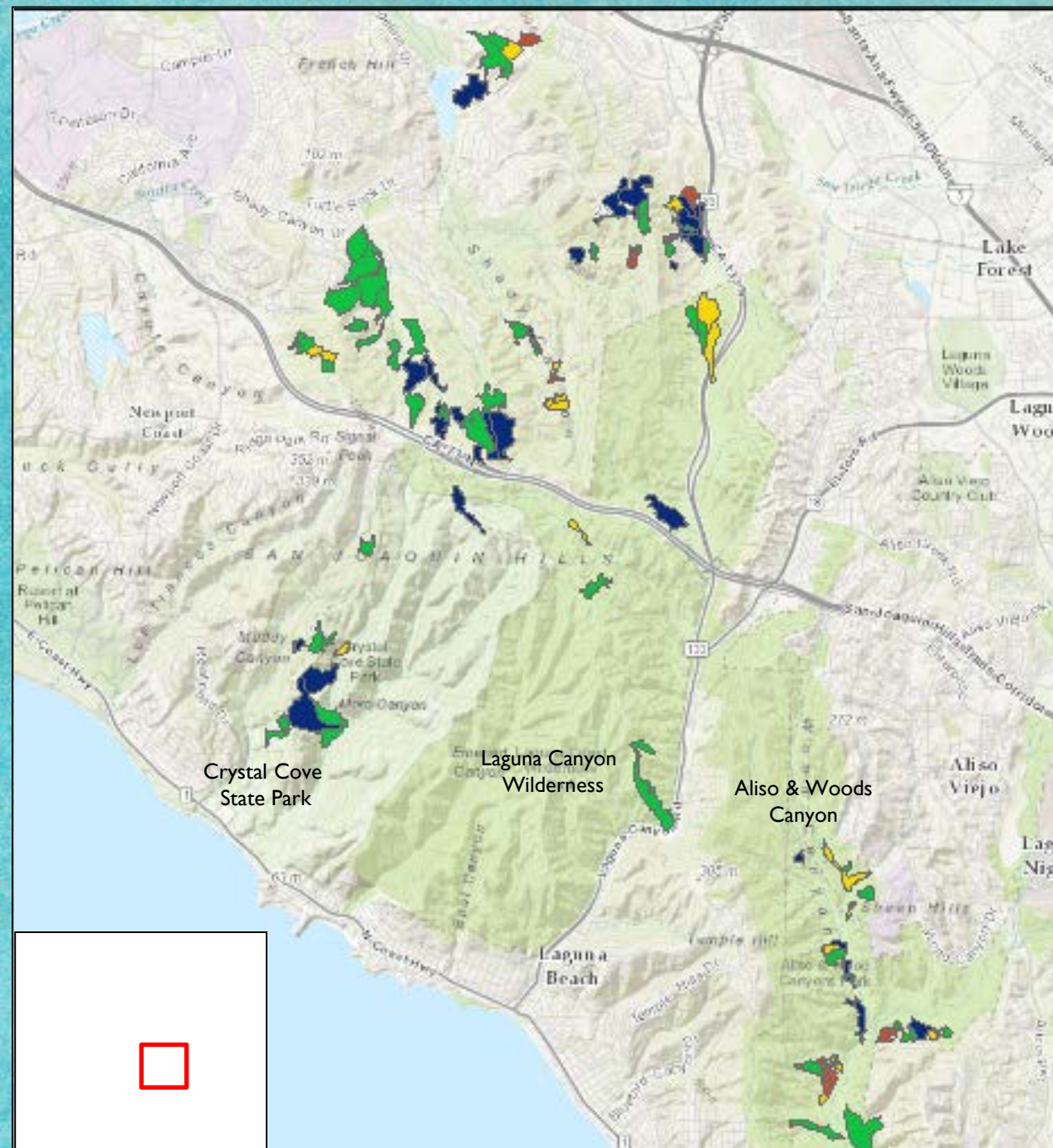
**1998-2008:** Bollen  $p = 0.294$ , RMEAS = 0,  $p = 1.0$

# 1998-2013 Change in Native Cover



**Stuck sites are in areas of:**

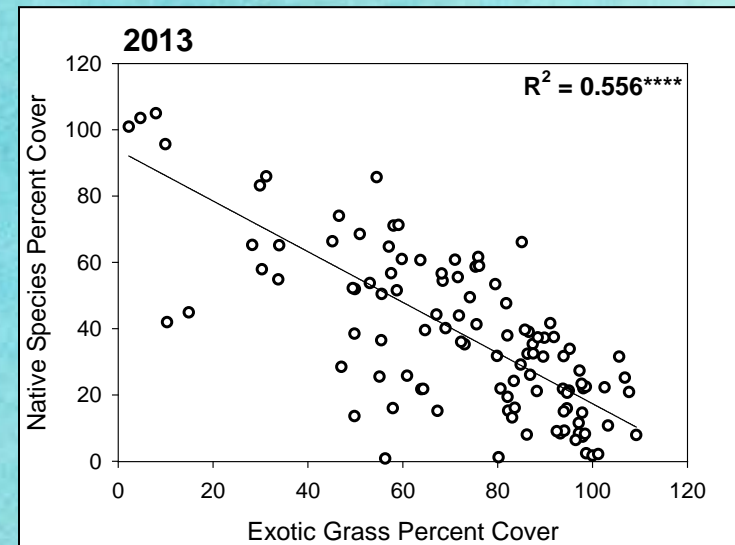
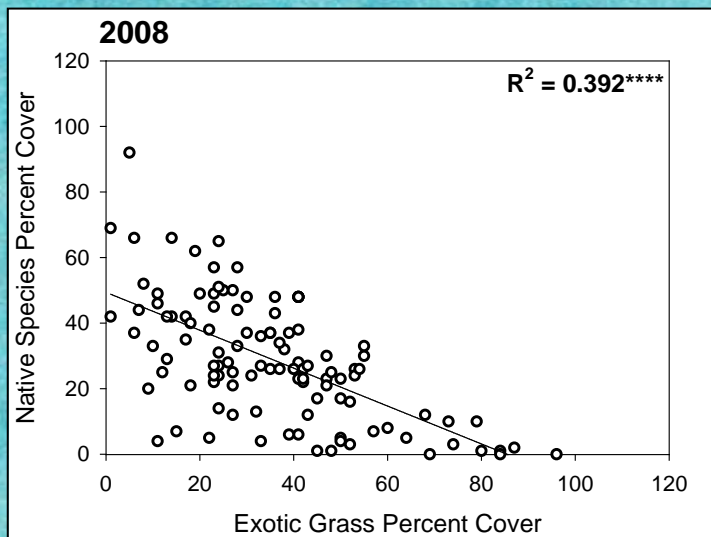
- Lower elevation
- Fewer years of treatment
- More recent fires





# Environmental, Land Use/Disturbance and Management Contexts Explain Presence of “Stuck” Sites; Or not?

- ? Environment: Lower elevations (agriculture x elevation\*\*\* unpublished data)
- ? Land use/disturbance: Recent fires ( $R^2 = 0.102^{***}$ )
- X Management: Fewer years treated.
- ? Other: Exotic grasses are invading where BRNI is declining (grazed  $R^2 = 0.0720^*$  and eroded  $R^2 = 0.045^*$ )



# Conclusions

- 15 years of weed control reduced CYCA and moved many sites onto a trajectory of restoration.
- Disturbances such as grazing and erosion were associated with greater initial invasion of CYCA, greatest reductions in CYCA and the 1998-2008 pulse in BRNI.
- Removal of CYCA alone did not produce the BRNI pulse, the combination of available disturbed sites and favorable precipitation levels did.
- Some “stuck” sites persist and tend to be at lower elevations where there were fewer treatment years, more recent fires and greater increases in exotic grass cover.



# Conclusions

## Native cover class was limited by exotic species:

- Greatest intensities of grazing and agriculture at lower elevations which were most susceptible to invasion and least likely to have native cover.
- 1998-2008 increases in CYCA and BRNI cover had a negative influence on native cover, but not in 2008-2013 when CYCA and BRNI cover was lower.
- Lower precipitation was associated with increased native cover class, but decreased exotic cover class (particularly 2008-2013).
- Exotic grass cover was increasing in disturbed areas where CYCA and BRNI were previously and at sites that appear “stuck” or declining in native cover.



# Management Implications

- Areas with a history of erosion and grazing should be monitored more regularly as they are at higher risk of invasion.
- Though disturbed sites are at higher risk, control of CYCA is effective and BRNI control efforts may be most needed in wetter years.
- Native plant community needs may change over time as plant community composition changes and intense disturbances are reduced.
- Regular monitoring is necessary to ensure management actions adapt to current needs and identify when even smaller battles have been won.







**Thank You!**