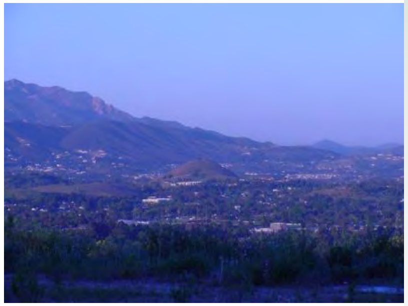
National Park Service

EXPERIENCE YOUR AMERICA

Conservation of Rare Plants in the Santa Monica Mountains NRA or How I Learned to Stop Worrying and Love Rare Plants



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Santa Monica Mountains National Recreation Area

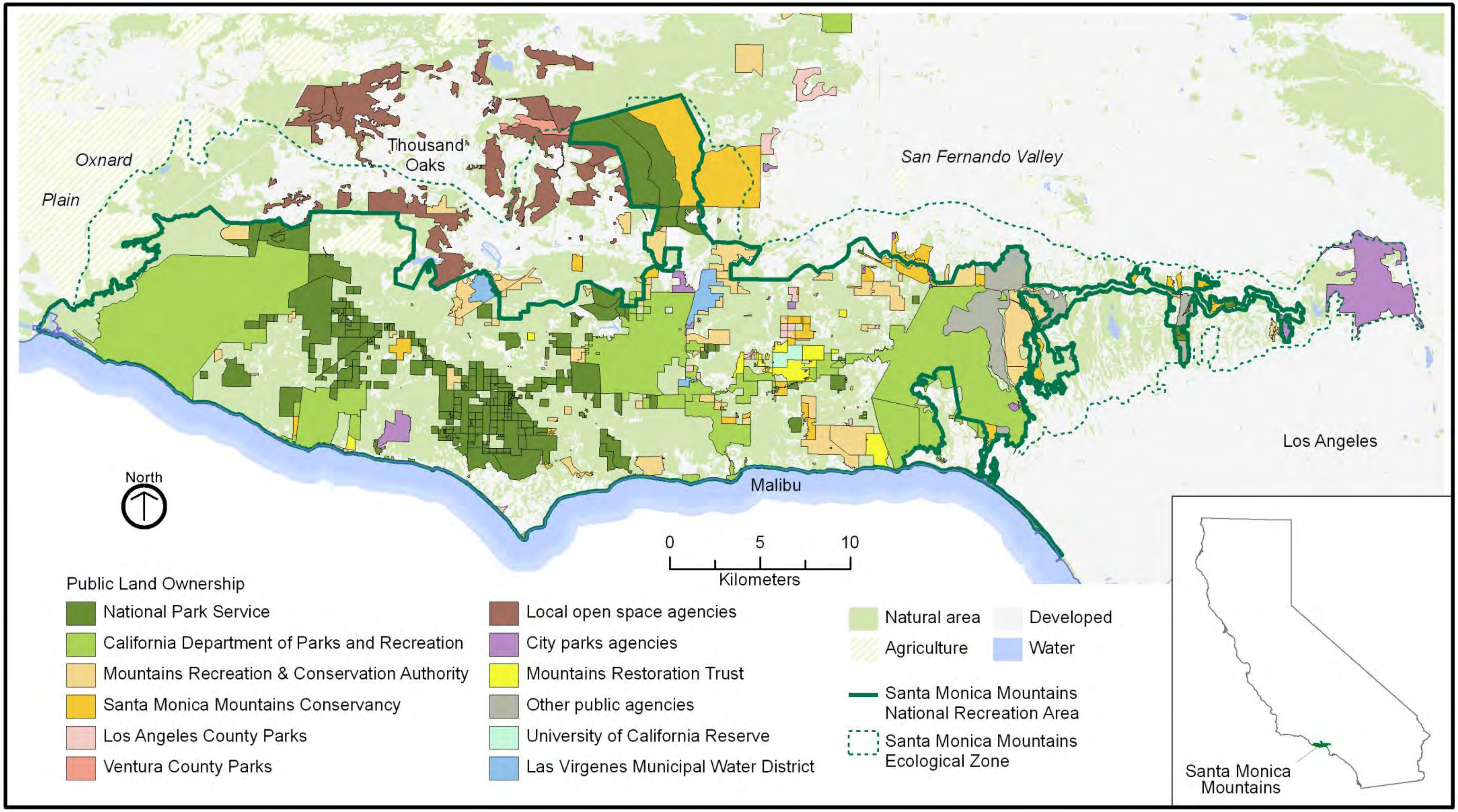
Conservation of Rare Plants in the United States Largest Urban National Park

1. Background
2. Actual Research
3. Philosophizing
4. Other Considerations

1. Santa Monica Mountains NRA

- 150,000 acres
- NPS lands = 23,000 acres
- 67 cooperating land management agencies
- Main habitats: coastal sage scrub, chaparral
- Also oak savanna, native grassland remnants, riparian

1.1 A Complex Mosaic of Ownership



1.2 Management Issues

- Invasive species
- Conservation of threatened and endangered species
- Impacts of urbanization
- Impacts of past land use
- How to protect existing biological diversity
- Detecting change in park resources

1.2 SMMNRA Intro. Continued:

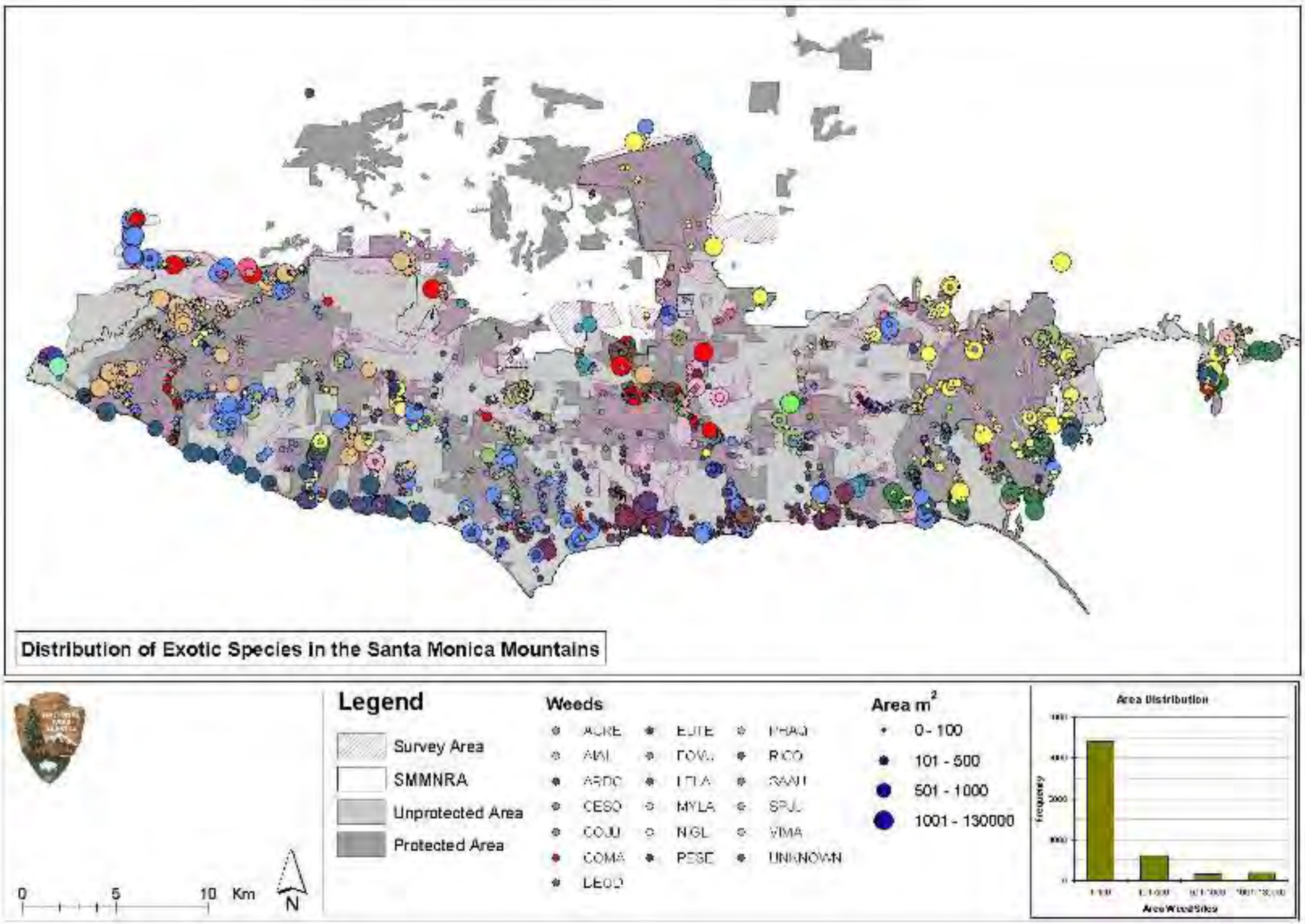
Rare Plants

- Nine state and/or federally listed species
- Large number of sensitive species
- Large number of sensitive plant communities

1.3 SMMNRA Intro. Continued: Major invasive species

- Ailanthus altissima
- Acroptilon repens
- Arundo donax
- Asphodelus fistulosus
- Centaurea solstistialis
- Cortaderia jubata
- Conium maculatum
- Delairea odorata
- Euphorbia terracina
- Foeniculum vulgare
- Lepidium latifolium
- Myoporum laetum
- Nicotiana glauca
- Pennisetum setaceum
- Phalaris aquatica
- Ricinus communis
- Salsola australis
- Spartium junceum
- Vinca major

1.3 Invasive species, cont.



1.3 Invasive Species Cont.

- 300 non-native species
- 19 identified by local experts and literature review as invasive
- 4000 infestations mapped
- Most infestations small in size

2. A Research Synopsis – What Have We learned?

- Nothing earth-shattering
- Impacts of invasive species on T and E plants
- Reintroduction and restoration of rare species
- Genetic differentiation across species ranges
- No evidence of ecotypic differentiation
- No signs of pollinator limitation
- Periodic events and persistence

2.1a Endangered Species and Impacts of Non-natives: Making the world better for Lyon's Mini Daisy

- Restricted to Santa Monica Mountains
- Populations in decline
- Large scale habitat loss
- Unknowns

Photo courtesy of Michael Charters

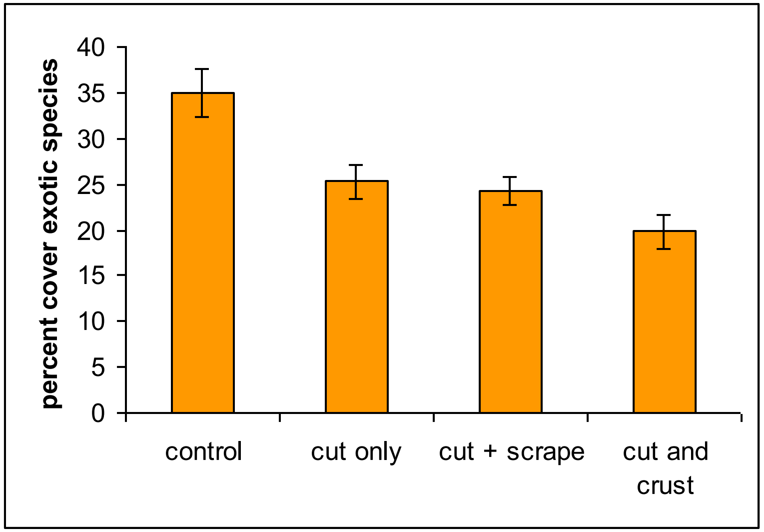
Team Pentachaeta

- Two sets of experiments
  - Population level
    - Remove exotics
    - Remove exotics + scrape soil
    - Remove exotics + scrape + soil crust
  - Individual
    - With and without competitors
- Population surveys
- General habitat improvement projects

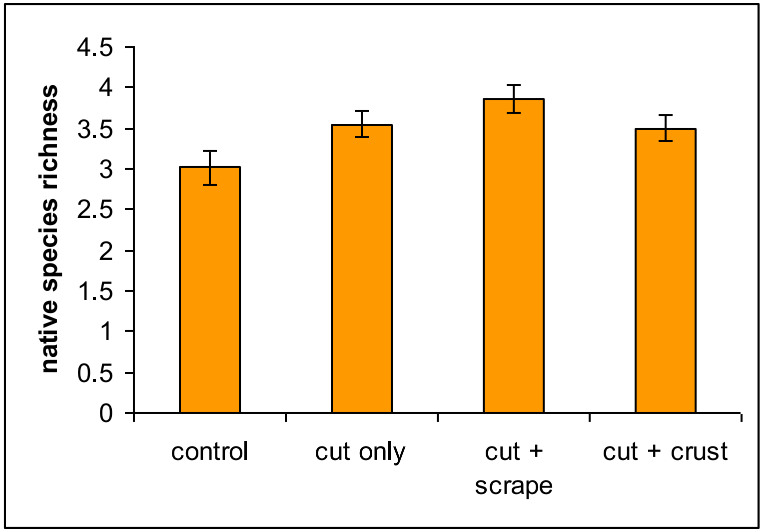
Thesis work of Jolene Moroney

Results: Community Studies

Treatment Effects on Exotic Species Cover



Treatment Effects on Number of Native Species

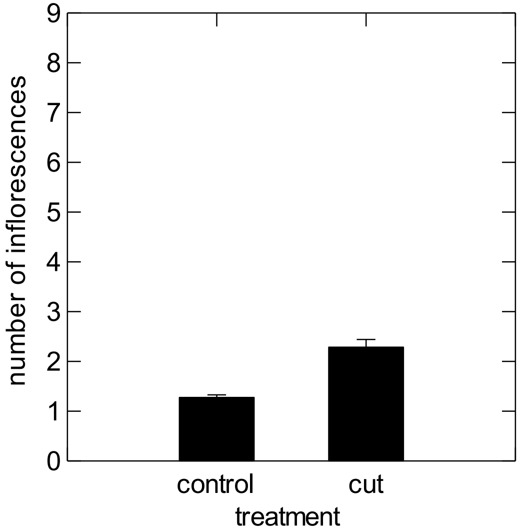


No effects of treatments on Pentachaeta numbers

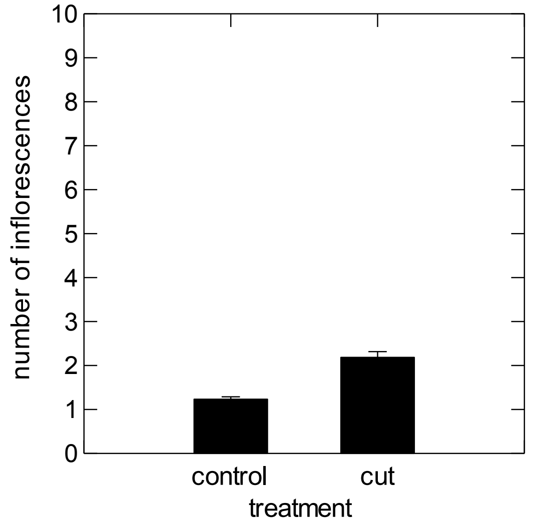
Results: Individual Plants

Exotic species impacts on the number of Pentachaeta flowers

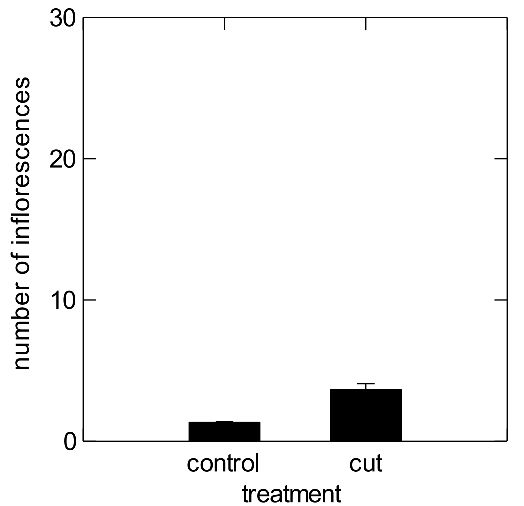
Effects of Erodium

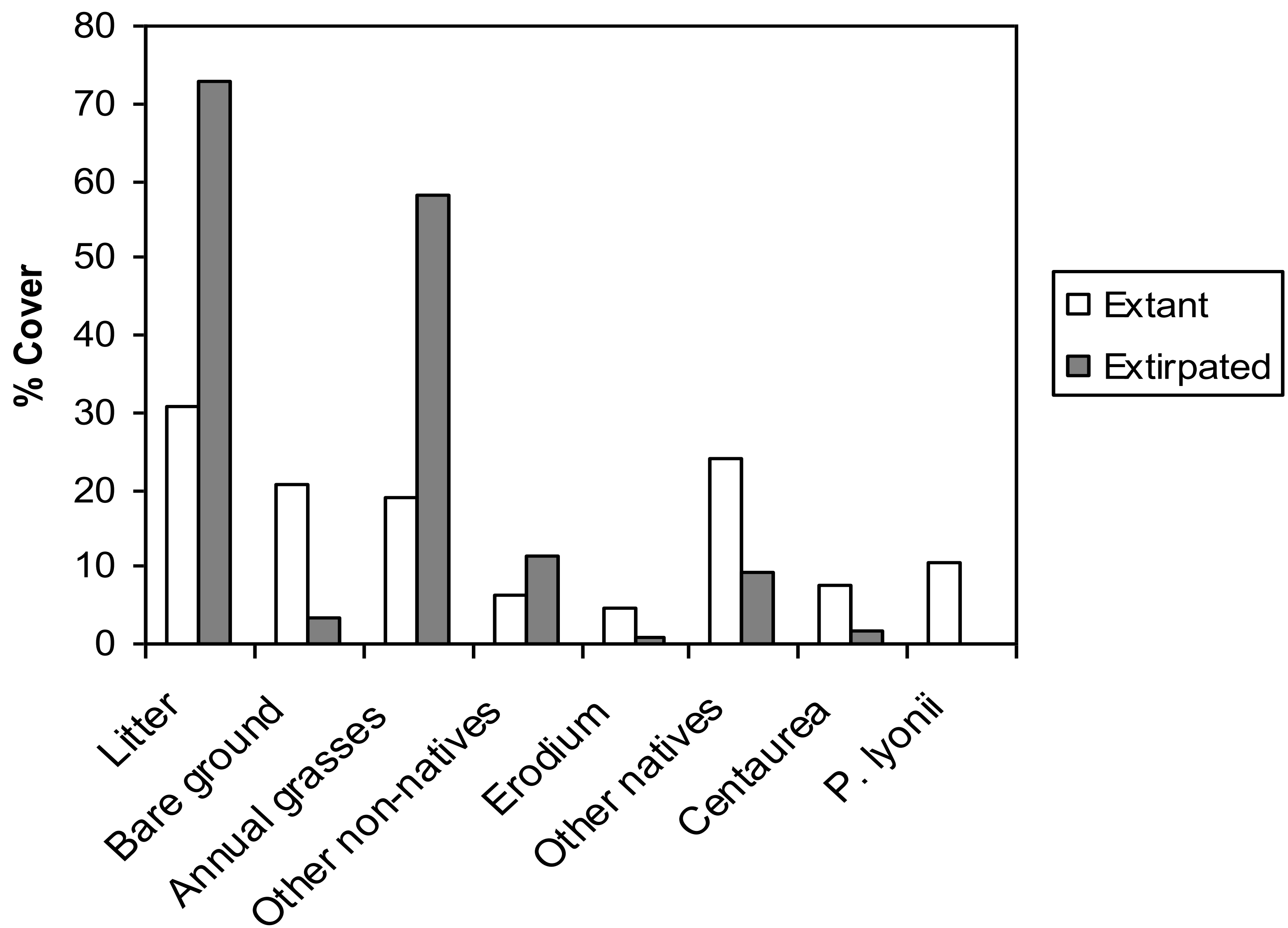


Effects of grass sp.

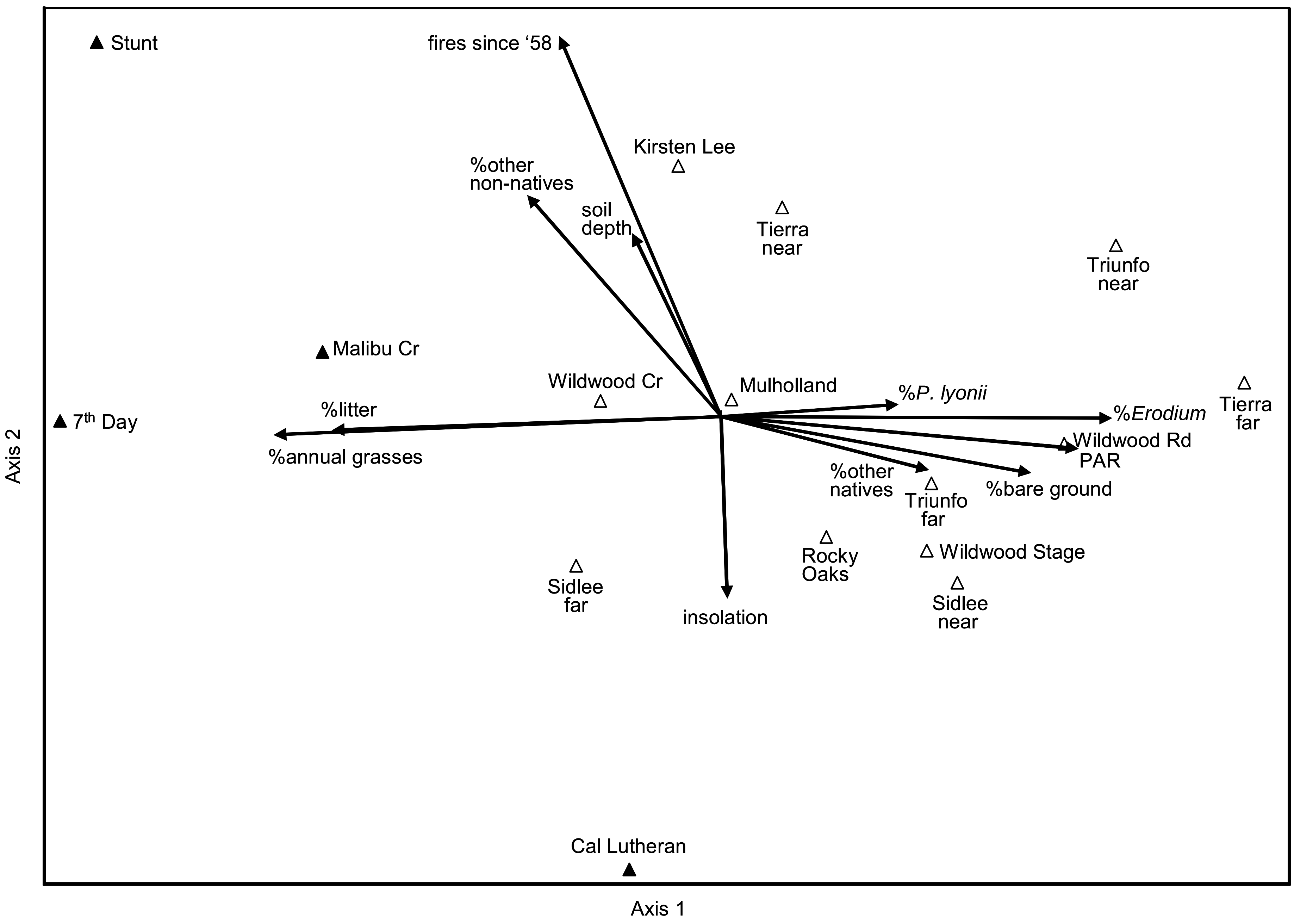


Effects of Centaurea




% Cover
80
70
60
50
40
30
20
10
0
Extant
Extirpated
Litter
Bare ground
Annual grasses
Other non-natives
Erodium
Other natives
Centaurea
P. lyonii

Non-metric Multi-dimensional Scaling – Extant vs. Extirpated Sites



Conclusions re: Lyon's Mini Daisy

- Exotic plants have negative impacts on Pentachaeta
- These impacts are likely due to direct competition
- Treatments that reduce competition will help Pentachaeta
- Within sites Pentachaeta is likely limited by a combination of factors, not just competition

2.1b Reintroduction of Pentachaeta

- Less than ten populations on protected open space
- Private populations being lost to development
- Only one population on NPS land

Simple Approach

- Site gestalt from competition experiments
- Looked for co-occurring species and appropriate habitat conditions
- Got USFWS permission for moving seed
- Used location as preliminary screen for genetics, later confirmed by graduate student project

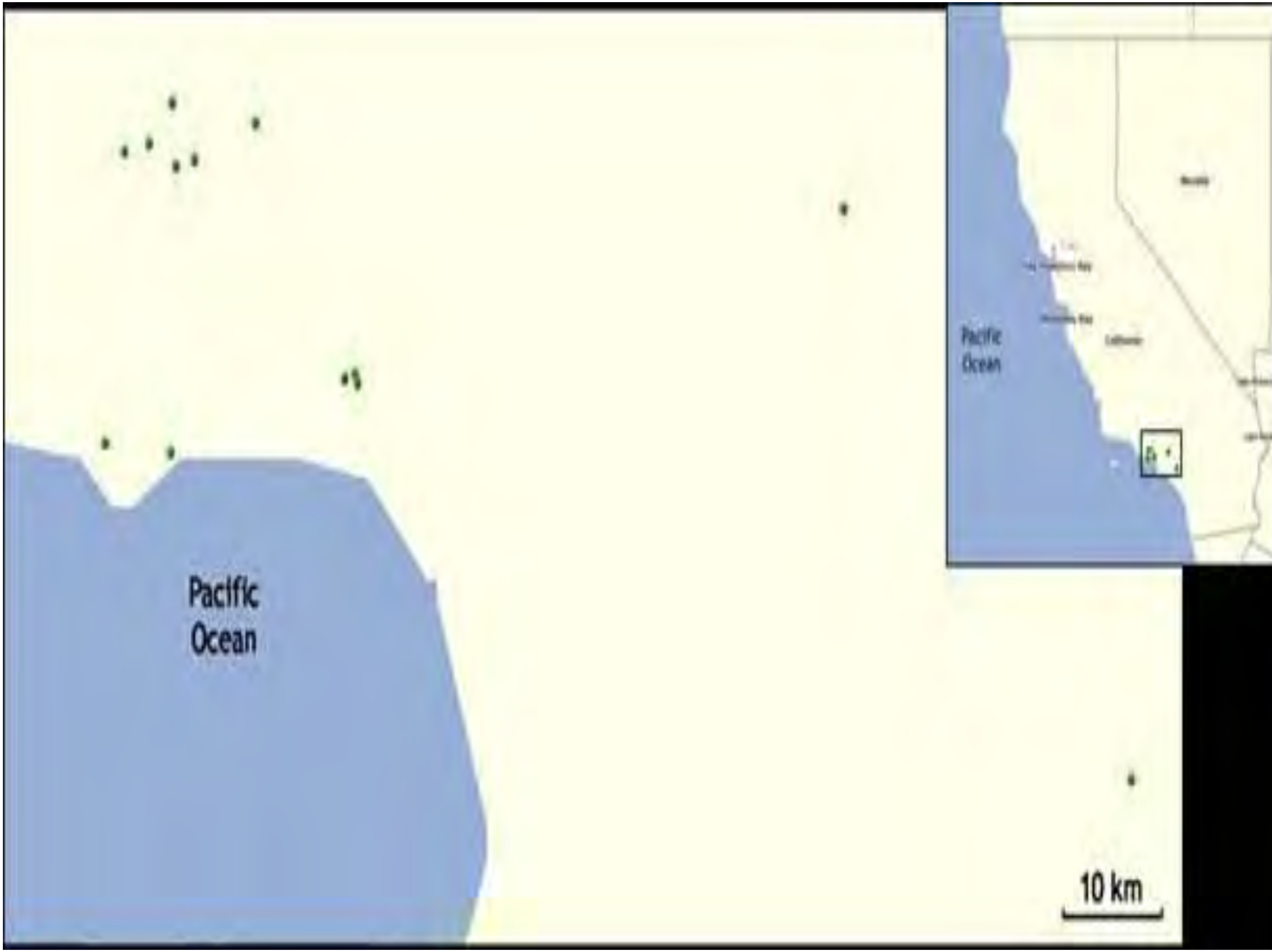
What, Where, What Happened?

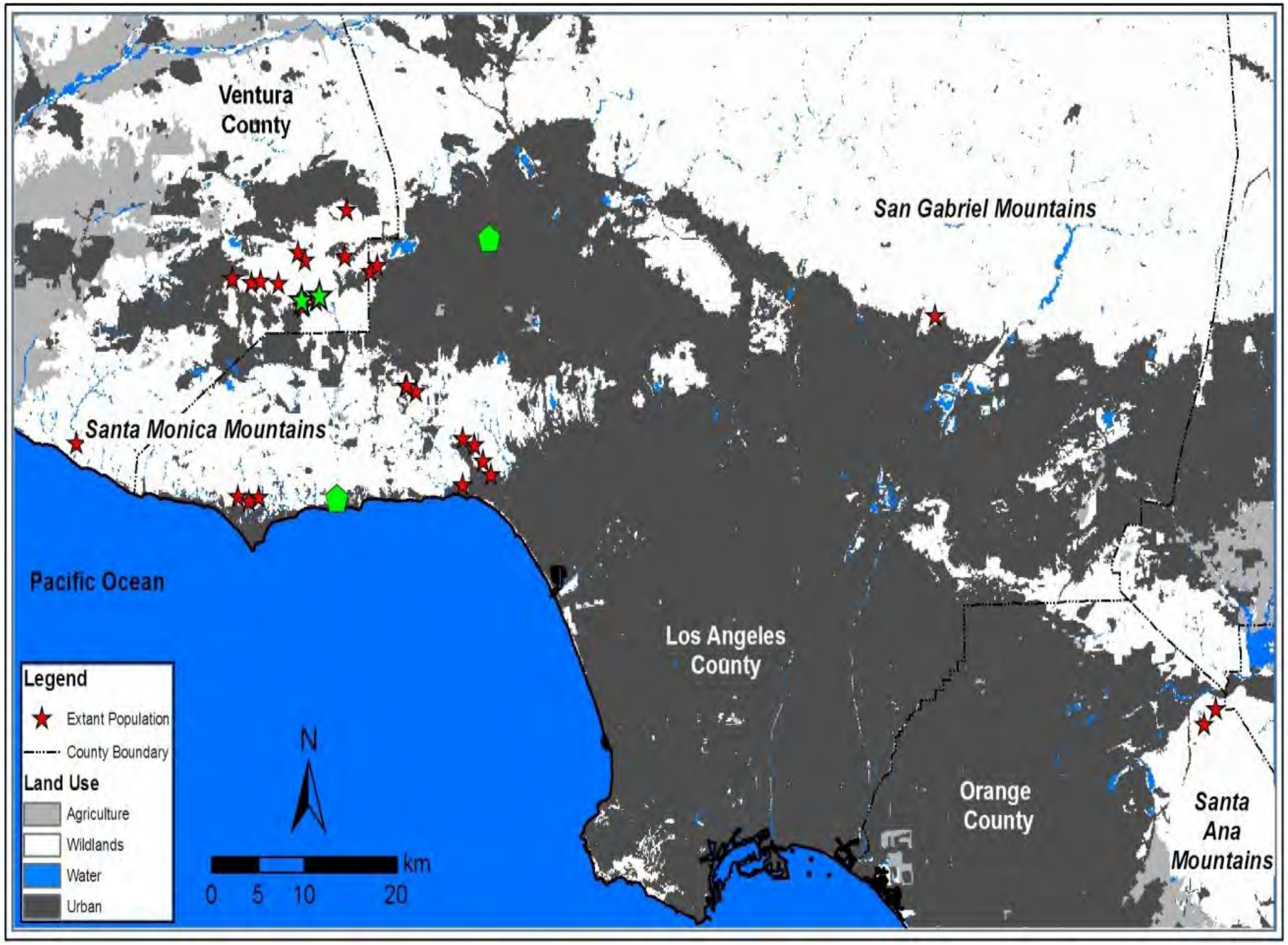
- Three sites
- 2 NPS, one land trust
- Small amounts of seed (100 seeds per half meter plot, between 10 and 15 plots per site)
- Put seed out in winter
- Populations persist (8 years later) and are stable to increasing

2.2 Genetics

- Pentachaeta genetics
- Astragalus quantitative traits

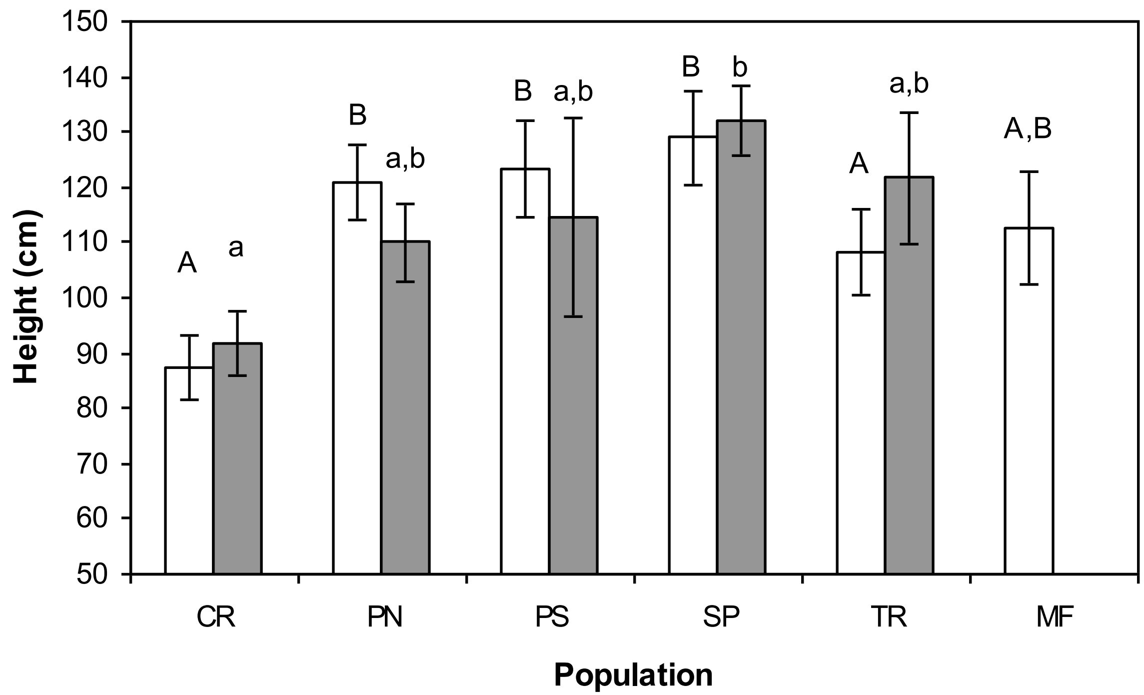
Thesis work by Chris Bowman-Prideux


Pacific
Ocean
10 km
Pacific
Ocean

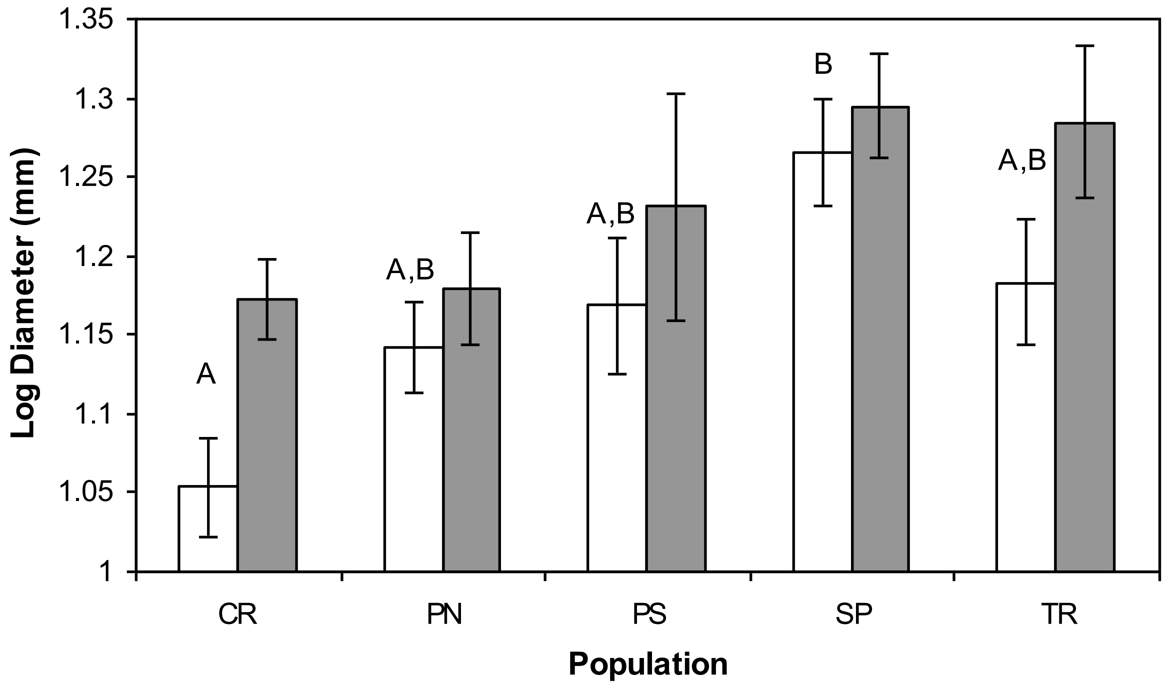


Ventura County
San Gabriel Mountains
Santa Monica Mountains
Pacific Ocean
Los Angeles County
Orange County
Santa Ana Mountains
Legend
Extant Population
County Boundary
Land Use
Agriculture
Wildlands
Water
Urban
N
0 5 10 20 km

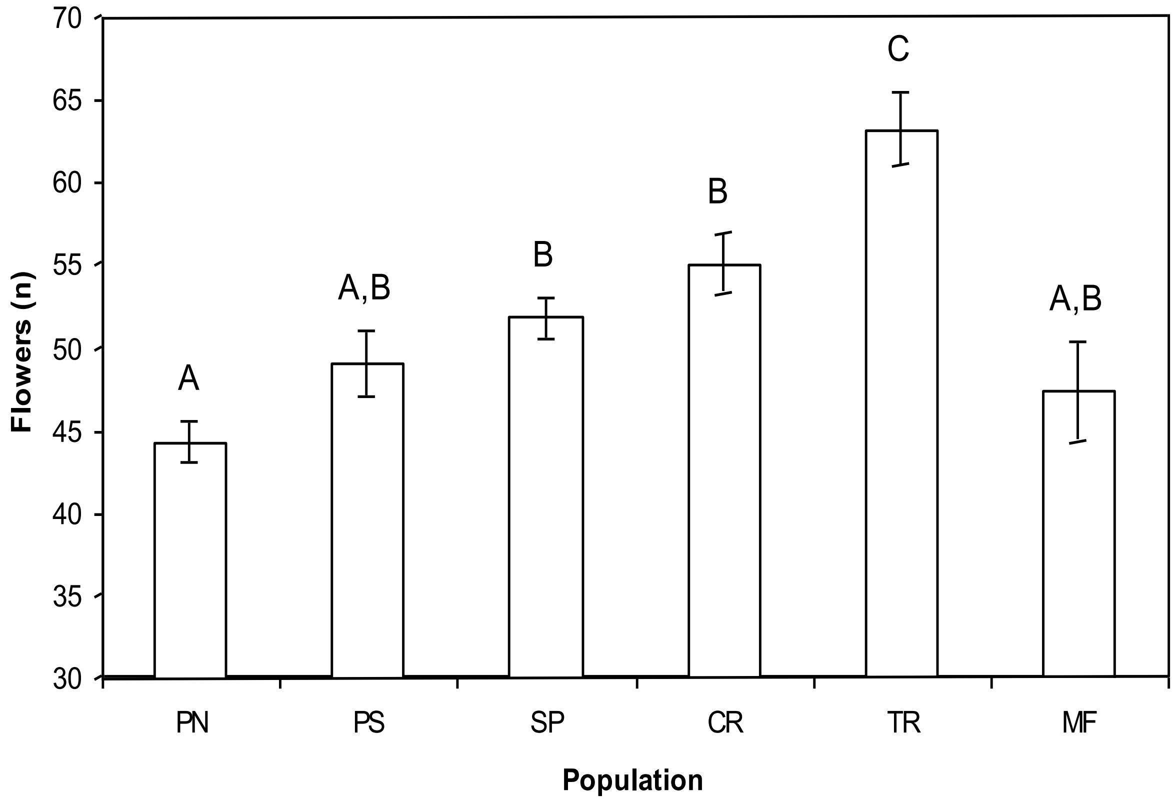
Population Differences in Height



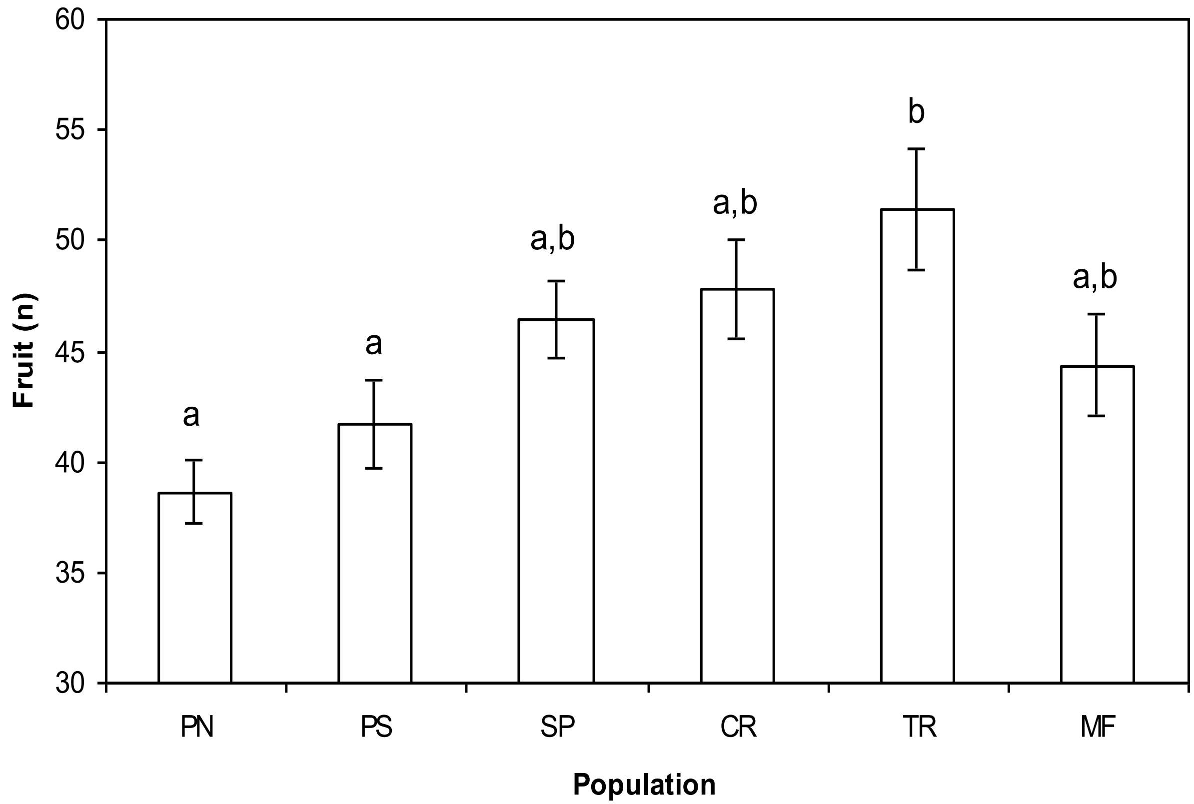
Population Differences in Diameter



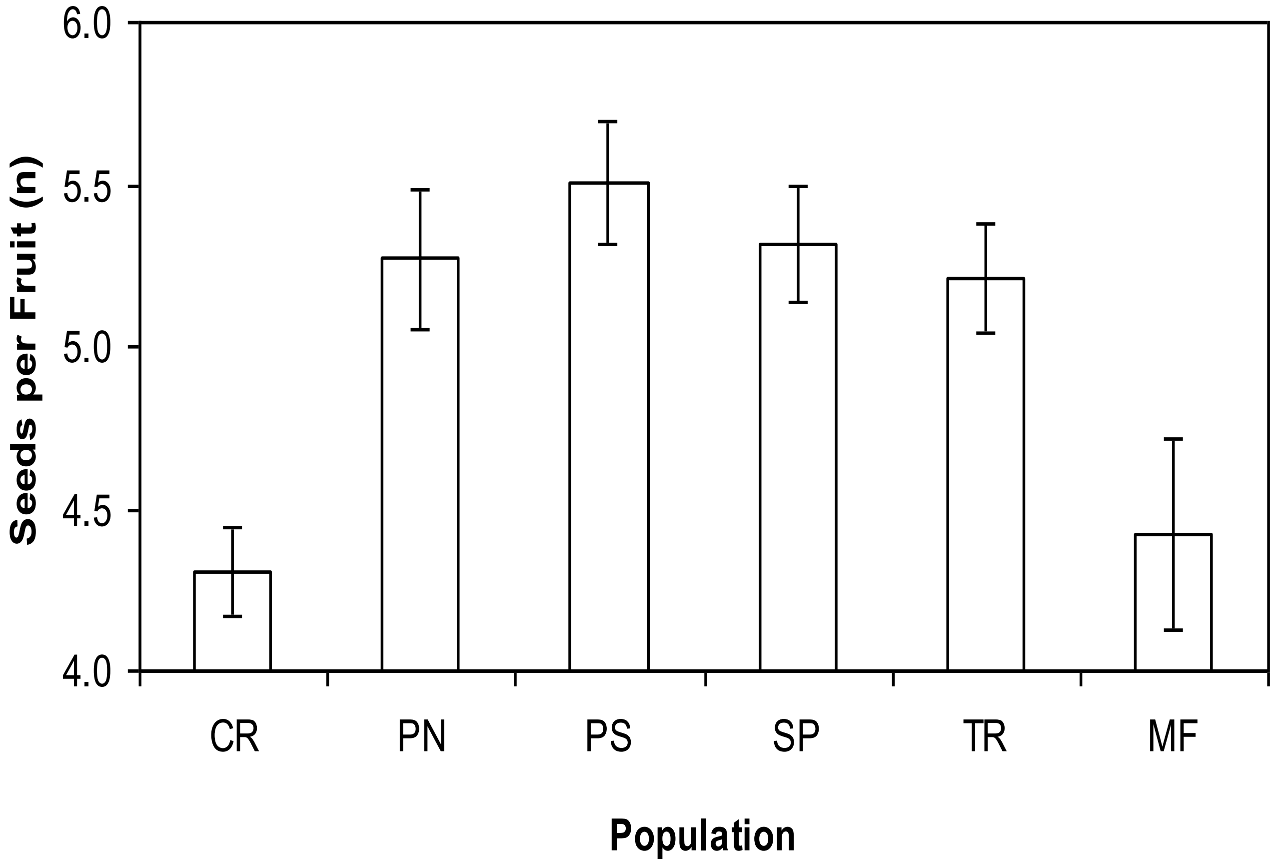
Population Differences in Number of Flowers/plant



Population Differences in Fruit/plant



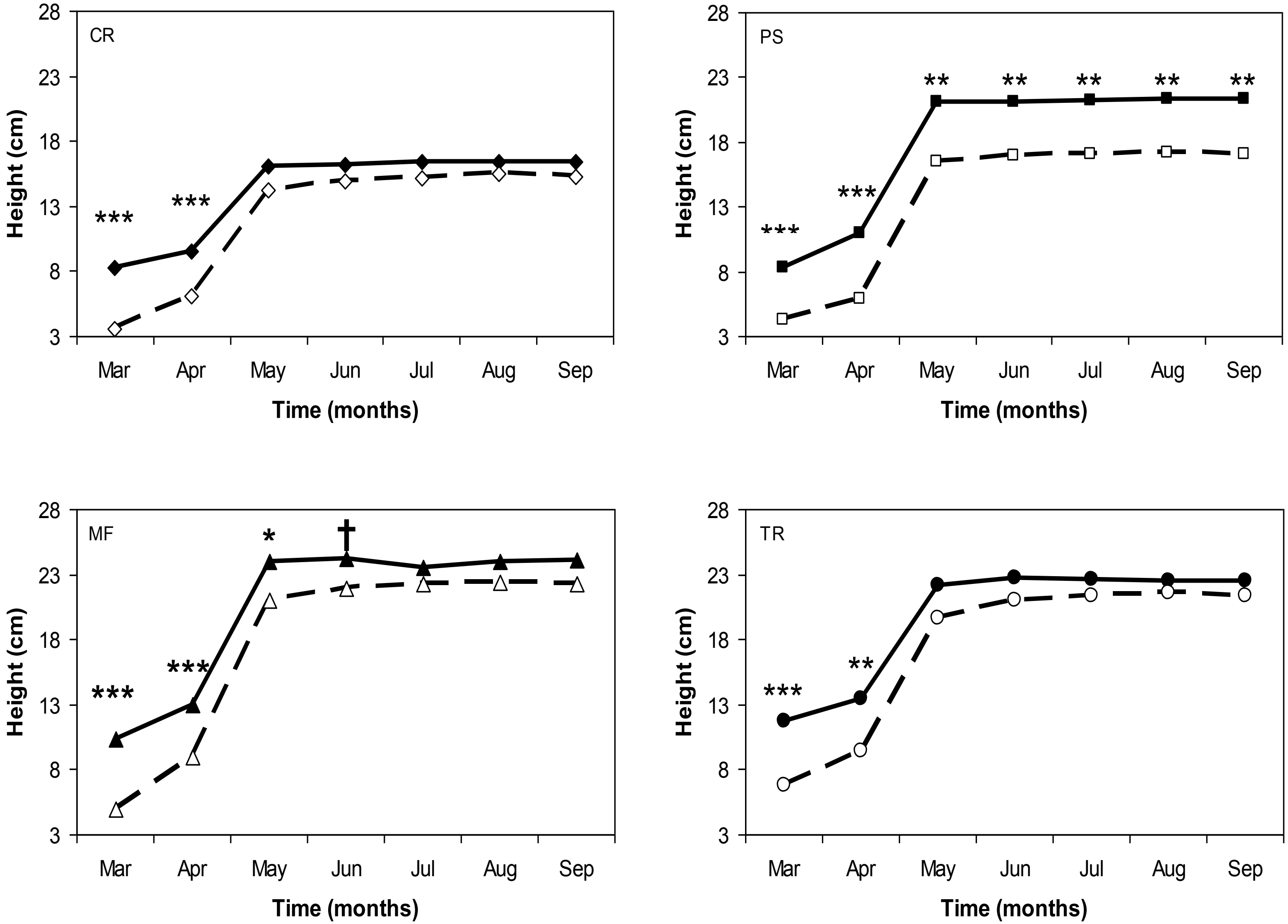
Population Differences in Seeds/fruit



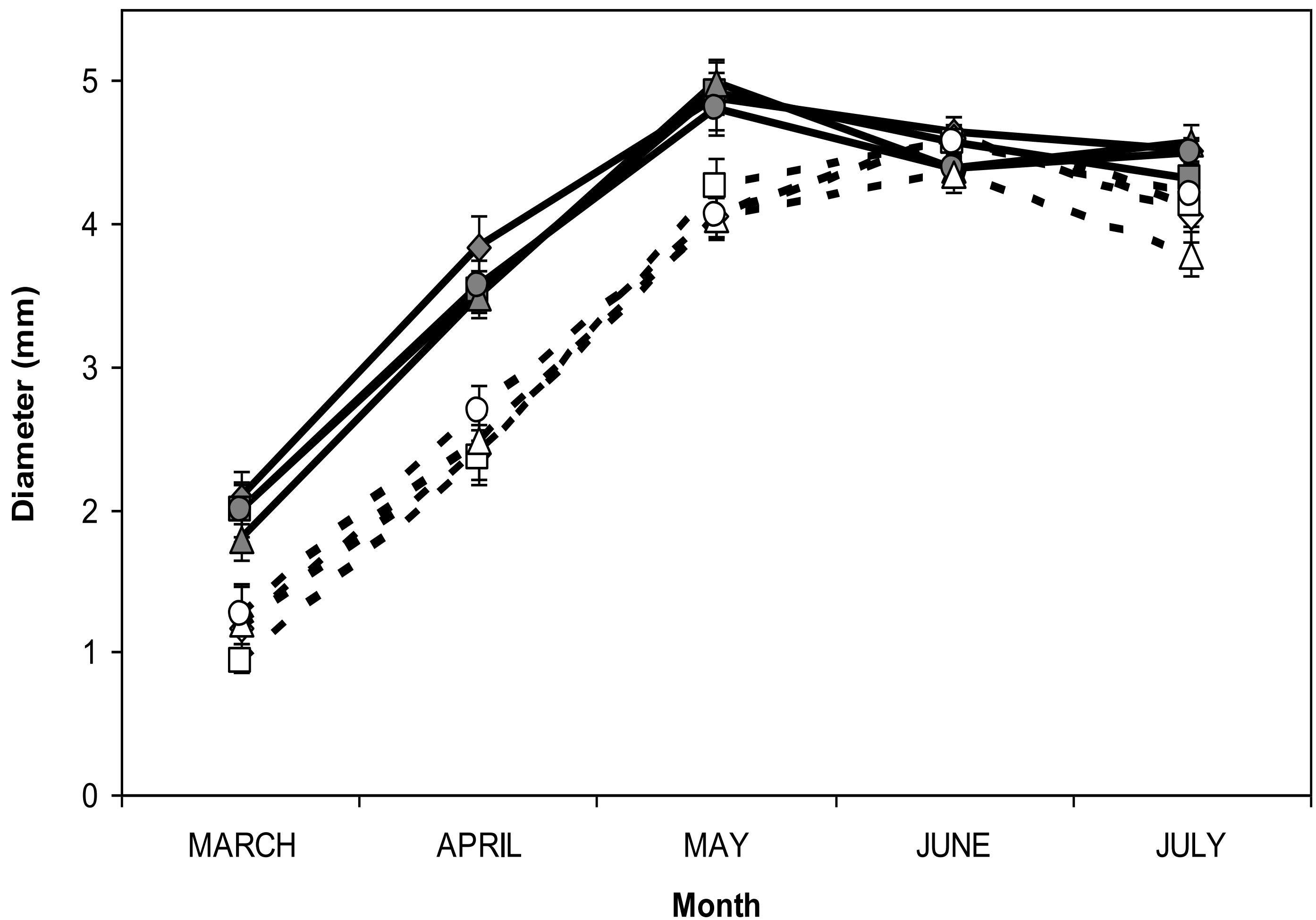
	Summer Temperature (°C)	Precipitation (cm)
TR	27.5	46.2
Coastal Garden	21.4	46.1
MF	32.9	39.0
CR and PS	30.6	47.8
Inland Garden	32.8	42.3

Climate data for the populations and the common gardens. The mean summer temperature was calculated based on daily high temperatures between June 1 and September 30, 2010. Precipitation reflects the total precipitation for those locations between July 1, 2009 and July 30, 2010.

Common Garden Results: Plant Height



Common Garden Results: Plant Diameter



Common Garden Conclusions

- Populations do show genetic differences in performance
- All populations grow better in warmer, inland areas, even those that were from a coastal location
- No crossing of performance lines – the population that performs the best, performs best in all environments
- No evidence for ecotypic differentiation

2.3 Pollination

- Small populations of Lyon's pentachaeta
- Adjacent to development
- Annual plant
- Variable seed set

Thesis work of Jocelyn Holt

Methods

- 2 years of pollinator observations at three populations
- 15 minute observation periods
- Over 2 years observed 5,720 insect visits, 24,012 flower heads
- One year of experiments with placing individual plants at different positions within a patch

Results

Visitation to Patches

- Pollinator service was sufficient
- 7.6 visits per 8 mid-day hours
- Generalist pollinators in Bombylliidae, Megachilidae, Apidae
- Weak positive relationship between increasing density and increasing pollinator visits
- Pollinator service showed only a proportional increase in pollination with increased density

Visitation to Phytometers

- Phytometers in less dense areas got slightly MORE visits
- Phytometers placed furthest from neighbors produced no seed
- Caveat: majority of seed heads were damaged

2.4 Periodic Events

- Astragalus dependent on vegetation clearing events (fire, grading)
- Pentachaeta dependent on high rainfall years
- Dudleya verityi almost wiped out by fire

3. Philosophizing or Best Guesses

- Priority Adaptive Management Actions
- Manage existing or create new?
- Stepping stones?

3. Continued

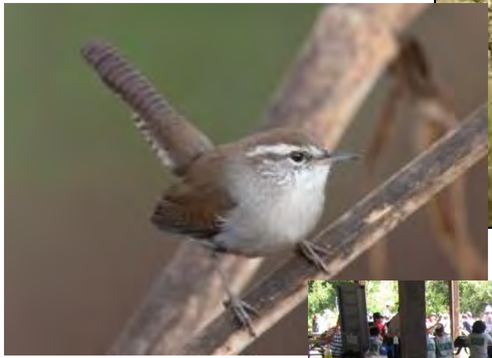
- Management targets and life history / ecology
  - Stability of environment and life history = need less
  - Susceptibility to catastrophe = need more
  - Are threats spatial in nature?

4. Other Considerations

- Climate change
- Genetics
- Toughness of rare plants
- Focus on factors we can change (SAMO example)

Don’t Give Up Hope!

- What you do is SUPER important
- We can take actions and make choices that matter
- You are protecting the biological heritage of our human and non-human communities
- You are helping people see what is special




Questions?