Ecological Correlates of Fountain Grass in Coastal Sage Scrub

Lynn Sweet and Jodie Holt
U.C. Riverside

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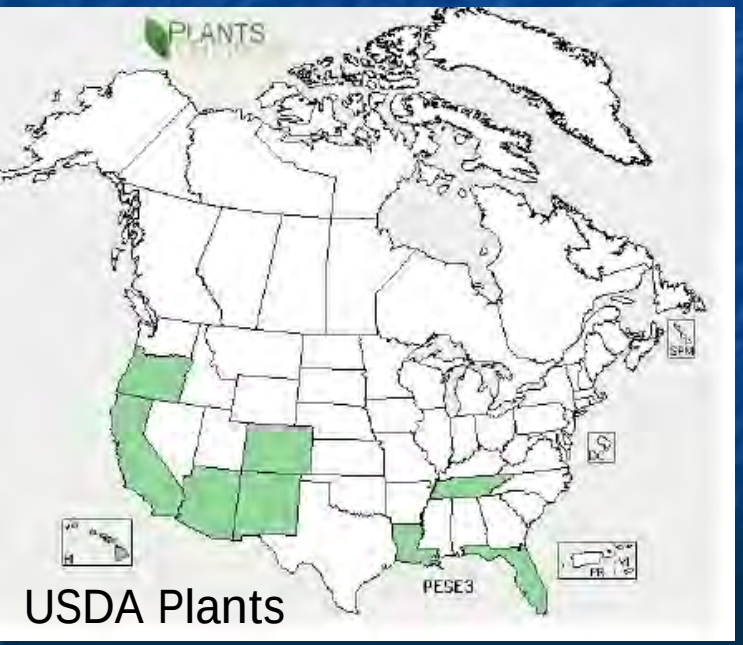
Fountain grass (*Pennisetum setaceum* (Forssk. Chiov.)



USDA Plants

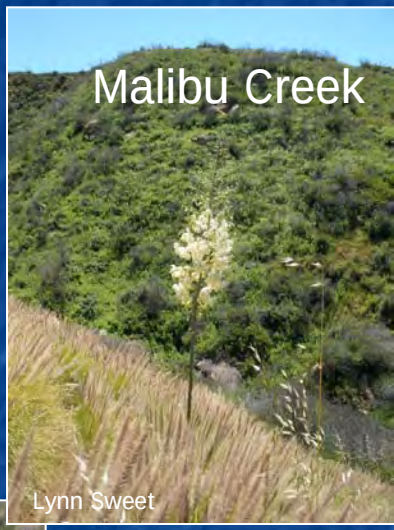
- Native to North Africa and the eastern Mediterranean region
- Naturalized or invasive in Hawaii, Arizona, Nevada, Australia and Southern Africa
- Horticultural introduction
- Perennial C_4 bunchgrass
  - Drought-tolerant, “warm-season”

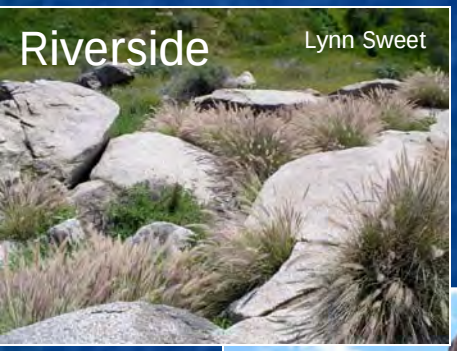
Fountain Grass Problems

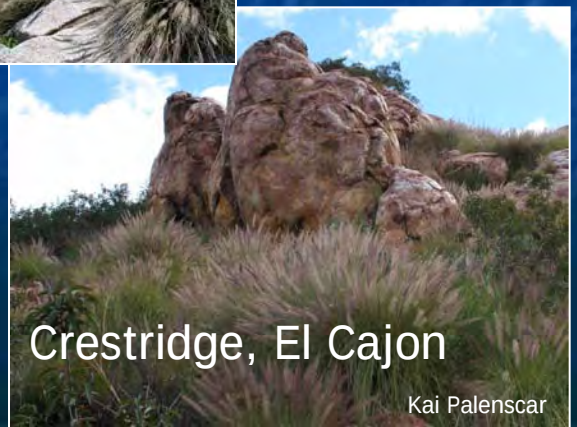
- Invades dry landscapes
- Alters fire cycles and microhabitats (Hawaii)
- Facilitates a conversion from dry forest to grassland (Hawaii) (Blackmore and Vitousek 2000)
- Interferes with recruitment of native species (Hawaii)
- No published information on fountain grass ecology in California

Fountain Grass in California

- First wild-land record from 1917 in Los Angeles
- Extensive stands exist on roadsides
- Localized escaped populations at undisturbed sites in coastal sage scrub (CSS), especially in post-fire areas







Research Goals

- **Improve knowledge about areas susceptible to invasion by fountain grass**
  - *Where in CSS is it most likely to invade?*
  - *Examine physical and biological correlates*
- **Overall study goal: examine changes in communities with fountain grass invasion over several study years**

Sites and Site Selection

- Experiment Replicated in 3 Regions
  - Santa Monica Mountains (SAMO)
  - Riverside County
  - Eastern San Diego
- Selection of Sites
  - >10m invasion
  - Wild populations located in undisturbed CSS

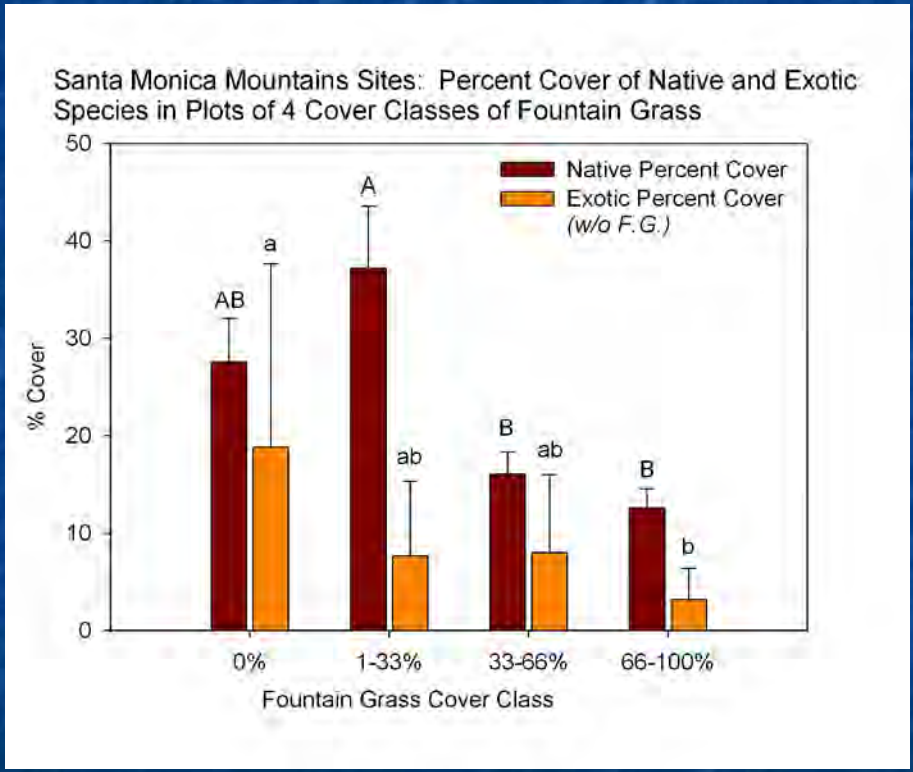
(Riverside County site results not reported here)
(2010 Data not reported here)

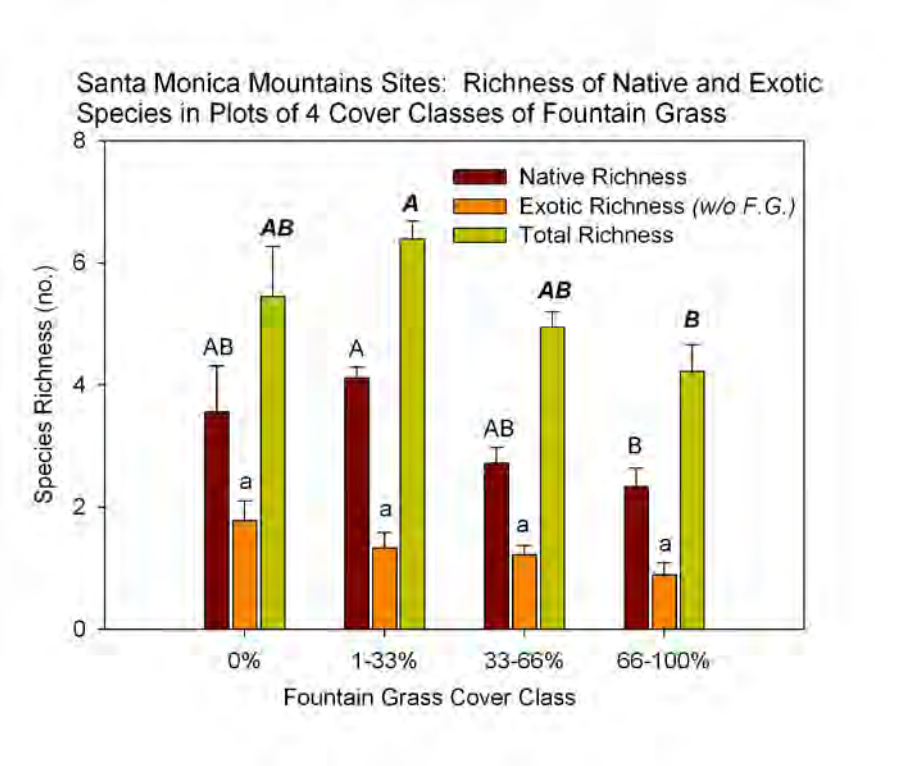
Materials and Methods

- 3 transects per site
- Sampling
  - Stratified random along transect at 2m intervals
- 2 plots of each cover class per transect
  - Cover classes of fountain grass:
    - 0%
    - 1-33%
    - 33-66%
    - 66-100%

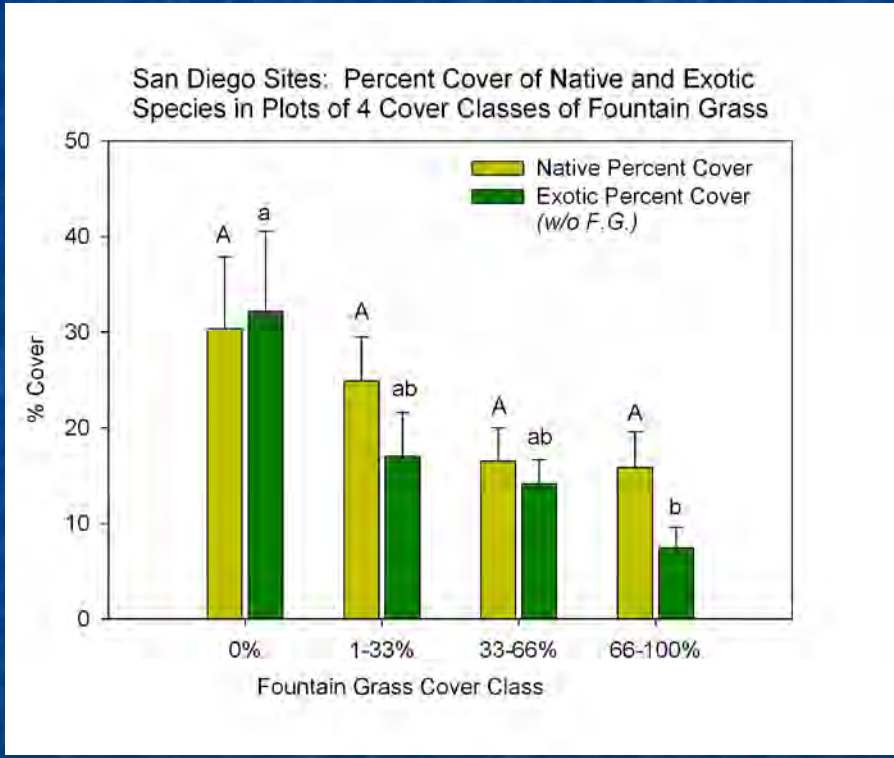
- Data
  - % cover of all species, rock, bare ground & litter
  - Site characteristics and soil samples

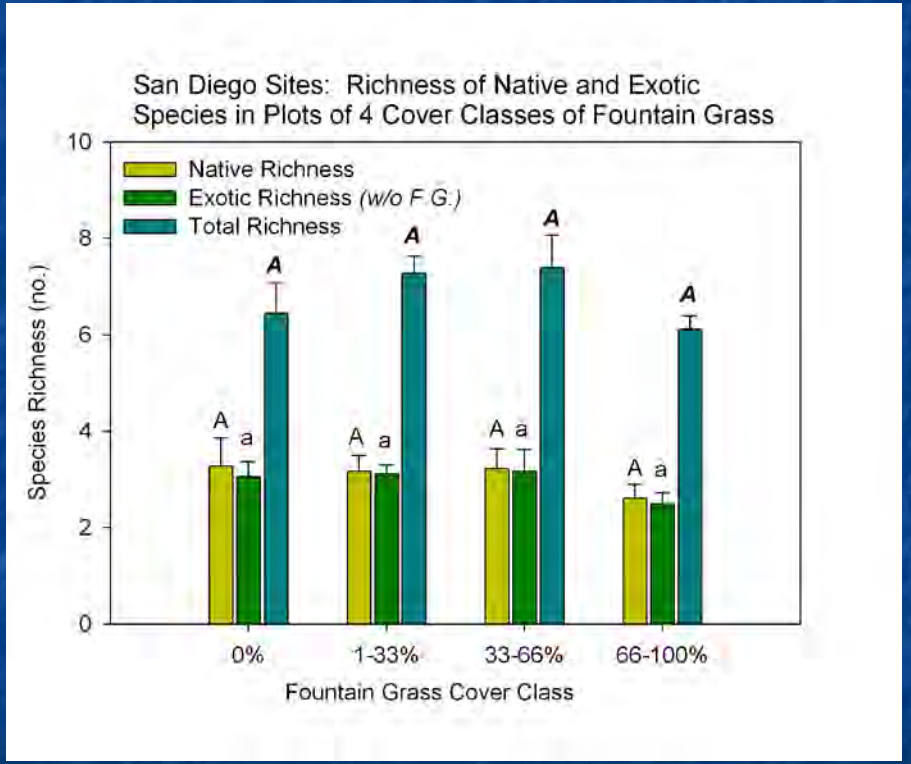
ANOVA Results: Santa Monica Mountains





ANOVA Results: San Diego County





Regression Results

- Functional groups impacted differently
- Percent cover declines
  - Native annuals (SD + SAMO)
  - Perennial grasses (SAMO)
  - Perennial forbs (SD)
  - Exotic annuals (SD)
- Richness declines
  - Native annual and perennial grasses (SAMO)

Discussion

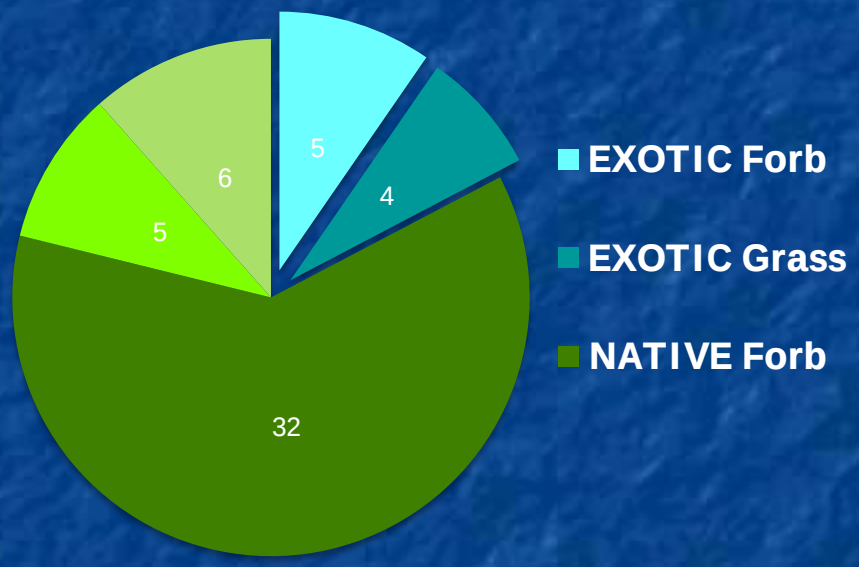
- Why are there declines in native and exotic cover as fountain grass increases?
  - Preemption of (collectively “space”):
    - Light, Water, Nutrients
- Why is there a decline in richness as fountain grass increases?
  - Change in type, frequency and characteristics of safe sites
  - This might change recruitment conditions for species

Regional Differences

- Why were results different in the two regions?
- Can we explain these results in terms of...
  - Biotic characteristics or community structure?
  - Physical or abiotic characteristics?

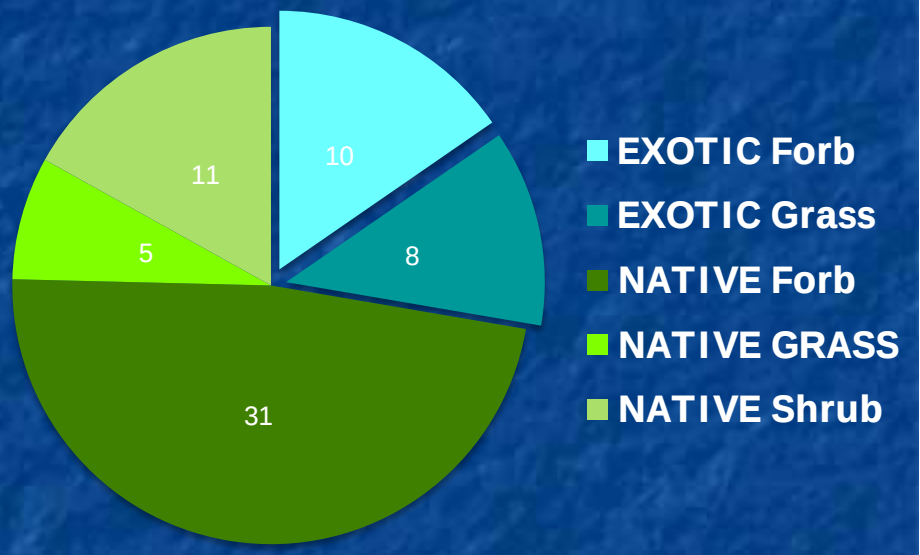
Regional Richness Differences: Functional Groups

SAMO



52 TOTAL SPECIES

SAN DIEGO



65 TOTAL SPECIES

Biotic Differences

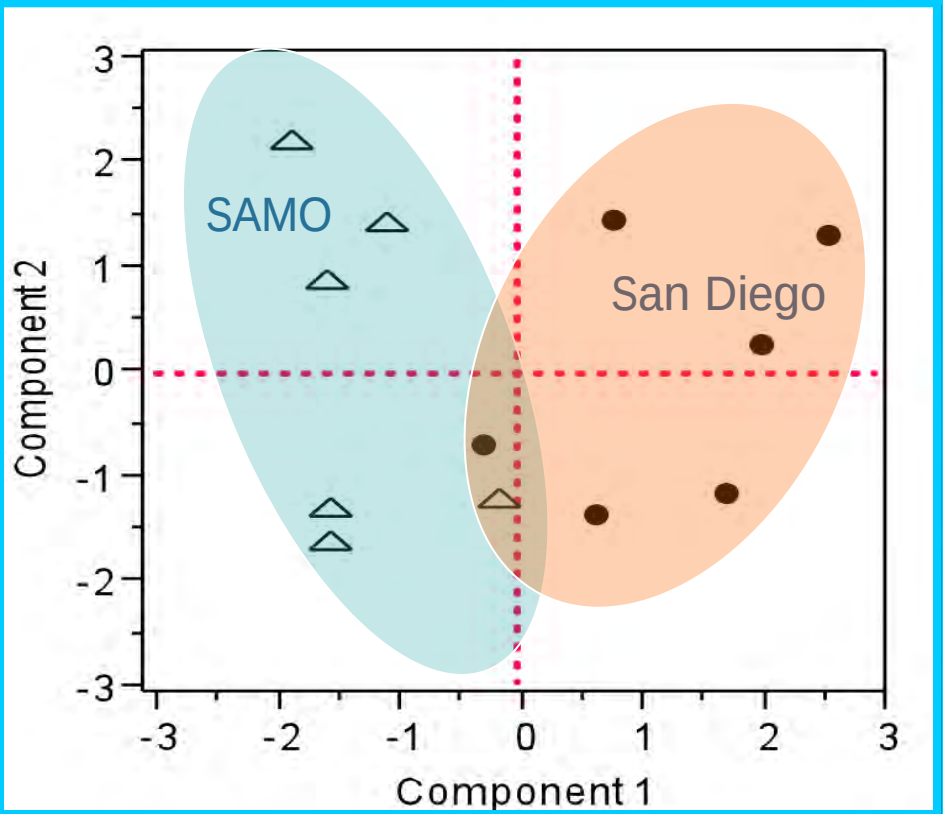
- San Diego *vs.* Santa Monica Mountains
  - San Diego- higher number of native species overall but similar native species richness average *per plot*
  - San Diego- higher mean cover and richness of exotic species overall
  - San Diego- similar richness of native and exotic species
  - Santa Monica Mountains- higher ratio of native: exotic richness

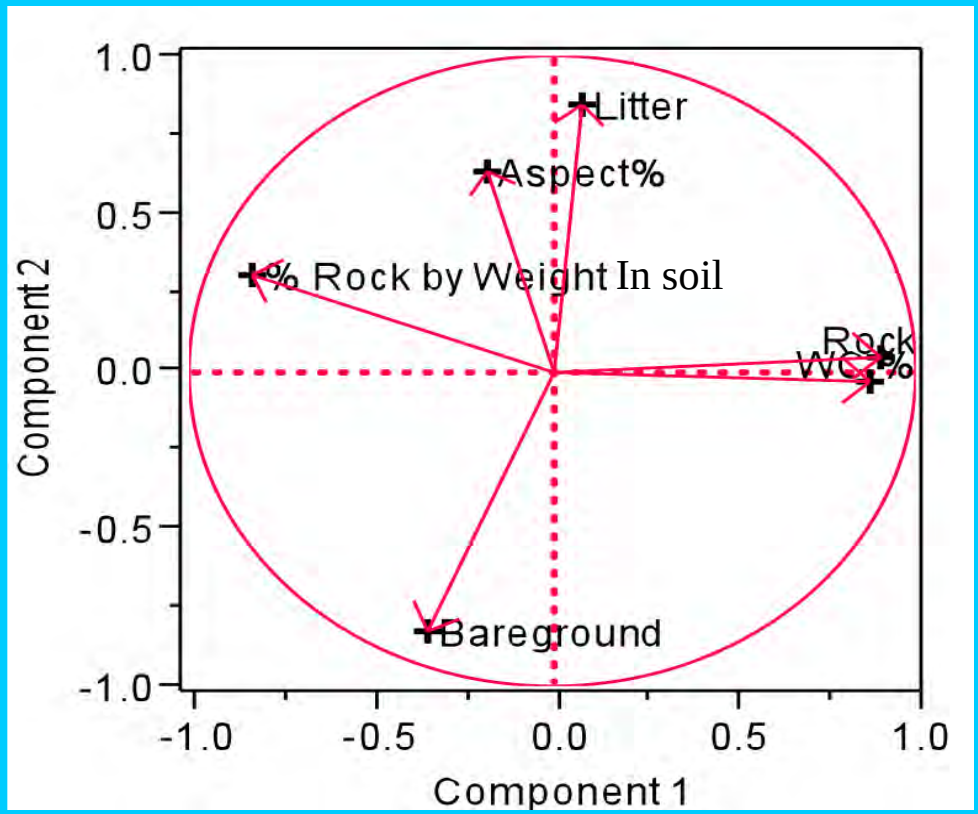
Principal Components Analysis: Physical Characteristics

Eigenvectors

	PCA 1	PCA 2
Bareground	-0.22157	-0.60132
Rock	0.58153	0.03149
Litter	0.05015	0.61553
WC %	0.55997	-0.02313
% Rock by Weight In soil	-0.53267	0.22055
Aspect%	-0.11361	0.45756

Regions significantly split by variables making up PC1 (one-way AOV, $p<0.01$)





Conclusions

- Declines and differences noted, especially comparing low and high cover classes
- Regional differences may explain different community responses
  - Higher Water Content= non-limiting resource?
  - Further investigation necessary
- There is no “before” here
  - Results must be considered correlation
  - Longer-term data might reveal whether results are due to fountain grass impacts

Broader Implications

- Fountain grass can invade intact coastal sage scrub

- Fountain grass can reach 100% cover
- All invasive populations were found on southwest-facing slopes

Kai Palenscar

Thanks to...

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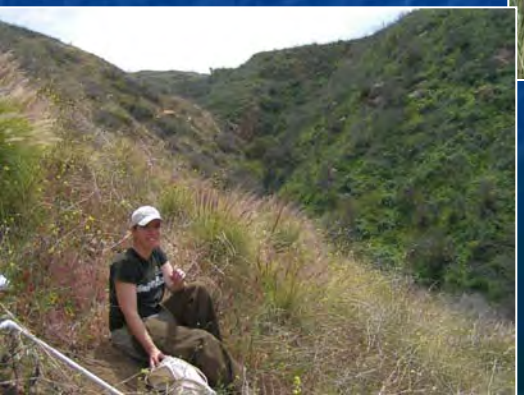

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  - Shipley-Skinner Riverside County Endowment (2009, 2010)
  - UCR Botany & Plant Sciences Department

Initial 2010 Results

- Patterns similar
- Recruitment seen into 0% cover areas
  - Formerly outside the invasion “boundary”
- Abiotic characteristics- at Mullholland
  - No differences in soil temperature or moisture correlated with cover of fountain grass