How are functional traits related to the invasibility of a restored plant community?

Jennifer Funk
Chapman University

Sarah Kimball, Travis Huxman, Megan Lulow, Gregory Vose
University of California, Irvine
Community resistance to invasion could be increased in a number of ways:

1. Limiting similarity: there is a finite limit to the similarity between the resource-use of co-existing species
Community resistance to invasion could be increased in a number of ways:

1. **Limiting similarity**: there is a finite limit to the similarity between the resource-use of co-existing species

2. **Functional diversity**: more diverse communities use resources more effectively
Community resistance to invasion could be increased in a number of ways:

1. Limiting similarity: there is a finite limit to the similarity between the resource-use of co-existing species

2. Functional diversity: more diverse communities use resources more effectively

3. Competitive hierarchy: species with fastest growth and resource extraction will outcompete invaders
1. What mix of native species produces a community that is resistant to invasion by non-native species?

2. How are the traits of species in a restored community related to the invasibility of that community?

3. Does the relationship between traits and invasibility vary depending on environment?
Santa Ana Mountains, Orange County, CA
25 hectare restoration project
Multiple seed mixes within coastal sage scrub and grassland communities

Seeds applied with drill or imprint seeder in strips
Manual weeding and glyphosate wicking for one year after seeding
Plot measurements

- Number of native and non-native seedlings and adults
- *Brassica nigra*: density, height, biomass, specific leaf area, stomatal conductance, soil moisture
Photosynthetic rate
Water-use efficiency
Specific leaf area
Leaf N concentration
Seed mass
Root diameter
Specific root length
Root tissue density
Root mass fraction
Effect of community on *Brassica nigra*.
Effect of community on *Brassica nigra*

North slopes had fewer, but larger weeds with higher SLA.
Effect of community on *Brassica nigra*

North slopes had fewer, but larger weeds with higher SLA

No strong support for limiting similarity hypothesis
Effect of community on *Brassica nigra*

North slopes had fewer, but larger weeds with higher SLA

No strong support for limiting similarity hypothesis

Diverse mixes tended to be more invasion resistant
Effect of traits on *Brassica nigra*
Effect of traits on *Brassica nigra*

Traits of effective competitors
- Low photosynthesis
- Low water-use efficiency
- Low seed mass
- Low root mass fraction
- Low root tissue density
- High specific root length
Conclusions

Diverse species mixes tend to be more invasion resistant

Community mix is strongly affected by environment

Competitive hierarchy: fast-growing species with aboveground allocation are best competitors in high-resource environments
Acknowledgements

Irvine Ranch Conservancy Staff: Isaac Oliva, Isaac Ostmann, Mike Geneau, Yi-Chin Fang, Josie Bennett, Matt Garambone, Daniel Romero, Guillermo Silvano, Susie Anon, Matt Nourmohamadian, Jutta Burger, Lars Higdon & Sherry Fuller

Chapman University Students: Luke Sanborn, Nate Vorapharuek

Center for Environmental Biology Staff and Interns: Johanna McCollum, Rosemary Garica, Roxanne Murill

Funding: Orange County Parks, Center for Environmental Biology, The Irvine Company