



Brachypodium distachyon

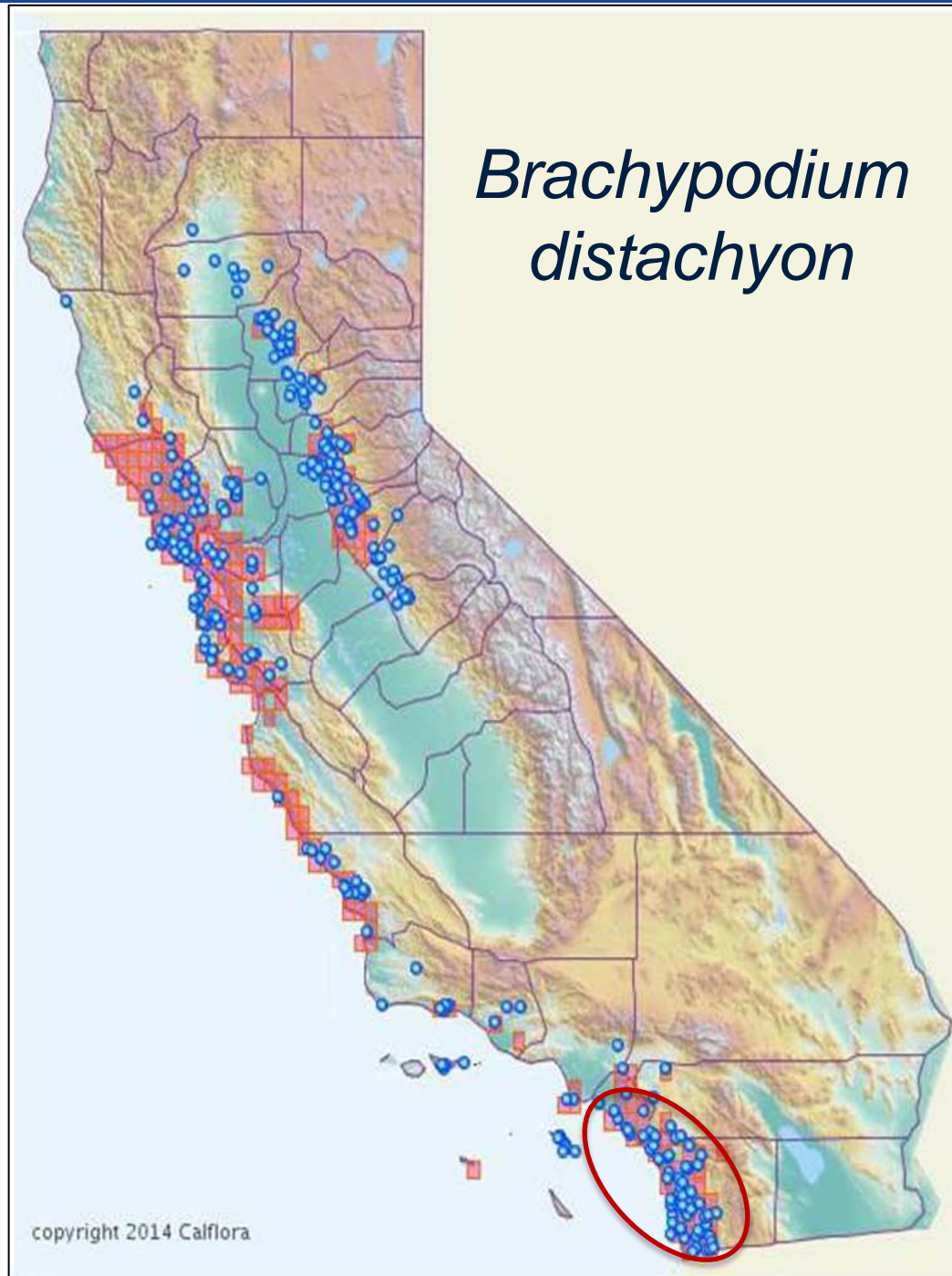
*An adaptive approach to controlling an invasive species
to conserve endemic species and sensitive habitats*

Patricia Gordon-Reedy
Cal-IPC Symposium, October 29, 2015



An Emerging Invasive

- High Regional Priority
 - rate of spread
 - reproductive biology
 - dense stands
 - impacts to covered resources
 - potential ecosystem impacts



Approach

1 Biology

- ID invasion pathways
- ID species, habitats at-risk

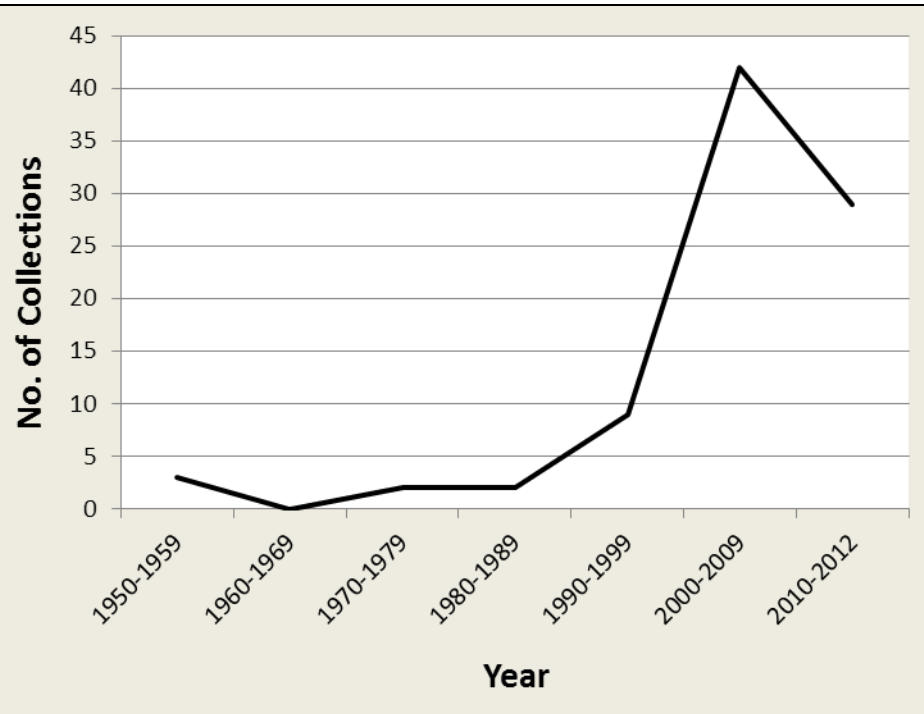
2 Models

- Visualize life history traits, ecological effects
- ID control variables
- Predict areas at risk of invasion

3 Field Experiments

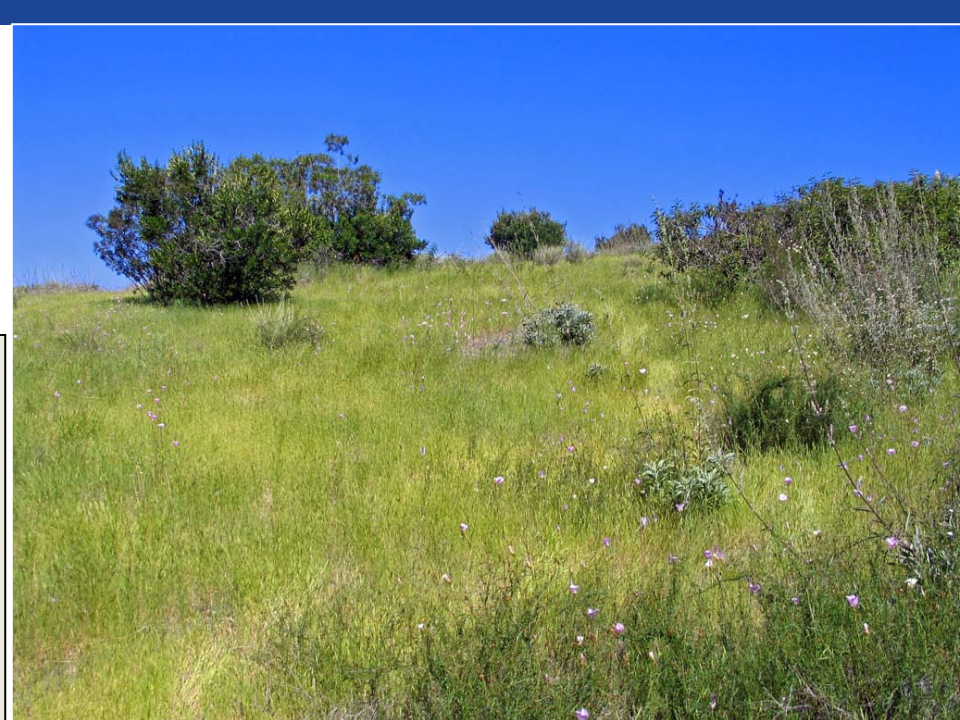
- Test or refine BMPs
- Provide management options

Invasion History



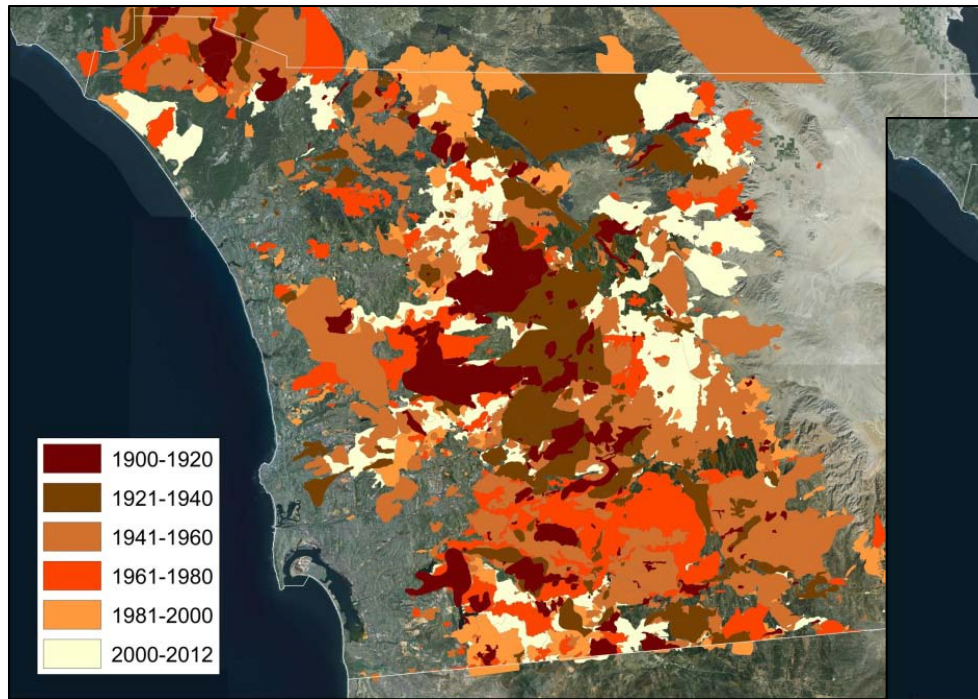
1986 – uncommon

2011 – *Brachypodium distachyon*
Semi-Natural Stand Type)

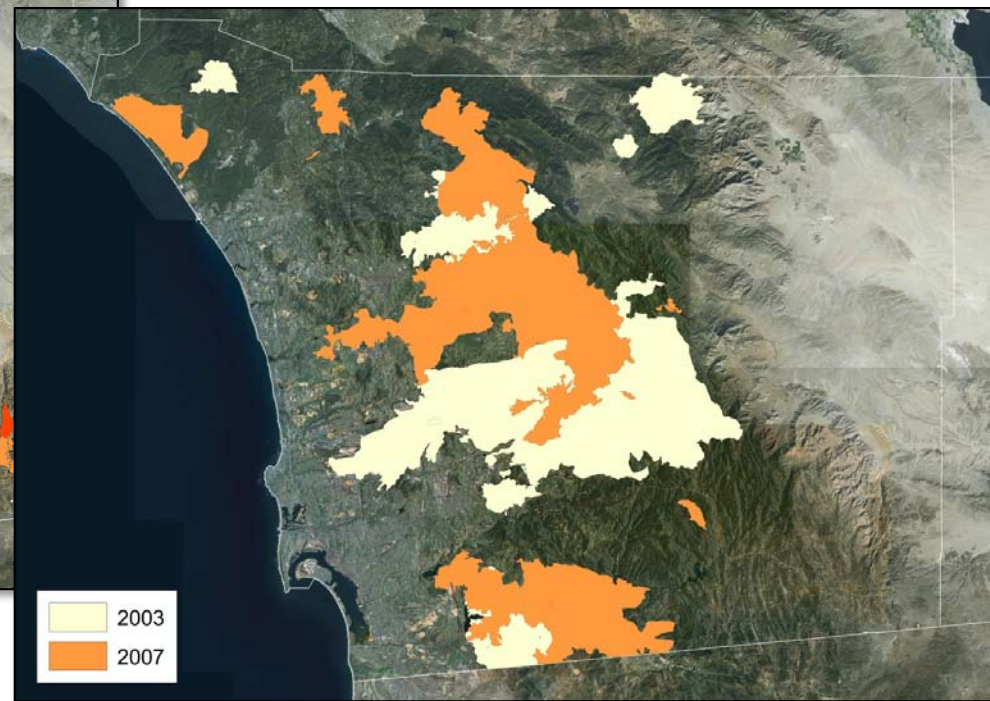


Fire as a Change Agent

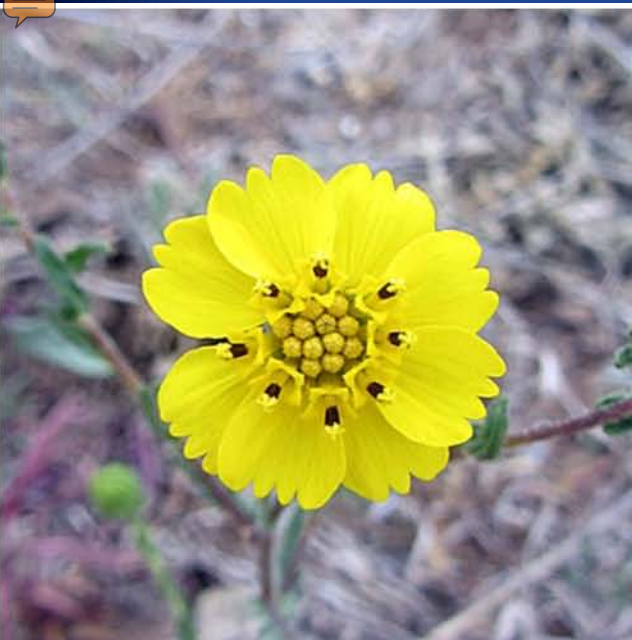
100+ year fire history



2003/2007 Firestorms



- 1st, 6th largest fires
- >676,000 acres burned



Deinandra conjugens (FT/SE)



Acanthomintha ilicifolia (FT/SE)



Dudleya variegata (1B.2)



Brodiaea filifolia (FT/SE)

Photo: Pacific SW Region USFWS 2010

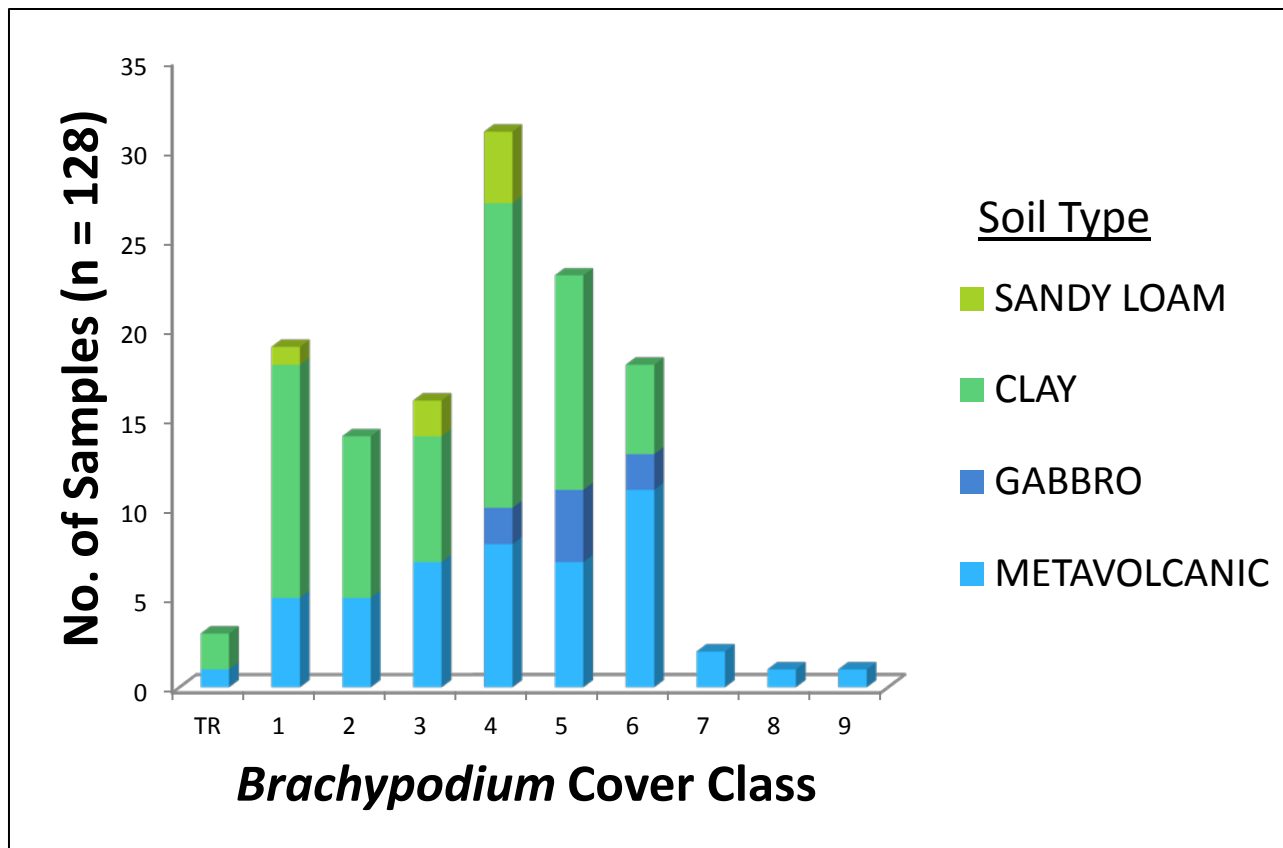


Nolina interrata (SE)



Nolina interrata (SE)

Soil Affinities



High density stands – clays, gabbro-derived, metavolcanic soils
Absent or low density stands – sands, loams (n=168)

Invasive Traits

- Annual grass
- Self-fertile
- Rapid growth
- Early flowering
- Short life cycle

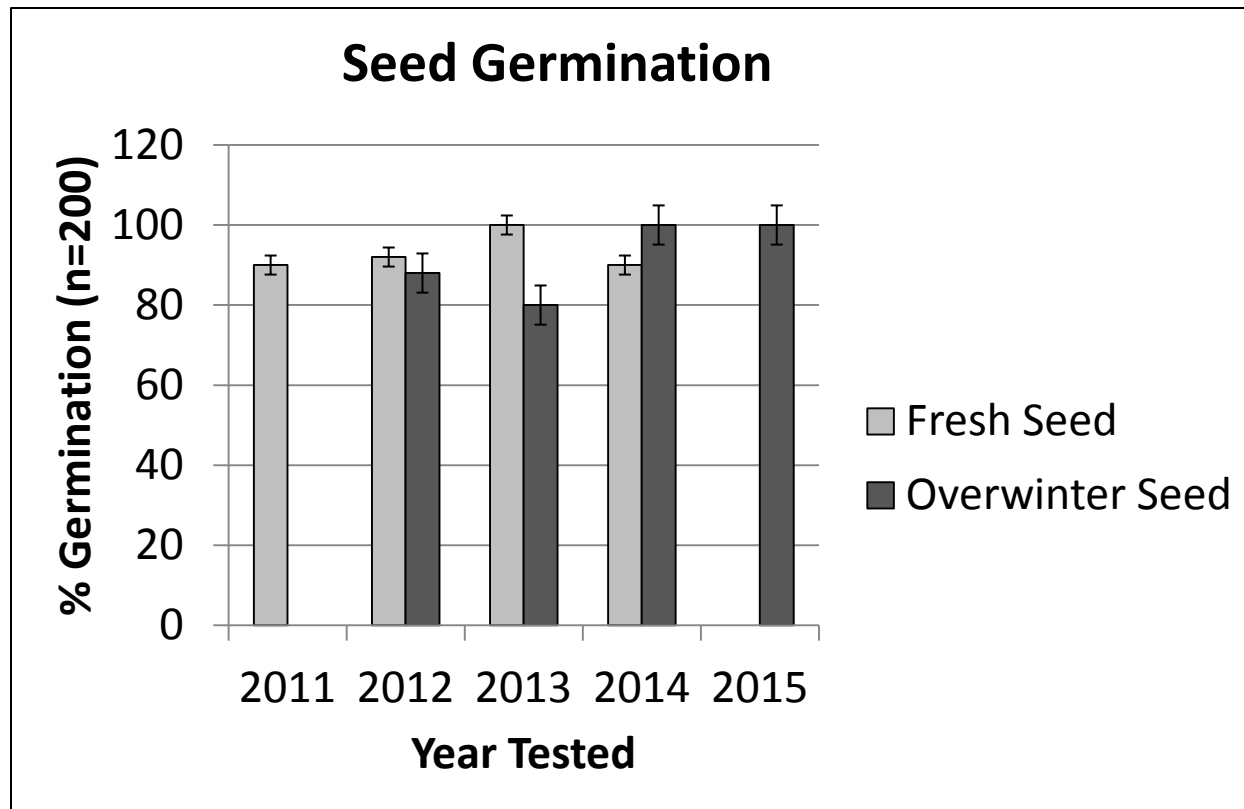


Seed Production

- Cal-IPC PAF
 - <1,000 seeds/m²
- San Diego
 - dense stands
 - > 25,000 seeds/m²

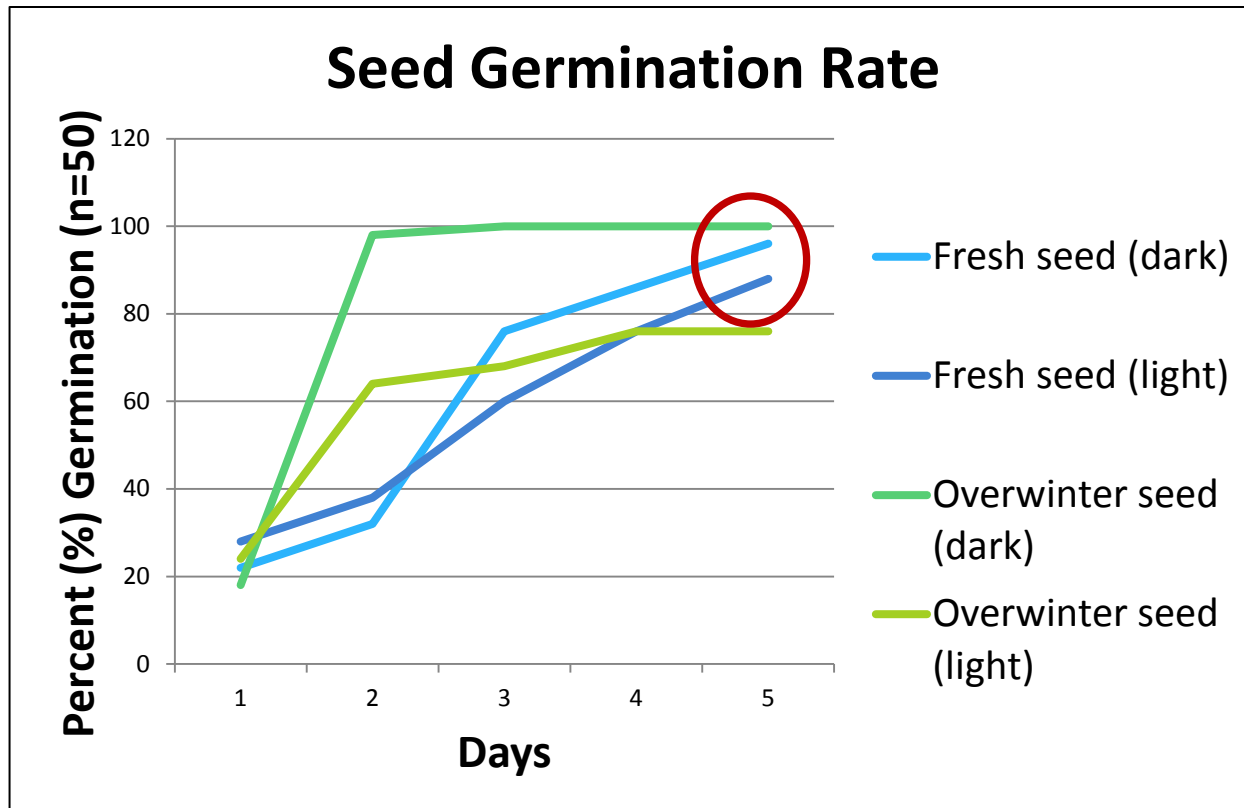


Seed Germination



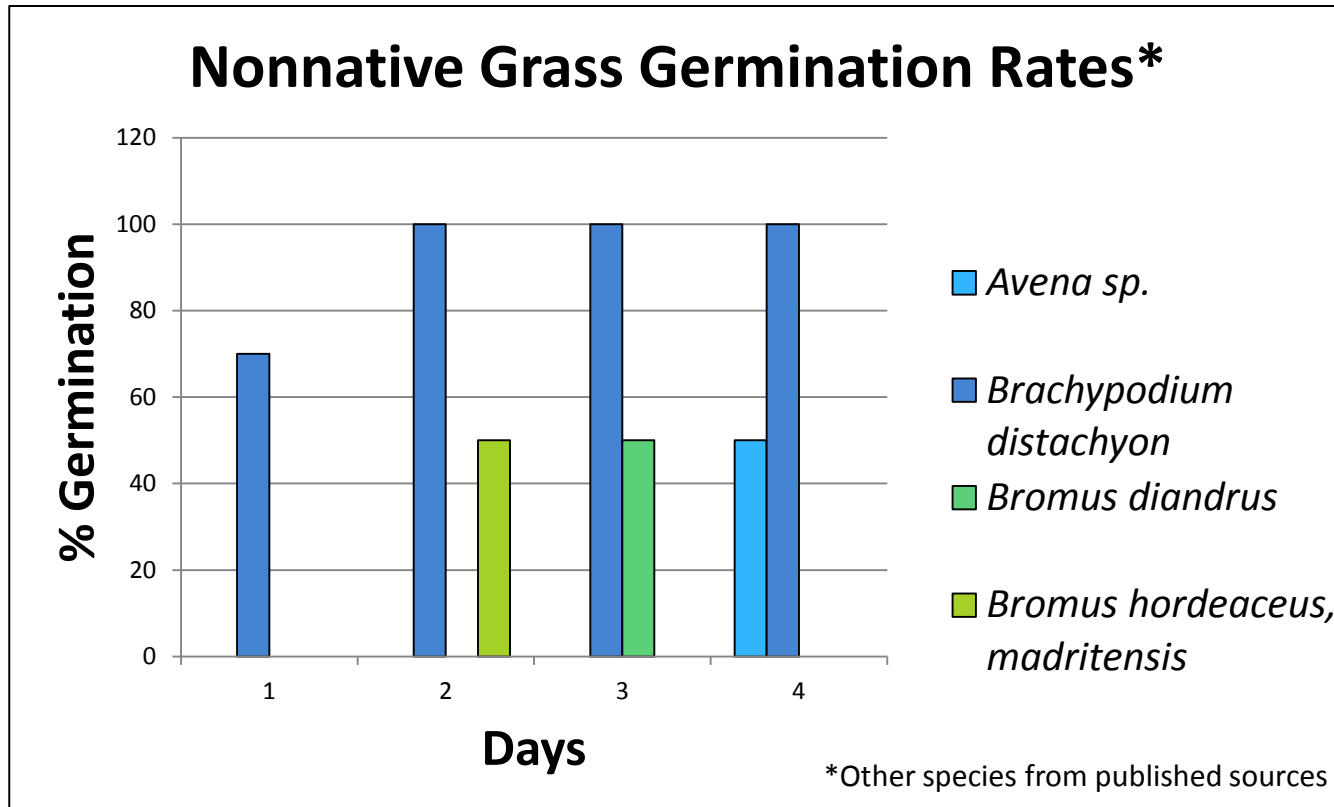
**Germination high;
no after-ripening; low dormancy**

Germination Rate



100% germination in 2 days

Germination Rate Comparisons



Rapid germination = competitive advantage?

Understanding Invasion Success

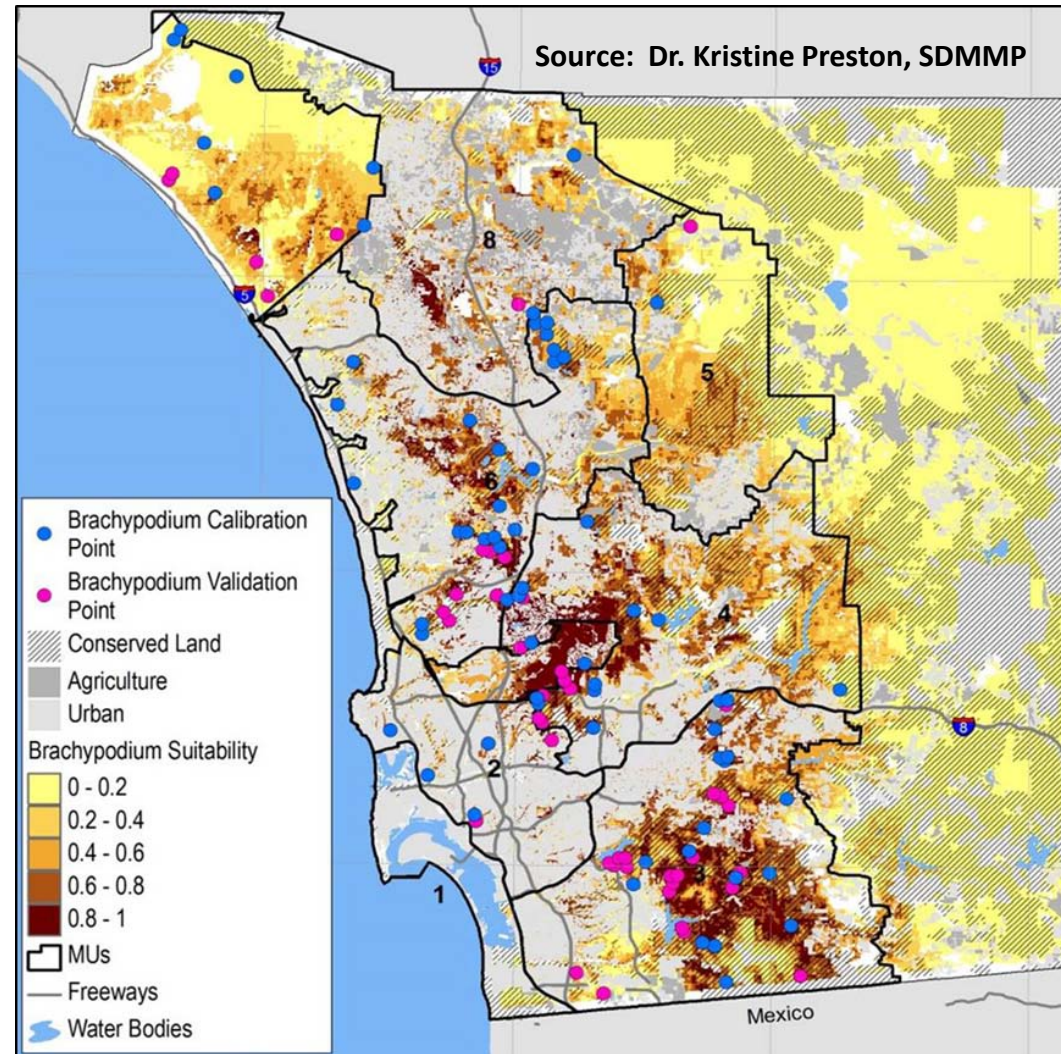
Life Stage	Trait	Effect
Seed	Low Dormancy High Viability Rapid Growth	Monopolizes Resources
Seedling (Vegetative)	Dense Stands	Outcompetes other Species
Flowering (Reproductive)	Self-fertile Short Life Cycle High Seed Production	Rapid Increase
Death (Thatch)	Dense Persistent Thatch Germinates in Dark	Suppression Self-perpetuating

Manage above- and below-ground seed bank

Habitat Suitability Model

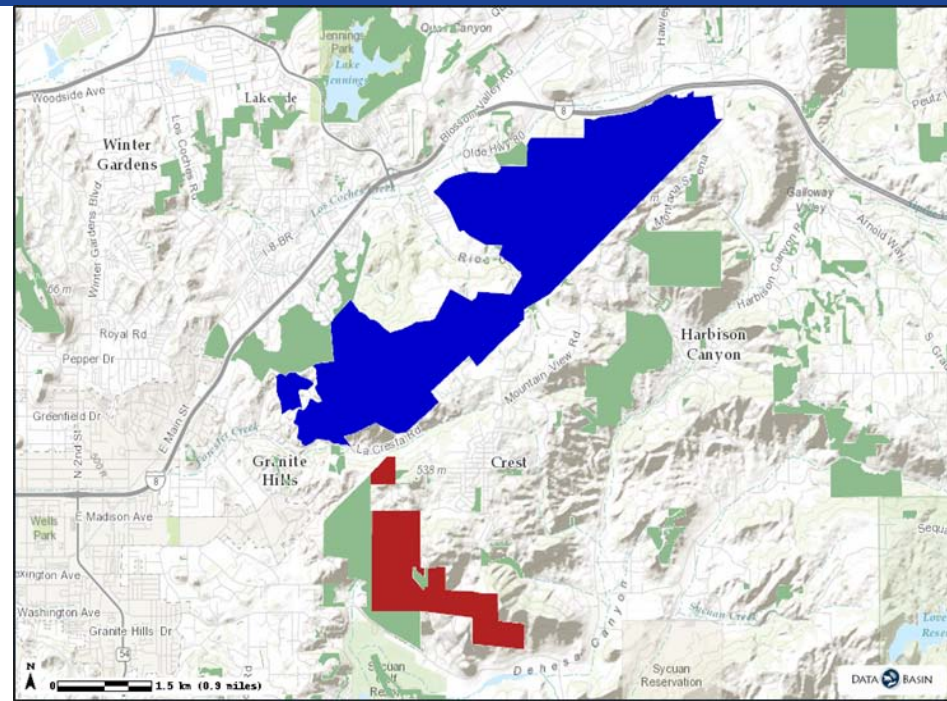
- Climatic and edaphic variables
- 46 calibration locations; 66 validation locations
- 5 top-performing models: average median HSI = 0.72

Predictive model for future invasions



Field Experiments

- 2 sites:10 acres/site
- Refine BMPs



Treatment Combinations

Fusilade-Glyphosate-Seed
(Dethatch)

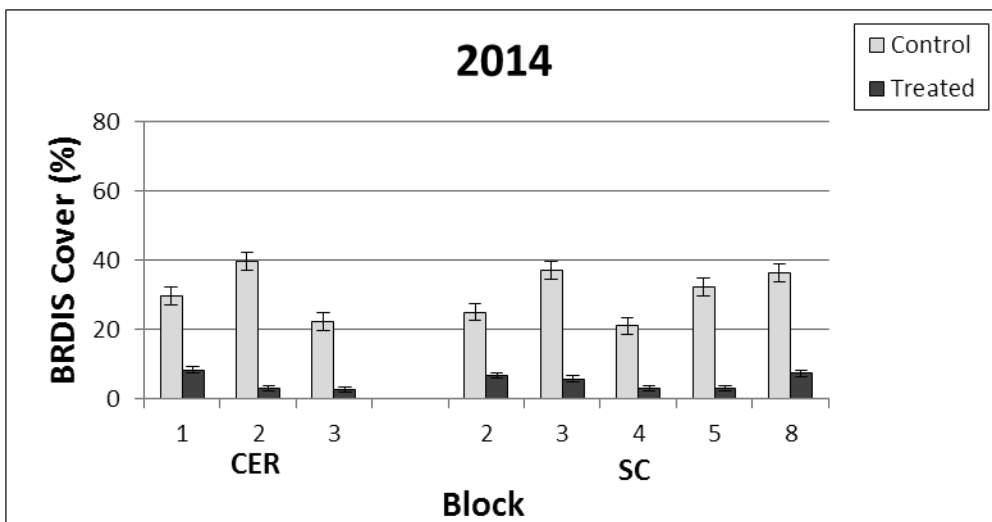
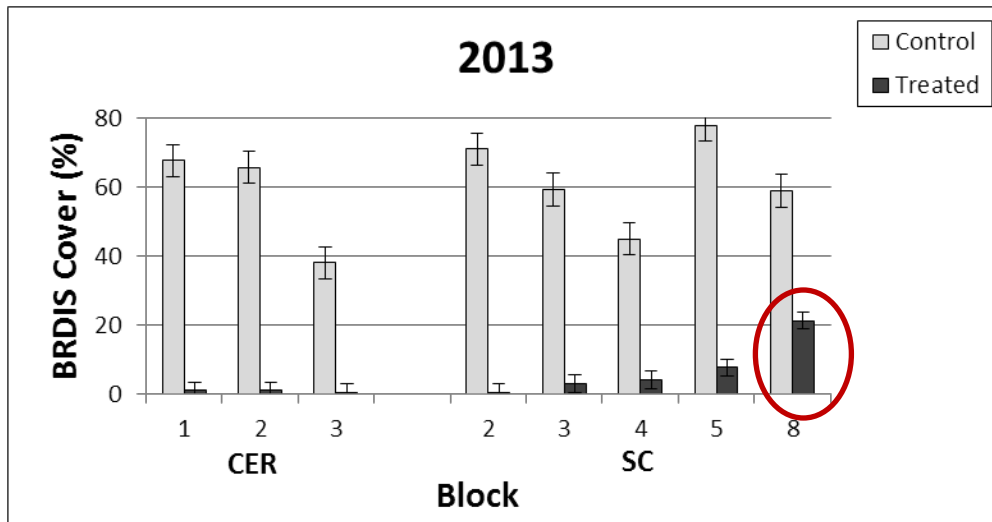
Mechanical-Glyphosate-Seed
(Dethatch)

Fusilade-Glyphosate

Control

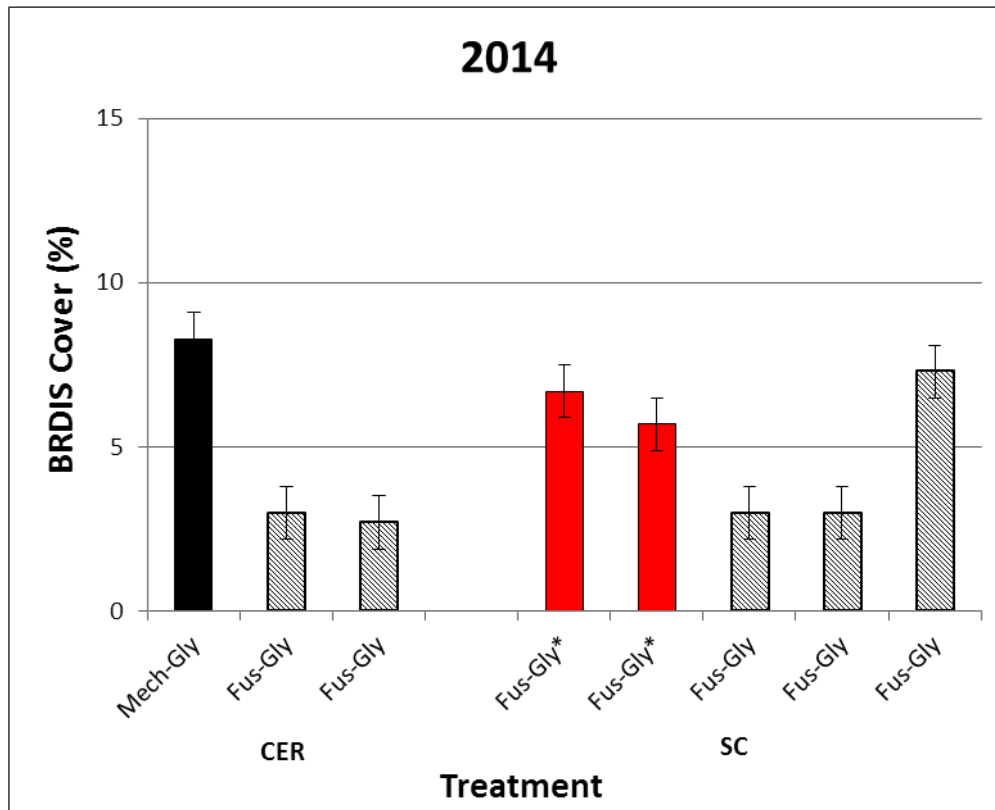


Brachypodium Control



- All treatments reduced BRDIS cover
- Some site variability; no consistent difference in treatment between sites
- Application inconsistency
- Multiple germination events

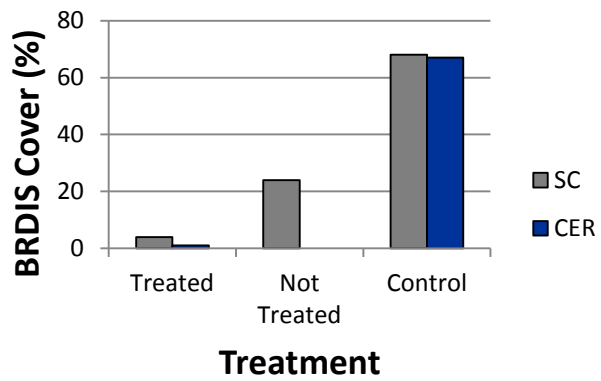
Treatment Effectiveness



- All treatments > 90% control
- Herbicide more effective than mechanical removal
- > 2 years of treatment needed

*Fus-Gly: treated 2x in 2013, not treated in 2014

2015



Recommendations

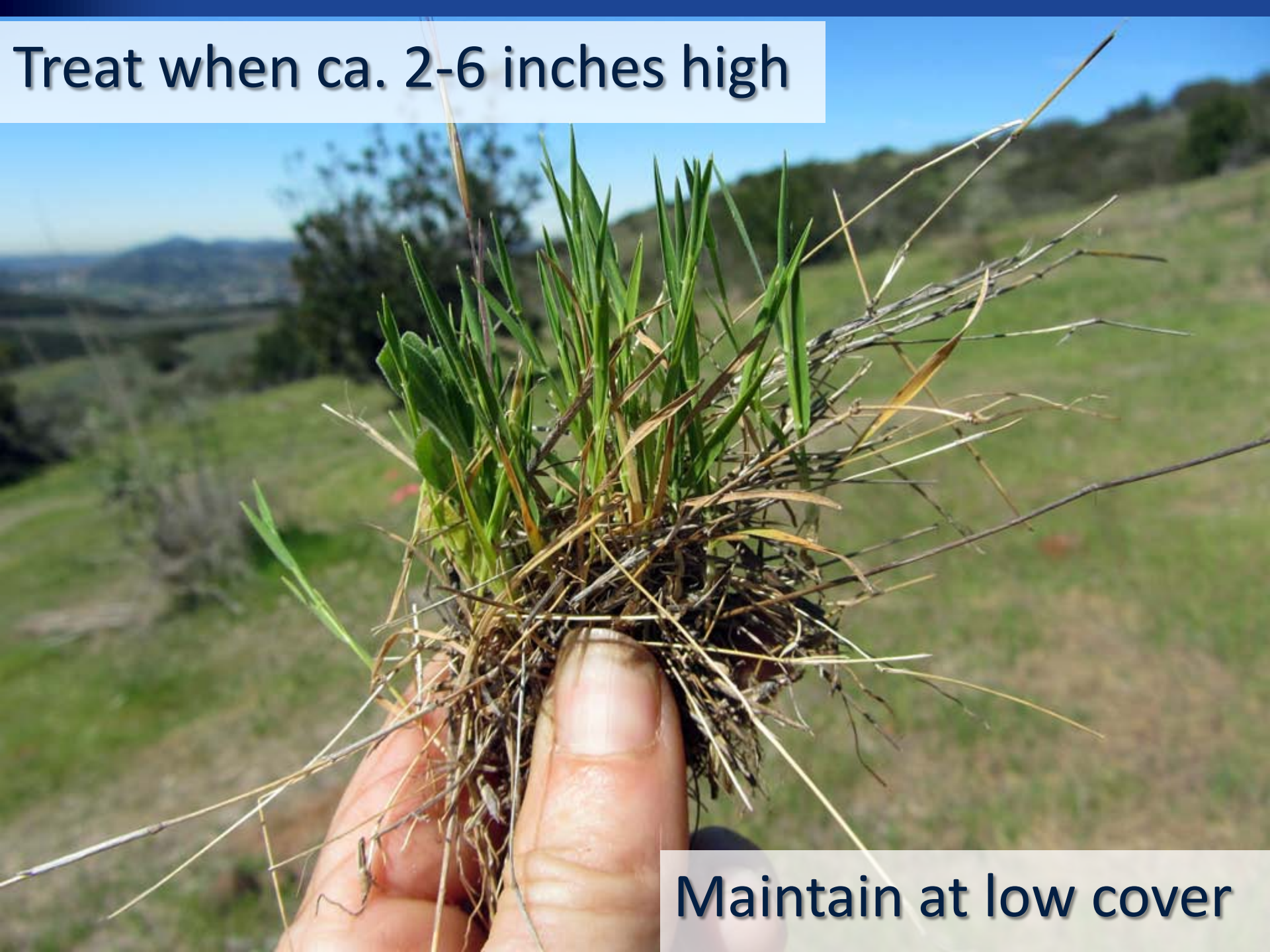
Treat in areas with sensitive resources on restricted soils



Remove thatch prior to treatment



Treat when ca. 2-6 inches high



Maintain at low cover

Budget multiple
treatments/year

Plan for multiple
years of treatment





**Monitor high potential sites for invasion;
treat proactively**

Acknowledgements

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John Martin, U.S. Fish and Wildlife Service

Michael Beck, Jonathan Appelbaum, Endangered Habitats Conservancy

Patrick McConnell, Center for Natural Lands Management

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San Diego Association of Governments

Soil Ecology and Restoration Group, SDSU

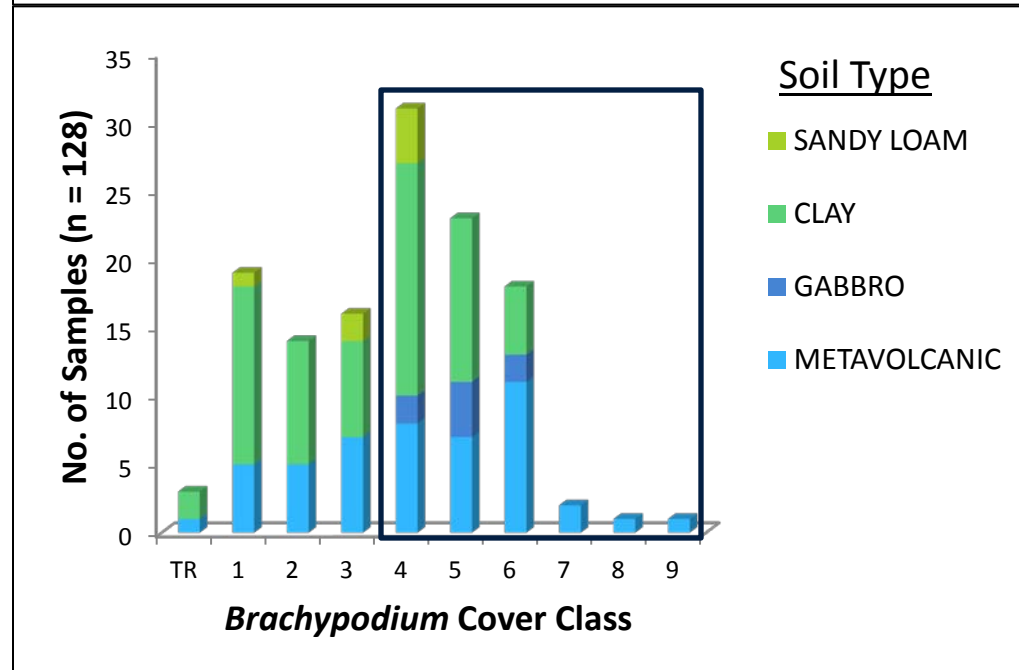
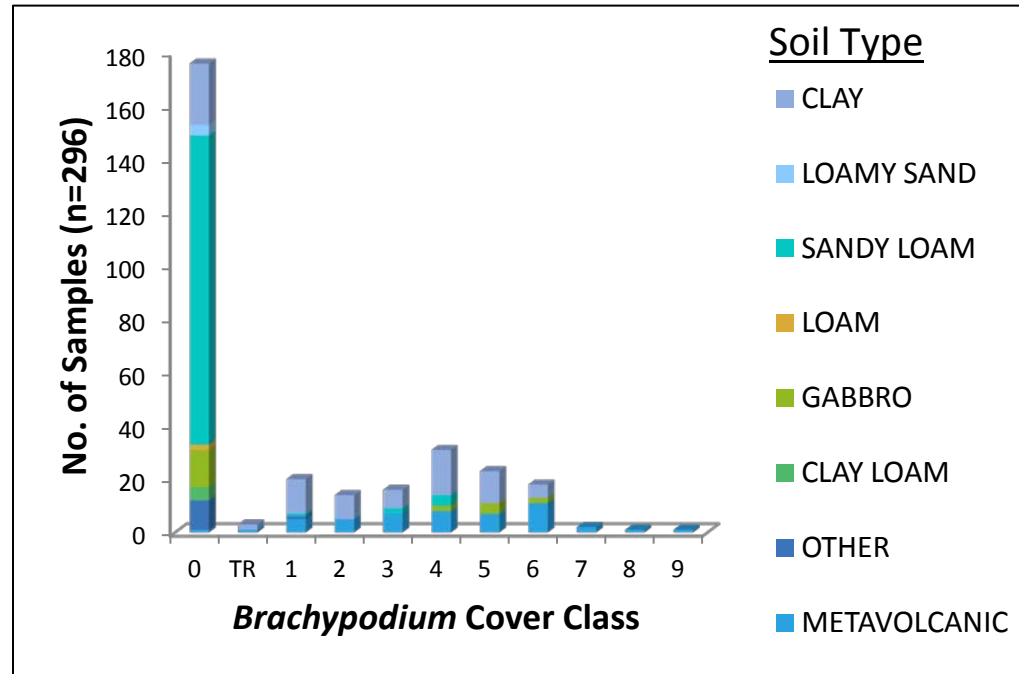
Trish Smith, The Nature Conservancy



Soil Affinities

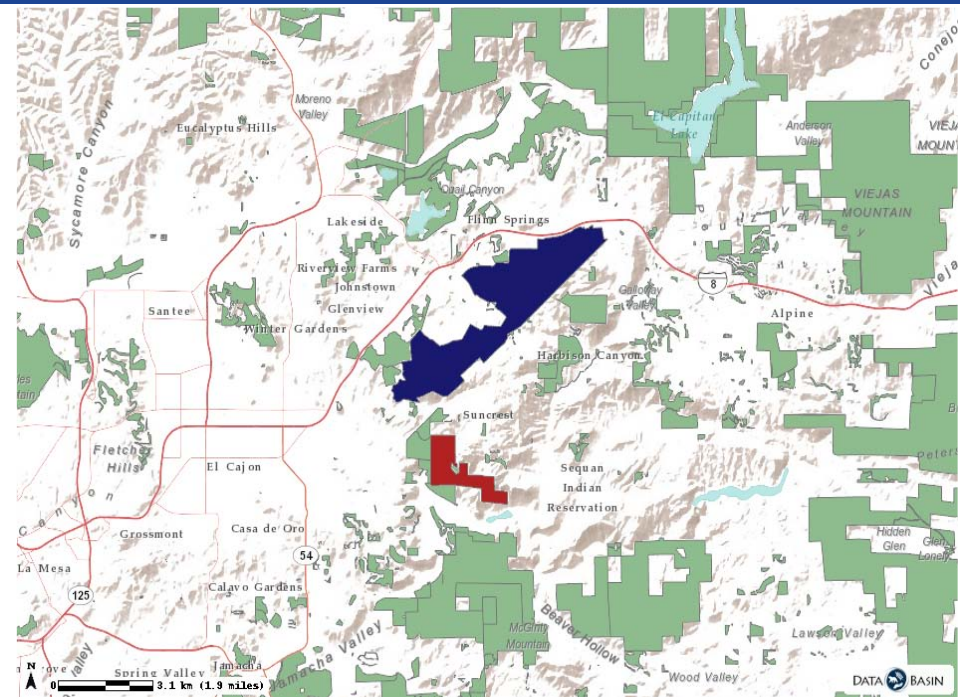
- Absent or low density stands
 - sands
 - loams

- High density stands
 - clays
 - gabbro-derived
 - metavolcanics



Field Experiments

- Refine BMPs
- 2 sites:10 acres/site
- Treatment variability



Treatment Combinations

Fusilade-Glyphosate-Seed
(Dethatch)

Mechanical-Glyphosate-Seed
(Dethatch)

Fusilade-Glyphosate

Control

