



Brachypodium distachyon

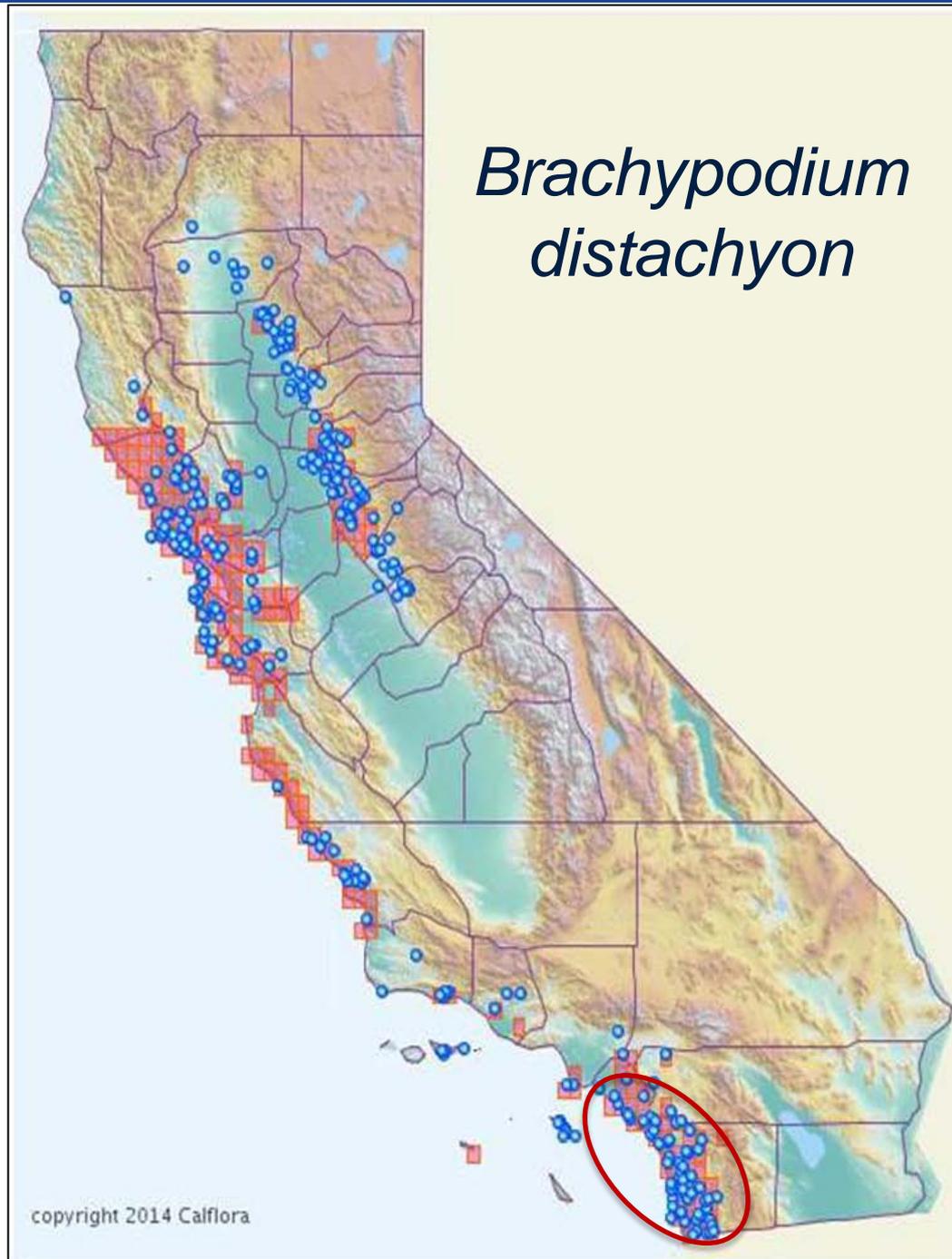
*An adaptive approach to controlling an invasive species
to conserve endemic species and sensitive habitats*

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

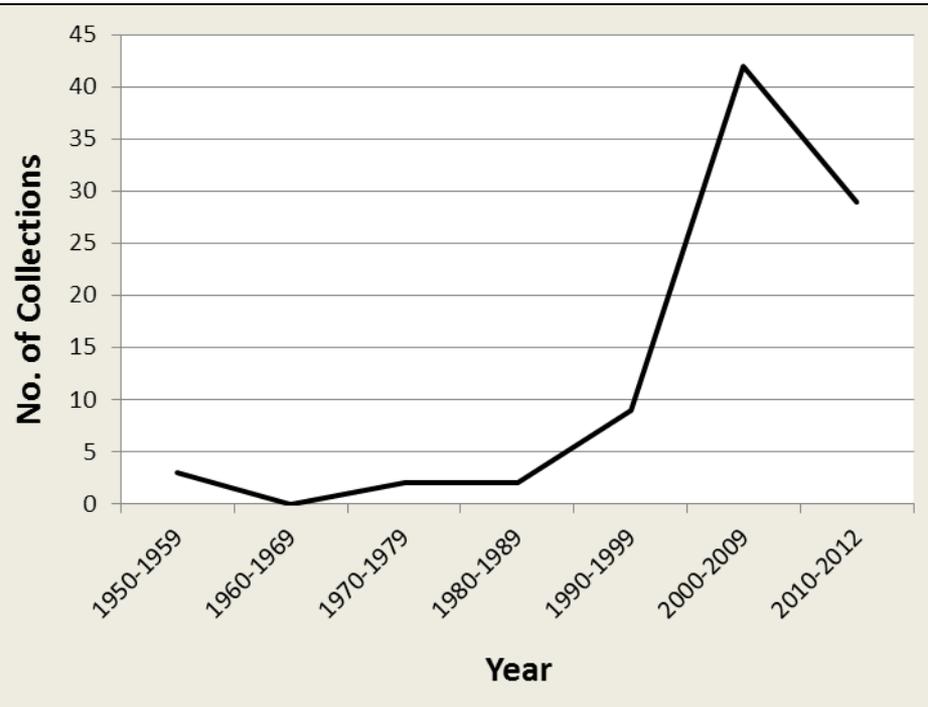
2 Models

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

3 Field Experiments

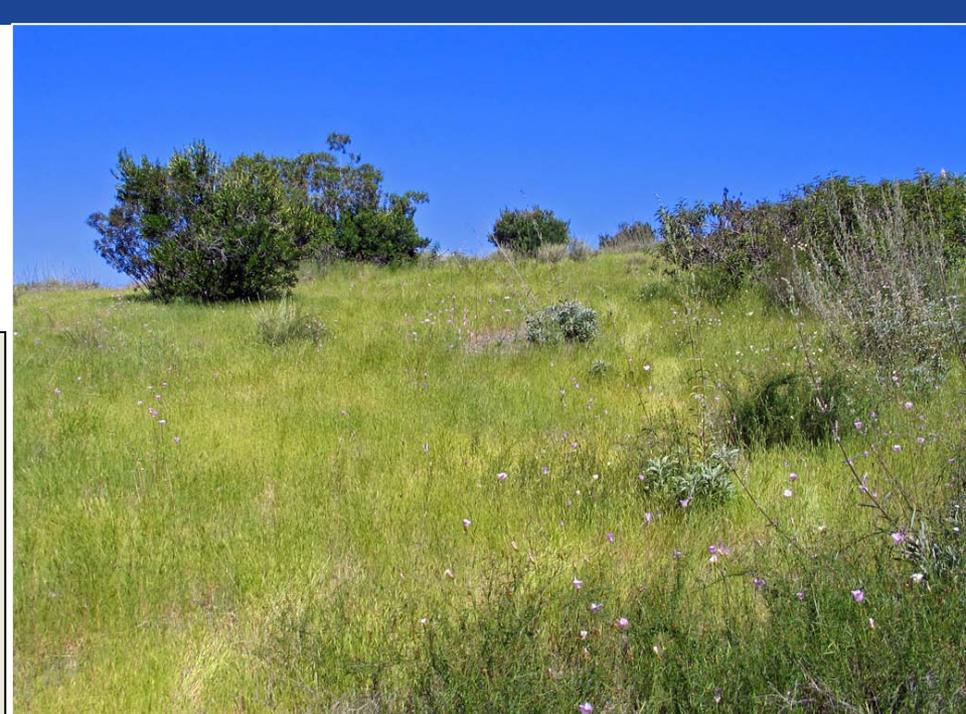
- Test or refine BMPs
- Provide management options

Invasion History



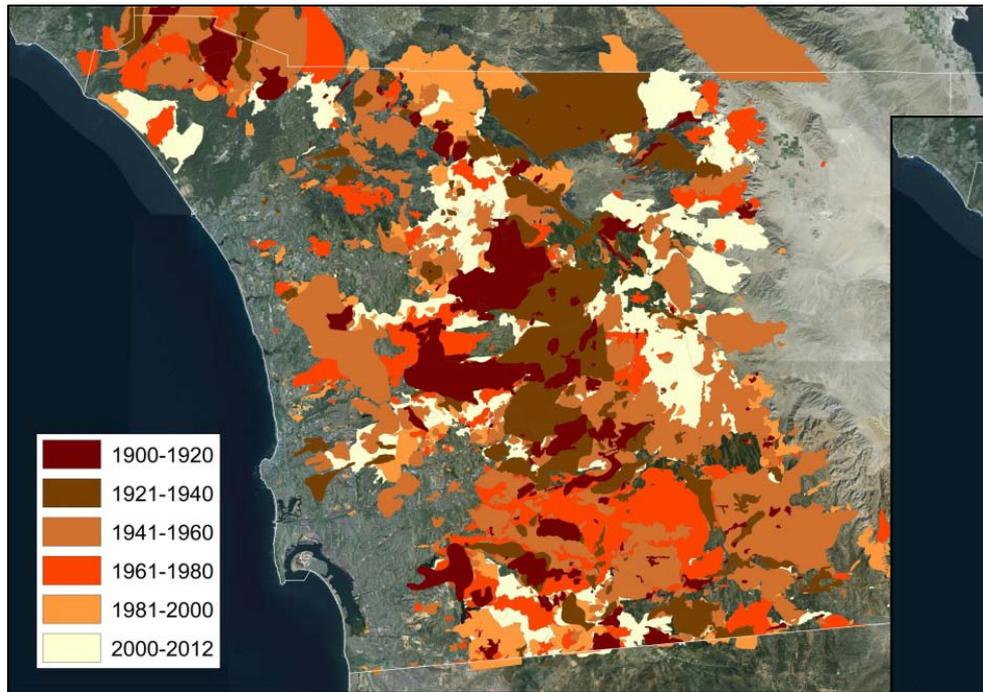
1986 – uncommon

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

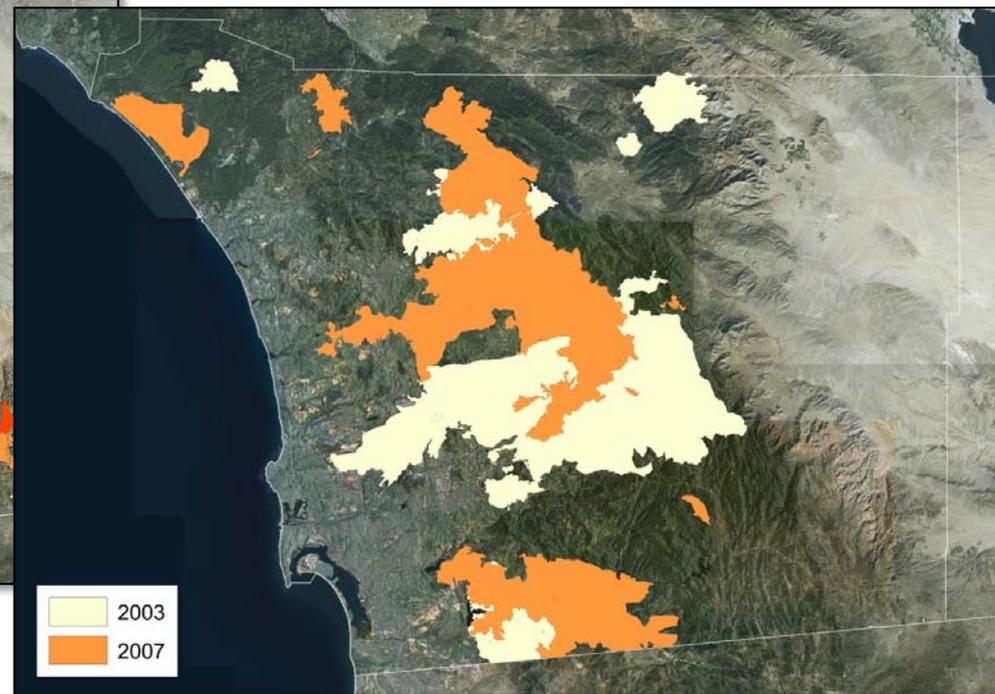


Fire as a Change Agent

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

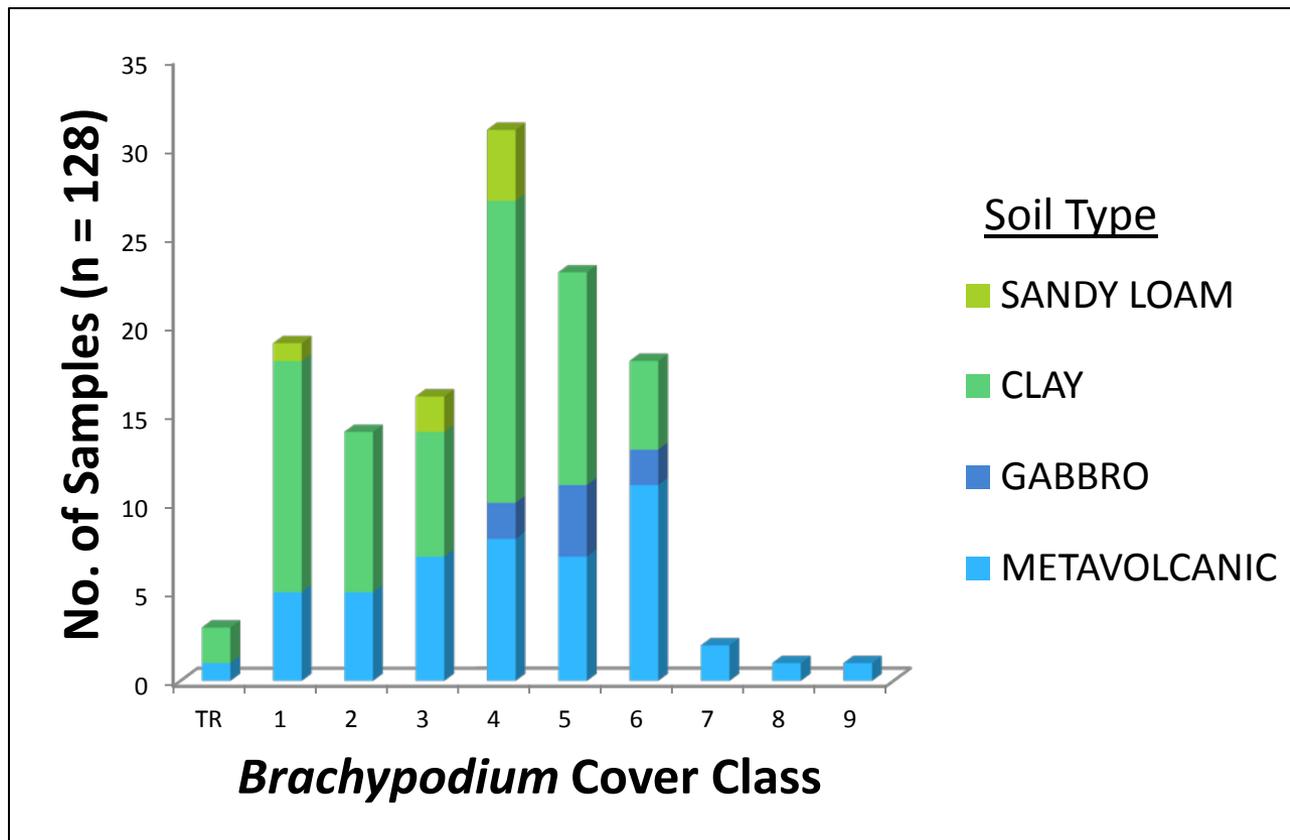


Nolina interrata (SE)



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

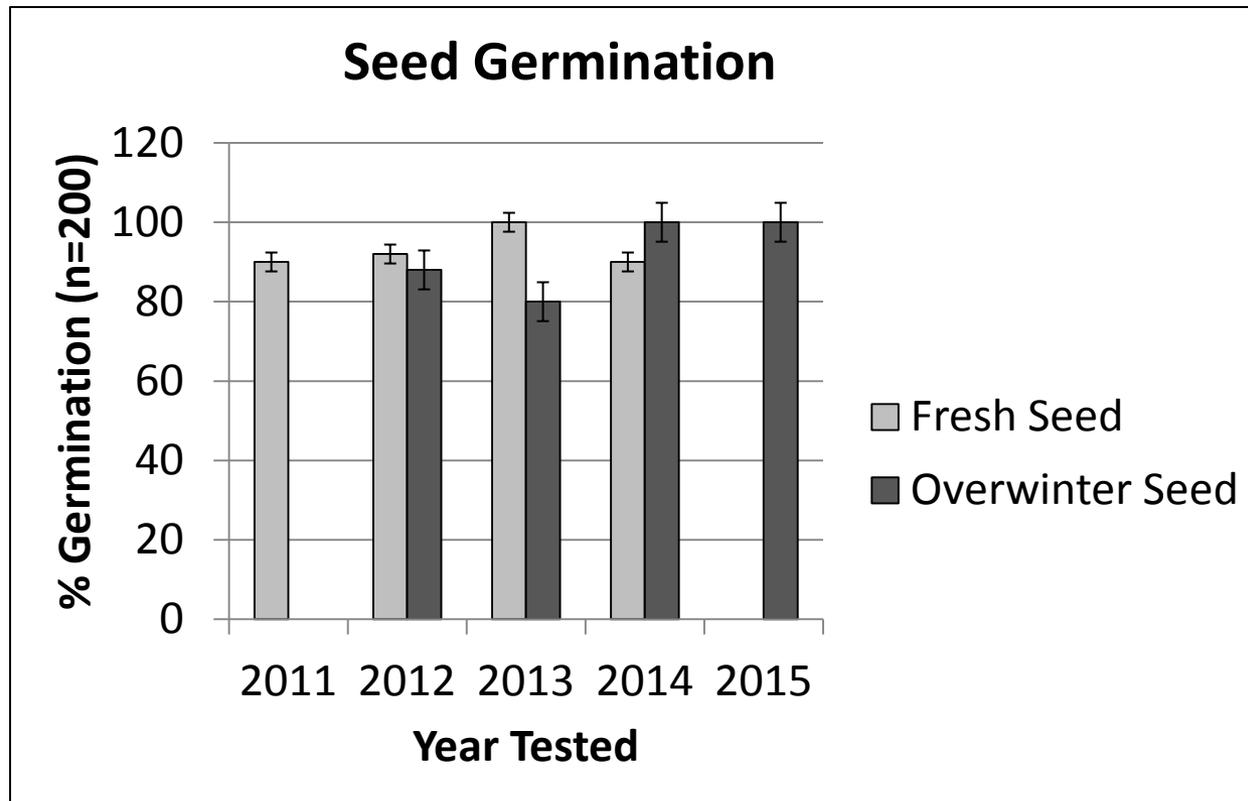


Seed Production

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

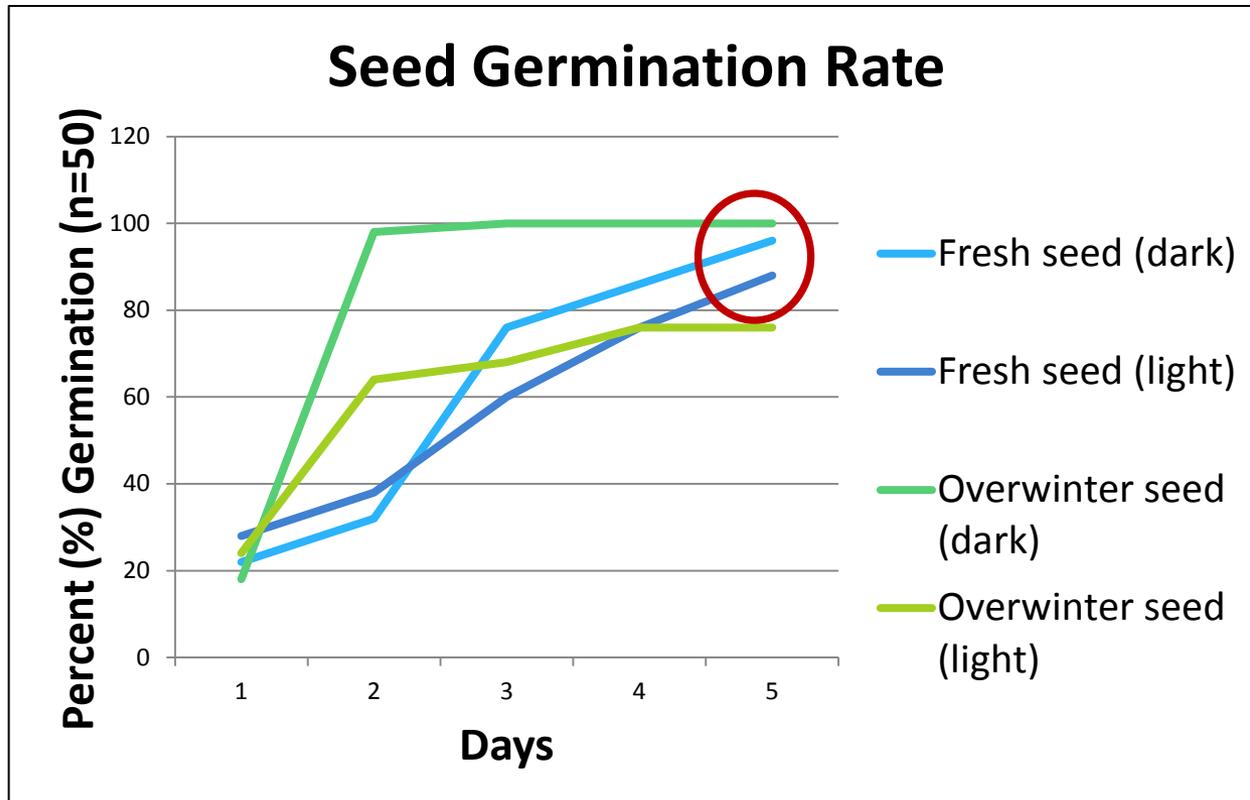


Seed Germination



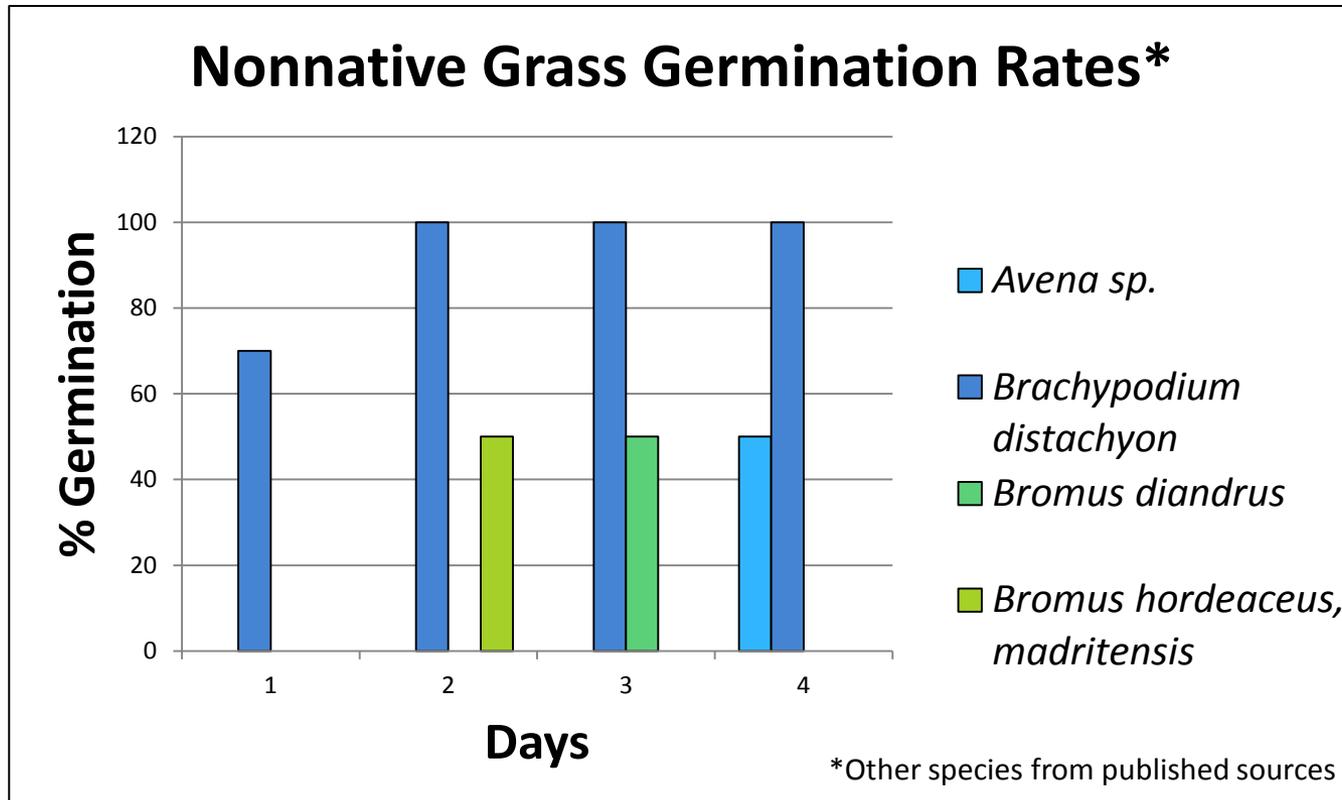
**Germination high;
no after-ripening; low dormancy**

Germination Rate



100% germination in 2 days

Germination Rate Comparisons



Rapid germination = competitive advantage?

Understanding Invasion Success

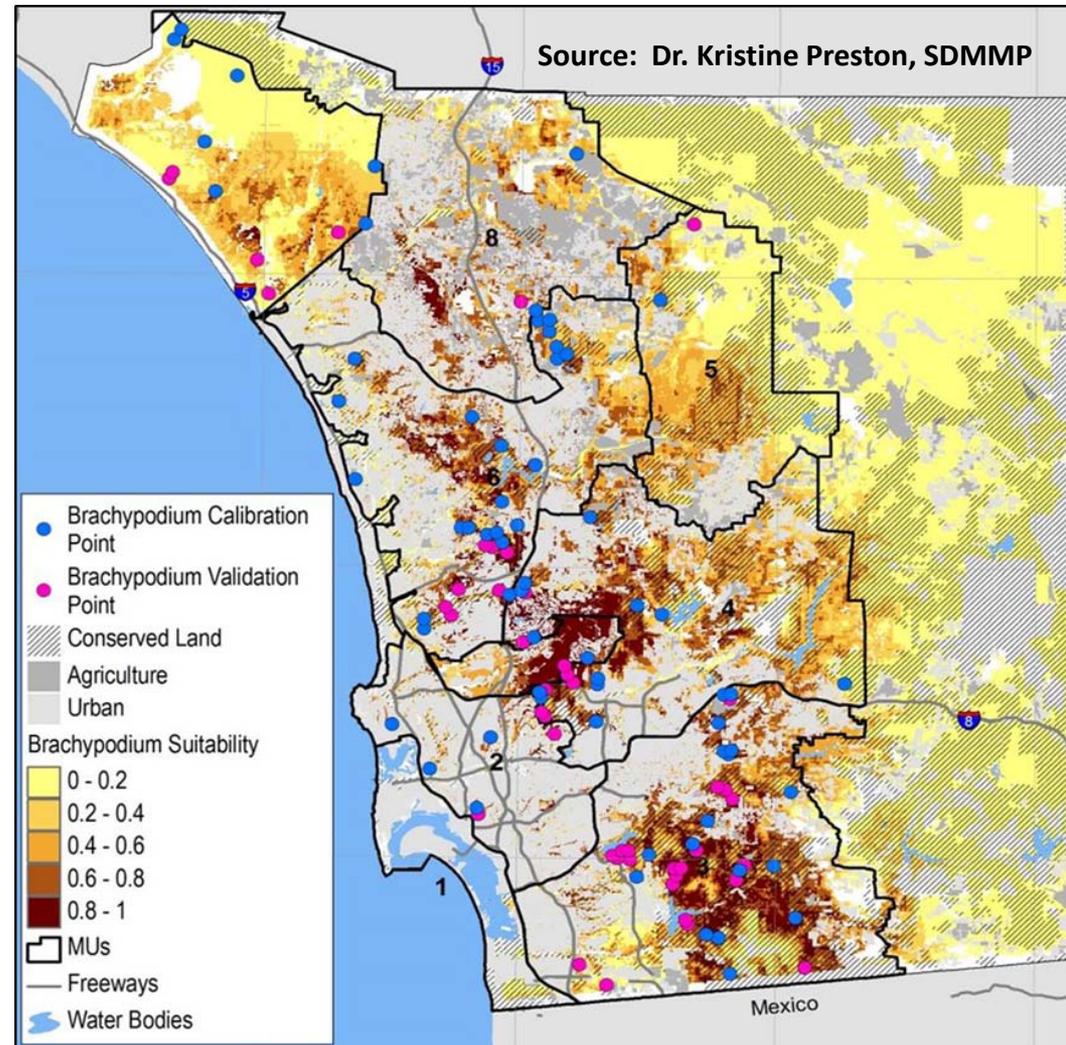
Life Stage	Trait	Effect
Seed	Low Dormancy High Viability Rapid Growth	Monopolizes Resources
Seedling (Vegetative)	Dense Stands	Outcompetes other Species
Flowering (Reproductive)	Self-fertile Short Life Cycle High Seed Production	Rapid Increase
Death (Thatch)	Dense Persistent Thatch Germinates in Dark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

Manage above- and below-ground seed bank

Habitat Suitability Model

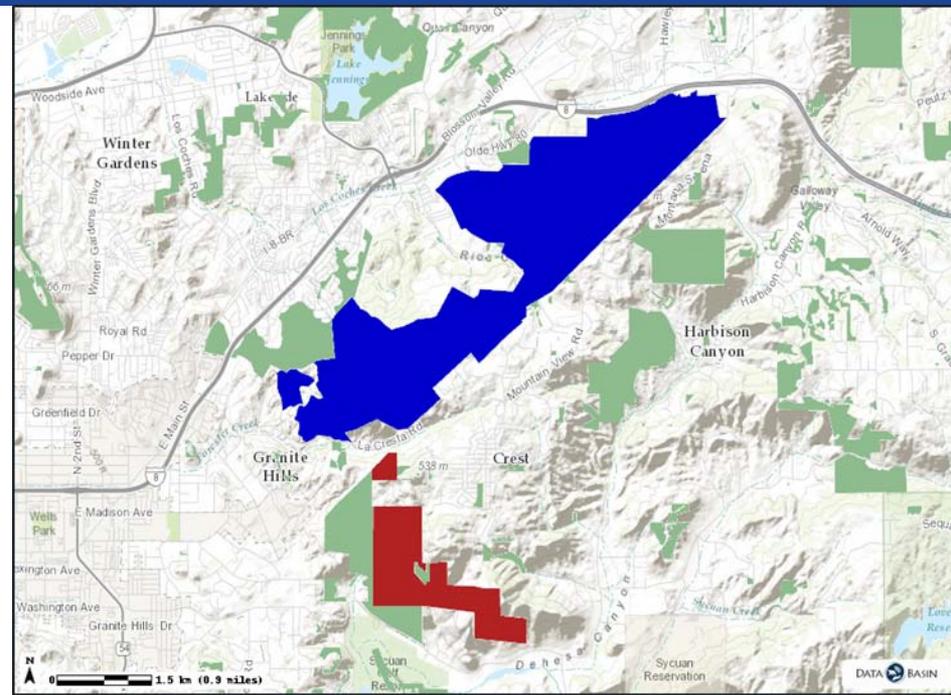
- Climatic and edaphic variables
- 46 calibration locations; 66 validation locations
- 5 top-performing models: average median HSI = 0.72

Predictive model for future invasions



Field Experiments

- 2 sites:10 acres/site
- Refine BMPs



Treatment Combinations

Fusilade-Glyphosate-Seed
(Dethatch)

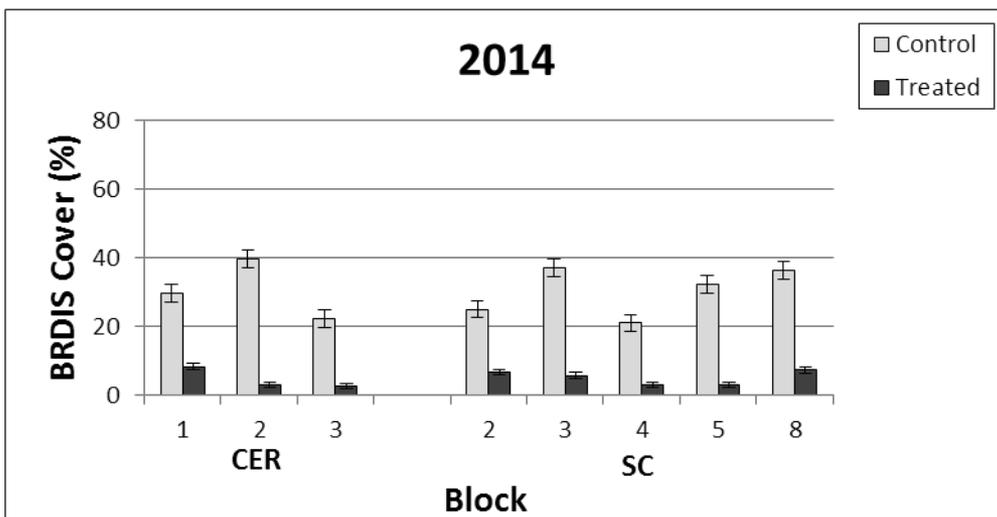
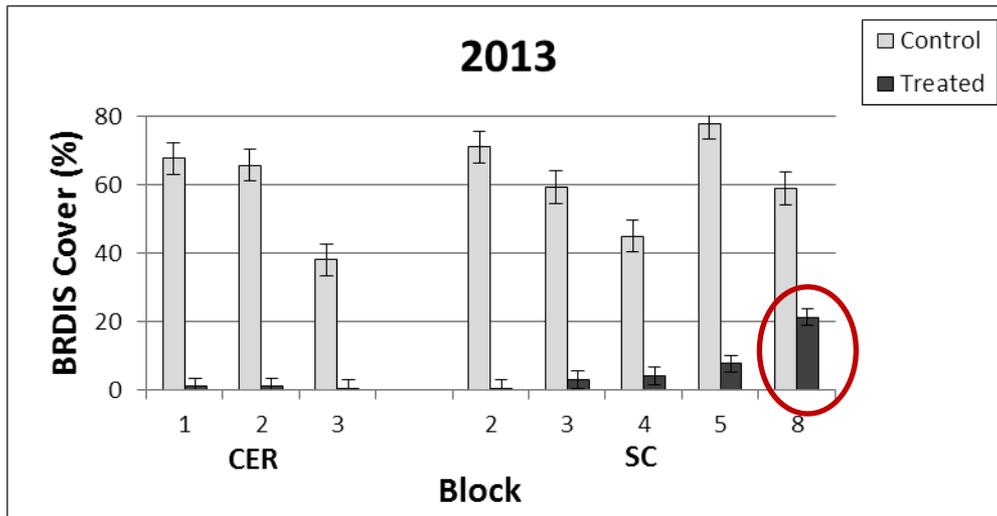
Mechanical-Glyphosate-Seed
(Dethatch)

Fusilade-Glyphosate

Control

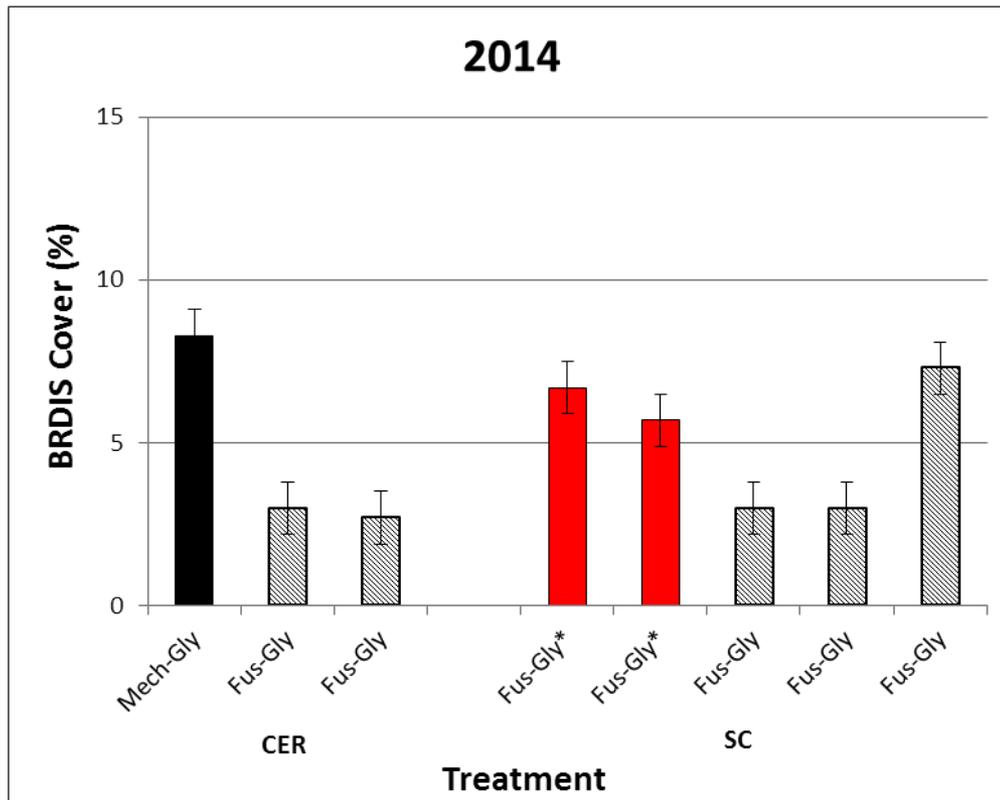


Brachypodium Control



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

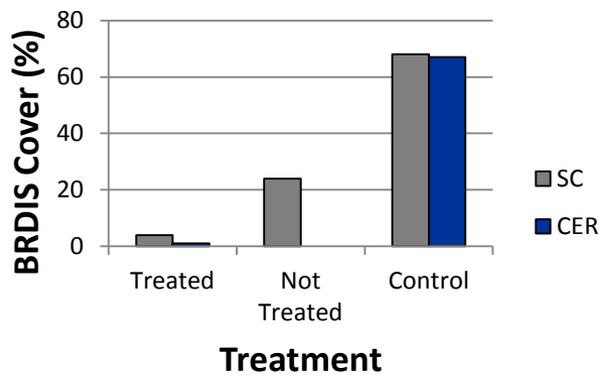
Treatment Effectiveness



- 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

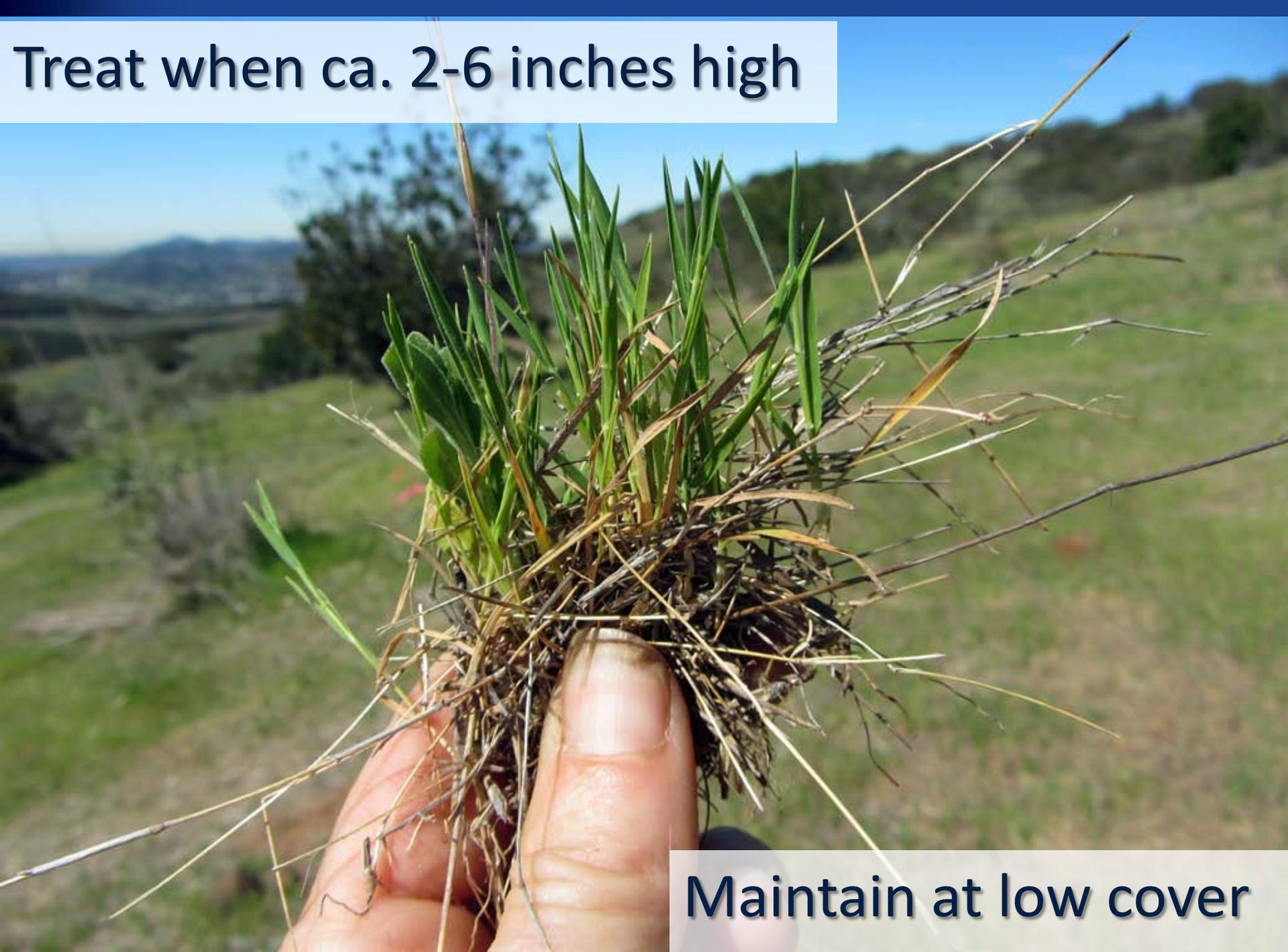
Treat in areas with sensitive resources on restricted soils



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

Betsy Miller, City of San Diego

Carl Bell, UC Agriculture and Natural Resources, Cooperative Extension

Cathy Chadwick (& volunteers), Earth Discovery Institute

Dr. Douglas Deutschman, Spring Strahm, Institute for Ecological Monitoring and Management (IEMM), San Diego State University

Dr. Kristine Preston, Emily Perkins, San Diego Management & Monitoring Program

Jessie Vinje, Conservation Biology Institute

John Ekhoﬀ, California Department of Fish and Wildlife

John Martin, U.S. Fish and Wildlife Service

Michael Beck, Jonathan Appelbaum, Endangered Habitats Conservancy

Patrick McConnell, Center for Natural Lands Management

Recon Environmental, Inc., Recon Native Plant Nursery

San Diego Association of Governments

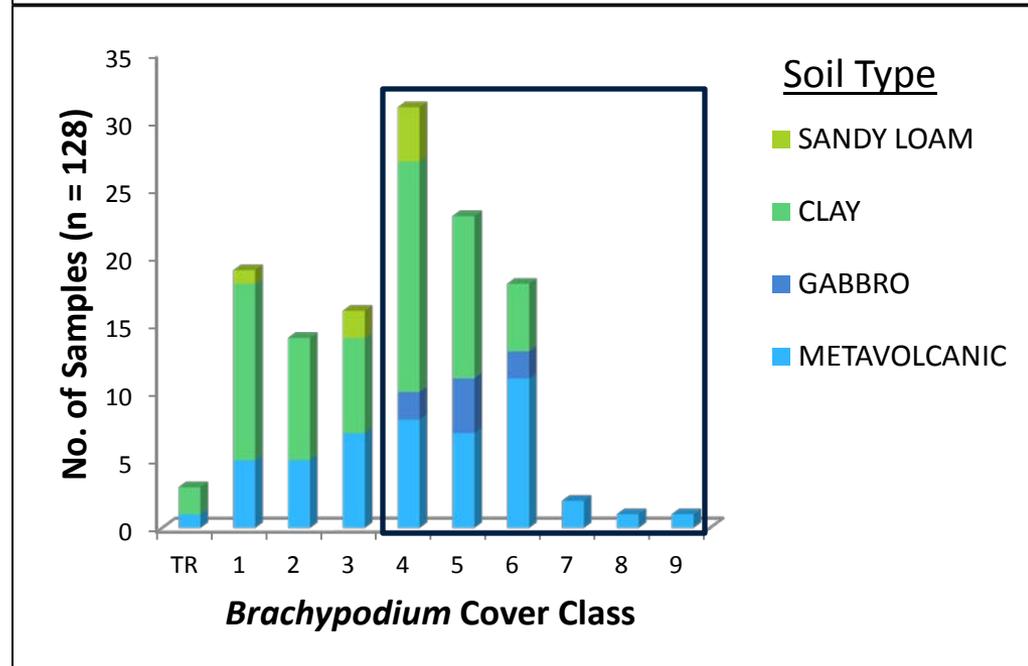
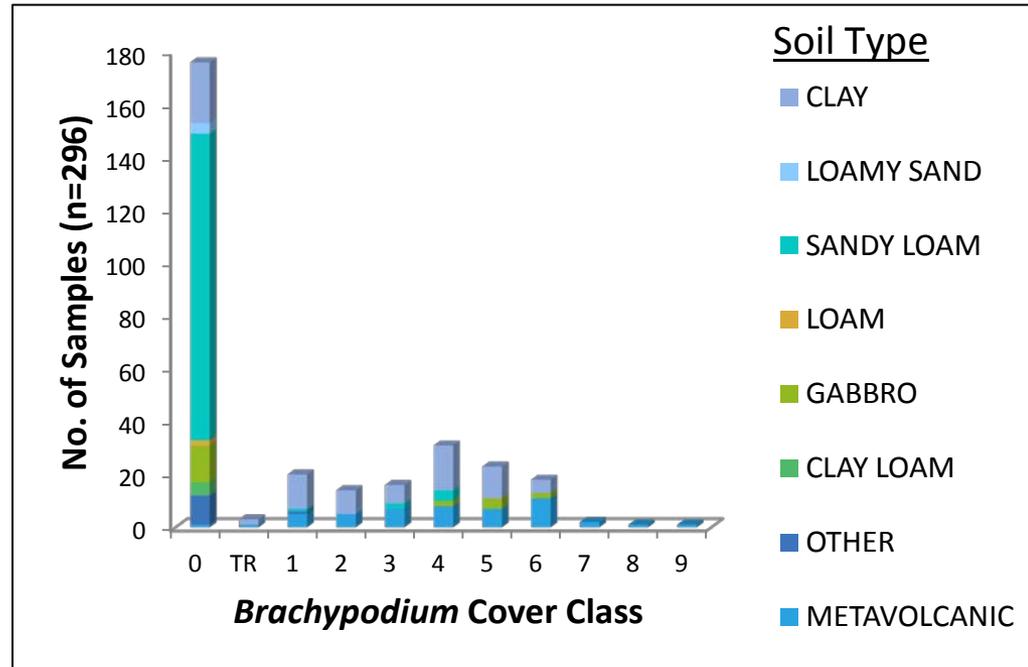
Soil Ecology and Restoration Group, SDSU

Trish Smith, The Nature Conservancy



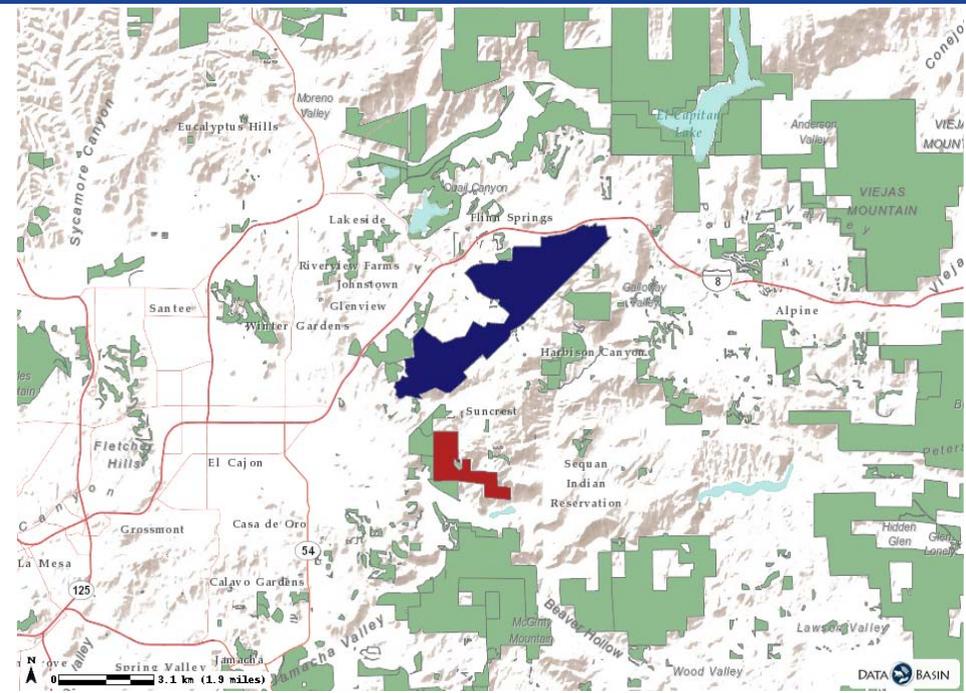
Soil Affinities

- 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

