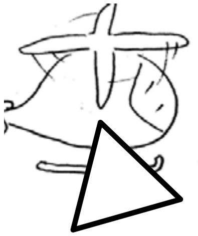

EFFECTS OF AERIAL HERBICIDE TREATMENT OF MELALEUCA ON NATIVE HABITAT RECOVERY IN THE NORTHERN EVERGLADES

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2. Arthur R. Marshall Loxahatchee National Wildlife Refuge, Boynton Beach, FL, USA
3. Fairchild Tropical Botanic Garden, Coral Gables, FL, USA

Melaleuca quinquenervia

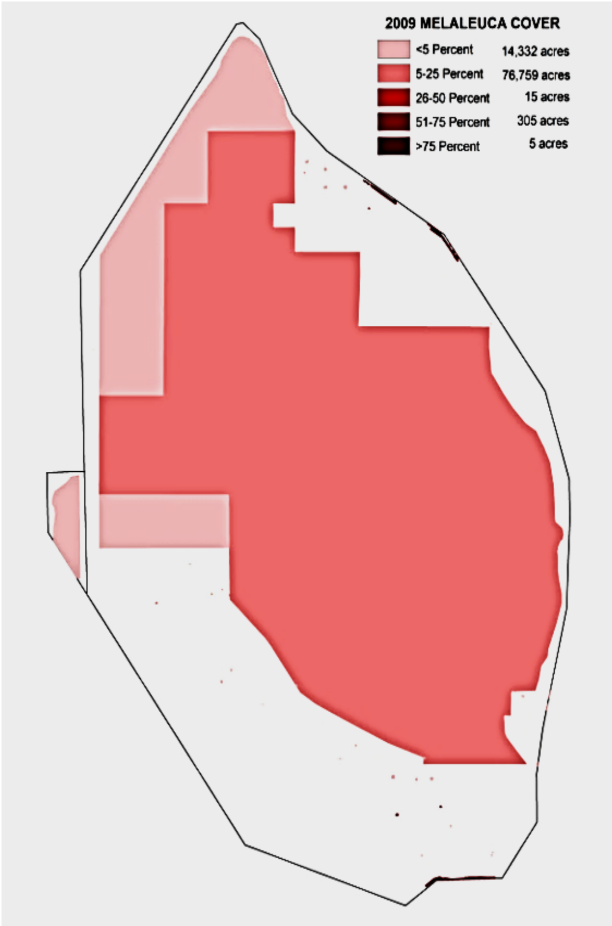
- Highly aggressive
  - **Reproductive in one year**
  - **100 million seeds/tree**

- Has invaded over 200,000 ha in south Florida

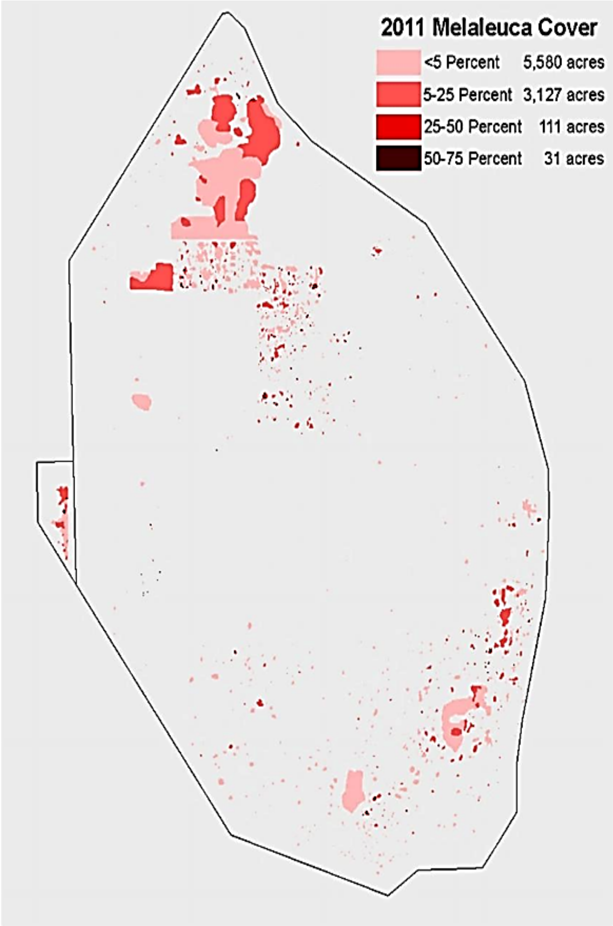
ars.usda.gov

A.R.M. Loxahatchee N.W.R.

- High levels of invasion
- Aggressive management



2009



2011

Selective Treatment Options

sflwww.er.usgs.gov/sfrsf/rooms/species/biocontrol/melaleuca.html

Hand Treatment

- Labor intensive
- Time
- Money
- Disturbance

Biological Control

- Variable efficacy
- Generally non-lethal
- Spatio-temporal dependancy

Non-Selective Treatment

Broadcast Aerial Herbicide

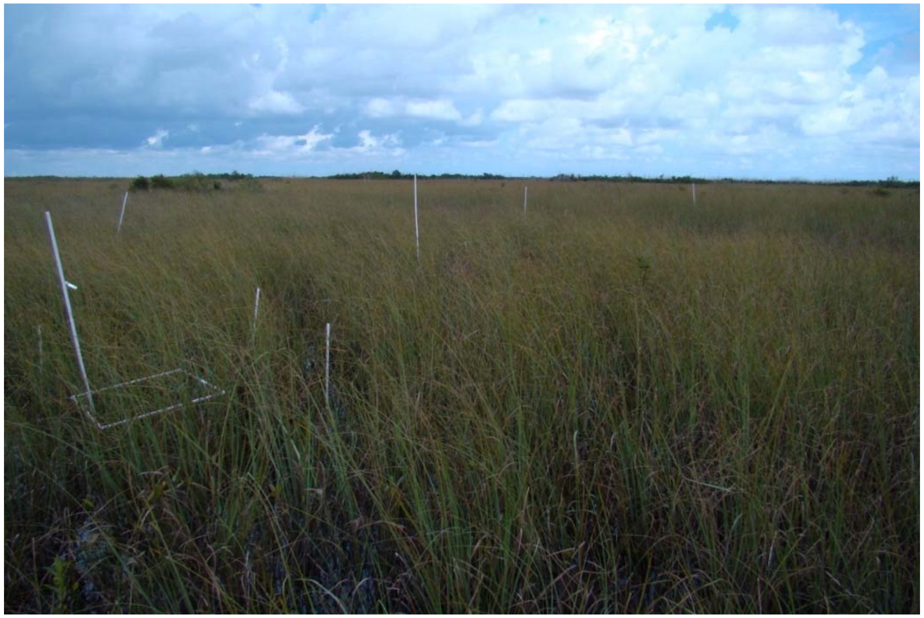
- Fast
- Cheap
- Effective
- **Non target impacts?**

Objectives

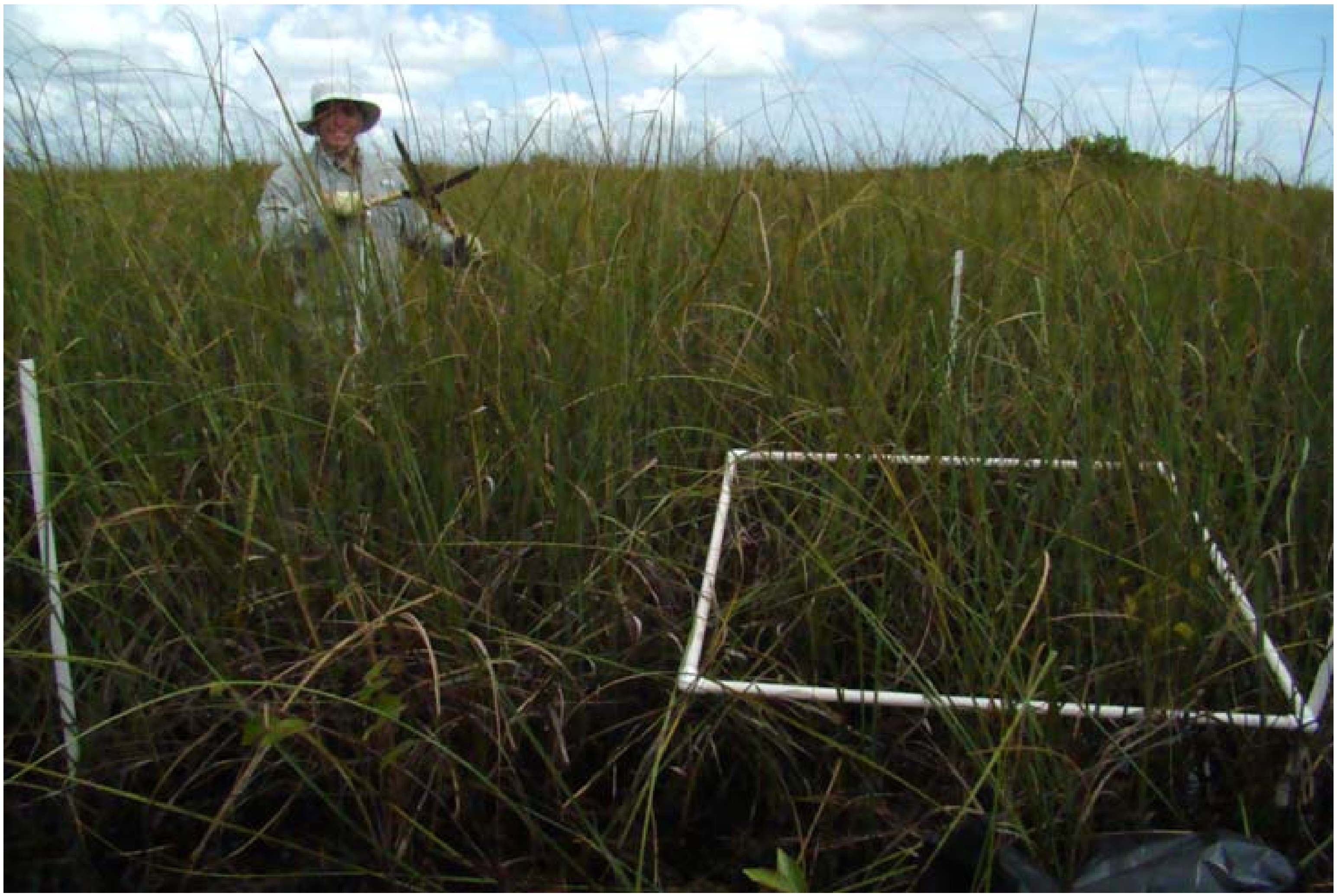
- Assess impact of aerial spraying on non-target vegetation community
- Quantify vegetation community composition and recovery of treated stands

Sawgrass Biomass Removal Experiment (S_aBRE)

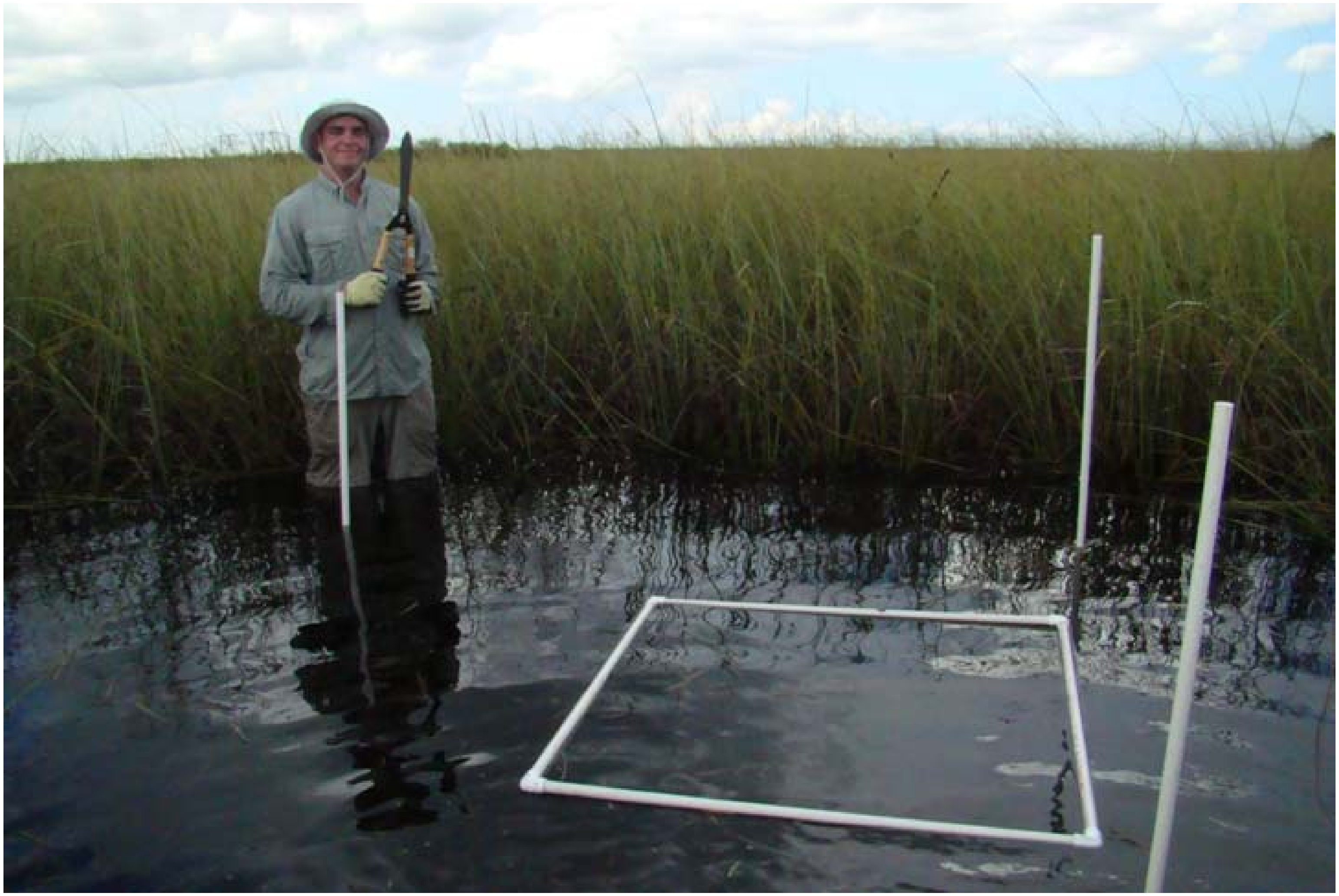
- Thirty 2m x 2m plots
- Control (n=10)
- Clipped (n=10)
- Herbicide (n=10)



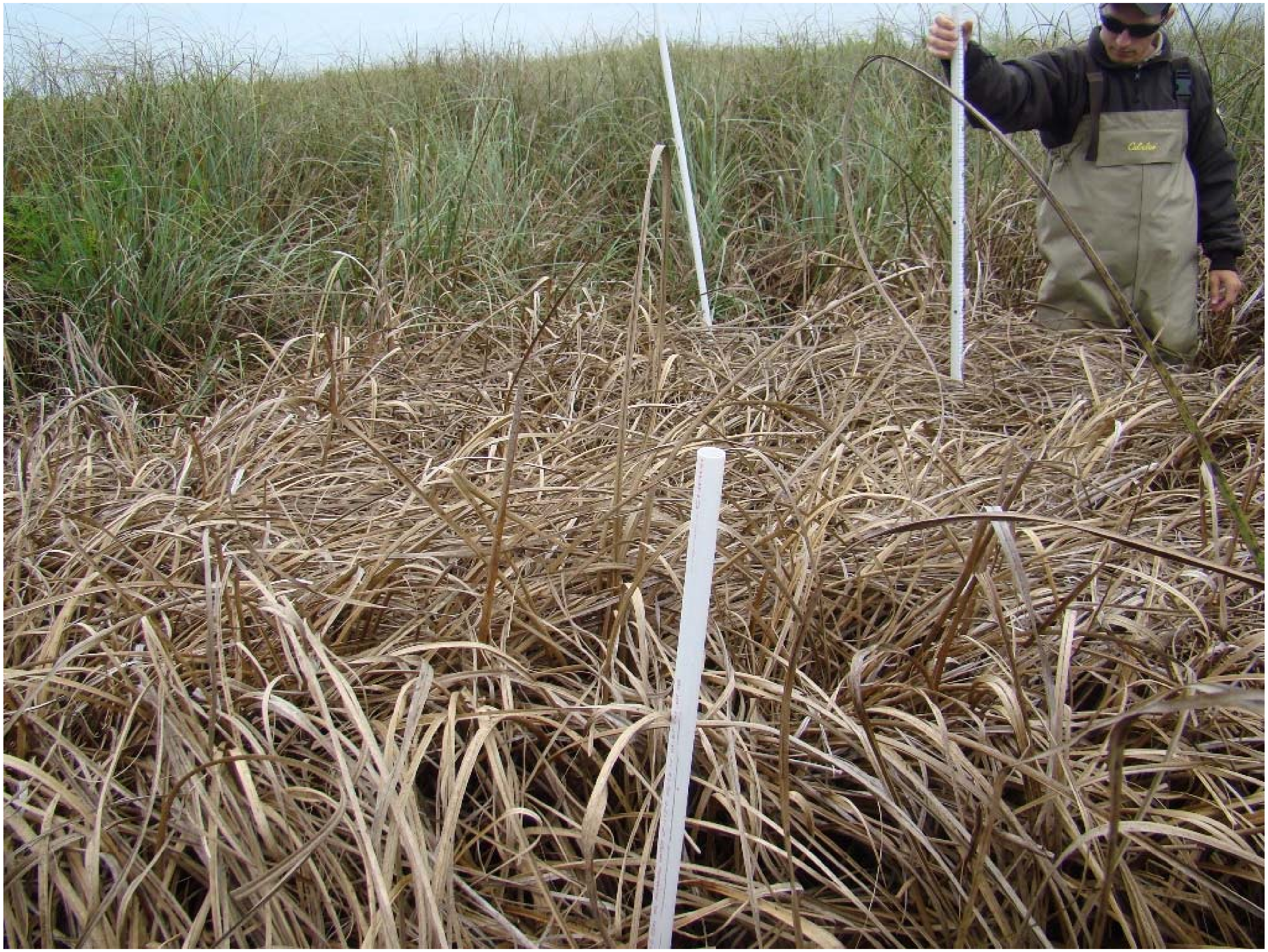
Control Plots



Clipped Plots



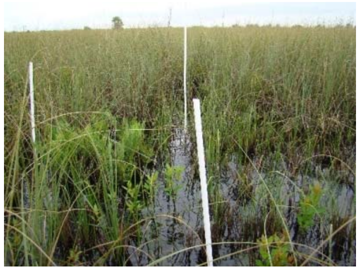
Herbicide Plots



Mean Percent Change in Species Richness

Week	Clip	Herb	Control
3	- 41	- 7	+ 9
7	- 3	- 20	+ 8
15	+ 24	- 7	+ 22
21	+ 44	- 3	+ 25
36	**+ 43[C]**	**- 11[A]**	**+ 31[B]**

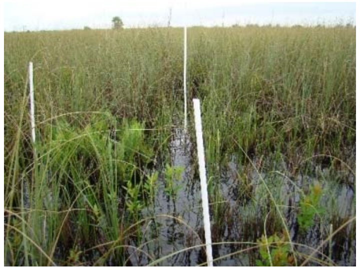
Herbicide decreases species richness



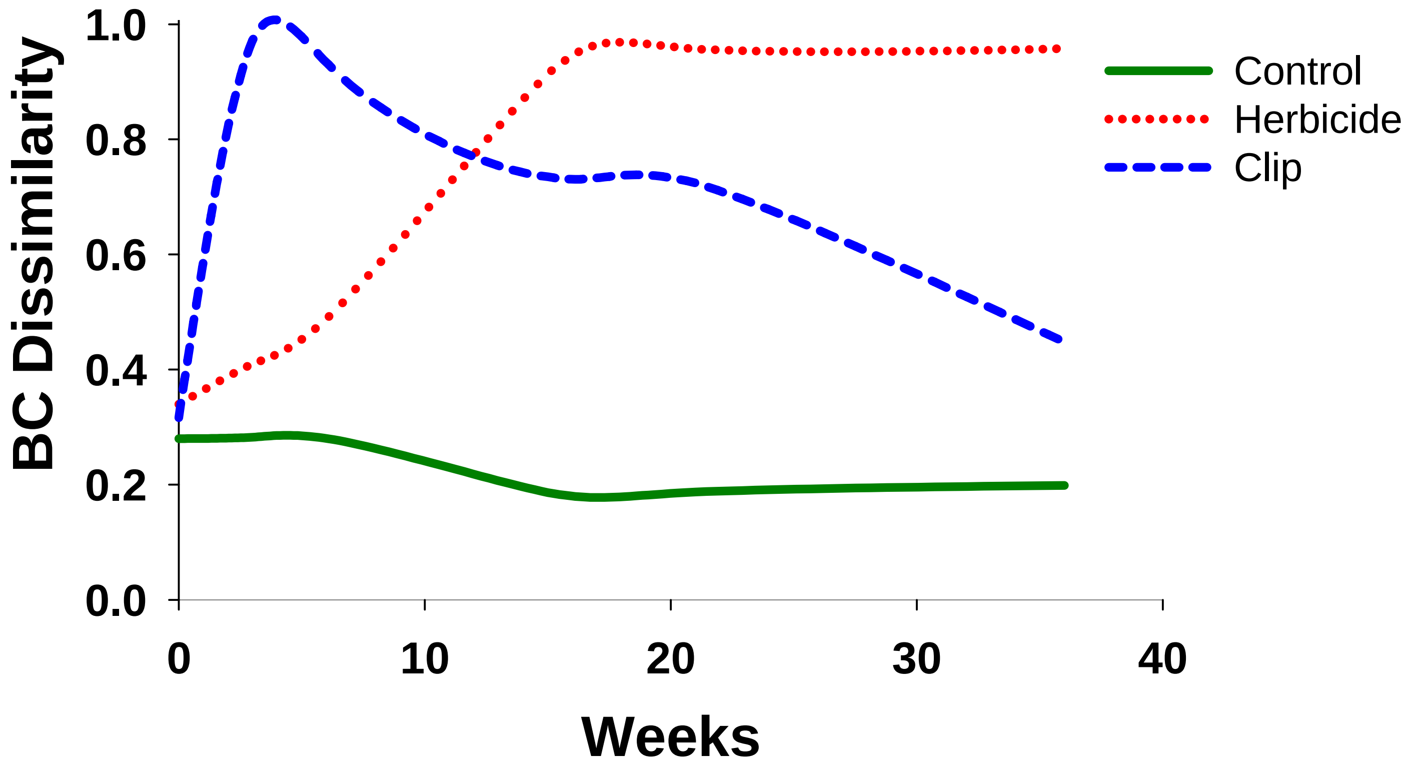
Mean Percent Change in Live Vegetation Cover

Week	Clip	Herb	Control
3	- 84	- 15	+ 1
7	- 75	- 55	+ 10
15	- 59	- 84	+ 12
21	- 51	- 82	+ 21
36	**+ 10^{B}**	**- 74^{A}**	**+ 28^{C}**

Herbicide reduces total live cover



Community Recovery Trajectory



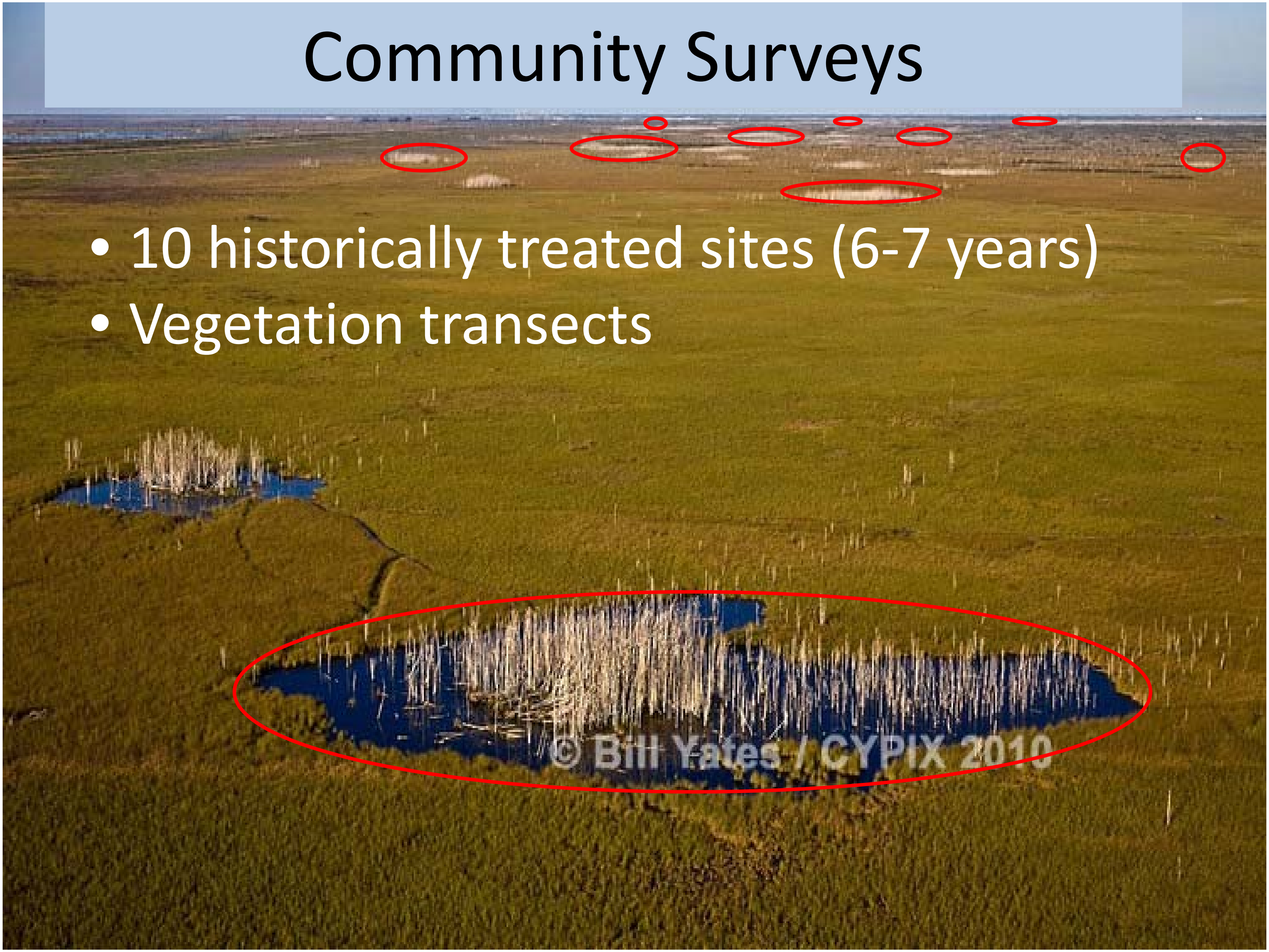
Changes are long-lasting!

Objectives

- Assess impact of aerial spraying on non-target vegetation community
- Quantify vegetation community composition and recovery of treated stands

Community Surveys

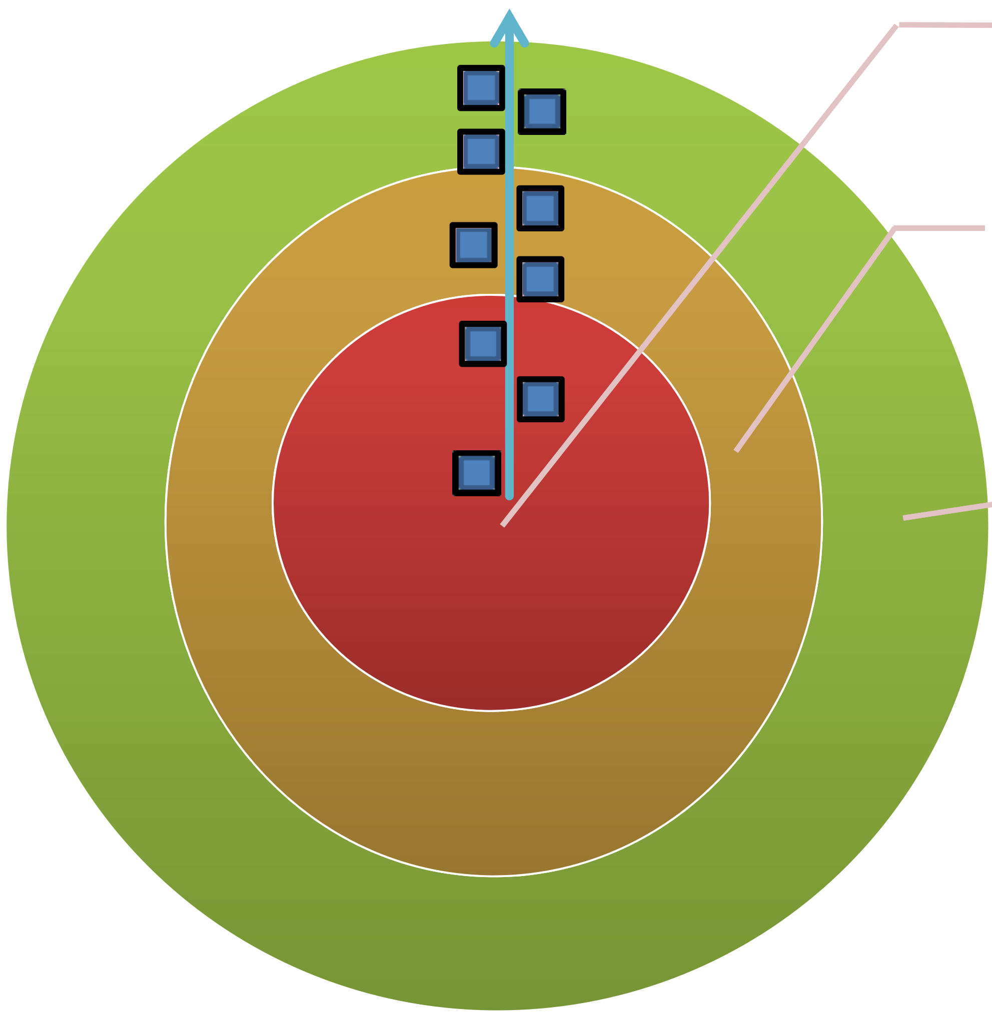
- 10 historically treated sites (6-7 years)
- Vegetation transects



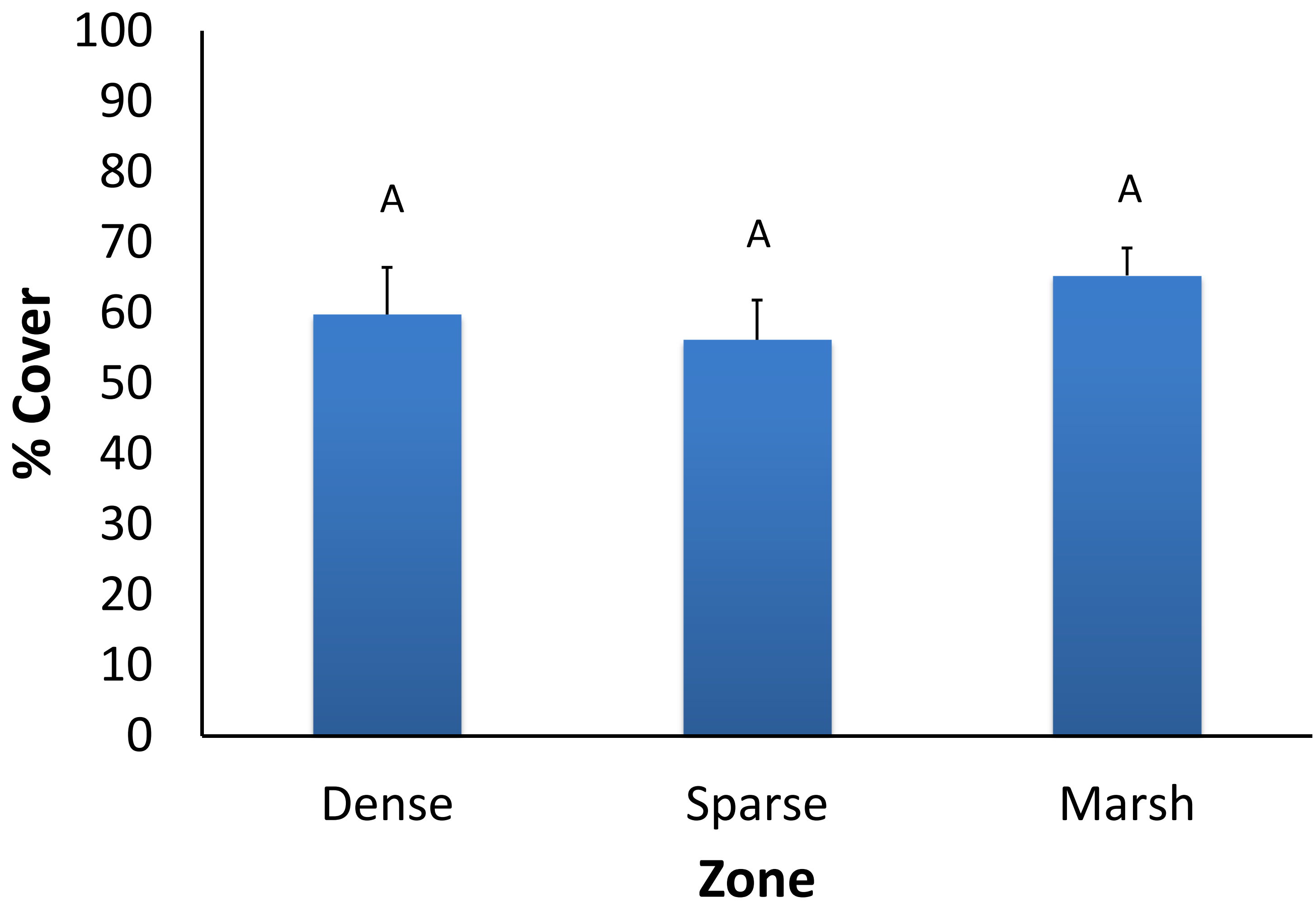
Structural Influence

- Stand density may influence herbicide interception
- Greater herbicide impact to understory in sparse stands
- Trees occupy space long after treatment
- Increased habitat complexity

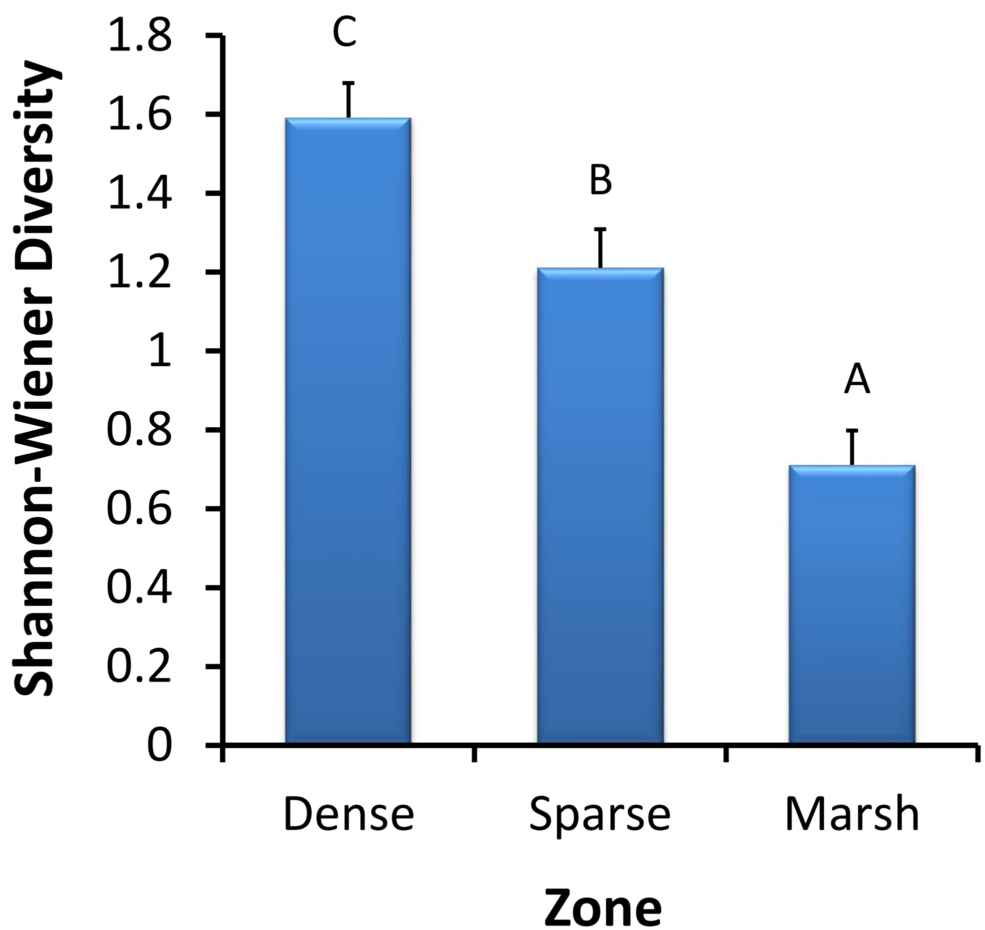
Transects



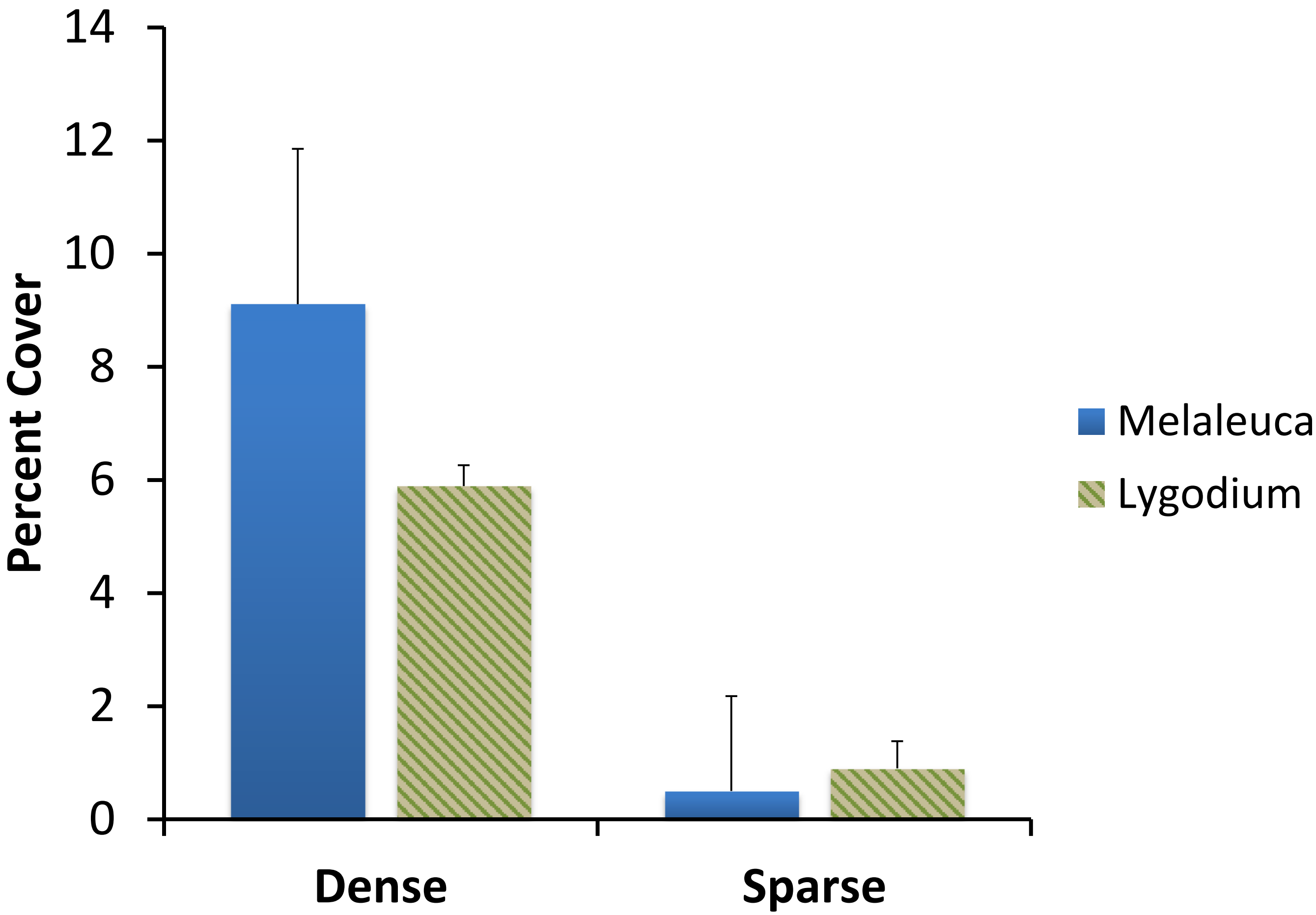
Melaleuca Adjusted % Native Live Cover

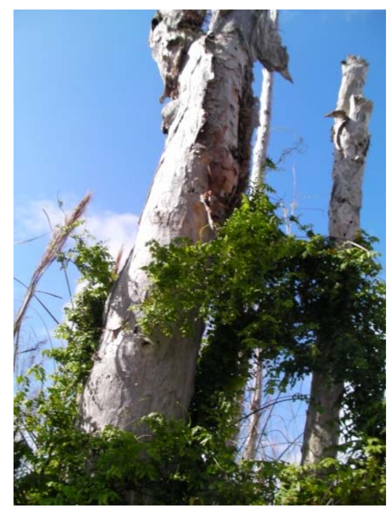


Community Diversity

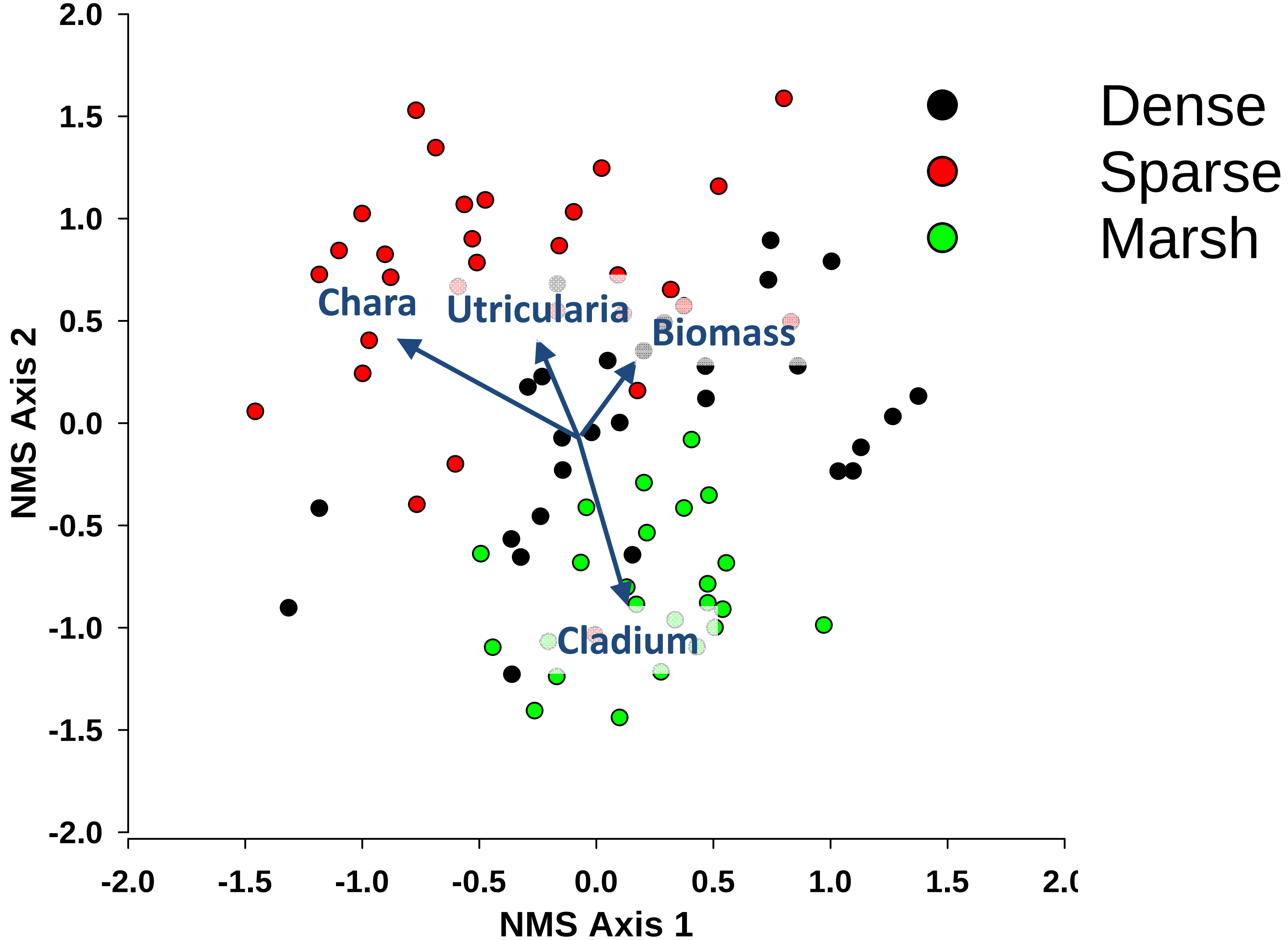


Invasive Cover





Shift in Community Composition



Results: Vegetation Patterns

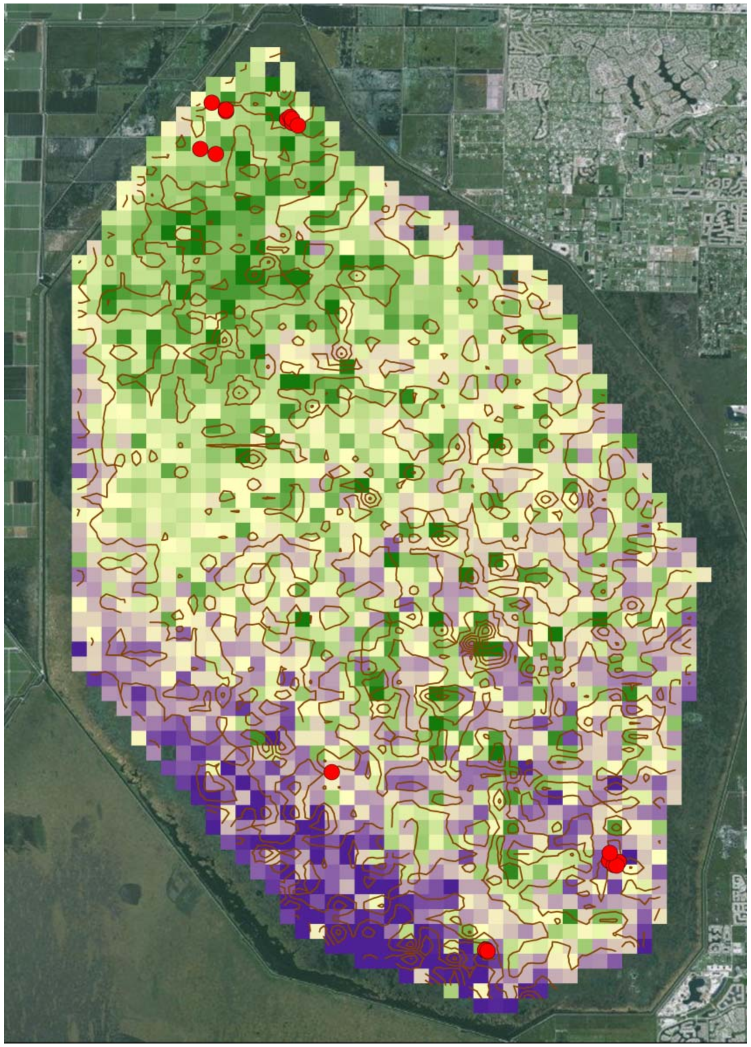
- Stand density-dependent effectiveness of aerial spraying
- Greater impact but lower reinvasion in sparse stands
- Community shifts long-lasting

Objectives

- Assess impact of aerial spraying on non-target vegetation community
- Quantify vegetation community composition and recovery of treated stands

Monitored Treatments

- **19** Melaleuca-invaded sites received aerial herbicide application
- sawgrass marsh (n=5 south, 5 north), slough/wet prairie (n=4), and pocosin (n=5) and were found in the northern and southern parts of the refuge

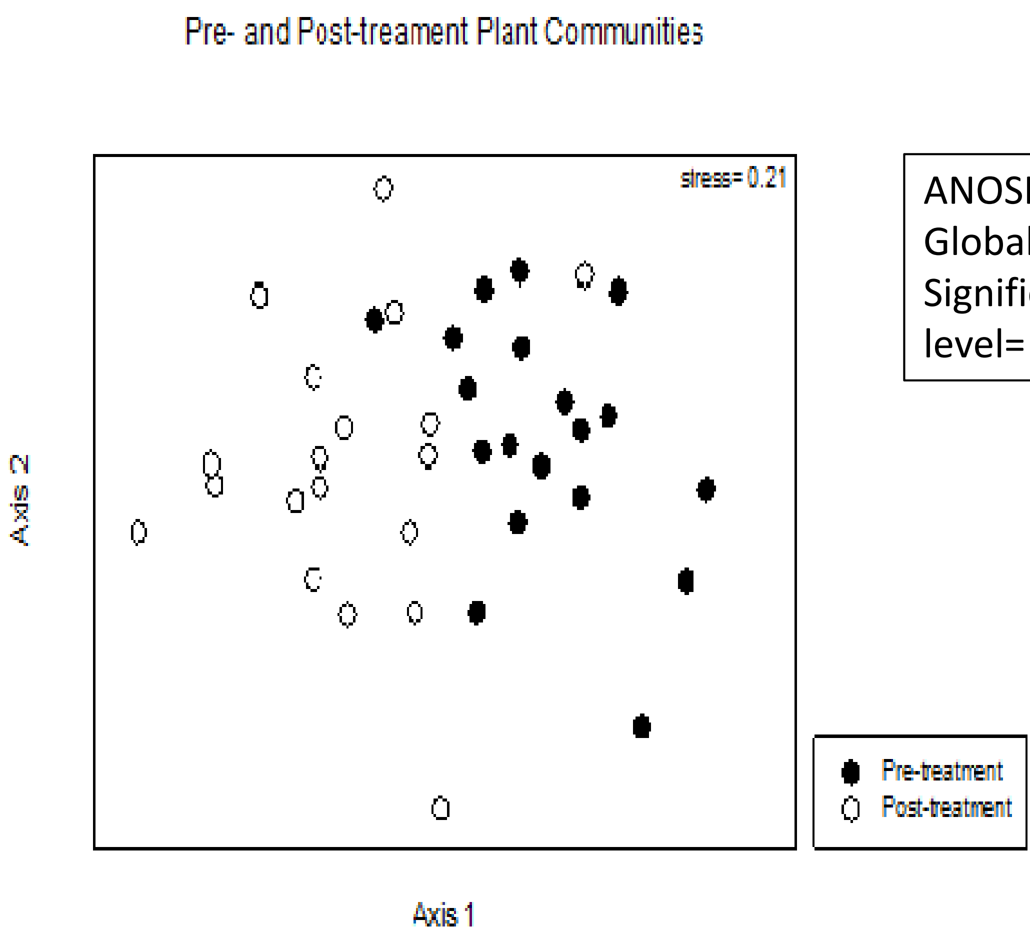


Methods

- Vegetation composition, canopy density, and water depth within each site were assessed prior to and following herbicide treatment
- First surveyed in November 2013
- Treated with a glyphosate-based herbicide in January 2014
- Resurveyed in March 2015 (14 mos).

Treated islands

Results



ANOSIM results
Global R= 0.373
Significance level= 0.1%

Conclusions

- Non-target communities have extended recovery trajectories or shifts to novel communities
- Stand density-dependent effectiveness of aerial spraying
- Greater impact but lower reinvasion in sparse stands

Management Implications

- Stand density/ area minimum threshold for aerial spraying
- Adaptive management strategies
- Risk of habitat alteration must be weighed against benefits of spraying

Acknowledgments

- US Fish and Wildlife Service (USFWS)
- Refuge staff: Christen Mason, Ryan Hudgins, Darren Pecora, Marcie Kapsch
- Committee: Dr. Brian Benscoter, Dr. Nathan Dorn, Dr. Rebekah Gibble, and Dr. Scott Markwith

Questions?