

Use of prescribed fire, glyphosate and seeding  
in cogongrass infested longleaf pine stands:  
Impacts on species relative dominance.

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## Primary Objectives

- Impacts of cogongrass invasion on insect communities of southeastern pine forests
- Influence of cogongrass management strategies on insect diversity and abundance



## Secondary Objective

- Impact of seeding with native plants on cogongrass control.
- Impact of early seeding with native plants on restoration efforts.



# Methods

## Study sites

- 10-year-old planted longleaf pine forests in south Alabama – one in Mobile county (RW), one in Baldwin county (BB)
- Heavily infested with cogongrass (90-100% cover)
- Sandy loam soils

## Treatments

- Prescribed fire
- Glyphosate
- Seeding with mix of native species
- Control

## Design

- Split plot with CRD
- 10 X 10 m plots
- 5 replicates per treatment
- Evaluated plant cover and composition summer and fall (2010 – 2012)





## Vegetation Sampling

- Two 1 m<sup>2</sup> quadrats per plot
- All species recorded by cover class on scale of 0-6
  - 0=absent
  - 1=less than 2.5%
  - 2=2.5-10%
  - 3=10-25%
  - 4=25-50%
  - 5=50-75%
  - 6=75-100%



## Prescribed Fire Treatment

- Block containing half of the plots was burned in March of 2010
- Backing fire and good weather conditions to minimize fire severity







Still got a bit hot!





## Glyphosate Treatments

- April 2010 - 2.5% v/v
    - 6 weeks post-burn, pre-flowering, regrowth was 12-18”
  - October 2010 - 4% v/v
  - November 2011 - 1% v/v
- } spot trts



- treatments applied with a single nozzle backpack sprayer at 55 GPA and 20 PSI





Several weeks after spraying ....



# Seeding With Native Plants

- Plots were lightly disked
- Broadcast sown
  - April 2010
  - Feb 2011







## 2010 Species List

common sunflower	<i>Helianthus annuus</i>	35%
switchgrass 'Carthage'	<i>Panicum virgatum</i>	32%
purpletop tridens	<i>Tridens flavus</i>	10%
partridge pea	<i>Chamaecrista fasciculata</i>	15%
dixie ticktrefoil	<i>Desmodium tortuosum</i>	2%
largeflower tickseed	<i>Coreopsis grandiflora</i>	2%
grey headed coneflower	<i>Ratibida pinnata</i>	2%
blackeyed Susan	<i>Rudbeckia hirta</i>	2%

25 lbs bulk seed per acre ... \$15.80 per lb ... \$395 per acre

Seeds from: Ernst Conservaton Seeds





common sunflower – *Helianthus annuus*





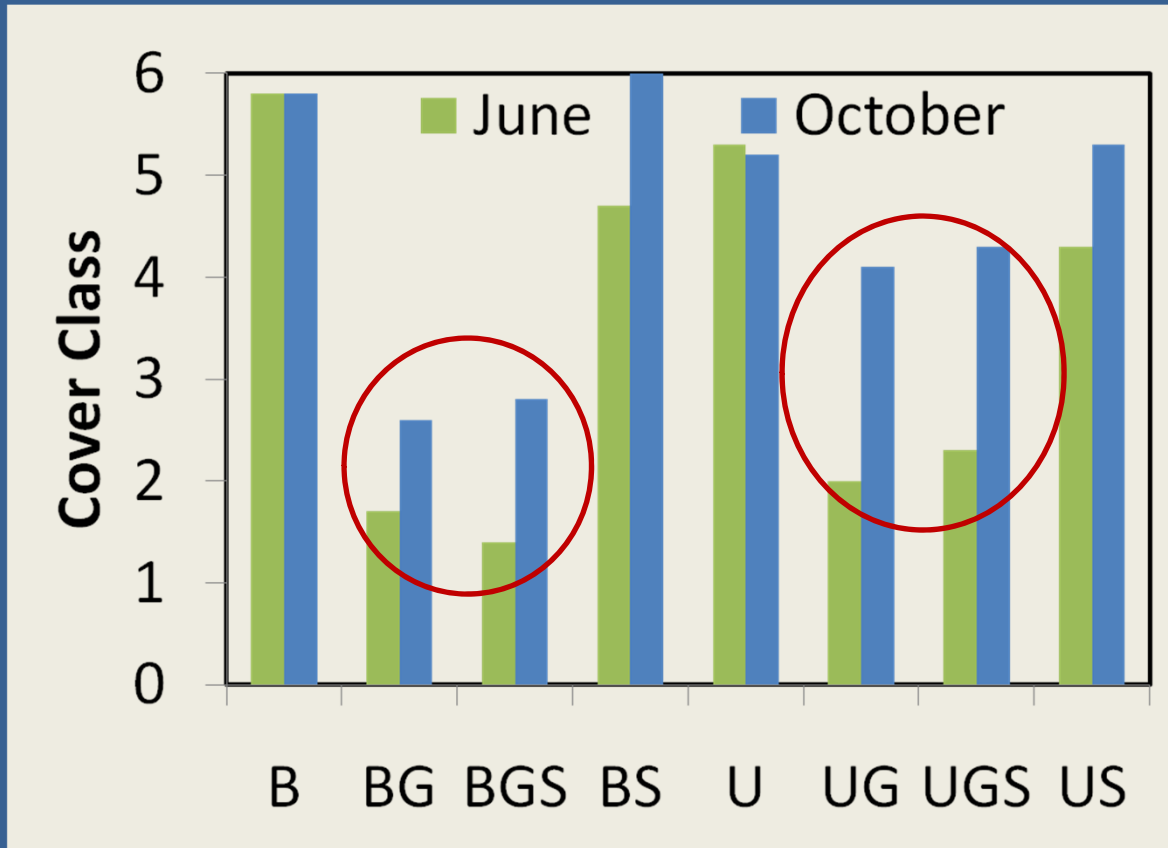


The problem with switchgrass and other grasses ...





## Cogongrass Cover - 2010



1=1-2.5%, 2=2.5-10%, 3=10-25%, 4=25-50%, 5=50-75%, 6=75-100%

B=burned, G=glyphosate, S=seeded, U=unburned

**The problem with cogongrass ... recovery was fairly strong.**





Fall applications of glyphosate ...





## 2011 SPECIES LIST

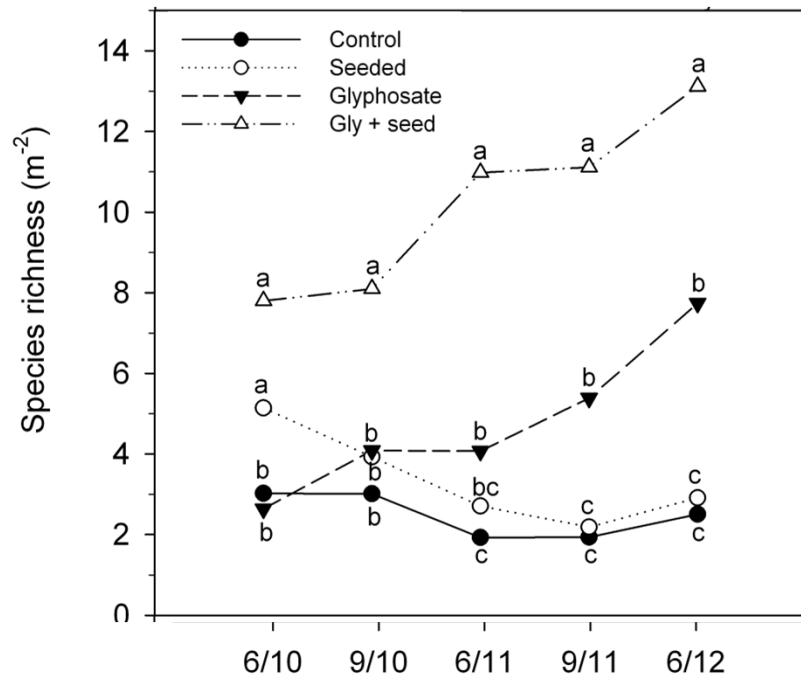
Virginia wild rye	<i>Elymus virginicus</i>	19%
Indian grass	<i>Sorghastrum nutans</i>	19%
purpletop tridens	<i>Tridens flavus</i>	12%
broomsedge	<i>Andropogon virginicus</i>	10%
partridge pea	<i>Chamaecrista fasciculata</i>	30%
lance-leaved coreopsis	<i>Coreopsis lanceolata</i>	2%
perplexed ticktrefoil	<i>Desmodium perplexum</i>	2%
greyheaded coneflower	<i>Ratibida pinnata</i>	2%
blackeyed Susan	<i>Rudbeckia hirta</i>	2%
white wingstem	<i>Verbesina virginica</i>	2%
spurred butterfly pea	<i>Centrosema virginianum</i>	1%

9 PLS per acre ... \$22.9 per pound ... \$206 per acre

Seeds from: Roundstone Native Seed



# Species Richness



- Very low richness in cogongrass
- As expected, seeding alone did not increase richness
- Richness tended to increase over time in the glyphosate only plots
- Richness was greatest in the seeded plots and also tended to increase over time, reaching levels comparable to those reported in managed longleaf



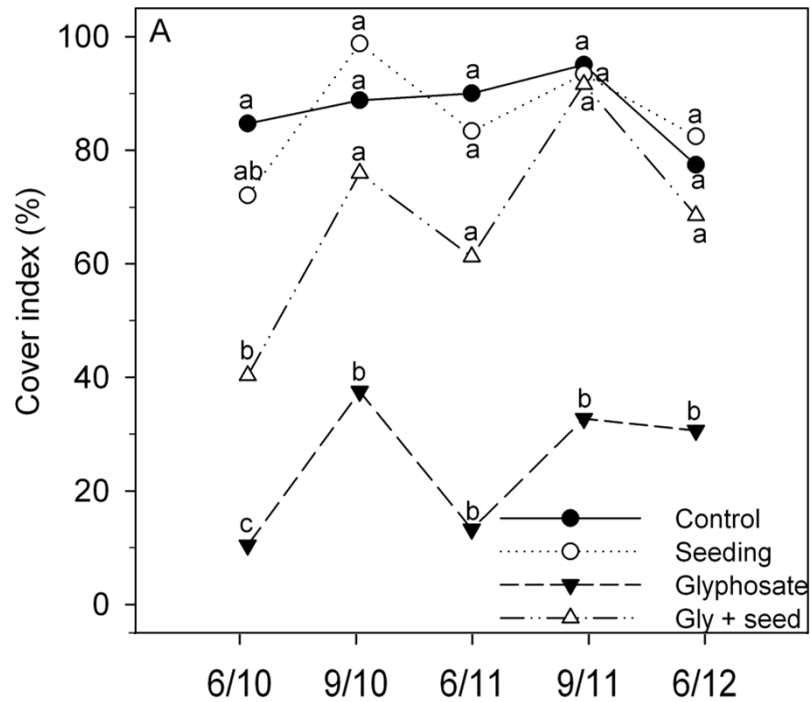
**Relative dominance ... cover of a given species expressed as a percentage of the total cover of all species present.**

$$RD_i = 100 \times \sum_{j=1}^Q C_{ij} / \sum_{j=1}^Q \sum_{i=1}^N C_{ij}$$

where  $C_{ij}$  = percent cover class mid-point for the  $i^{\text{th}}$  species on the  $j^{\text{th}}$  quadrat with a total of  $Q$  quadrats.



# Vegetation Cover Index

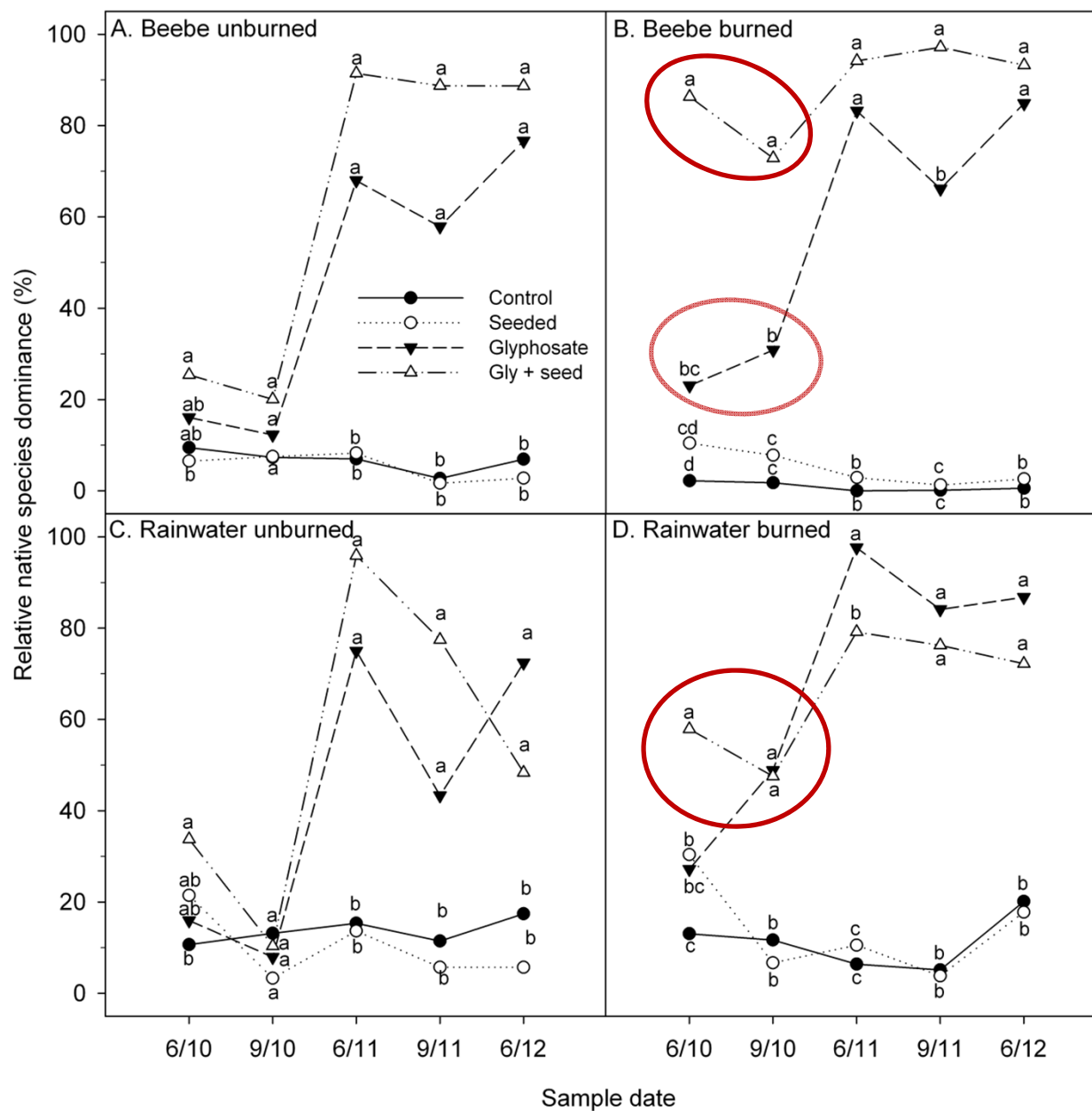


- Glyphosate significantly reduced plant cover.
- Plant cover was higher in the glyphosate plus seeding treatments and tended to increase over time





# Relative Dominance - Native Species



- Most species coming in after cogongrass control were native species.

- Trend for more rapid establishment in the burned plots.



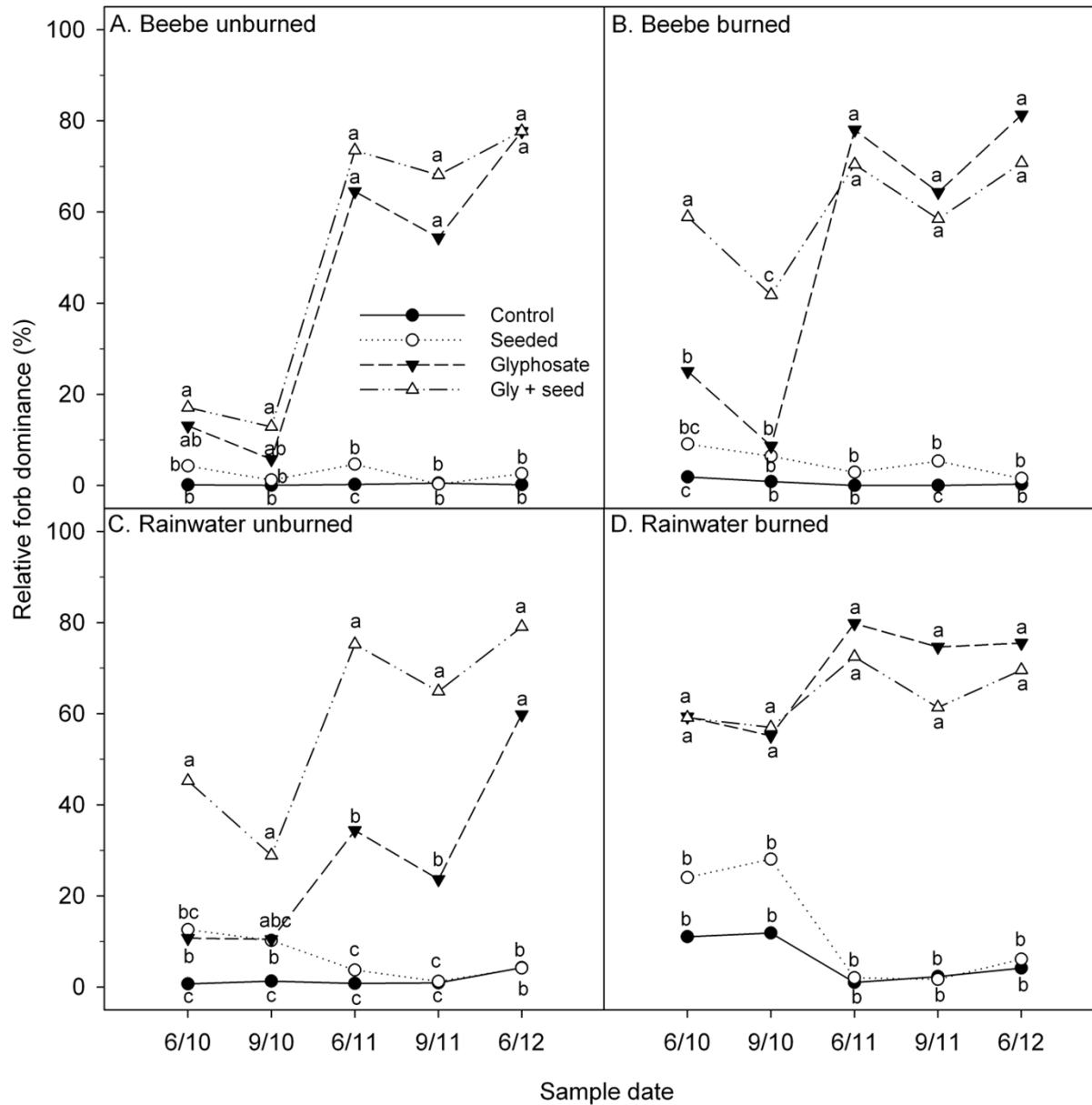


## Non-native plants other than cogongrass

- Between 3 to 9 non-native species occurred in each treatment.
- Abundance of non-natives generally higher in the G and GS treatments.
- Influence of seeding (soil disturbance) on non-native abundance varied.
- *Phyllanthus urinaria* (gripeweed) was the most abundant non-native, especially in the burned plots at RW.



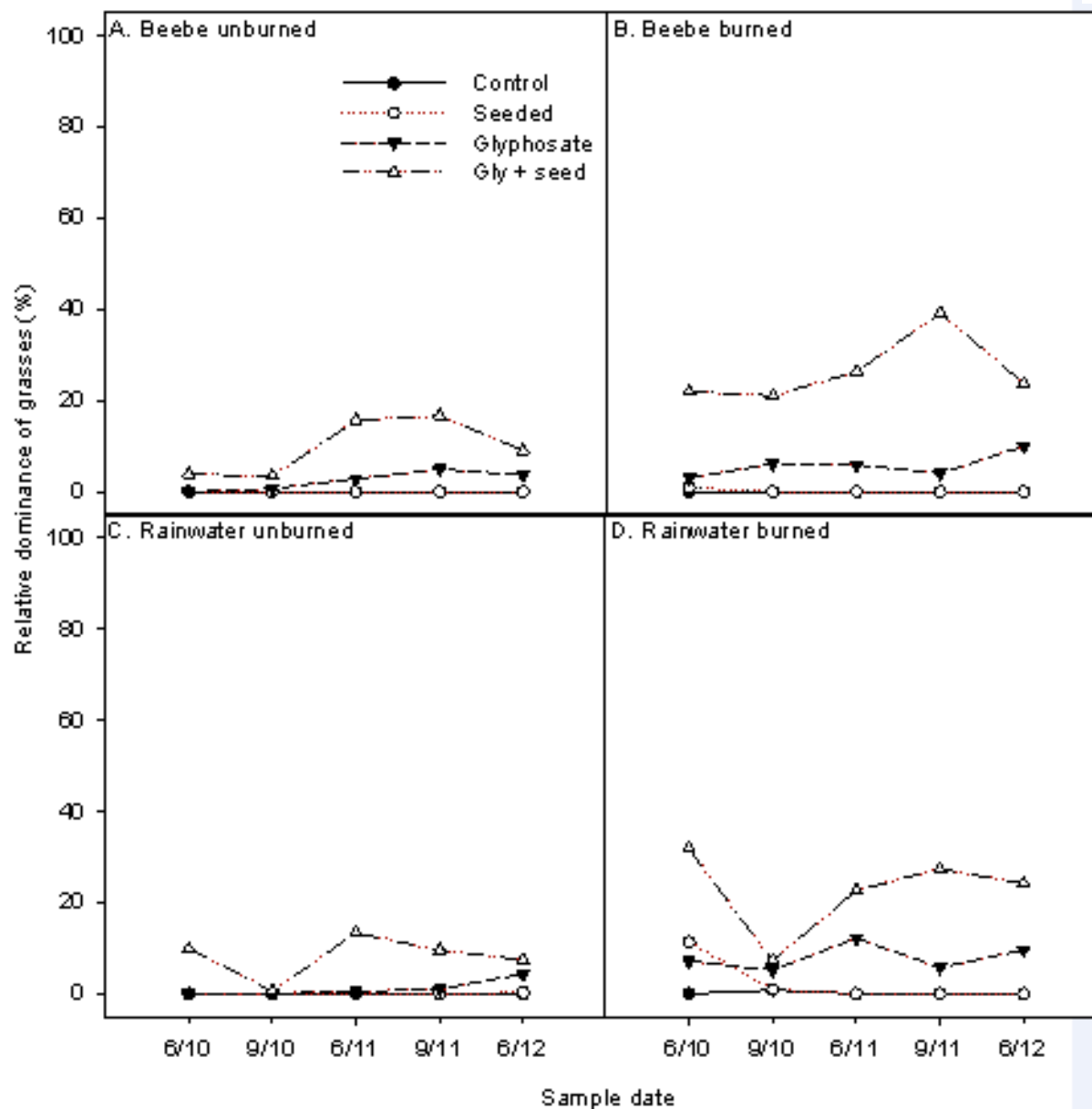
# Relative Dominance - Forbs



Forbs dominated species cover and composition after cogongrass was controlled.



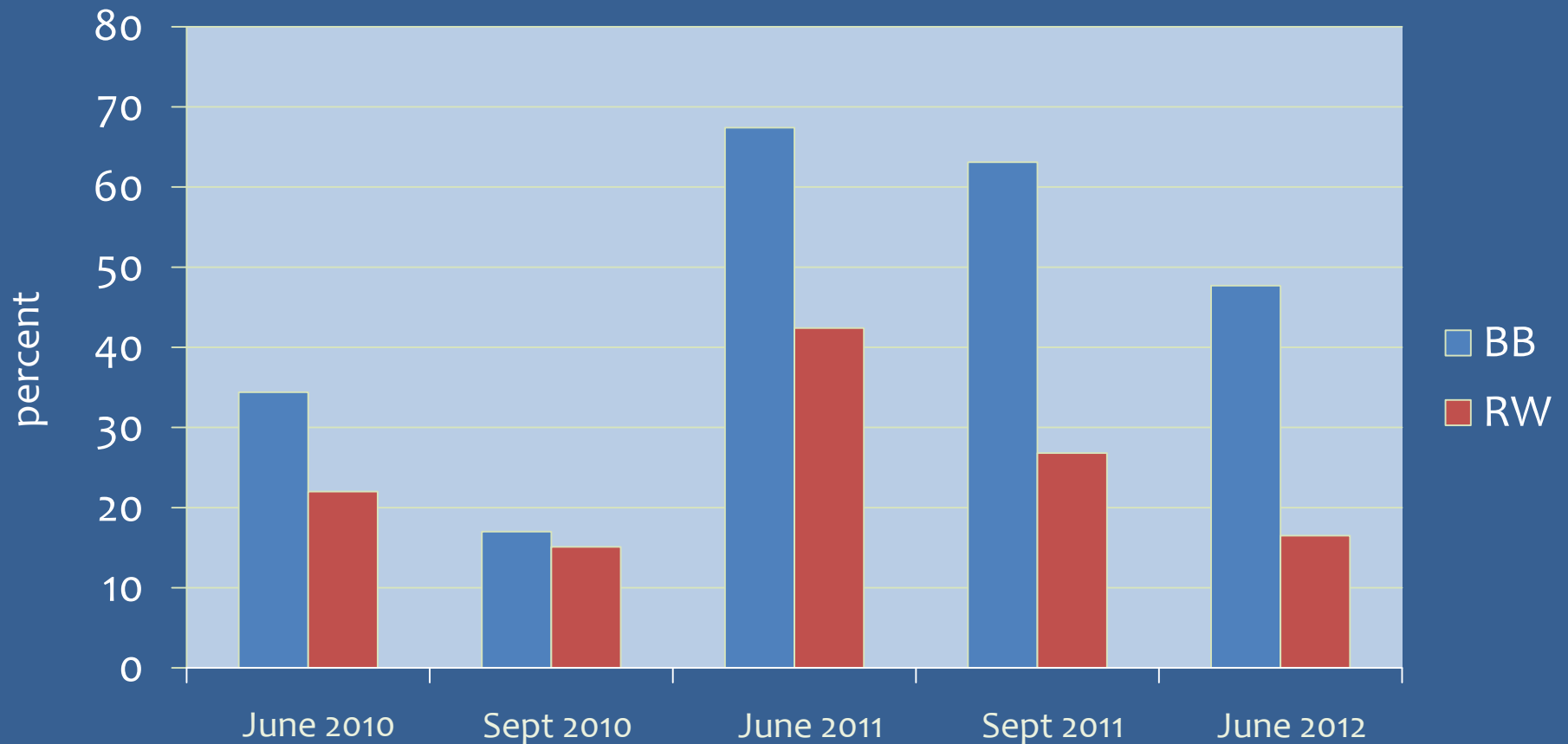
# Relative Dominance - Grasses



- Grasses other than cogongrass were a fairly minor part of the plant composition, even in seeded plots.
- Care was taken to avoid native grasses during spot spraying of cogongrass, but there was some collateral damage.



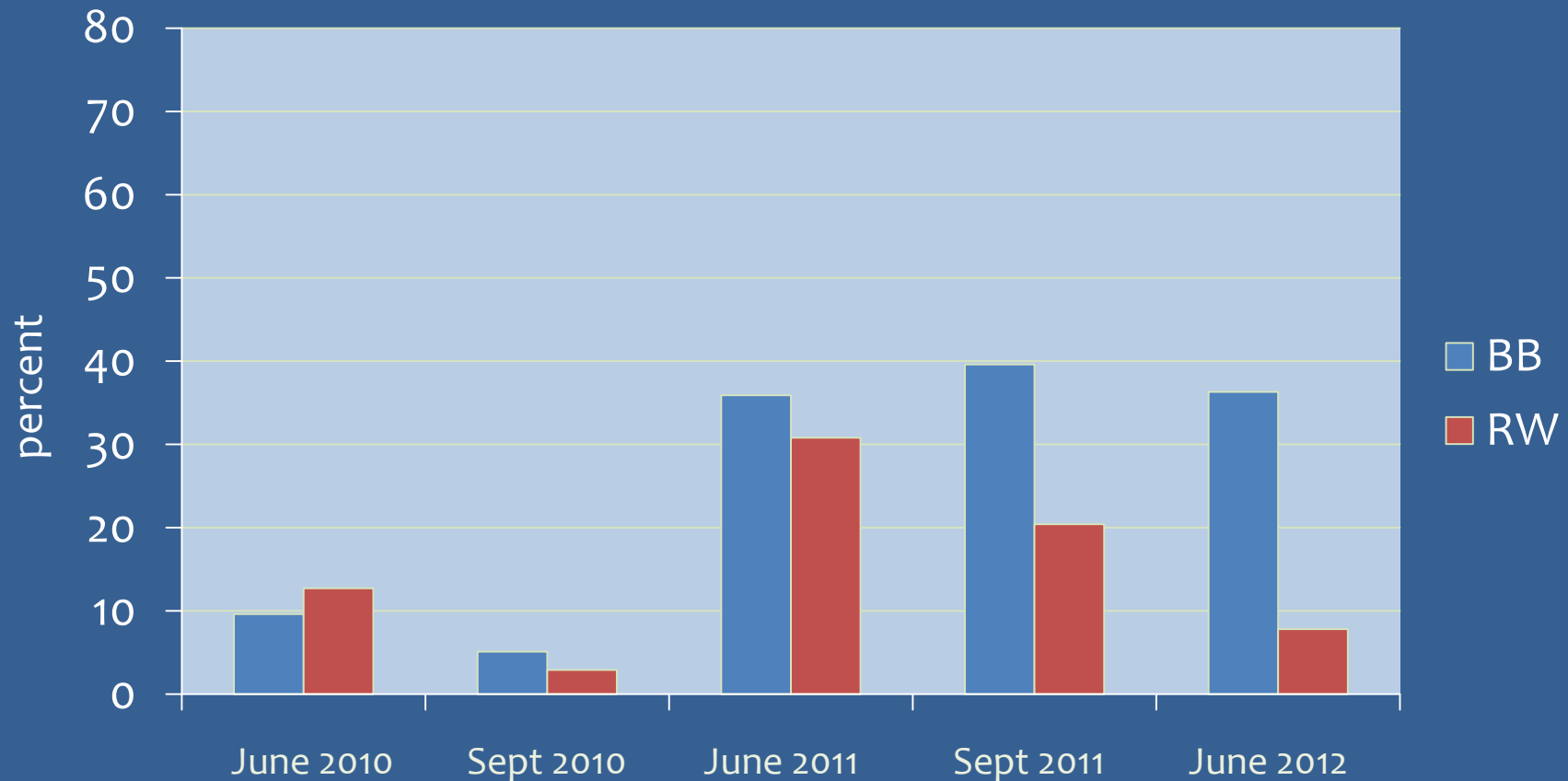
# Relative dominance of seeded species



burned plots treated with glyphosate and seeding



## Relative dominance of seeded species



unburned plots treated with glyphosate and seeding



## Best performing seeded species



*Rudbeckia hirta* and *Coreopsis* spp.



*Centrosema virginianum*



*Tridens flavus*



*Chamaecrista fasciculata*



# Summary

- After cogongrass control ...
  - Native forbs were most abundant.
  - Grasses were not abundant. (Collateral damage during spot spraying may have contributed to this.)
  - Some non-native species occurred, but they were not dominant.
- Success of seeding ....
  - Establishment varied by site and was generally better in the burned plots.
  - Did not contribute to cogongrass control.
  - Seeding did increase species richness.







# Acknowledgements

- Field Assistance: Joe Borden, Jatinder Aulakh, Will Dixon
- 2011 Plant Surveys: Gena Todia – Wetland Resources, Env. Consulting
- Study sites: Tommy Swearingen, Austin Rainwater
- Funding : USDA-CSREES-AFRI Biology of Weedy and Invasive Species Competitive Grant Program



A photograph of a forest floor covered in pine needles and various green plants. In the top left corner, there is a black bucket. The word "Questions?" is written in white text in the center of the image.

Questions?