

# Beach Vitex Biology and Control



# Beach Vitex

- Why?
- Introduced – 1955, 1980's
- Where?
- Korea –
- US - NC-JCRA
- How?
- Nursery/Landscape – after Hurricane Hugo



# Why is Beach Vitex invasive?

- Salt tolerant
- Aggressive, vegetative runners,
- Roots at nodes
- No disease, insect problems
- Eliminates other vegetation



- As high as 1000 fruit/ sq m
- Over 6000 seeds
- dormant
- Will persist in soil for more than 10 years
- Seed float – tolerant to salt water
- No specialized pollinators required
- Usually not bird disseminated



Why is Beach Vitex Invasive?

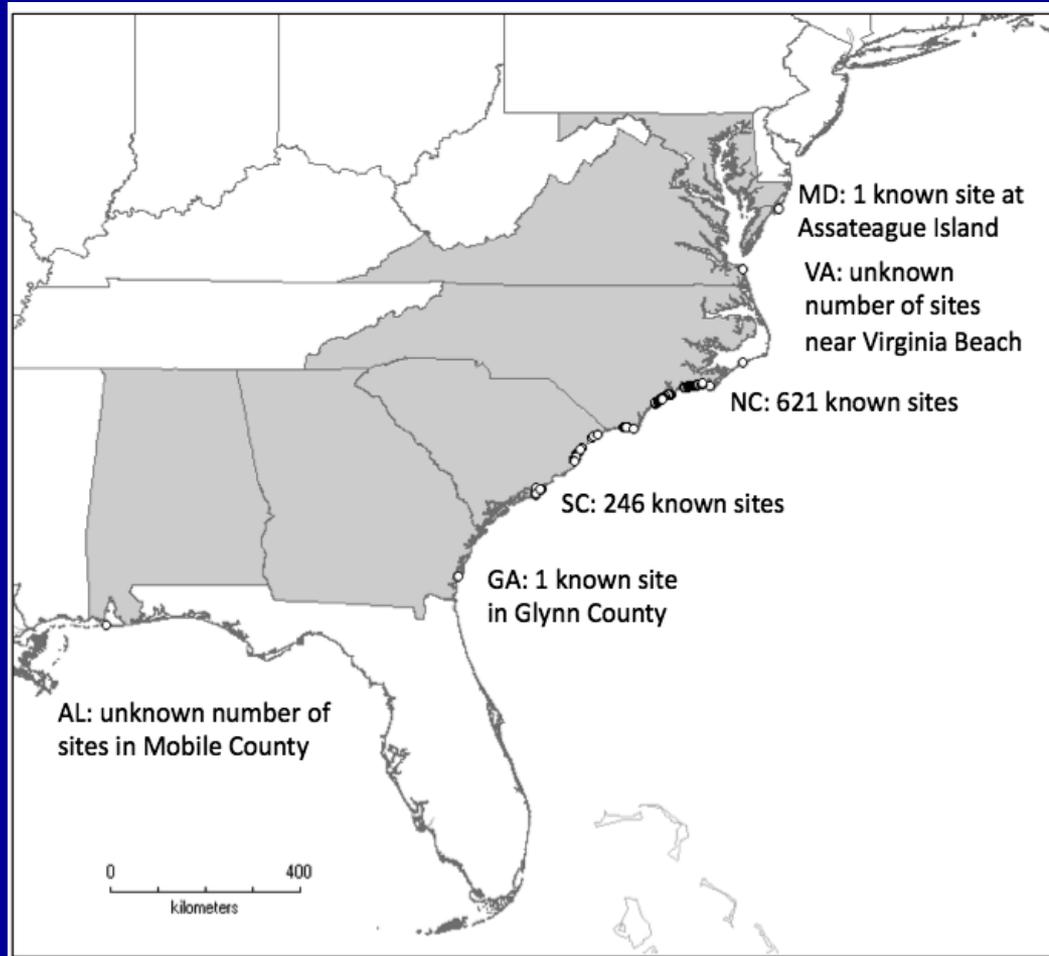


Figure 2.

# Known Distribution of Beach Vitex in SE US

# Beach Vitex on 'Forget Me Not'

- Cut, removed, and treated cut stems with Roundup in December, 2004.
- Cut and treated regrowth in May with Roundup or Renovate.
- Planted 200 Sea Oats and Sweet grass.

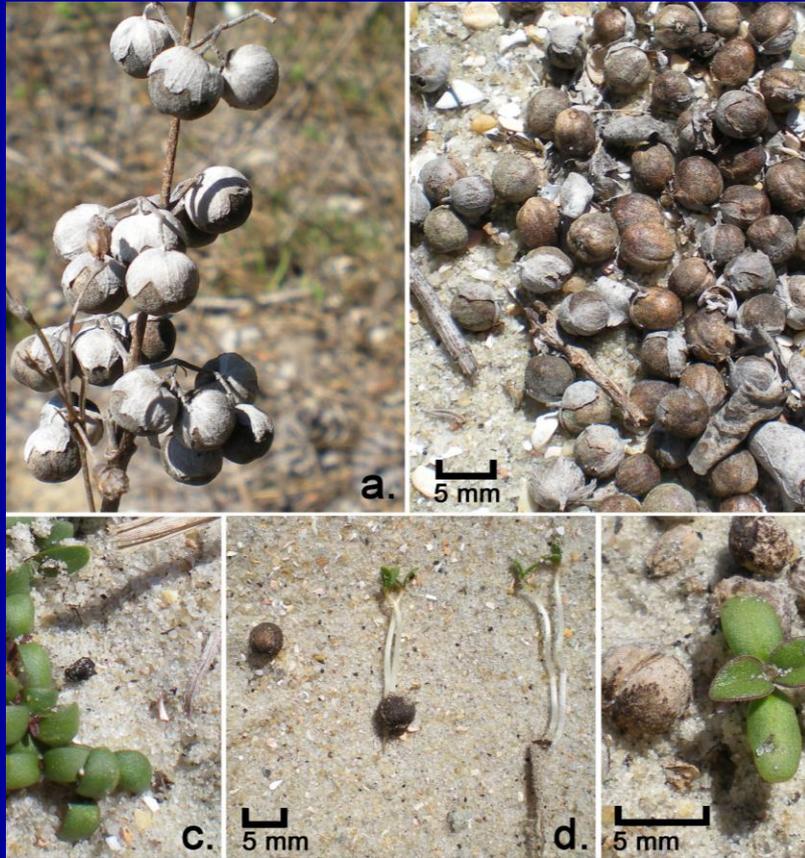


# Monitoring of 'Forget Me Not'

- 95 % control with Roundup in May, 2005
- 72 points of regrowth in Sept. 2005 from rooted runners.
- Retreated the regrowth with Roundup and Renovate in Sept.
- Emerged Seedlings were observed and measured.



# Vitex Seed



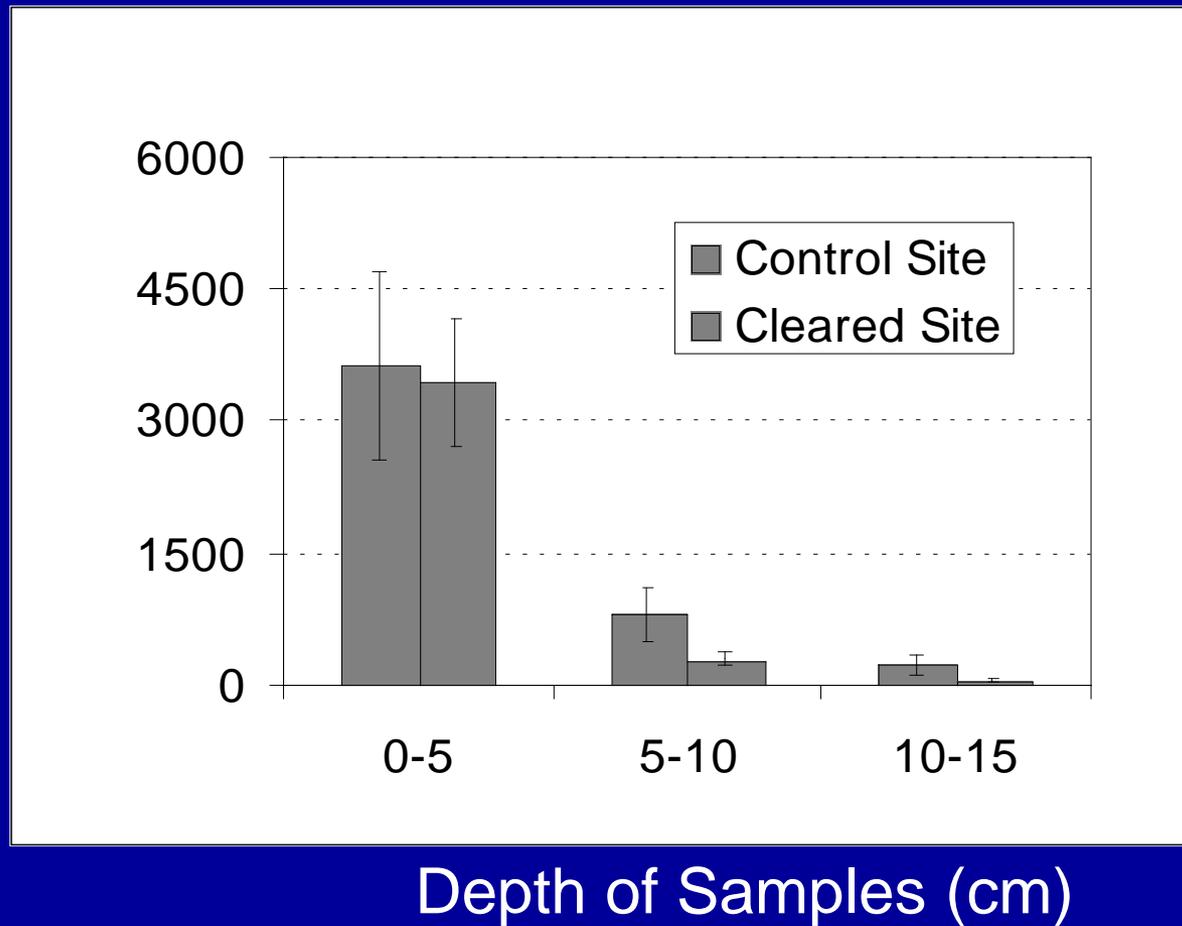
# DRUPES WITH VIABLE SEEDS



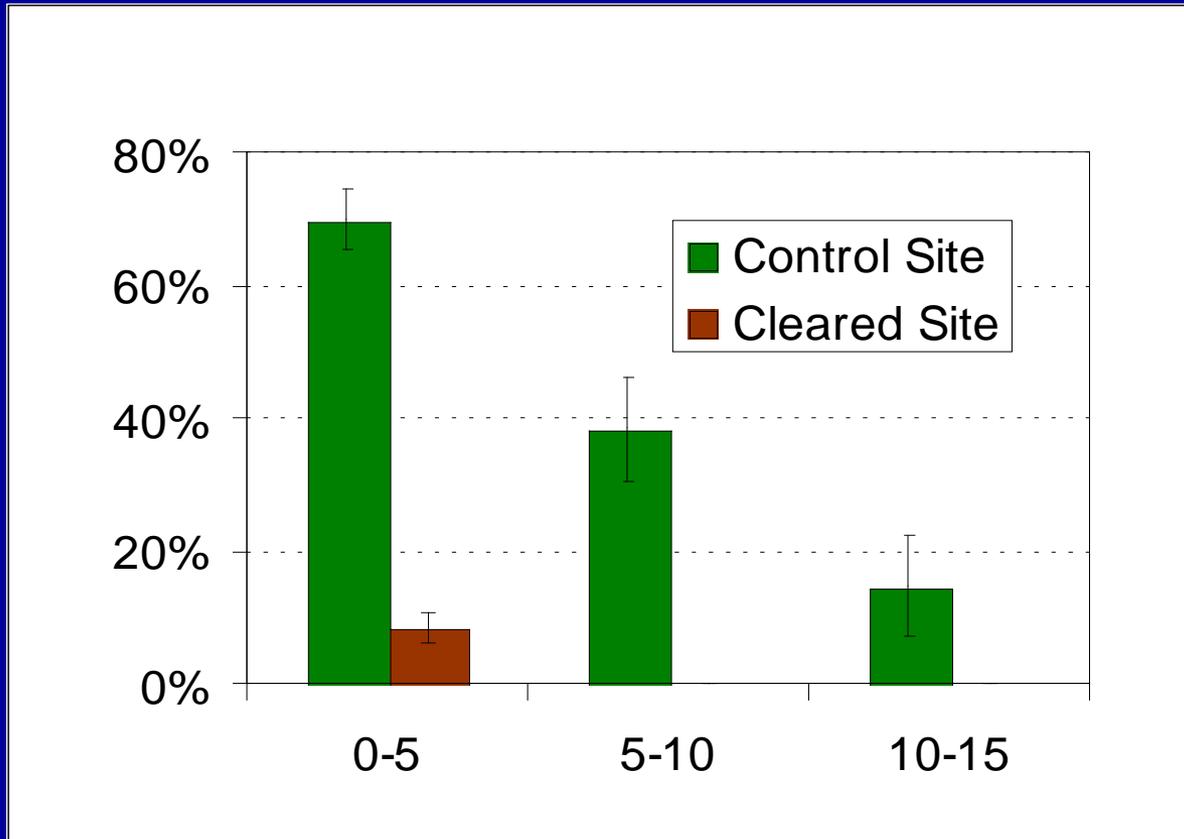
# Soil Seed Bank Characterization



# Number of Fruits - 2007 and 2008



# Percentage of Fruits with Viable Seeds after 4 Years



Depth of Samples (cm)

- ◆ Seeds are dormant and average 1.4 viable seeds per drupe.
- ◆ Substantial seed bank containing viable seed after 4 years
- ◆ Cold Stratification is required for germination (10 C for 4 to 6 wks).
- ◆ Beach Vitex can reestablish from seed after vegetation removal.



## Reestablishment Potential



# Seed Considerations

- Large numbers of drupes with viable seeds present soil
- Seedling germination at least 4 years following plant removal tied to water availability



Why was the sand  
hydrophobic?



# Beach Dune sand hydrophobicity due waxes on leaves and fruit

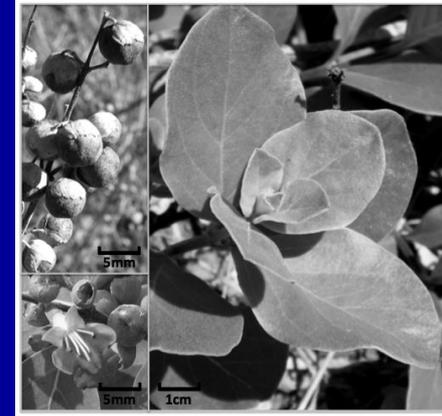


Figure 1.

Sand from Beach Vitex infested areas becomes hydrophobic from cuticular alkanes on the leaves and fruits persisting in the sand for as long as three years.

Cousins et al, 2009. J. Agric. Food Chem. 57:409-415

# Herbicide Studies



# Greenhouse Control studies

- ❑ Foliage spray and cut stem studies 2005 and 2006
- ❑ Spray used 2.5 % and 5 % v/v for sprays and 100% for cut stems.
- ❑ Studies were replicated 4 or 5 times and repeated.
- ❑ Inconsistent results due to Vitex growing status in the greenhouse.
- ❑ Most consistent results across all studies was imazapyr.



## Common name (Formulation) % ai

carfentrazone (Quicksilver) 21.3

glyphosate/carfentrazone/ (Stingray) 1.12/50.5

dicamba (Banvel) 48.2

fluroxypyr (Spotlight) 26.2

glyphosate (Aquamaster) 53.8

imazamox (Raptor) 12.1

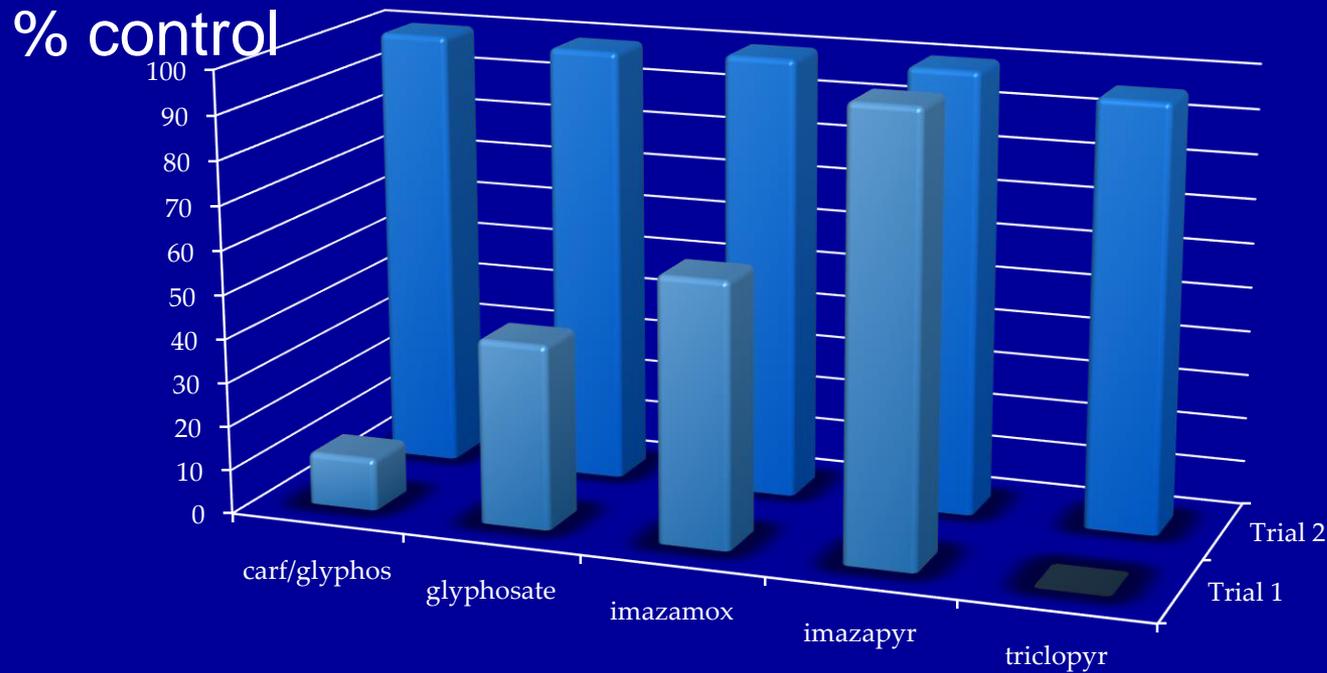
imazapyr (Habitat) 28.7

triclopyr (Renovate) 44.4



# Herbicides – Greenhouse Studies

# Vitex visual control ratings from foliar applications (5% v/v) 7 months after treatment



## Greenhouse – Foliar sprays

# Field Studies: Cut stems and Spray

Beach vitex planted in sand beds in 2006 and allowed to become established 1 year.

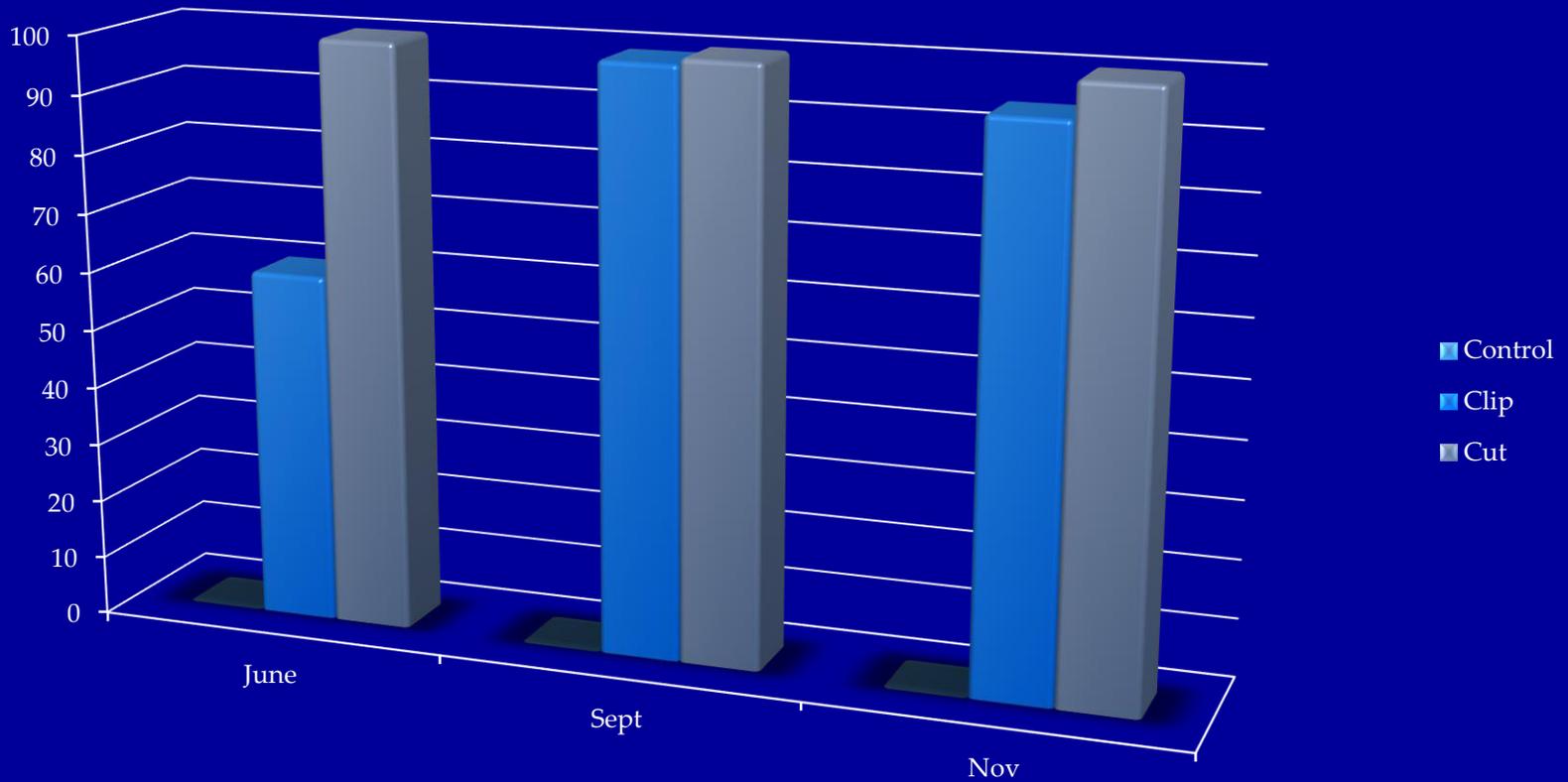


Cut stem experiment – 2007  
Dipped pruners in 20 %  
Imazapyr

Treated cut stems with 1 ml  
Imazapyr (20 %)

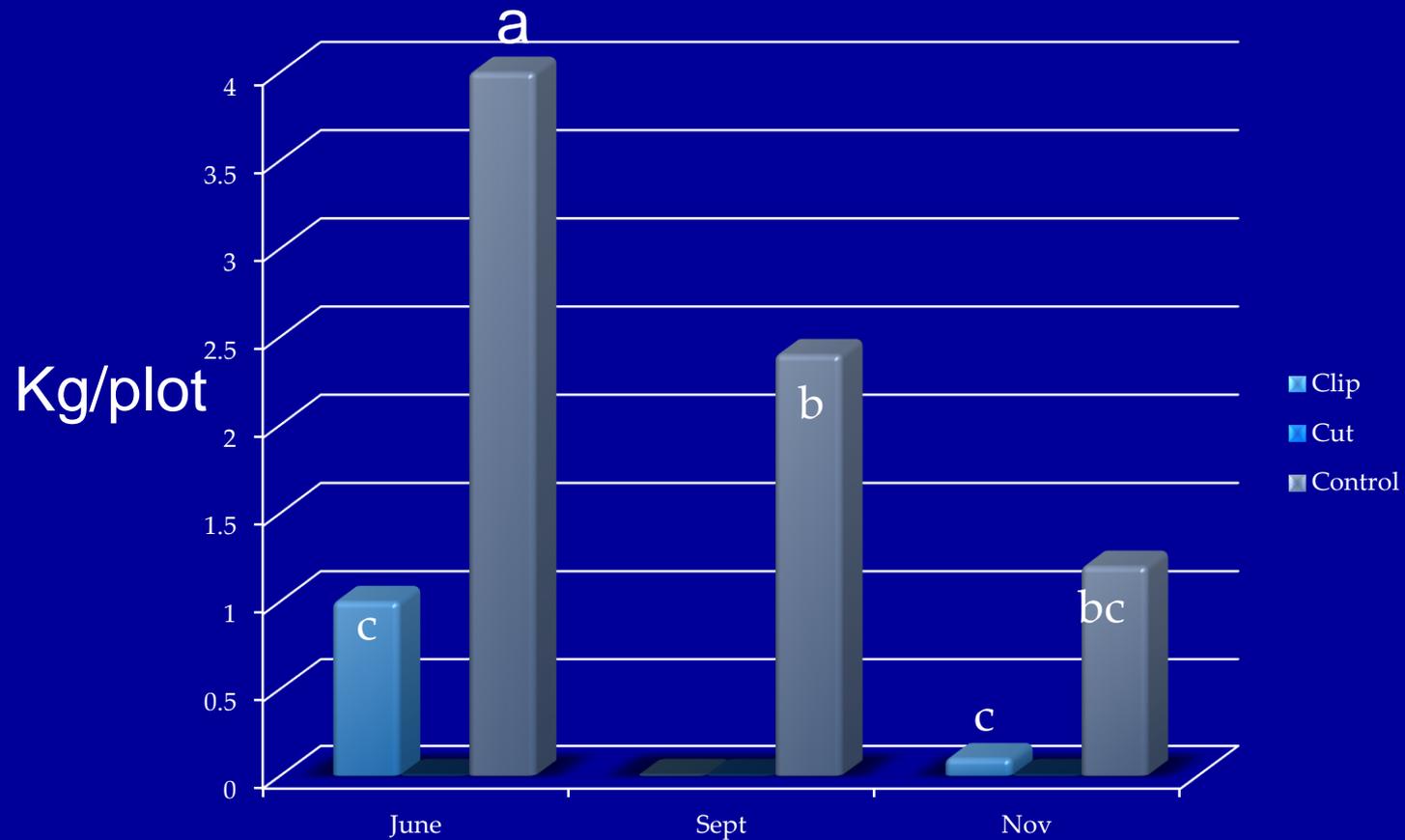


% Control



Field study – Vitex visual control ratings 1 year after June application

# Vitex regrowth biomass (fr wt) 1 year after June Application



# Field Studies – Foliar Spray

Well established plants from 2006 planting were treated in June with herbicides – 5 single plant replications - RCBD

Imazapyr 5% v/v

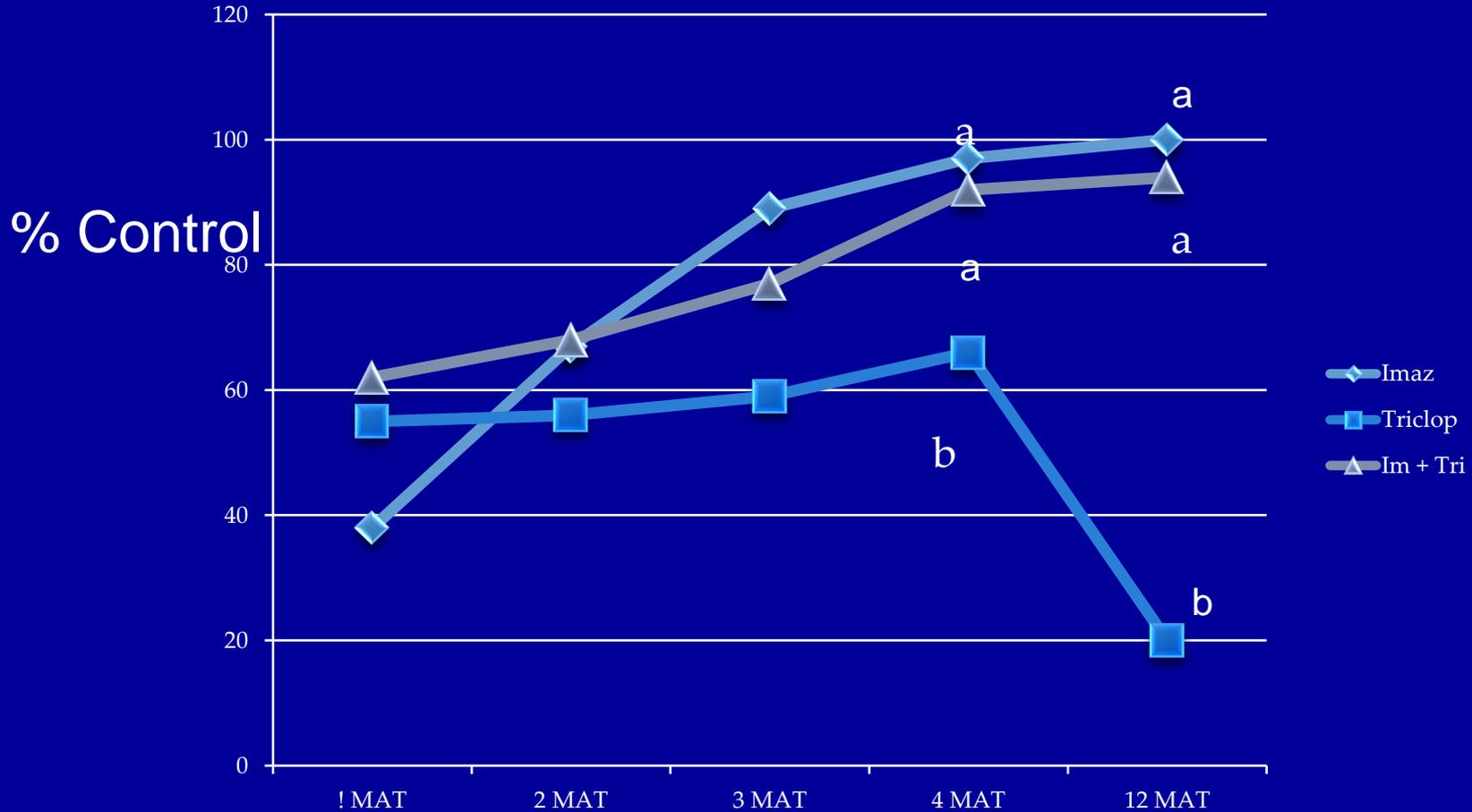
Imazapyr 5%+ Triclopyr 5%

Triclopyr 5%

Untreated control

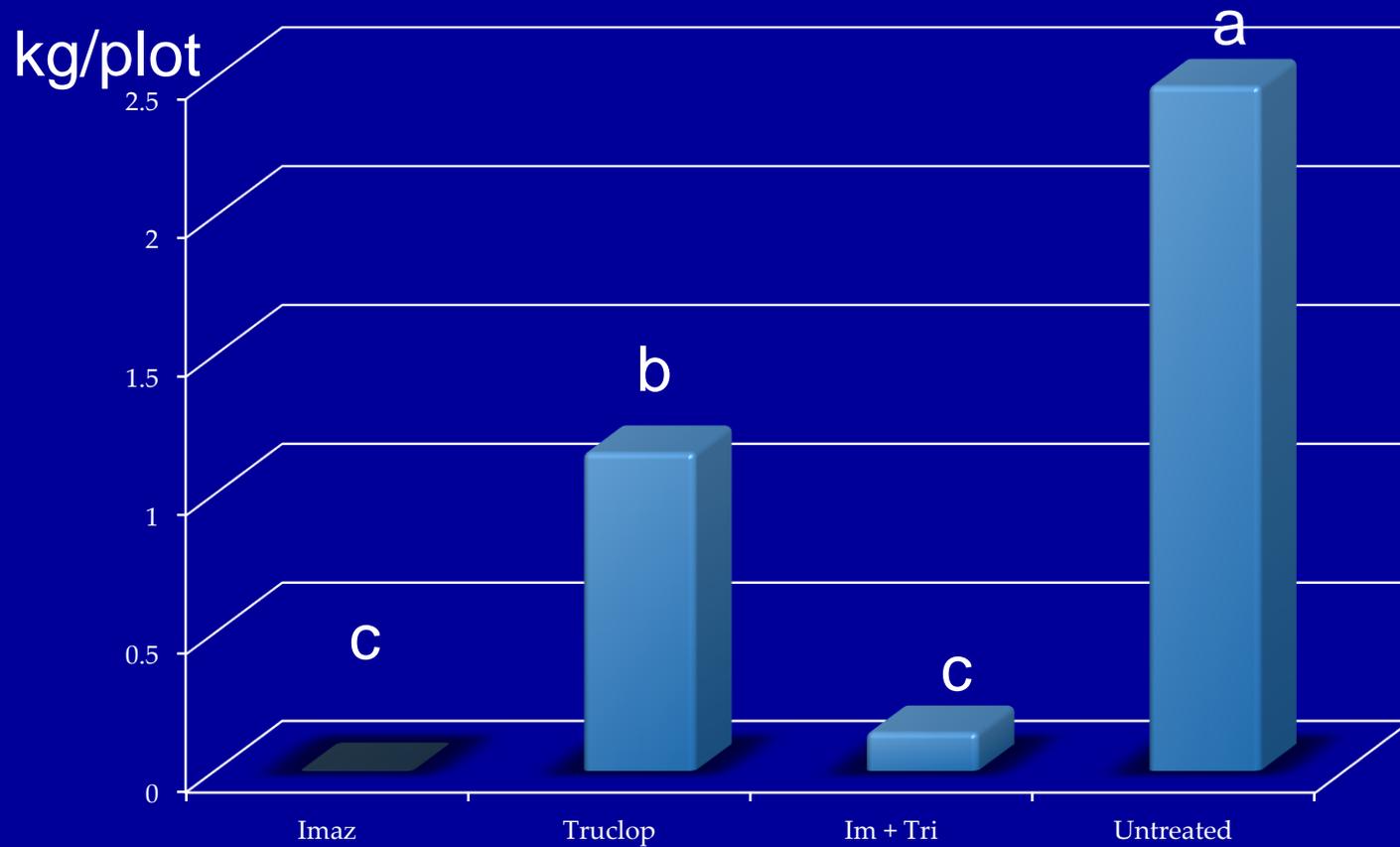
Surfactant added at 0.5% v/v





Field study – Foliar sprays  
 Vitex control visual ratings – months after  
 treatment (MAT)

# Vitex regrowth (fr wt) 1 year after treatment



# FOLIAR SPRAY PLOT PICTURES

## 1yr after treatment

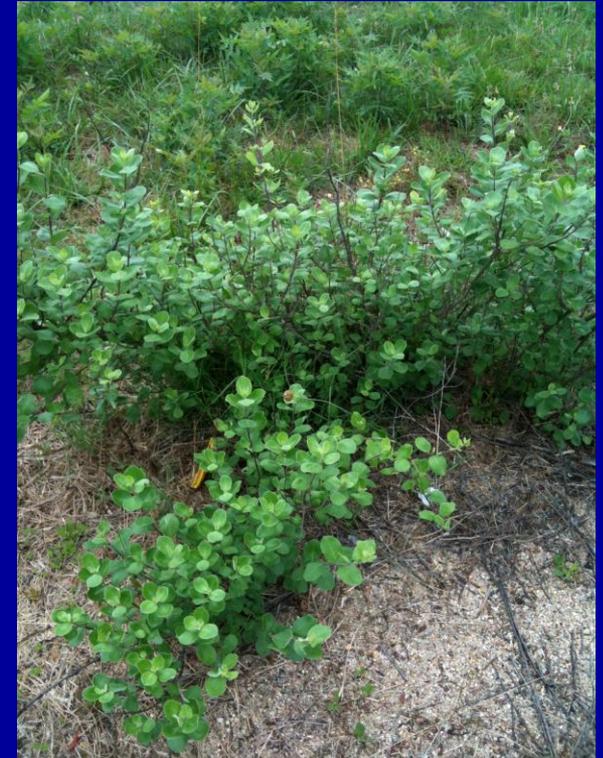
Imazapyr



Imazapyr +  
Triclopyr



Triclopyr



- ✓ Vitex control was inconsistent in greenhouse experiments.
- ✓ Imazapyr was the most consistent of all herbicides evaluated in greenhouse trials.
- ✓ In field studies, cut stem treatments were effective regardless of date of application.
- ✓ Treatments with imazapyr dipped pruners were effective for Sept and Nov treatment dates but not June.
- ✓ Regrowth weights matched control ratings.

## Summary

- ✓ Foliar sprays of Imazapyr was effective in controlling Beach vitex with no regrowth a year after application.
- ✓ Mixtures with triclopyr did not improve control.
- ✓ Solitary plants can be controlled with cut stem or foliar sprays of imazapyr applications.
- ✓ Plants with extensive rooted runners may not be controlled as effectively.



## Summary



# Beach Vitex Task Force

- Started in 2003
- Key Partners –
  - Betsy Brabson- SCUTE
  - Chuck Gresham & Jack Whetstone - Clemson University
  - Randy Westbrooks – US Geological Service



# Participating Agencies

BASF

Clemson University

North Inlet-Winyah Bay Nat  
Research Reserve

Natural Resources  
Conservation Service

North/South Carolinas Sea  
Turtle Networks

Town of Pawleys Island

Donnelley Foundation

SC Dept. of Health and  
Environ Control

SC Native Plant Society

US Army Corps of Engineers

US Fish and Wildlife Service

US Geological Survey



# Outreach and Education

- 7 symposia - update
- 3 plant ID workshops
- Task Force Website
- Extensive media Coverage
- Beach vitex brochures
- ID cards and signs



# Beach Vitex Eradication Program

- Education
- Survey and identify sites
- Agreement from lot owners
- Removal and reestablishment Native vegetation
- Survey and retreatment



# Beach Vitex Control Program

Fall applications work best

20% Habitat – with Dye

Allow 4 to 6 mos before removal of dead stems

95% control, regrowth usually occurs in summer

Follow-up retreatments – for as many 3 years



# Vitex Seeding Control

- Seedlings emerge associated with water
- Seedlings are easily pulled up
- Spray - Triclopyr (5%)



# >150 Days after treatment - Clearing

keep all the  
debris in a  
single location  
on Hobcaw  
Barony.



Sea Oats and  
Bitter Panicum in  
Spring and  
Summer

American  
Beachgrass in  
Fall and Winter





sites checked for  
sprouting vitex  
and plant  
survival

Retreating and  
interplanting

# Beach Task Force Accomplishments

- Funding – NFWF, USFWS, NRCS, Town of Pawleys Island, Donnelley and Bunnelle Foundations
- Task Force – received over \$800,000 – 2004 - 11



# SUCCESS – BEACH VITEX TASK FORCE

(Received three national awards for inter-agency partnering )

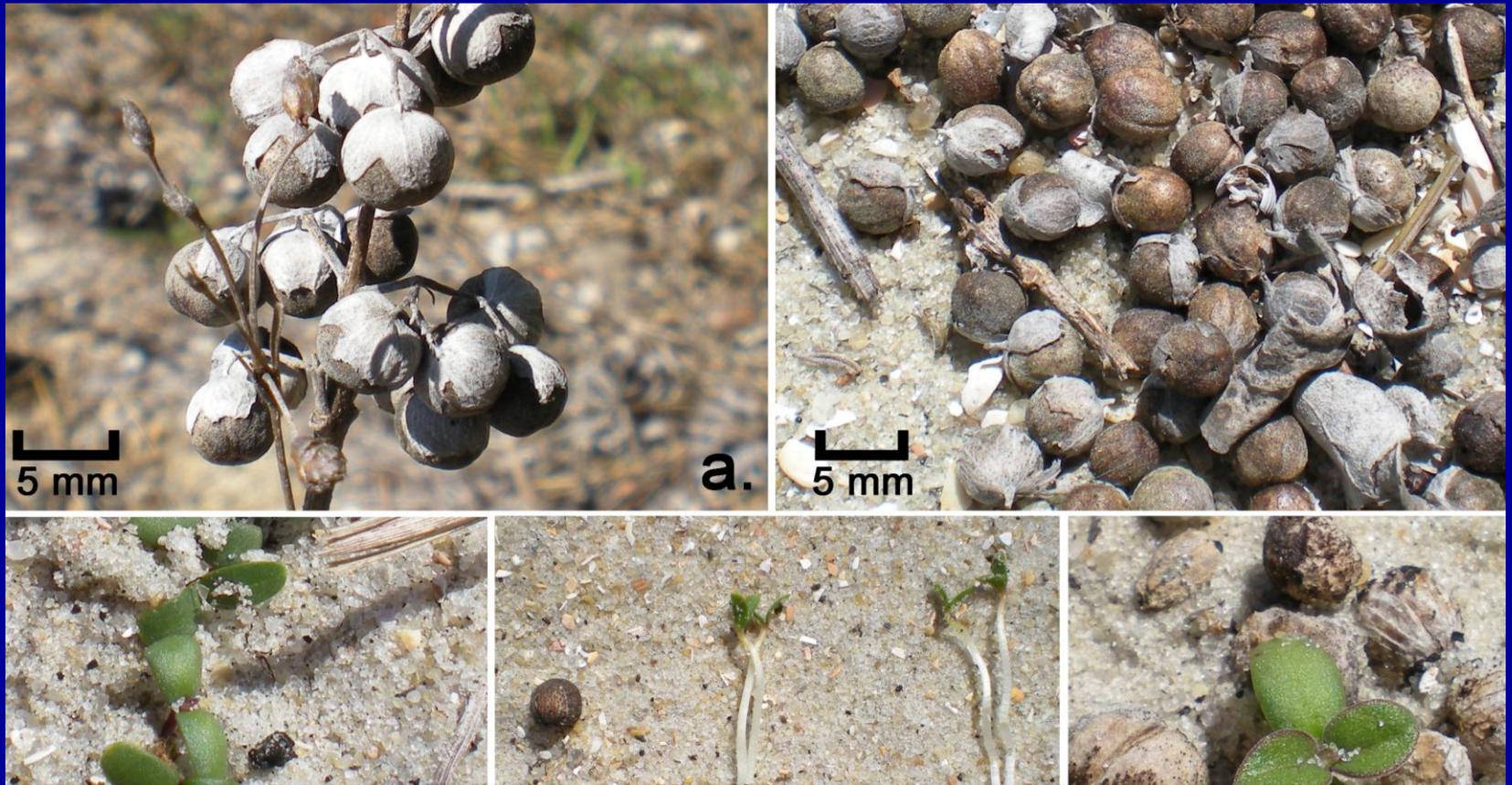
1. Funding
2. Permits and Policy
3. Research and Monitoring
4. Removal and Restoration
5. Outreach & Education



# Hack and Squirt



# Seed Production



# Beach Vitex Removal

## Chronology

- 2004 - Initial Control Trials
- 2005 - Rate 2004, Refine Technique, Search
- 2006- Rate 2005, Search, Agreements, Treat A List
- 2007- Remove & Plant A List, Treat B List
- 2008- Remove & Plant B List, Retreat and Interplant A List and Treat C List
- 2009- Remove & Plant C List, Retreat and Interplant A & B List

We have searched all inhabited  
beaches from Edisto to the North  
Carolina state line



LOTS of HELP

“Beach vitex is a salt-tolerant, perennial invasive shrub that has naturalized in coastal areas of the southeastern United States”





US in 1955

Nurseries mid - 1980's

Mid - 1990's - problems on  
Primary dunes beach

Aggressive and invasive  
vegetative stems/rooting at  
nodes

Seed production

Sea turtle egg laying activities

# Beach Vitex



