

***Restoring Native Xeric Sandhill Groundcover
on Abandoned Citrus Grove Lands Near Lake Apopka in Ferndale, FL;
Exotic Species Control, Site Preparation and Direct Seeding***

***2010 Joint Meeting of the SE-EPPC & SE-SERI
Chattanooga, Tennessee – 12 May 2010***



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With Acknowledgement for all the funding, support, and logistical help provided by:



LAKE COUNTY

DEPARTMENT OF PUBLIC WORKS

Parks & Trails Division



**US Forest Service
OCALA NATIONAL
FOREST**



RECIPIENT SITE
Ferndale, Florida



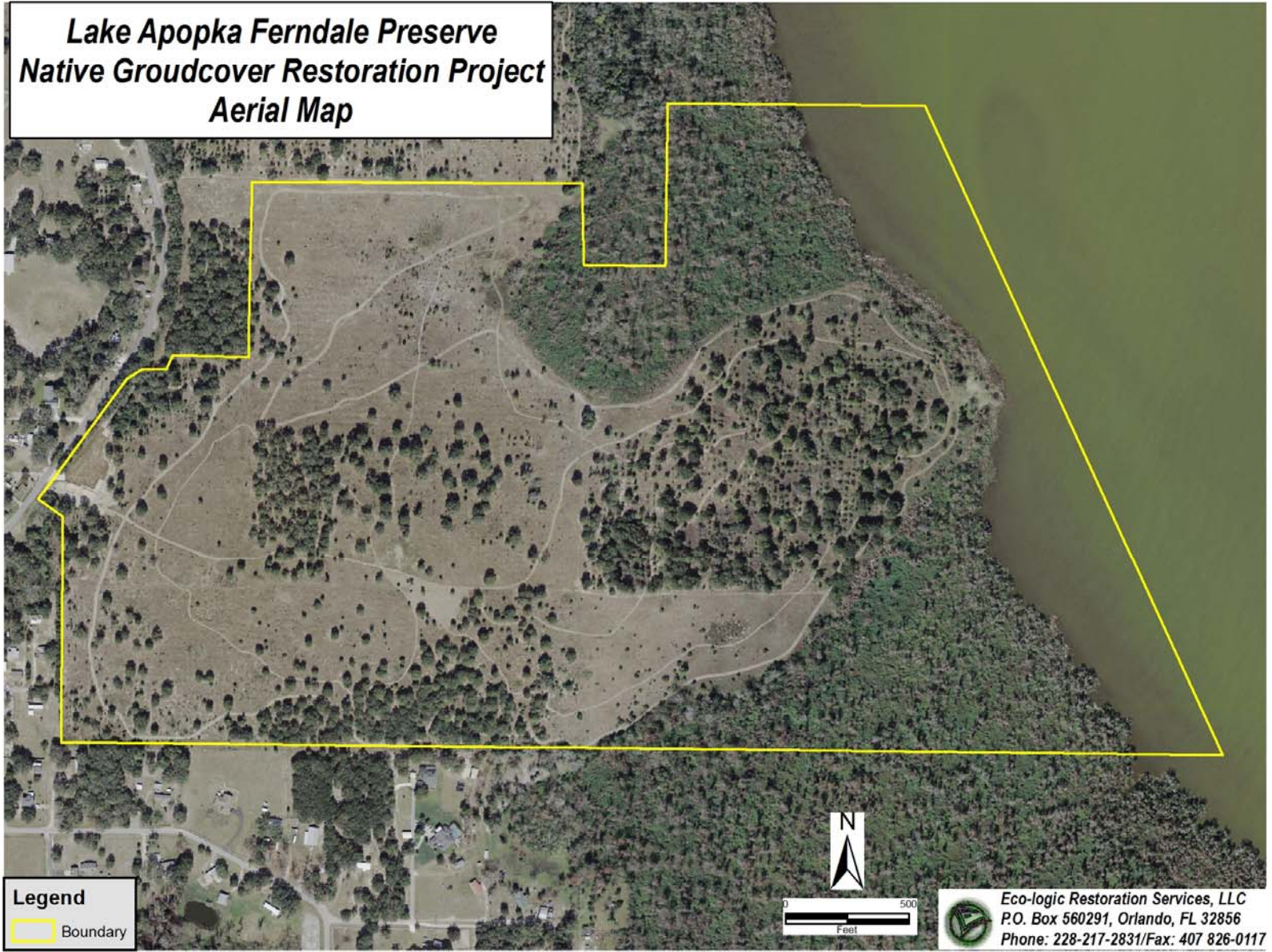
Ferndale Preserve is located in Lake County, Florida at the northern end of the Lake Wales Ridge.



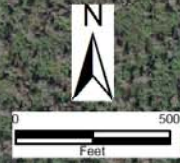
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**Lake Apopka Ferndale Preserve
Native Groundcover Restoration Project
Aerial Map**



Legend
Boundary



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**Lake Apopka Ferndale Preserve
Native Groundcover Restoration Project
Map B - Native Seeding Areas**



Recipient Site

Ferndale Preserve; Ferndale, FL

View E toward Lake Apopka w/dense rose natalgrass infestation



Recipient Site

Ferndale Preserve; Ferndale, FL; rose natalgrass infestation



Recipient Site

Ferndale Preserve; Ferndale, FL View NE w/oak hammock in background, rose natalgrass and lantana in foreground



Recipient Site

Ferndale Preserve; Ferndale, FL View E toward Lake Apopka
w/hardwoods, lantana and rose natalgrass infestation



Recipient Site

Ferndale Preserve; Ferndale, FL; Relict citrus trees, hardwoods and cogongrass



RECIPIENT SITE PREPARATION





Recipient Site Preparation
Prescribed Burning



Recipient Site Preparation

Mulching Unwanted Trees and Shrubs



Recipient Site Preparation

Mulching Unwanted Trees and Shrubs



Recipient Site Preparation

Mulching Unwanted Trees and Shrubs



Recipient Site Preparation

Mulching Unwanted Trees and Shrubs



Recipient Site Preparation

Mulching Unwanted Trees and Shrubs



Recipient Site Preparation

Herbicide Application; Broadcast spray 2% glyphosate & 2% triclopyr



Recipient Site Preparation

Herbicide Application; Broadcast spray 2% glyphosate & 2% triclopyr



Recipient Site Preparation

Herbicide Application; Broadcast spray 2% glyphosate & 2% triclopyr



Recipient Site Preparation

Discing



Recipient Site Preparation

Discing



Recipient Site Preparation

Discing



DONOR SITE
Ocala National Forest, Florida





Donor Site
Ocala National Forest, FL



Donor Site
Ocala National Forest, FL



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Ocala National Forest, FL



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2009/11/14



Donor Site

Ocala National Forest, FL



2009/11/17



Donor Site

Ocala National Forest, FL



SEED

HARVEST



Donor Site

Hand Seed Harvest-began on 30 October and continued through 15 November 2005





Donor Site
Hand Seed Harvest

Donor Site

Seed Harvest-

Liatris tenuifolia v.
tenuifolia



Donor Site

Hand Seed Harvest-
Liatris tenuifolia v.
tenuifolia



Donor Site

Hand Seed Harvest-

Sorghastrum secundum



Donor Site

Hand Seed Harvest-*Sorghastrum secundum*



Donor Site

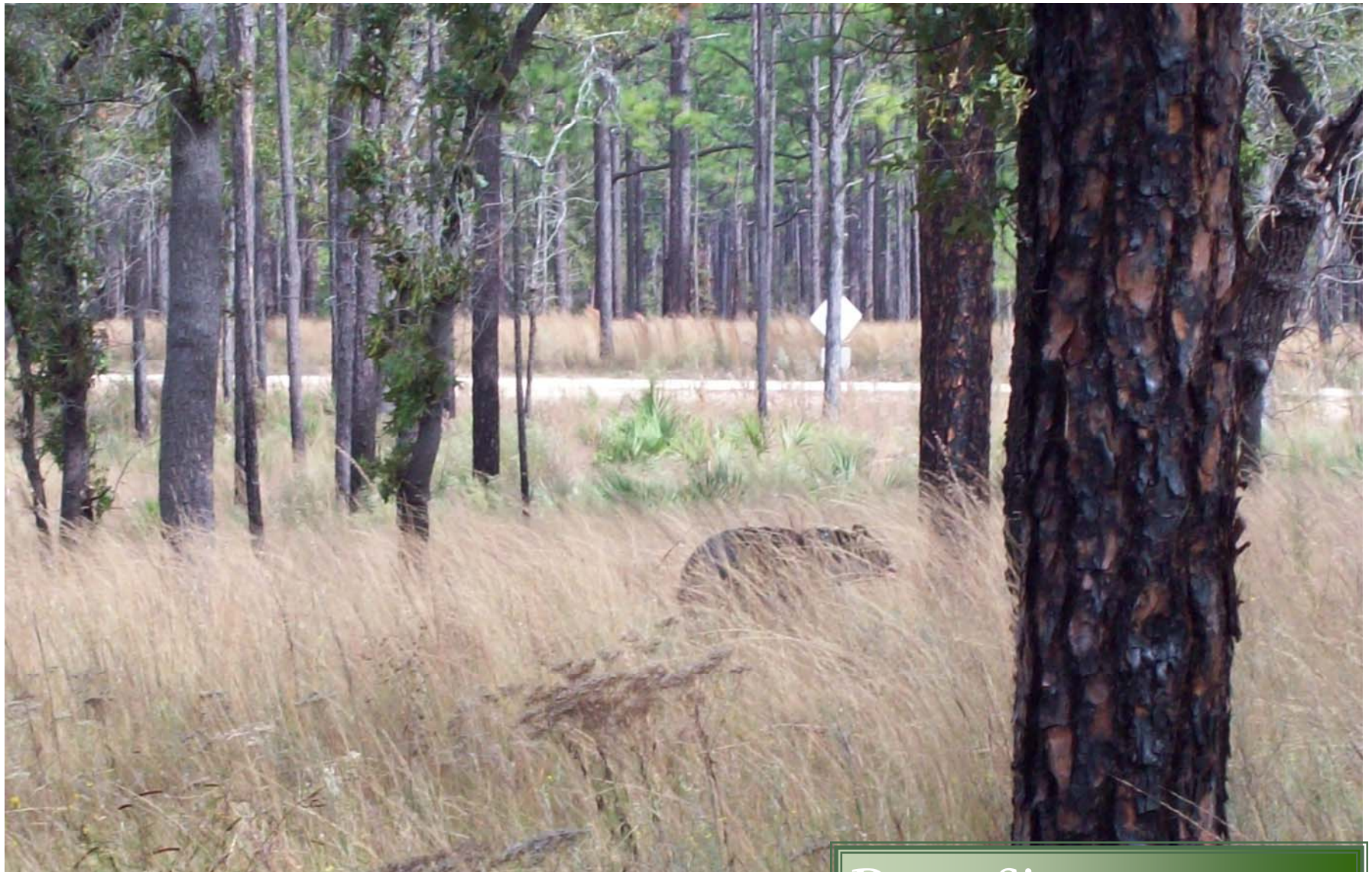
Hand Seed Harvest-*Lezpedeza hirta*



Donor Site

Hand Seed Harvest-*Carphephorus corymbosus*





Donor Site

Hand Seed Harvest

WATCH OUT FOR BEARS!!!!

Donor Site

Hand Seed Harvest-*Bulbostylis* spp.



Donor Site

Mechanical Seed Harvest-Target *Aristida stricta* - 16 NOV through 30 NOV - opportunistic hand harvest also continued during this period



2009/11/26



Donor Site

Mechanical Seed Harvest-Target *Aristida stricta*



2009/11/17





2009/11/17

Donor Site

Mechanical Seed Harvest-Target *Aristida stricta*



Donor Site

Mechanical Seed Harvest-Target *Aristida stricta*



2009/11/17



Donor Site

Mechanical Seed Harvest-Target *Aristida stricta*



Donor Site

Mechanical Seed Harvest-Target *Aristida stricta*



2009/11/17



Donor Site

Mechanical Seed Harvest-Target *Aristida stricta*



Donor Site

Mechanical Seed Harvest-Target *Aristida stricta*



2009/11/17



Donor Site

Mechanical Seed Harvest-Target *Aristida stricta*



Donor Site

Mechanical Seed Harvest-Target *Aristida stricta*



Donor Site

Mechanical Seed Harvest-bag and weigh



Donor Site

Mechanical Seed Harvest-
bag and weigh



Scientific Name	Common Name	Scientific Name	Common Name
<i>Ageritina jucunda</i>	Hammock snakeroot	<i>Eriogonum tomentosum</i>	Dogtongue wild buckwheat
<i>Andropogon brachystachyus</i>	Shortspike bluestem	<i>Eryngium aromaticum</i>	Fragrant eryngo
<i>Andropogon gyrans</i>	Elliott's bluestem	<i>Eupatorium album</i>	White thoroughwork
<i>Andropogon ternarius</i>	Splitbeard bluestem	<i>Eupatorium compositifolium</i>	Yankeeweed
<i>Aristida lanosa</i>	Woolysheath three-awn	<i>Garberia heterophylla</i>	Garberia
<i>Aristida purpurascens</i> v. <i>purpurascens</i>	Arrowfeather three-awn	<i>Helianthus angustifolius</i>	Narrowleaf sunflower
<i>Aristida stricta</i>	Wiregrass	<i>Hypericum tetrapetalum</i>	Fourpetal St. John's-wort
<i>Aster adnatus</i>	Scaleleaf aster	<i>Indigofera caroliniana</i>	Carolina indigo
<i>Balduina angustifolia</i>	Coastalplain honeycombhead	<i>Lechea sessiliflora</i>	Pineland pinweed
<i>Bulbostylis ciliatifolia</i>	Capillary hairsedge	<i>Lespedeza hirta</i>	Hairy lespedeza
<i>Bulbostylis warei</i>	Ware's hairsedge	<i>Liatris tenuifolia</i> v. <i>quadrifolia</i>	Shortleaf gayfeather
<i>Carphephorus corymbosus</i>	Florida paintbrush	<i>Liatris tenuifolia</i> v. <i>tenuifolia</i>	Shortleaf gayfeather
<i>Chamaecrista fasciculata</i>	Partridge pea	<i>Palafoxia integrifolia</i>	Coastalplain palafox
<i>Chamaecrista nictitans</i>	Sensitive pea	<i>Pityopsis graminifolia</i>	Narrowleaf silkgrass
<i>Chrysopsis scabrella</i>	Coastalplain goldenaster	<i>Polygonella gracilis</i>	Tall jointweed
<i>Cyperus plukenetii</i>	Plukenet's flatsedge	<i>Pterocaulon pycnostachyum</i>	Blackroot
<i>Cyperus retrorsus</i>	Pinebarren flatsedge	<i>Rhynchospora megalocarpa</i>	Sandyfield beaksedge
<i>Dalea pinnata</i>	Summer farewell	<i>Schizachyrium scoparium</i> v. <i>scoparium</i>	Little bluestem
<i>Desmodium strictum</i>	Pinebarren ticktrefoil	<i>Sisyrinchium ?xerophyllum</i>	Jeweled blueeyed grass
<i>Digitaria filiformis</i> v. <i>filiformis</i>	Slender crabgrass	<i>Solidago tortifolia</i>	Twistedleaf goldenrod
<i>Diodia teres</i>	Rough buttonweed	<i>Sorghastrum secundum</i>	Lopsided indiagrass
<i>Elephantopus elatus</i>	Tall elephantsfoot	<i>Trichostema dichotomum</i>	Forked bluecurls
<i>Eragrostis elliotii</i>	Elliott's lovegrass		
<i>Eragrostis spectabilis</i>	Purple lovegrass		

Donor Site-46 known species harvested



Donor Site
Seed Harvest & Storage



Donor Site
Seed Harvest & Storage



Donor Site
Seed Harvest & Storage



Donor Site
Seed Harvest & Storage



Donor Site
Seed Harvest & Storage



Donor Site

Seed Harvest & Storage



Donor Site

Hand Seed Harvest- *Garberia heterophylla* on 14 DEC 2009



Donor Site

Hand Seed Harvest-
Garberia heterophylla
on 14 DEC 2009



Donor Site

Hand Seed Harvest-
Garberia heterophylla
on 14 DEC 2009



SEED INSTALLATION





Recipient Site
Seed Installation-Mixing and Bagging





Recipient Site
Seed Installation-Mixing and Bagging





Recipient Site

Seed Installation-Mixing and Bagging



Recipient Site

Seed Installation-Massey-Ferguson 33 seed drill



Recipient Site

Seed Installation-Massey-Ferguson 33 seed drill



Recipient Site

Seed Installation-Massey-Ferguson 33 seed drill





Recipient Site

Seed Installation-Massey-Ferguson 33 seed drill



Recipient Site

Seed Installation-Massey-Ferguson 33 seed drill





Recipient Site

Seed Installation-seed distribution





Recipient Site

Seed Installation-seed distribution





Recipient Site

Seed Installation-seed distribution



Recipient Site

Seed Installation-Final drag w/chains



Recipient Site

Seed Installation-Final drag w/chains



Direct-seeding began on 07 December and continued through 23 December 2010

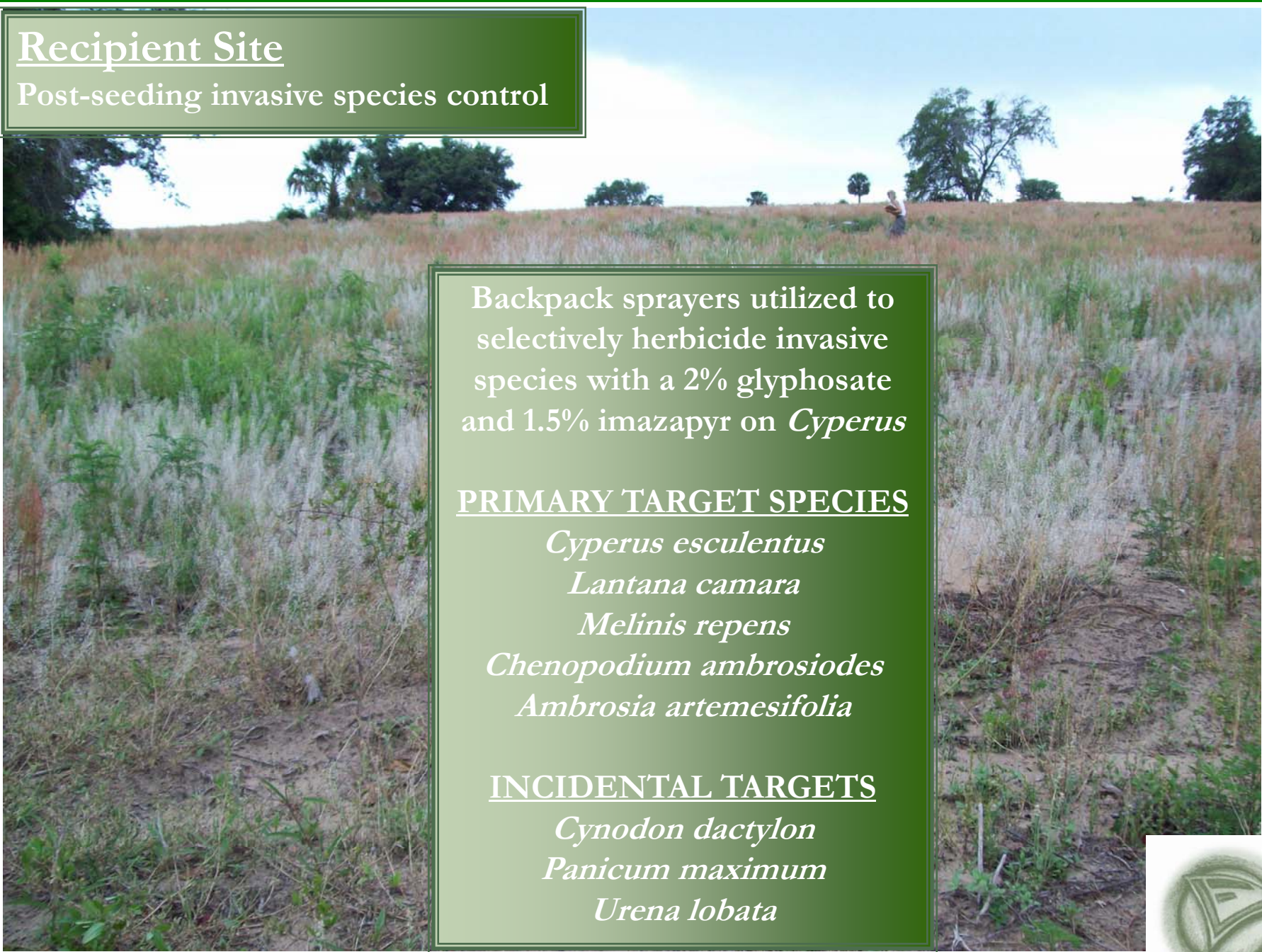


Approximately 2,268 pounds of bulk mixed seed distributed on site at a rate of 17.4 pounds/acre



Recipient Site

Post-seeding invasive species control



Backpack sprayers utilized to selectively herbicide invasive species with a 2% glyphosate and 1.5% imazapyr on *Cyperus*

PRIMARY TARGET SPECIES

Cyperus esculentus

Lantana camara

Melinis repens

Chenopodium ambrosiodes

Ambrosia artemesifolia

INCIDENTAL TARGETS

Cynodon dactylon

Panicum maximum

Urena lobata



Recipient Site

Four months post-seeding

15 species observed germinating of 46
known collected



April 2010 – What's Up??
Aristida stricta



Recipient Site

Four months post-seeding

15 species observed germinating of 46
known collected



April 2010 – What's Up??
Liatris tenuifolia v. *tenuifolia*
Liatris tenuifolia v. *quadrifolia*



Recipient Site

Four months post-seeding

15 species observed germinating of 46
known collected



April 2010 – What's Up??
Garberia heterophylla



Recipient Site

Four months post-seeding

15 species observed germinating of 46
known collected



April 2010 – What's Up??
Dalea pinnata



Recipient Site

Four months post-seeding

15 species observed germinating of 46 known collected



April 2010 – What's Up??
Pityopsis graminifolia



Recipient Site

Four months post-seeding

15 species observed germinating of 46
known collected



April 2010 – What's Up??
Chrysopsis scabrella



Recipient Site

Four months post-seeding

15 species observed germinating of 46 known collected



April 2010 – What's Up??
Carphephorus corymbosum



Recipient Site

Four months post-seeding

15 species observed germinating of 46 known collected



April 2010 – What's Up??
Polygonella gracilis



Recipient Site

Four months post-seeding

15 species observed germinating of 46 known collected



April 2010 – What's Up??
Lespedeza hirta



Recipient Site

Four months post-seeding

15 species observed germinating of 46
known collected



April 2010 – What's Up??
Bulbostylis sp.



Recipient Site

Four months post-seeding

15 species observed germinating of 46
known collected



April 2010 – What's Up??
Balduina angustifolia



Recipient Site

Four months post-seeding

15 species observed germinating of 46 known collected



April 2010 – What's Up??
Eriogonum tomentosum



Recipient Site

Four months post-seeding

15 species observed germinating of 46
known collected



April 2010 – What's Up??
Eupatorium album



Recipient Site

Four months post-seeding

15 species observed germinating of 46 known collected



April 2010 – What's Up??
Eupatorium compositifolium



Recipient Site

Four months post-seeding

15 species observed germinating of 46
known collected



April 2010 – What's Up??
Even in dense woody debris!!



Recipient Site

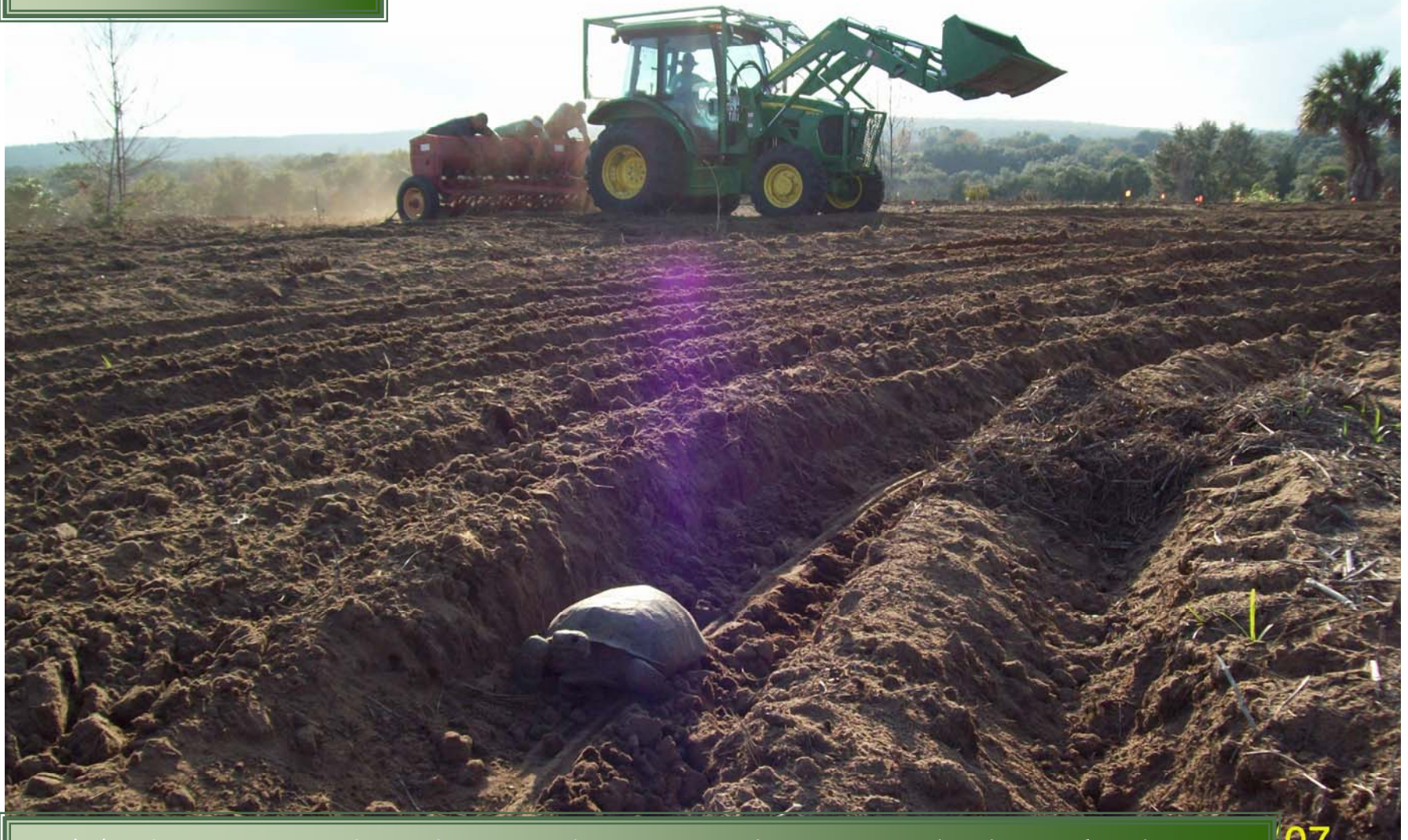
Four months post-seeding



April 2010 – What's Up??
And some wildlife utilization!



Recipient Site

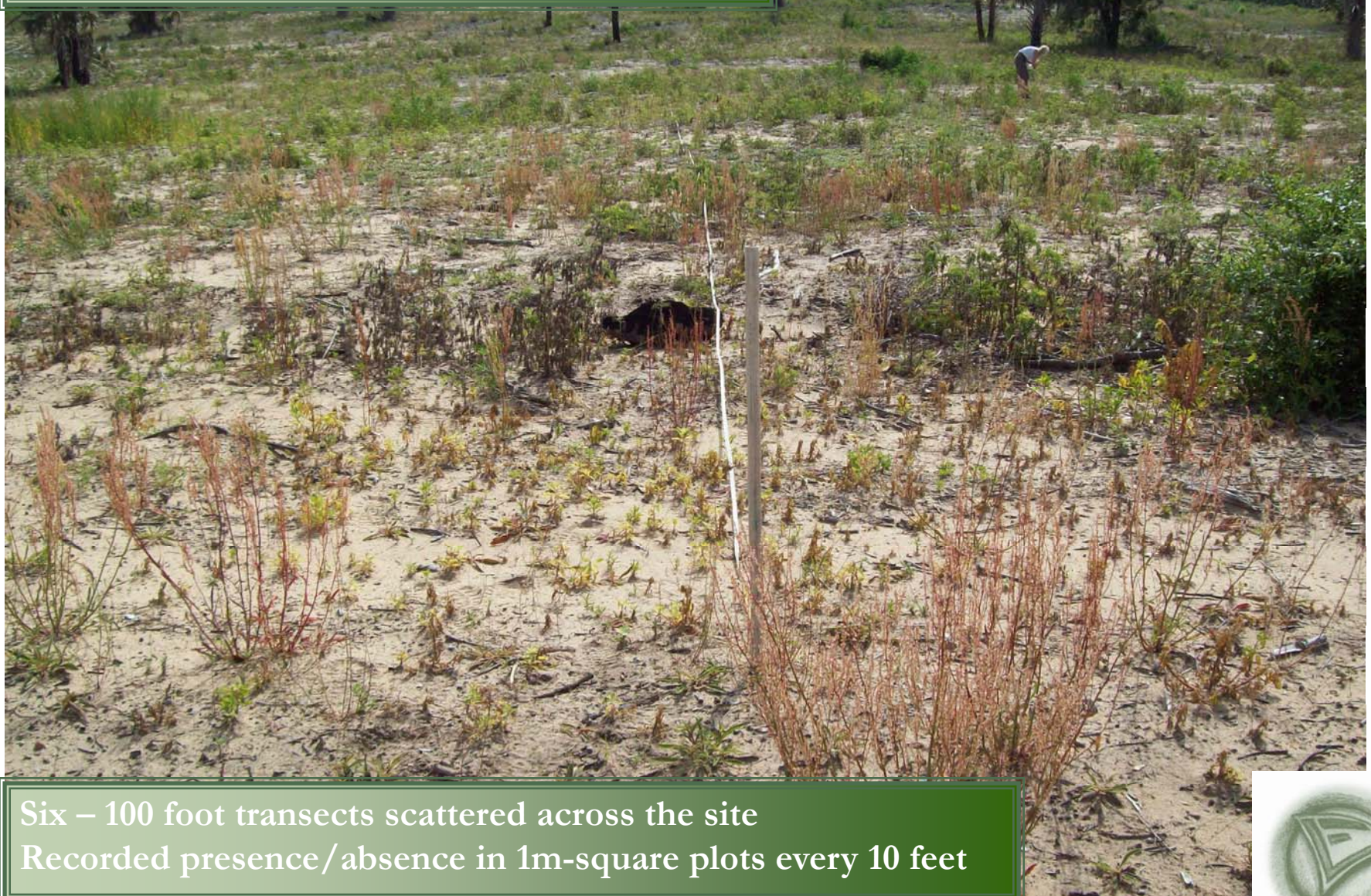


Trying to maintain gopher tortoise population during entire process



Recipient Site

Plant Species Inventory Transect 1 View East



Six – 100 foot transects scattered across the site
Recorded presence/absence in 1m-square plots every 10 feet



Recipient Site

Plant Species Inventory Transect 1 View West



Recipient Site

Plant Species Inventory Transect 2 View North



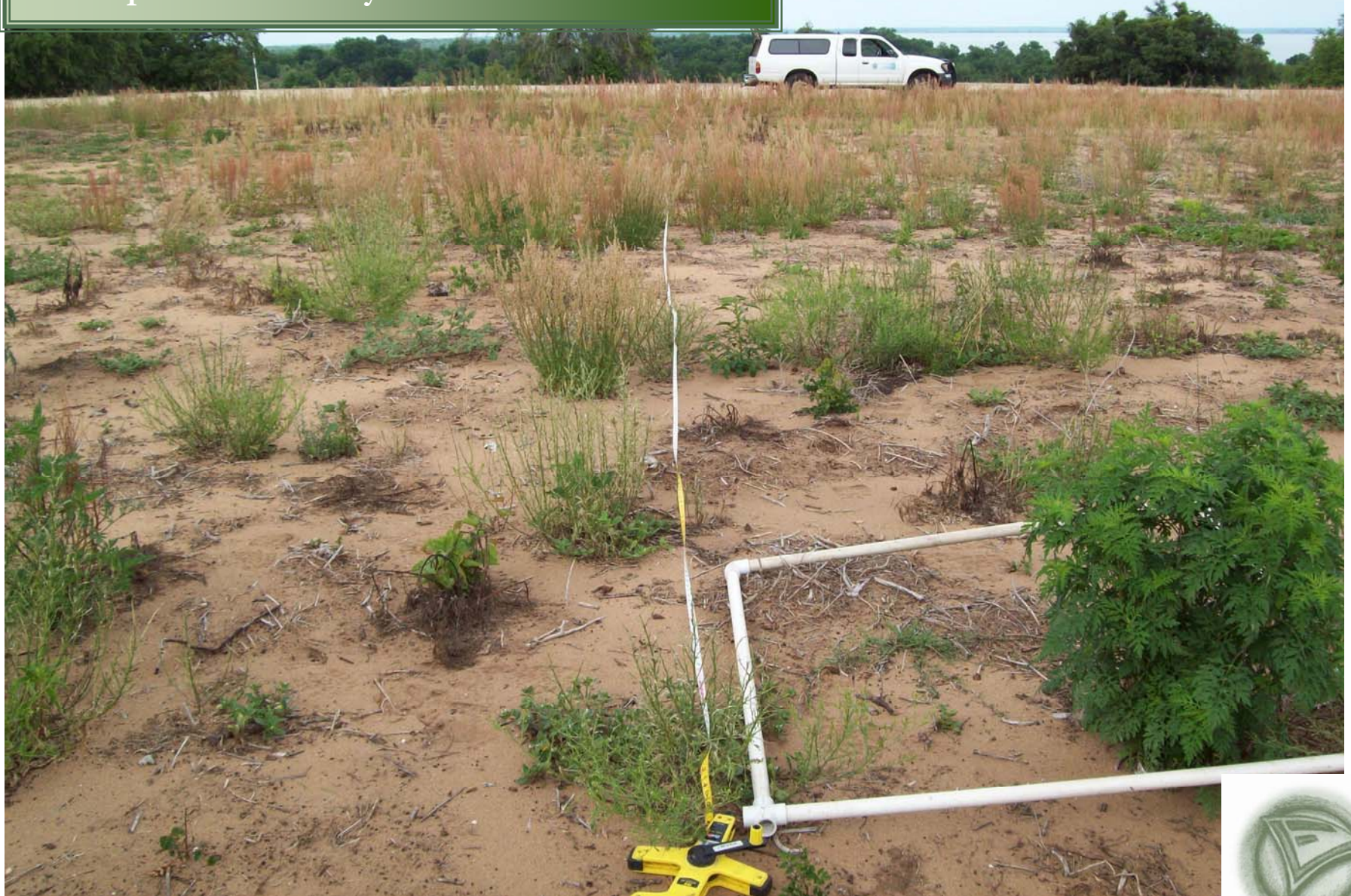
Recipient Site

Plant Species Inventory Transect 2 View South



Recipient Site

Plant Species Inventory Transect 3 View North



Recipient Site

Plant Species Inventory Transect 3 View South



Recipient Site

Plant Species Inventory Transect 4 View North



Recipient Site

Plant Species Inventory Transect 4 View South



Recipient Site

Plant Species Inventory Transect 5 View North



Recipient Site

Plant Species Inventory Transect 5 View South



Recipient Site

Plant Species Inventory Transect 6 View North



Recipient Site

Plant Species Inventory Transect 6 View South



Recipient Site

Preliminary transect inventory results

Scientific Name	Common Name	Comment	%Oc	%RF
<i>Cyperus esculentus</i>	Chufa flatsedge	EPPC I	51.7	7.9
<i>Lantana camara</i>	Shrubverbena	EPPC I	6.7	1.0
<i>Melinis repens</i>	Rose natalgrass	EPPC I	53.3	8.1
				17.0
<i>Amaranthus</i> sp. ? <i>hybridus</i>	Pigweed	Non-native	3.3	0.5
<i>Chenopodium album</i>	Lamb's-quarters	Non-native	1.7	0.3
<i>Chenopodium ambrosioides</i>	Epizote, Mexican tea	Non-native	23.3	3.6
<i>Cynodon dactylon</i>	Bermuda grass	Non-native	1.7	0.3
<i>Fumaria officinalis</i>	Earthsmoke, drug fumitory	Non-native	3.3	0.5
<i>Merremia dissecta</i>	Noyau vine	Non-native	3.3	0.5
<i>Richardia</i> sp. ? <i>brasiliensis</i>	Mexican clover	Non-native	91.7	14.0
<i>Sida acuta</i>	Common wireweed	Non-native	5.0	0.8
<i>Ambrosia artemesiifolia</i>	Annual ragweed		66.7	10.2
				30.5



Recipient Site

Preliminary transect inventory results

				Scientific Name	Common Name	%Oc	%RF
				<i>Ampelopsis arborea</i>	Pepper-vine	3.3	0.5
				<i>Bidens alba</i>	Romerillo, beggarticks	13.3	2.0
<i>Rumex hastatulus</i>	Heartwing dock	41.7	6.4	<i>Campsis radicans</i>	Trumpet creeper	3.3	0.5
<i>Sabal palmetto</i>	Cabbage palm	1.7	0.3	<i>Chamaesyce</i> sp.	Sandmat	5.0	0.8
<i>Smilax auriculata</i>	Earleaf greenbrier	5.0	0.8	<i>Conyza canadensis</i>	Canada horseweed	10.0	1.5
<i>Triodanis perfoliata</i>	Clasping Venus' lookingglass	1.7	0.3	<i>Cuscuta compacta</i>	Compact dodder	1.7	0.3
<i>Vitis cinerea</i> v. <i>floridana</i>	Florida grape	3.3	0.5	<i>Eupatorium capillifolium</i>	Dogfennel	1.7	0.3
				<i>Froelichia floridana</i>	Plains snakecotton	10.0	1.5
				<i>Heterotheca subaxillaris</i>	Camphorweed	3.3	0.5
			38.4	<i>Krigia virginica</i>	Virginia dwarfdandelion	1.7	0.3
				<i>Lepidium virginicum</i>	Virginia pepperweed	30.0	4.6
				<i>Linaria canadensis</i>	Canadian toadflax	40.0	6.1
				<i>Oenothera</i> sp.	Eveningprimrose	10.0	1.5
				<i>Paspalum setaceum</i>	Thin paspalum	1.7	0.3
				<i>Passiflora incarnata</i>	Purple passionflower	6.7	1.0
				<i>Phytolacca americana</i>	Pokeweed	3.3	0.5
				<i>Prunus serotina</i>	Black cherry	5.0	0.8
				<i>Pseudognaphalium obtusifolium</i>	Sweet everlasting	46.7	7.1
				<i>Ptilimnium capillaceum</i>	Mock bishop-weed	1.7	0.3



Recipient Site

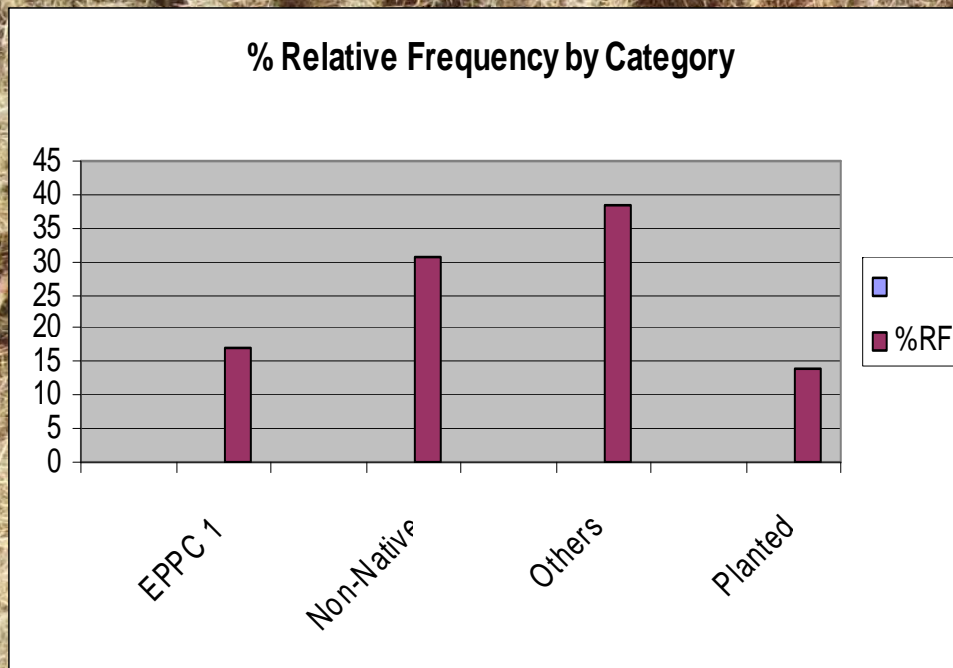
Preliminary transect inventory results

Scientific Name	Common Name	%Oc	%RF
<i>Aristida stricta</i>	Wiregrass	23.3	3.6
<i>Bulbostylis</i> spp.	Hairsedge	1.7	0.3
<i>Carphephorus corymbosus</i>	Florida paintbrush	1.7	0.3
<i>Chrysopsis scabrella</i>	Coastalplain goldenaster	1.7	0.3
<i>Dalea pinnata</i>	Summer farewell	5.0	0.8
<i>Diodia teres</i>	Rough buttonweed	5.0	0.8
<i>Eupatorium album</i>	White thoroughwork	3.3	0.5
<i>Eupatorium compositifolium</i>	Yankeeweed	5.0	0.8
<i>Garberia heterophylla</i>	Garberia	8.3	1.3
<i>Lespedeza hirta</i>	Hairy lespedeza	3.3	0.5
<i>Liatris tenuifolia</i> v. <i>tenuifolia</i>	Shortleaf gayfeather	15.0	2.3
<i>Pityopsis graminifolia</i>	Narrowleaf silkgrass	10.0	1.5
<i>Polygonella gracilis</i>	Tall jointweed	3.3	0.5
<i>Sorghastrum secundum</i>	Lopsided indiagrass	5.0	0.8
			14.0



Recipient Site

Preliminary transect inventory results



<u>CATEGORY</u>	<u>%RF</u>
EPPC 1	17.0
Non-Native	30.5
Others	38.4
Planted	14.0

Too early to tell?!
BUT encouraging!

2009/11/17



Questions??
Comments?
Criticism??
Cynicism!!
Sarcasm?!

