

Invasive Plant Operations Overview

2013 Everglades Invasive Species Summit

LeRoy Rodgers, SFWMD



EVERGLADES CISMA

Priority Plant Species

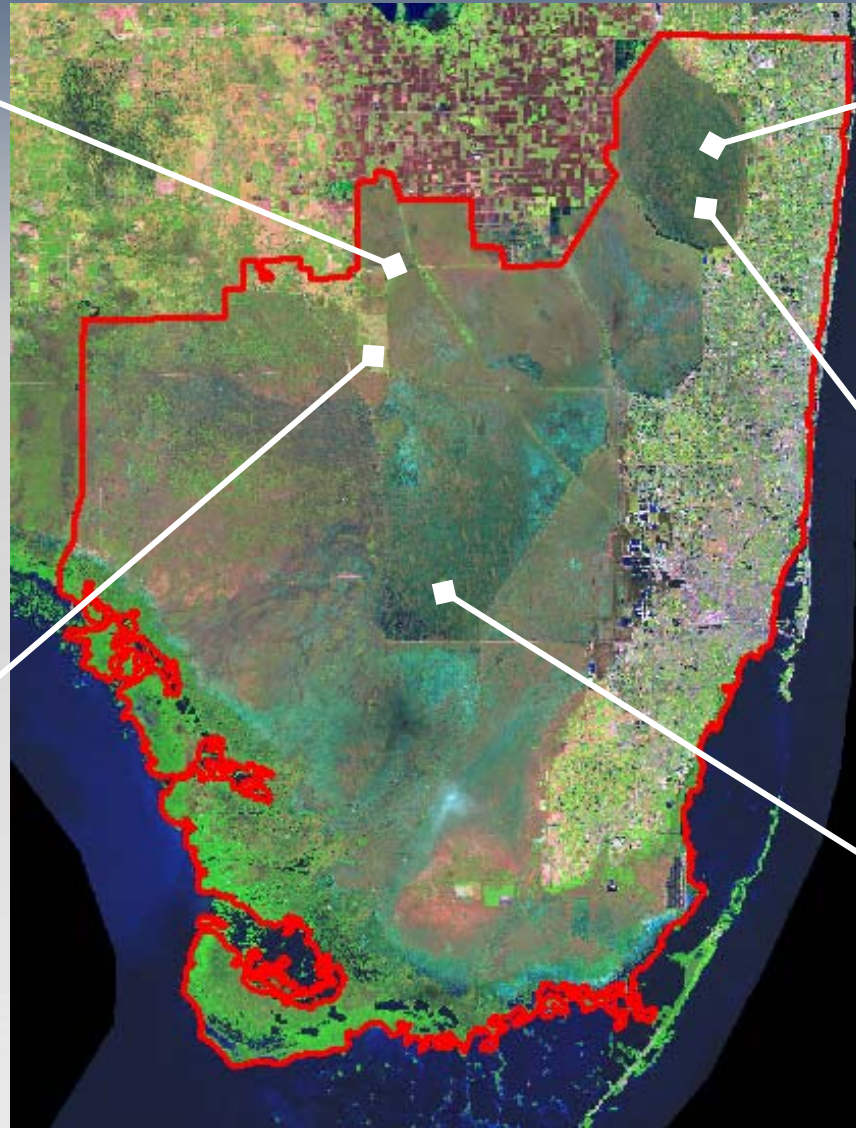
Agency/Tribe	Melaleuca	Lygodium	Brazilian Pepper	Australian Pine	Shoebuttan Ardisia	Lather leaf	Portia Tree	Air Potato	Many Cat.1
FWS (Lox Refuge)									
FWC									
SFWMD									
Seminole Tribe									
FP&L									
Big Cypress NP									
Everglades NP									
Palm Beach Co.									
Broward County									
Miami-Dade Co.									
Biscayne Bay NP									

EVERGLADES CISMA

2013 Newly Detected Plant Species

Cogongrass
(*Imperata cylindrica*)

Cuban bulrush
(*Oxycaryum cubense*)



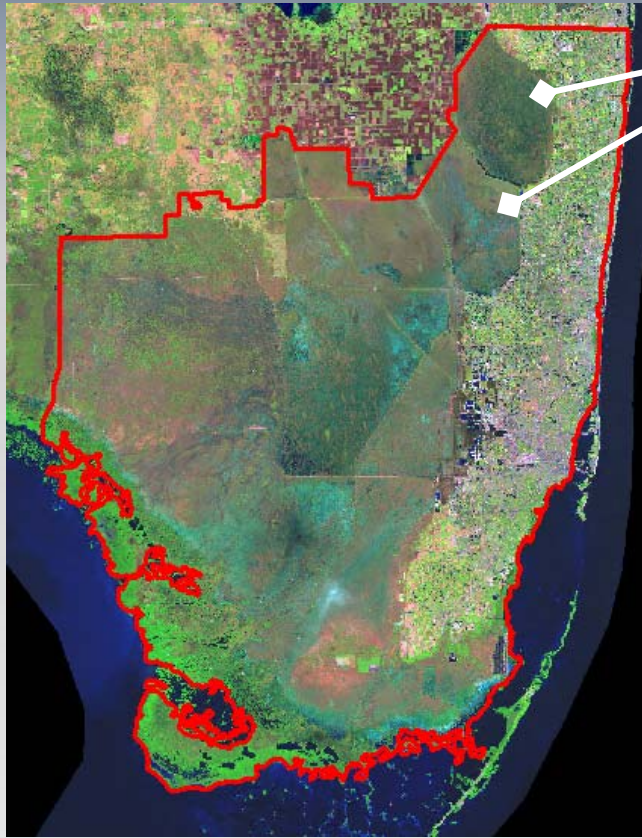
Dwarf Papyrus
(*Cyperus prolifer*)

Feathered Mosquito
Fern (*Azolla
pinnata*)

Cuban bulrush
(*Oxycaryum cubense*)

West Indian
Marsh Grass
(*Hymenachne
amplexicaulis*)

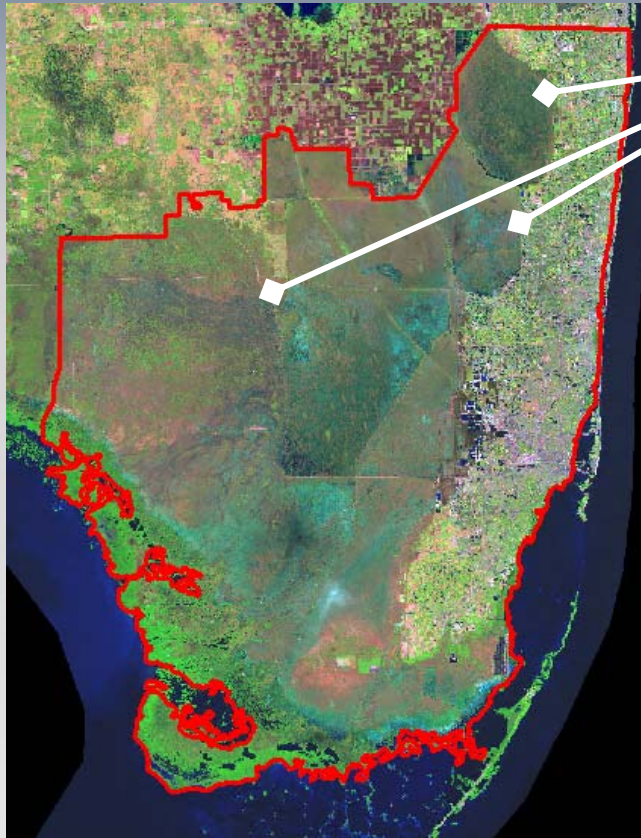
2013 Newly Detected Plant Species



Feathered Mosquito Fern
(*Azolla pinnata*)



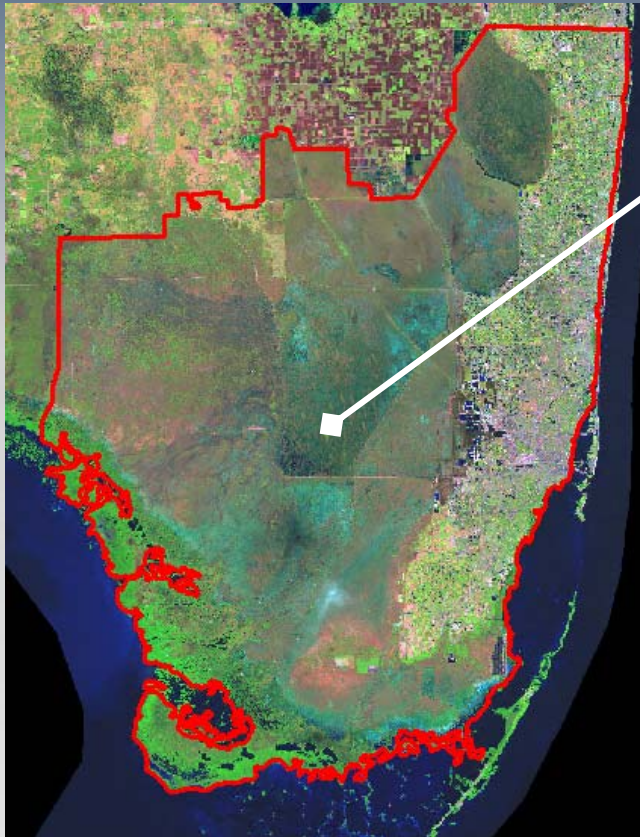
2013 Newly Detected Plant Species



Cuban Bulrush
(*Oxycaryum cubense*)



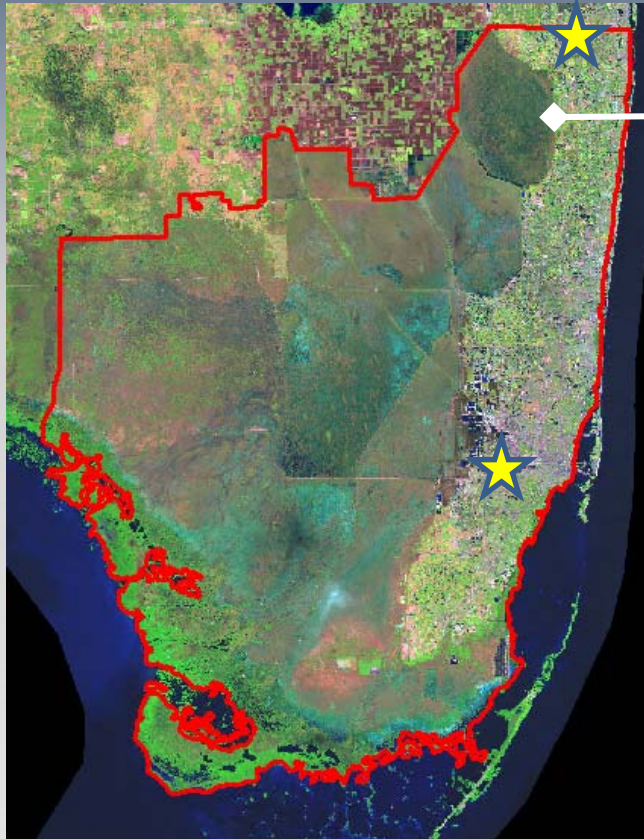
2013 Newly Detected Plant Species



West Indian Marsh Grass
(*Hymenachne amplexicaulis*)



2013 Newly Detected Plant Species



Miniature Flatsedge
(*Cyperus prolifer*)



beach star
Cyperus pedunculatus
Photo by Vic Ramey
© 2003 University of Florida

2012 Newly Reported Plant Species

Tropical Soda Apple
(*Solanum viarum*)

TREATED

Wright's Nut Rush
(*Scleria lacustris*)

Chinese Banyan
(*Ficus microcarpa*)

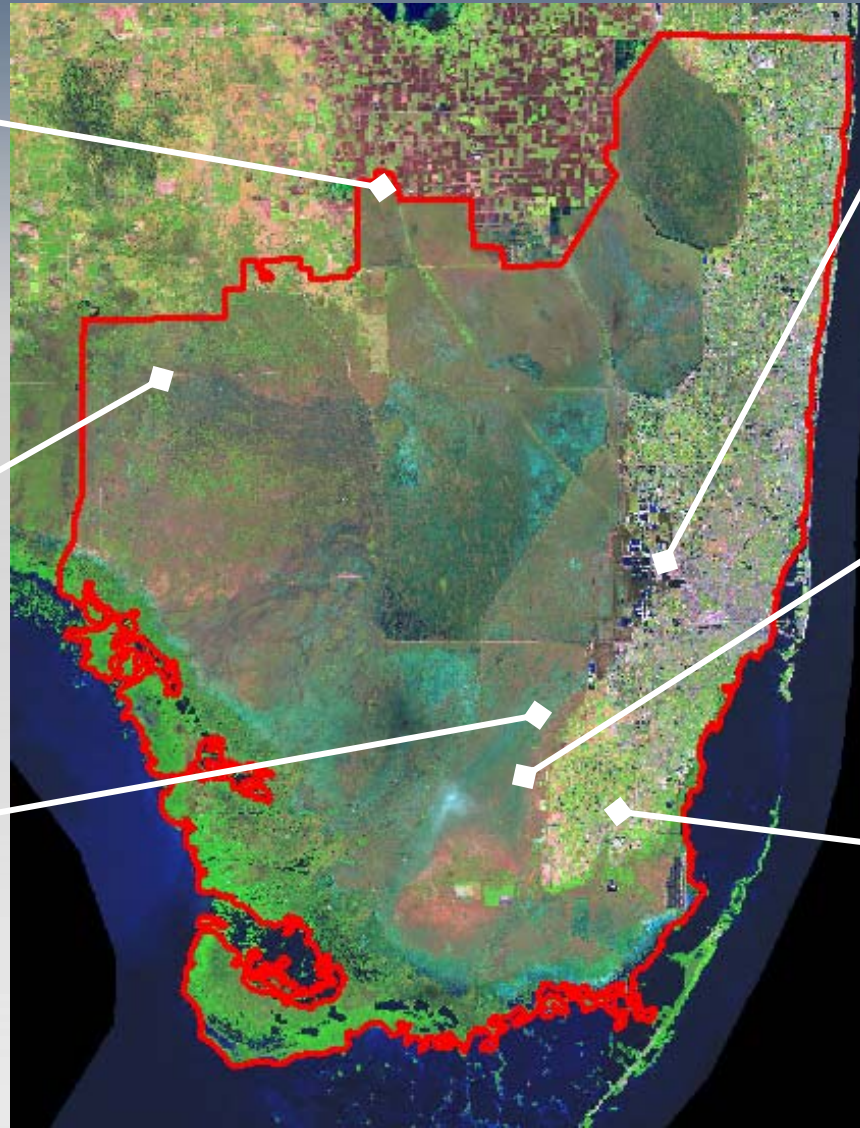
Spurge Creeper
(*Dalechampia scandens*)

PARTIALLY TREATED

Wild Indigo
(*Indigofera suffruticosa*)

Japanese Climbing Fern
(*Lygodium japonicum*)

TREATED



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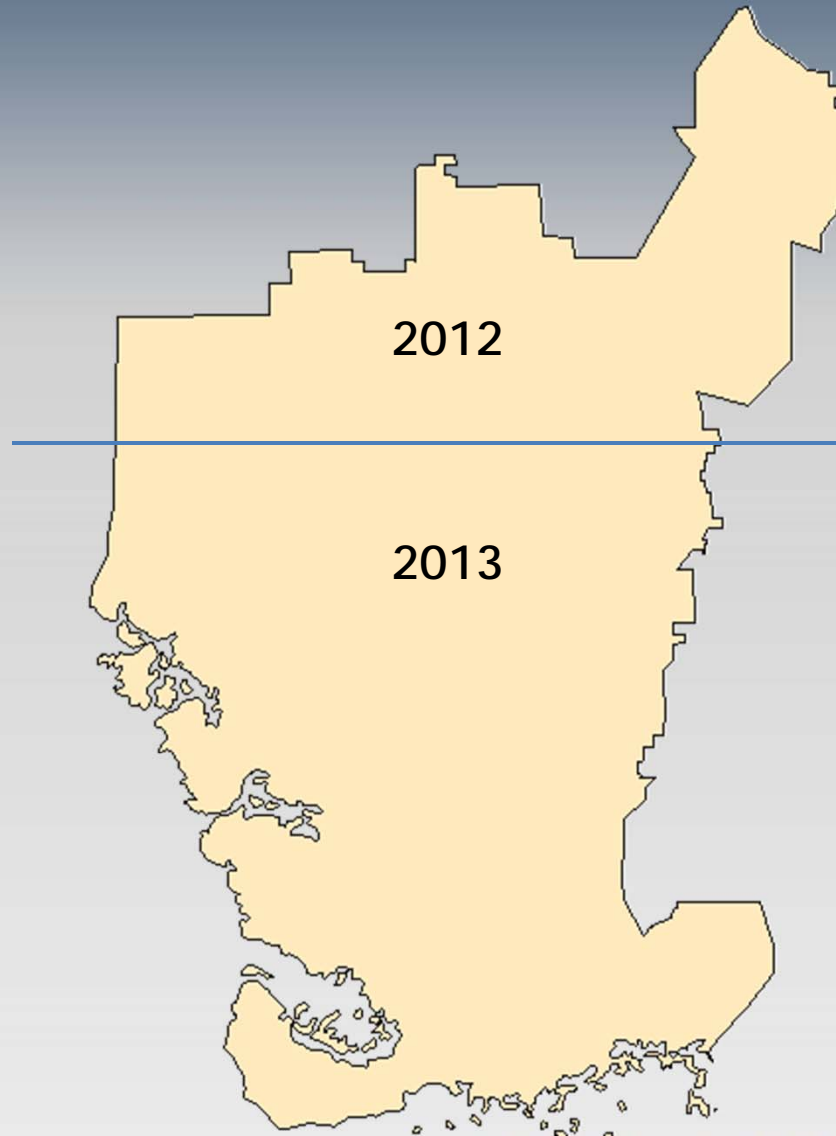
ECISMA Plant Monitoring

- Everglades CISMA Digital Aerial Sketch Mapping



- Aerial mapping “on-the-fly”
- Data collected 2012-2013
- Other monitoring activities
 - Big Cypress NP--supplementary aerial recon
 - EddMaps
 - Ground-based monitoring by many partners

DASM Sampling Regions



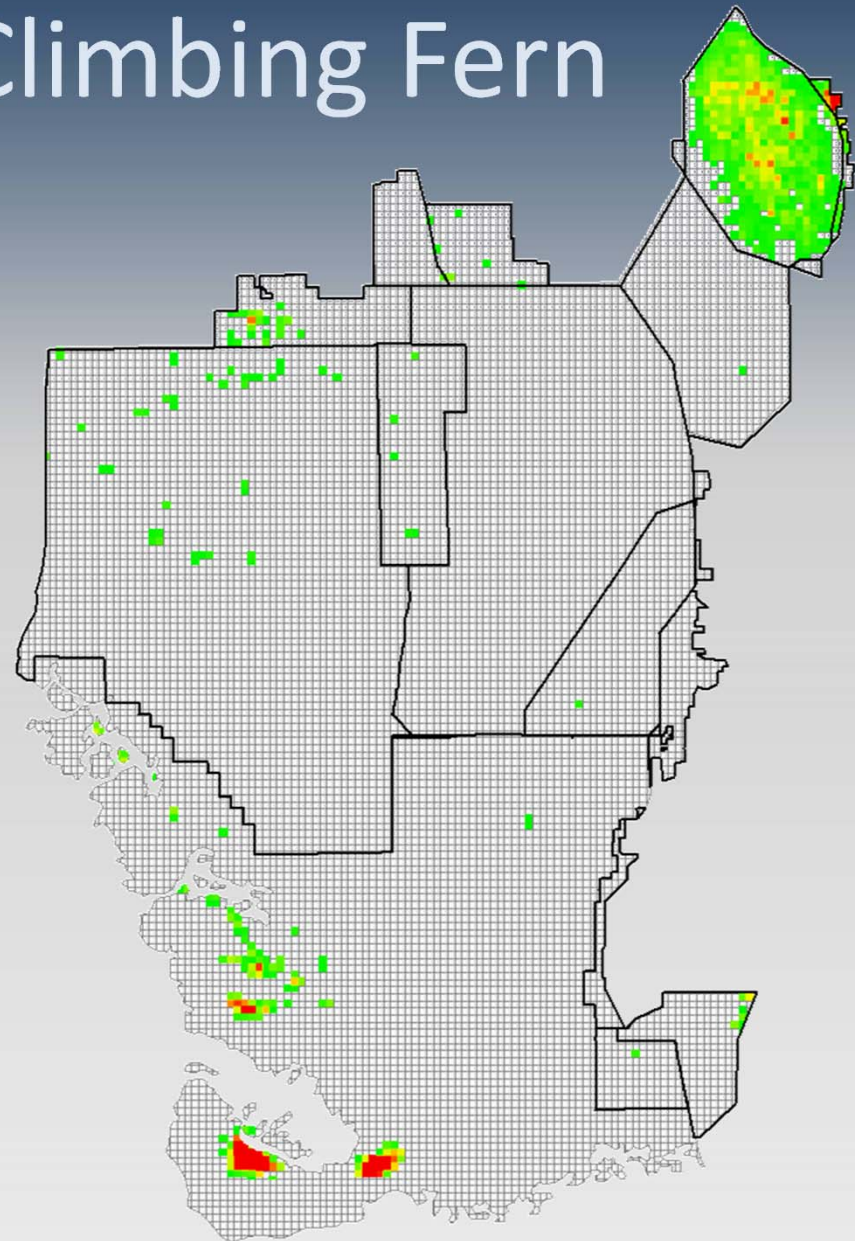
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Old World Climbing Fern

- 1k² Grid Values
 - Range: 0.003 – 37.5%
 - Mean: 3.2%

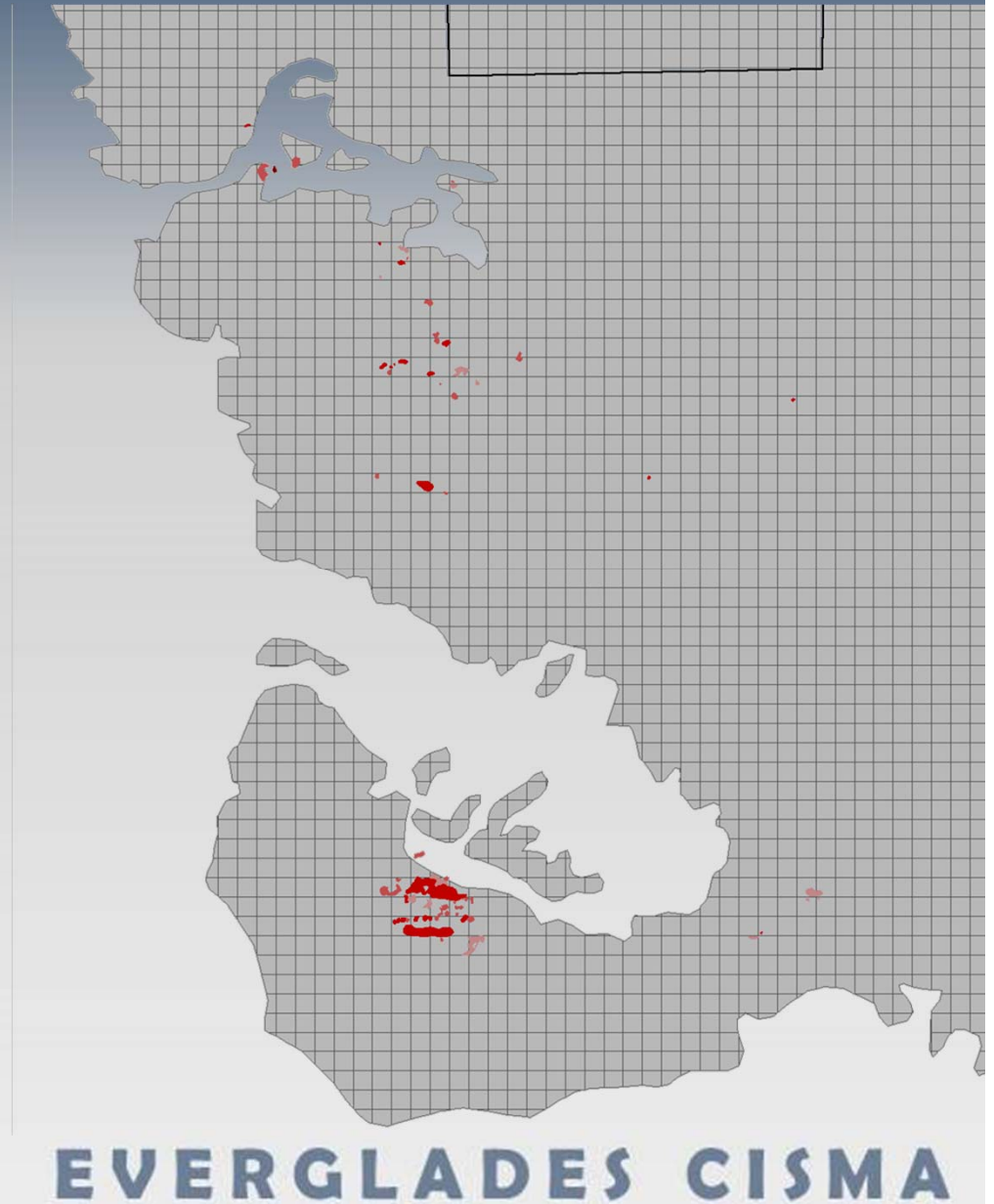
Infested Acres	Canopy Acres
25,619	5,927

- 69% increase in canopy cover since 2010-2012



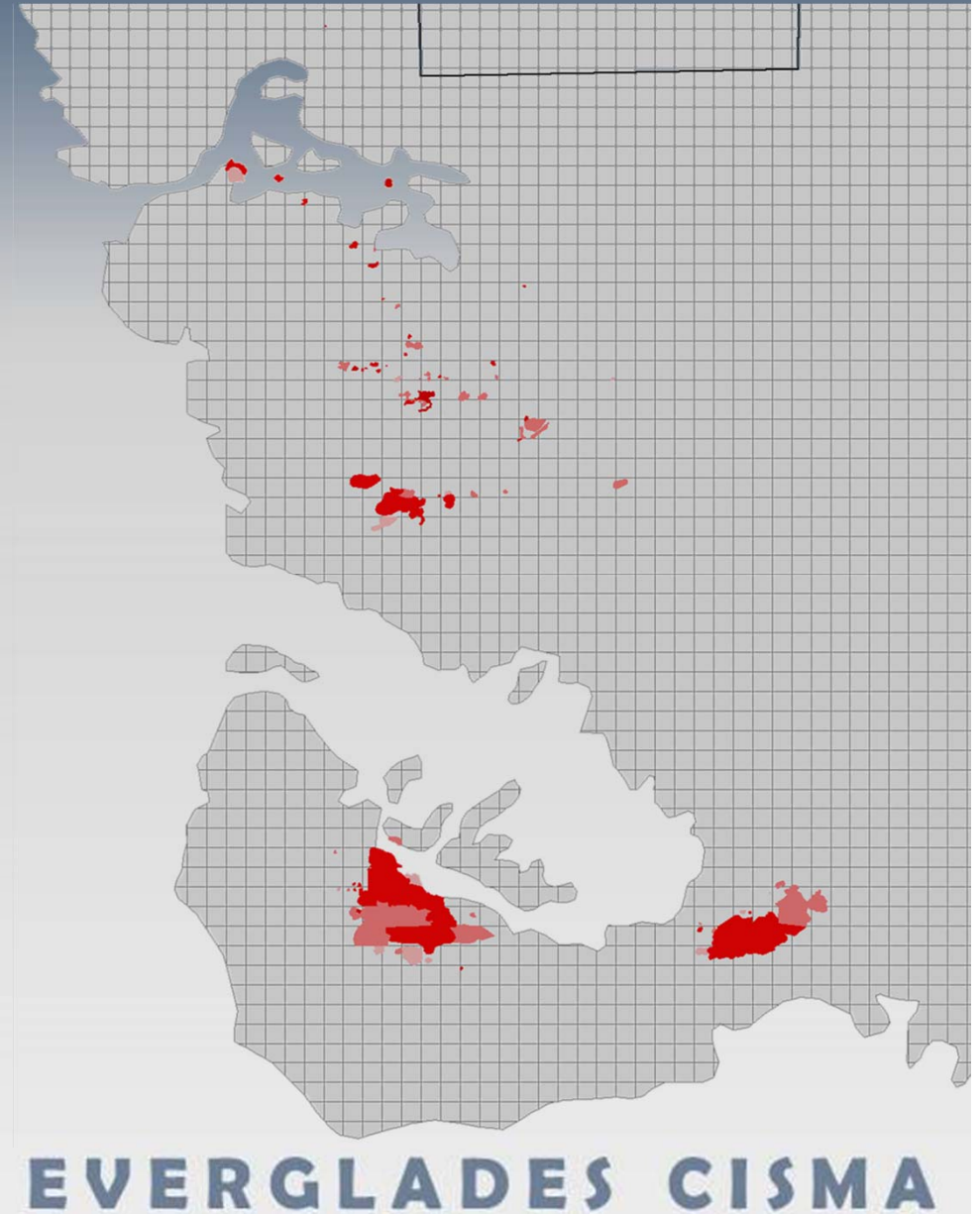
Cape Sable OWCF Infestations

- 2010 DASM data




Cape Sable OWCF Infestations

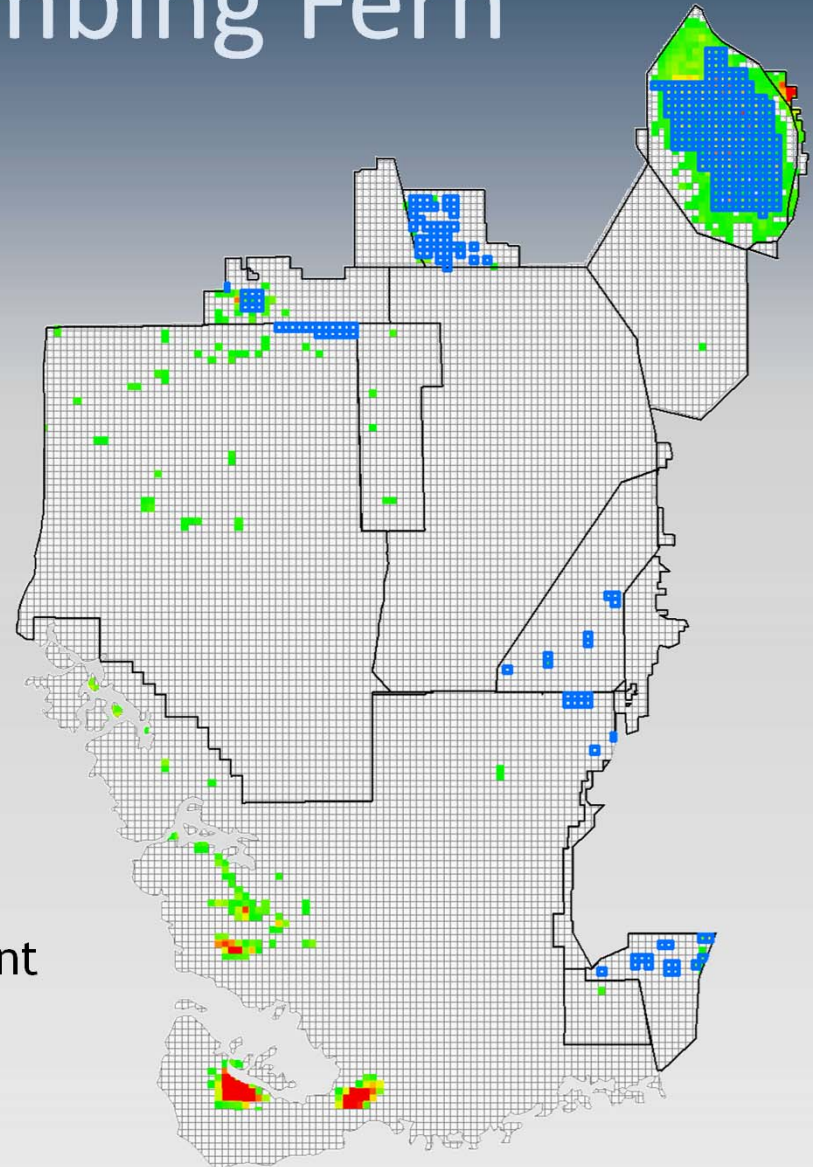
- 2013 DASM data



Old World Climbing Fern

~21,000 acres swept
since last year

 Ground/Aerial Treatment
within grid cell



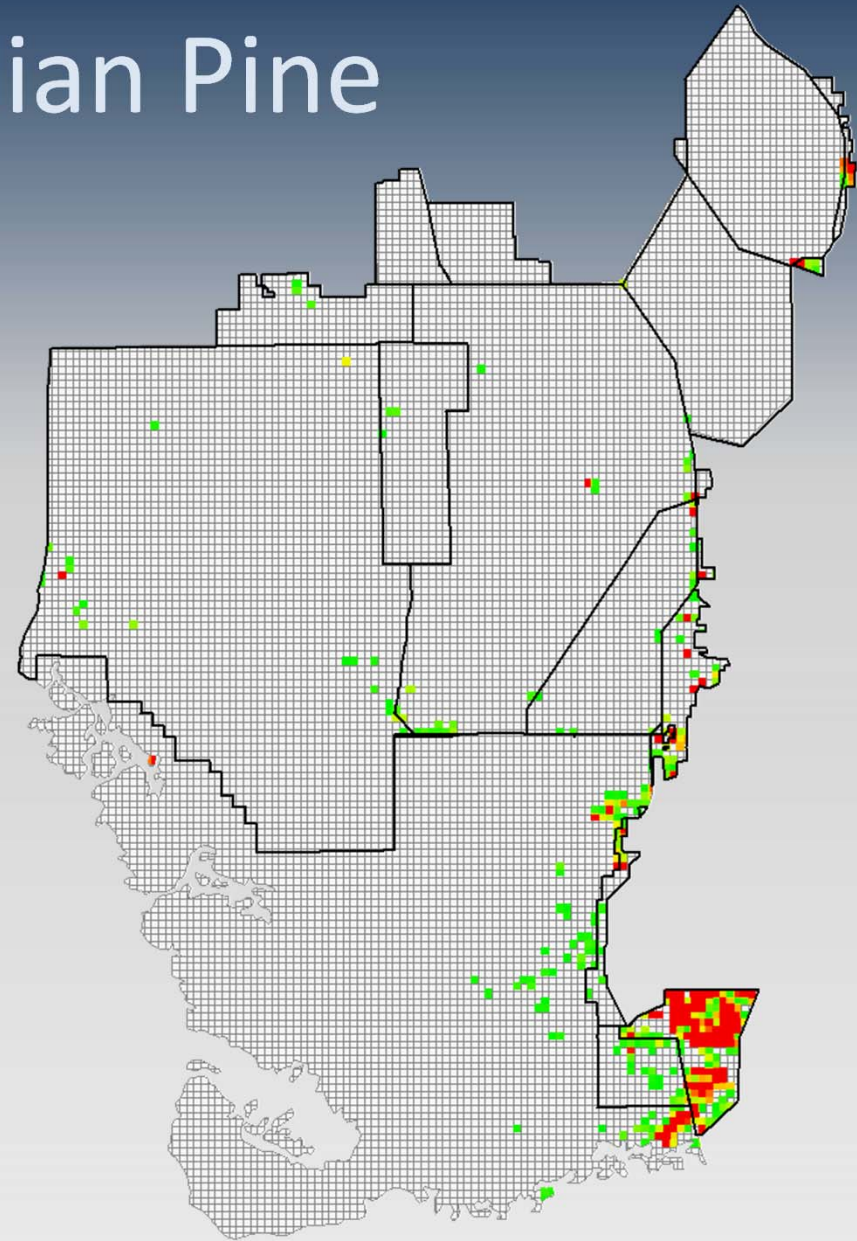
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Australian Pine

- 1k² Grid Values
 - Range: 0.003 – 48%
 - Mean: 2.3%

Infested Acres	Canopy Acres
10,325	1,869

- 94% increase in canopy cover since 2010-2012



SE Everglades Australian Pine

- 2010 DASM data



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SE Everglades Australian Pine

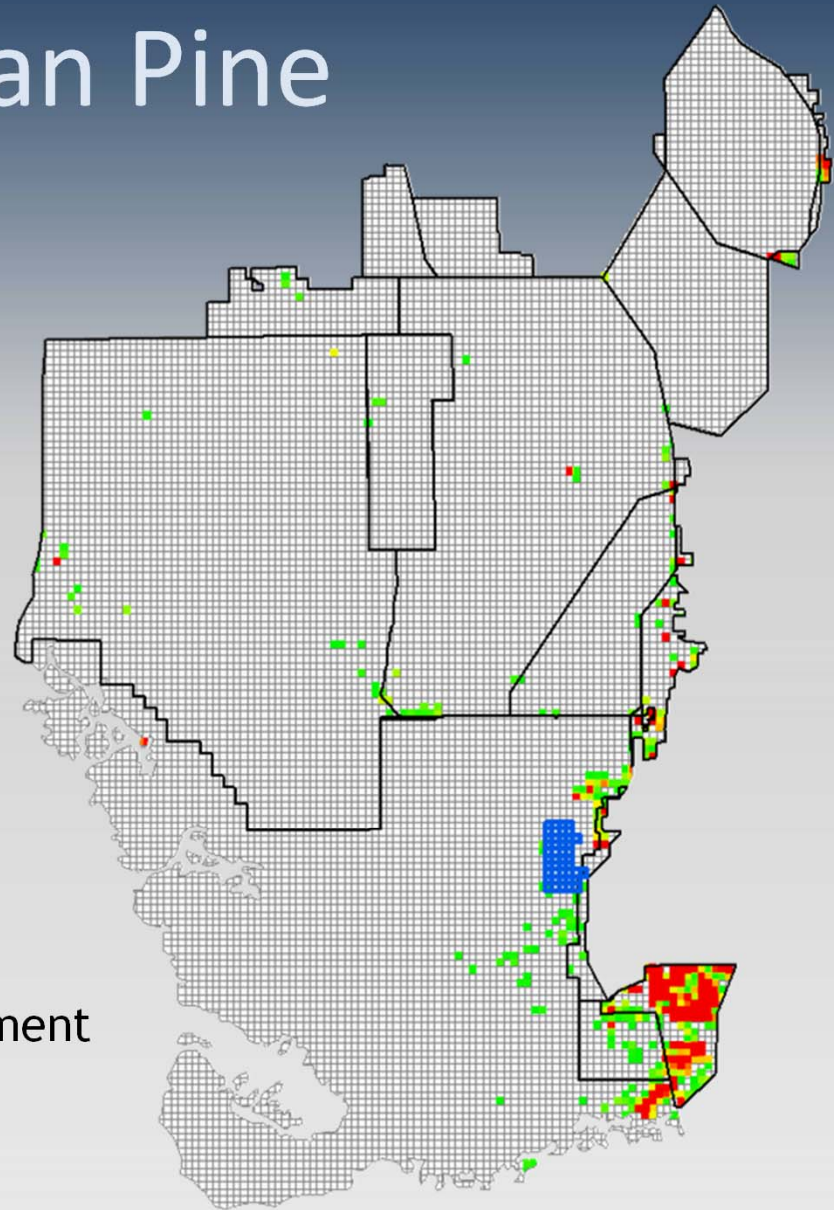
- 2013 DASM data
 - Distribution remains similar
 - But canopy cover is greater



Australian Pine

~11,000 acres swept
since last year

 Ground/Aerial Treatment
within grid cell

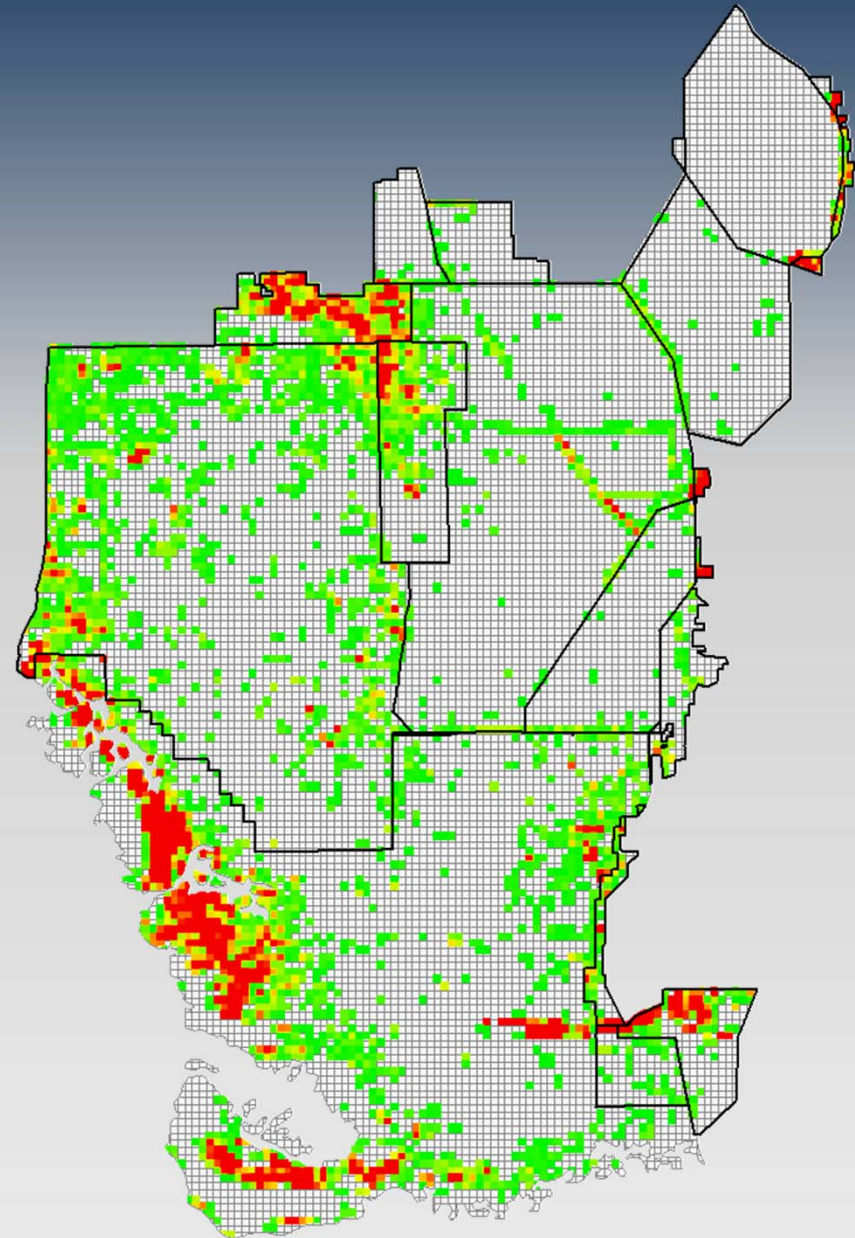


Brazilian Pepper

- 1k² Grid values
 - Range: 0.001-87.5%
 - Mean: 3%

Infested Acres	Canopy Acres
74,225	22,145

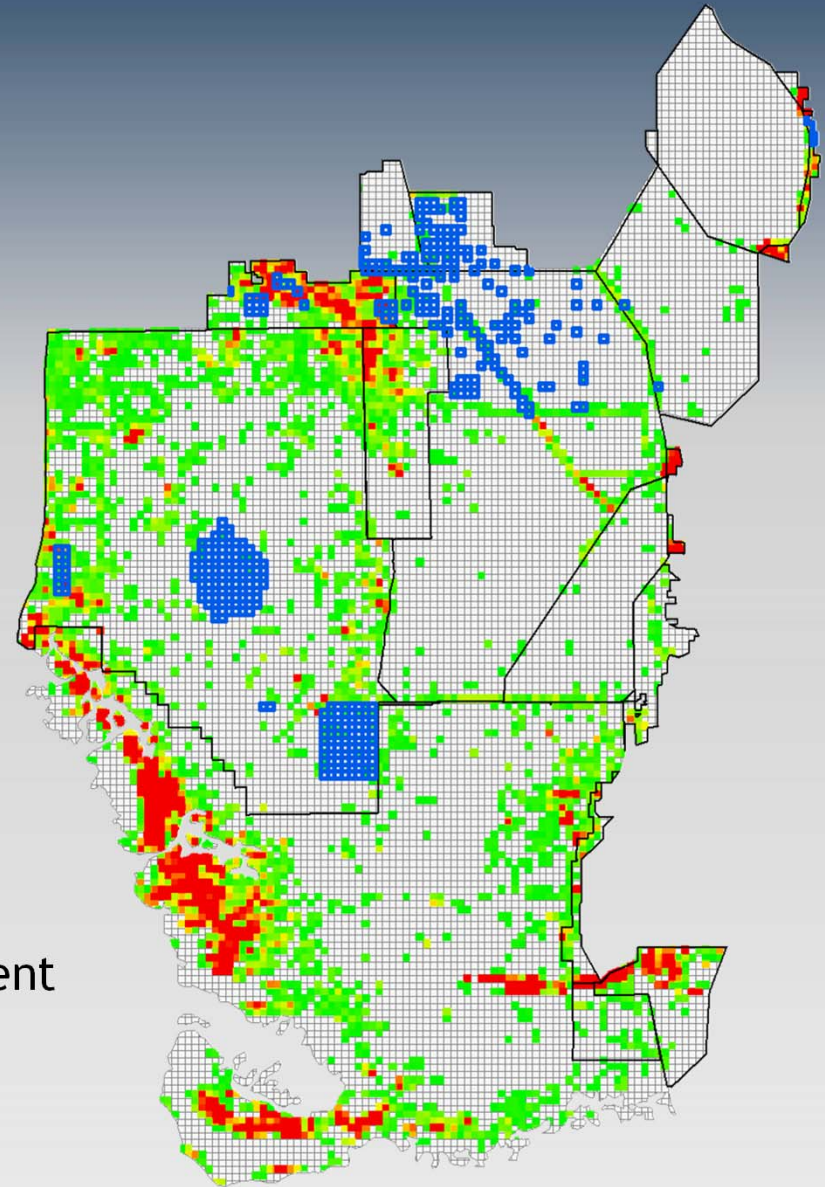
- 16% increase in canopy cover acre 2010-2012



Brazilian Pepper

~83,000 acres swept
in past year

 Ground/Aerial Treatment
within grid cell



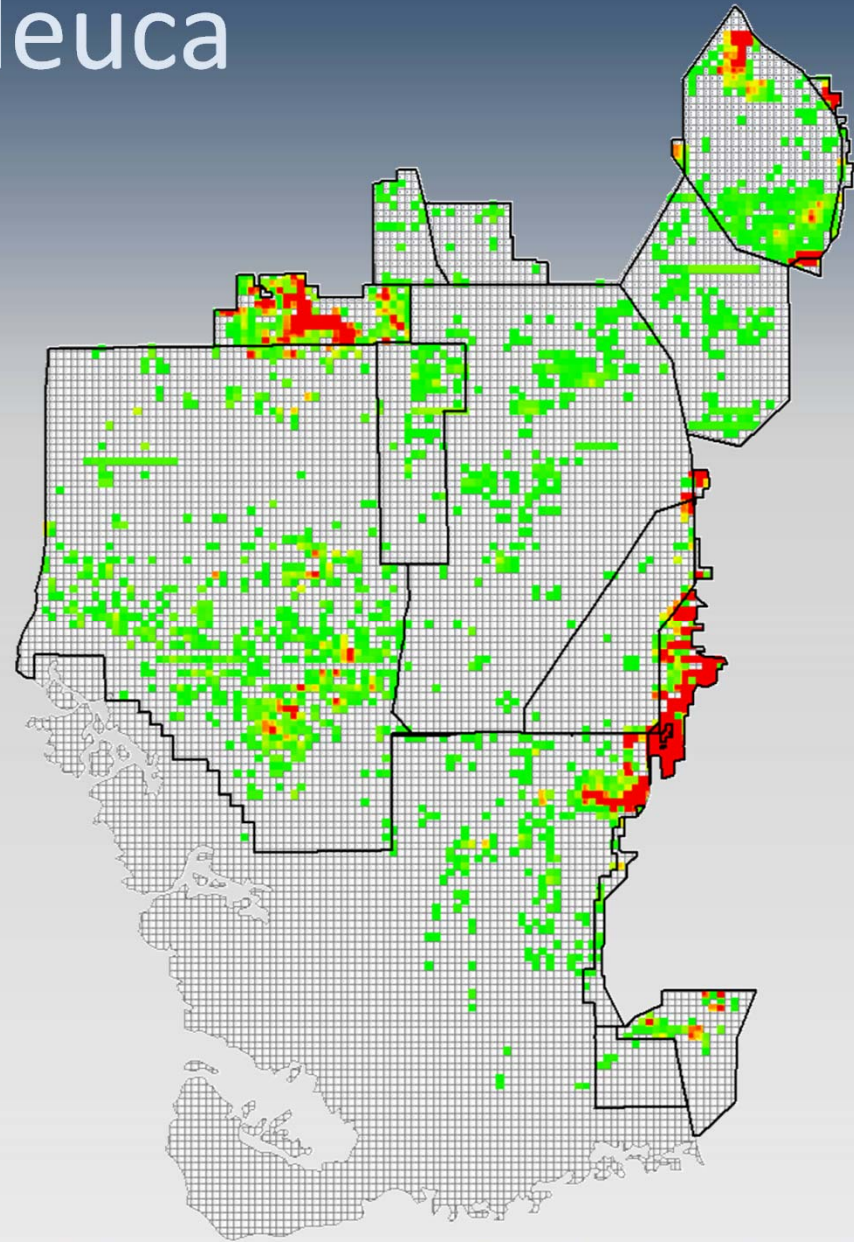
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Melaleuca

- 1k² Grid Values
 - Range: 0.002 - 63.3%
 - Mean: 2%

Infested Acres	Canopy Acres
40,804	10,035

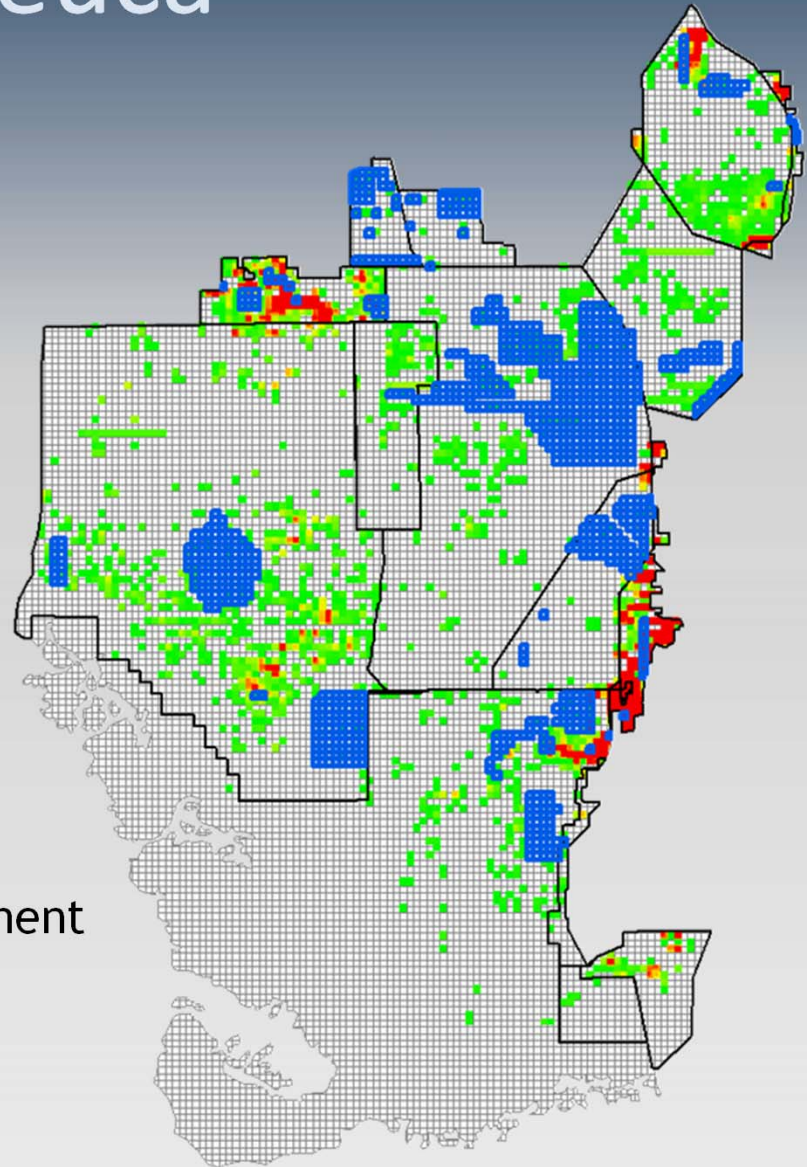
- 36% decrease in canopy acres since 2010-2012



Melaleuca

~238,000 acres swept
since last year

 Ground/Aerial Treatment
within grid cell



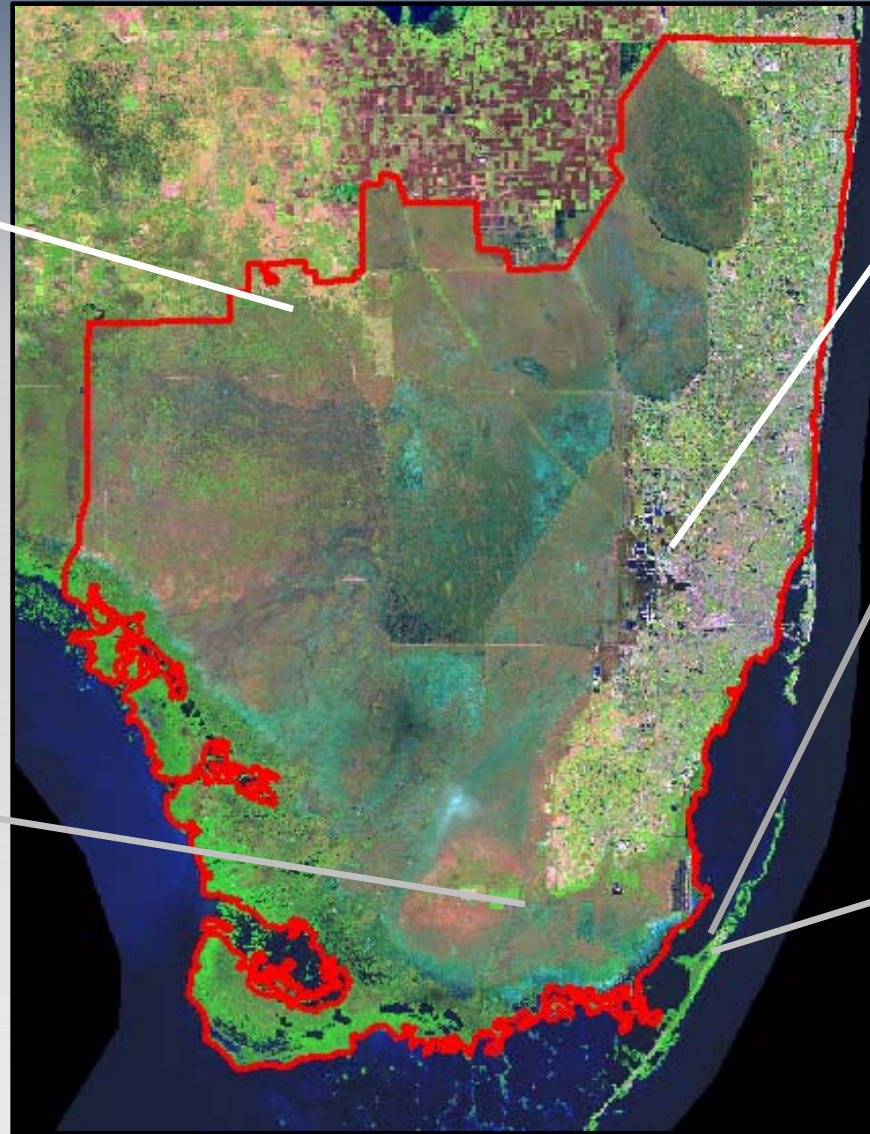
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Other Managed Plant Species

Air Potato
(*Dioscorea bulbifera*)

Arrowhead Vine
(*Syngonium podophyllum*)

Shoebutt
Ardisia
(*Ardisia elliptica*)

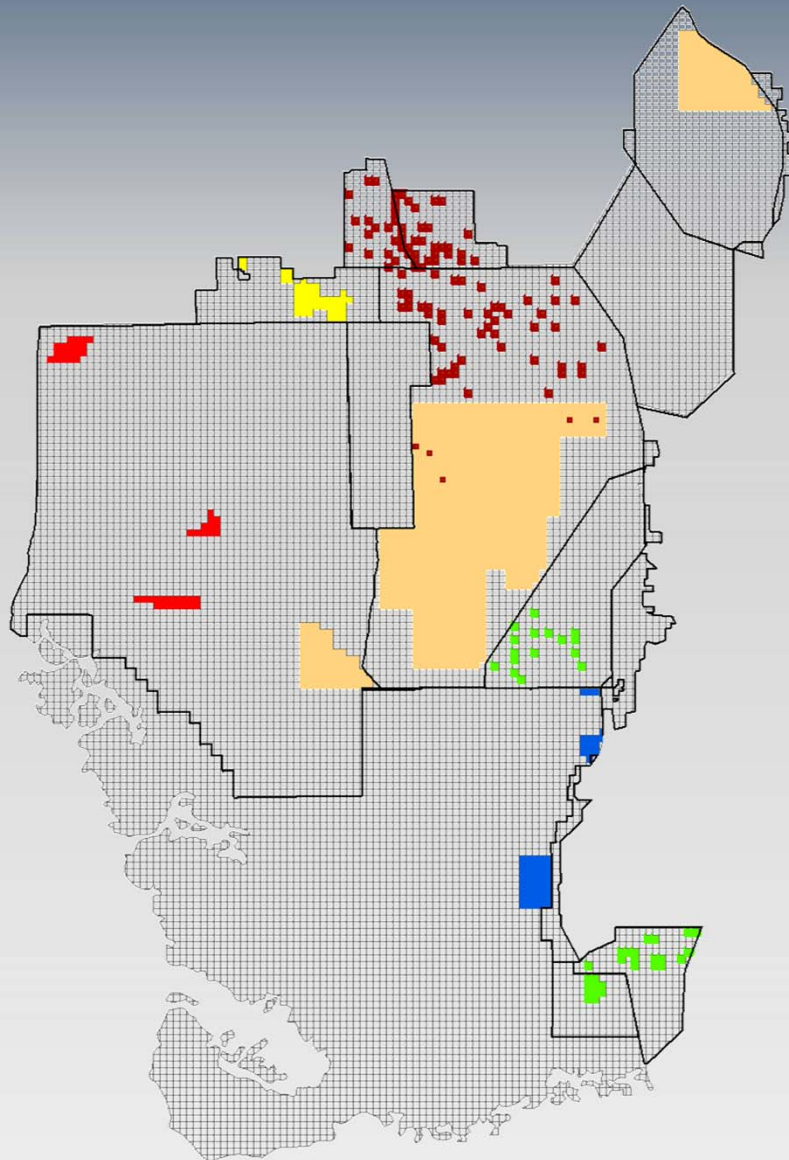


Skunk Vine
(*Paederia foetida*)

Latherleaf
(*Colubrina asiatica*)

Portia Tree
(*Thespesia populnea*)

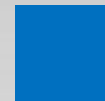
Planned Treatments FY14



Melaleuca



Melaleuca, Brazilian Pepper



Melaleuca, Australian Pine



Melaleuca, Lygodium, Brazilian Pepper



Lygodium, Brazilian Pepper



Lygodium

~285,000 acres planned

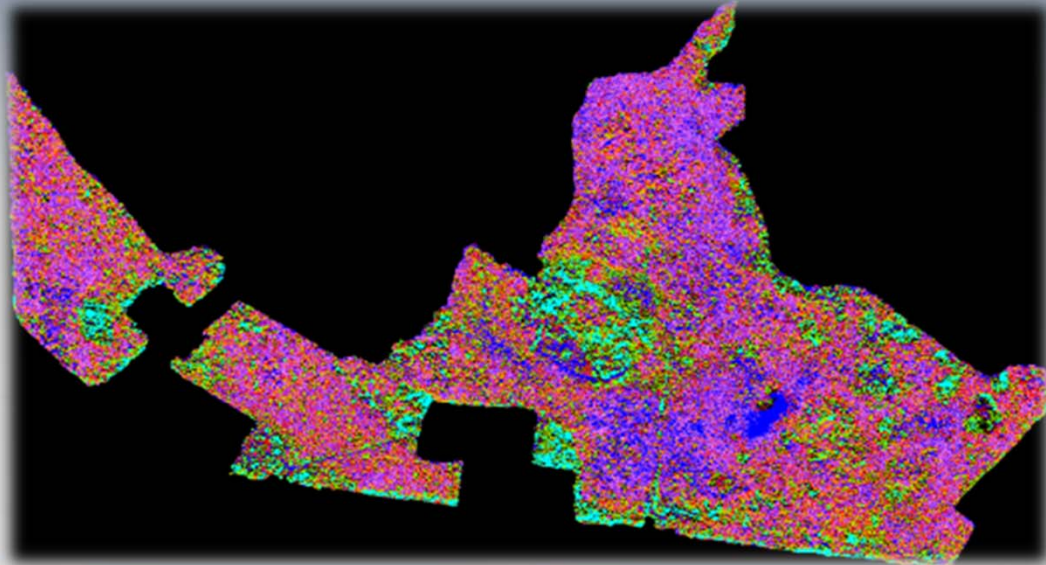
EVERGLADES CISMA

Thanks

- Presentation support from:
 - Shea Bruscia (USNPS)
 - Jed Redwine (USNPS)
 - Ellen Allen (SFWMD)
 - Jim Burch (Big Cypress NP)
 - Hillary Cooley (Everglades NP)
 - Jane Dozier (Miami-Dade Co.)
 - Pat Howell (Broward Co.)
 - Christen Mason (USFWS, Loxahatchee NWR)
 - Elizabeth Letts (Seminole Tribe of Indians)
 - Vanessa McDonough (Biscayne Bay NP)

Seminole Tribe of Florida

Everglades Restoration Canopy Species Characterization and Change Detection Analysis

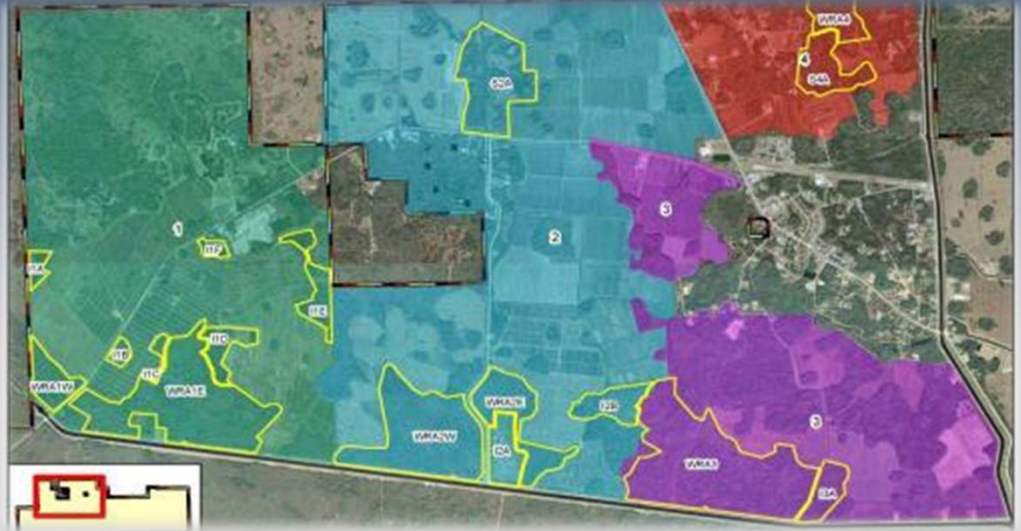


EVERGLADES CISMA

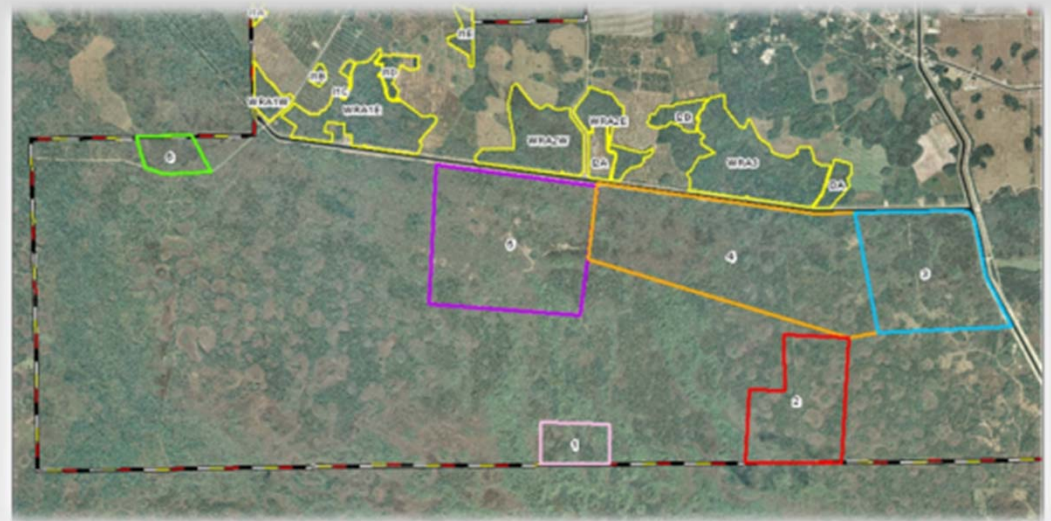
Florida Everglades Restoration

Restoring The Impacts

- Comprehensive Everglades Restoration Plan (CERP) Project Features
 - Restore hydroperiods
 - Improve water quality
 - Preserve habitats & water resources
- Big Cypress Seminole Indian reservation (BCSIR) deemed as 6th most critical everglades habitat to restore out of 100 initially considered



Water Conservation Plan Project (WCP)



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Critical Habitat Restoration

Seminole Tribe of Florida Big Cypress Reservation



Pop Ash Wetlands
Fraxinus caroliniana



Blue Flag Iris
Iris virginica



Butterfly Orchid
Encyclia tampensis



Slash Pine
Pinus ellioti



Cypress Forested Wetlands
Taxodium distichum

Critical Wildlife Habitat Restoration

Seminole Tribe of Florida Big Cypress Reservation



Barred Owl
Strix varia



Florida Panther
Puma concolor coryi



Florida Black Bear
*Ursus americanus
floridanus*



Swallow-tailed Kite
Elanoides forficatus



White-Tailed Deer
Odocoileus virginianus



Cdy00004.M4V

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The Everglades Exotic Invaders

Florida Exotic Pest Plant Council's 2007 List of Florida's Most Invasive Species

Category I - Species that are invading and disrupting native plant communities in Florida



Category I Exotic Old-World Climbing Fern
Lygodium microphyllum

**Category I
Exotic**
Melaleuca
*Melaleuca
quinquenervia*



**Category I
Exotic**
Brazilian
Pepper
*Schinus
terebinthifolius*



Standard Quantitative and Qualitative Analyses

- Wetland science section utilizes standard scientific methodology to analyze vegetation ground, subcanopy, and canopy covers through monument transects & quadrats
- Baseline conditions & subsequent monitoring events determine the successes of everglades restoration activities



- The use of ERDAS Imagine Remote Sensing and ArcMap has expanded the analysis of wetland systems to entire habitats unrestricted by transect locations

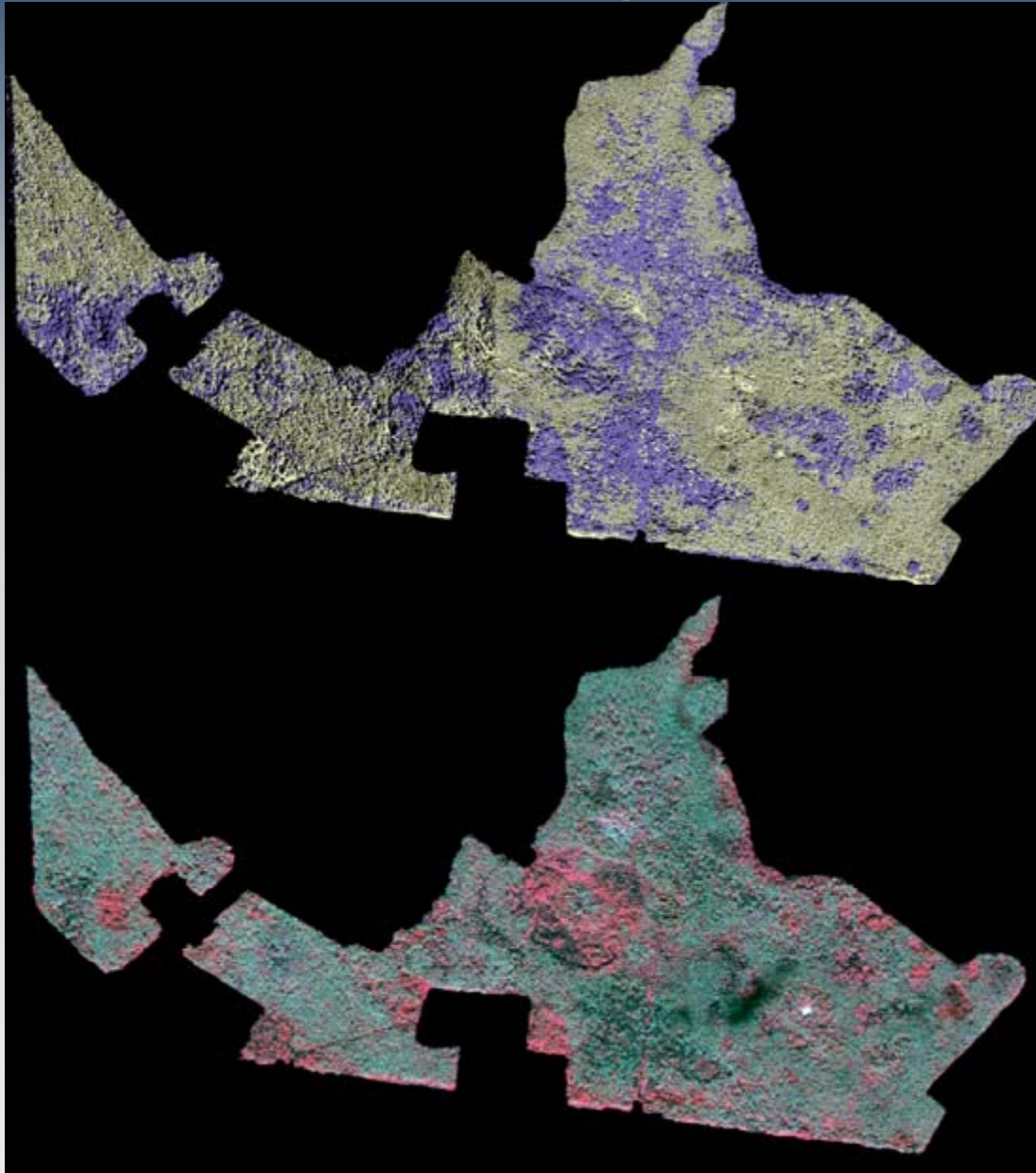
Basin 1 (WCP) WRA 1 Canopy Study

Baseline Conditions:
1999 CIR DOQQ
Imagery (Color
Infrared Digital Ortho
Quarter Quads)



Current Conditions:
2012 SPOT Imagery (16
bit, 50 cm ortho-mosaic)

Creating Subset AOI WRA 1



AOI Subset of 1999
CIR DOQQ Imagery

Area of Interest (AOI)
Clips canopy study
imagery to your project
boundary

AOI Subset of 2012
SPOT 16 bit 50 cm
ortho-mosaic Imagery

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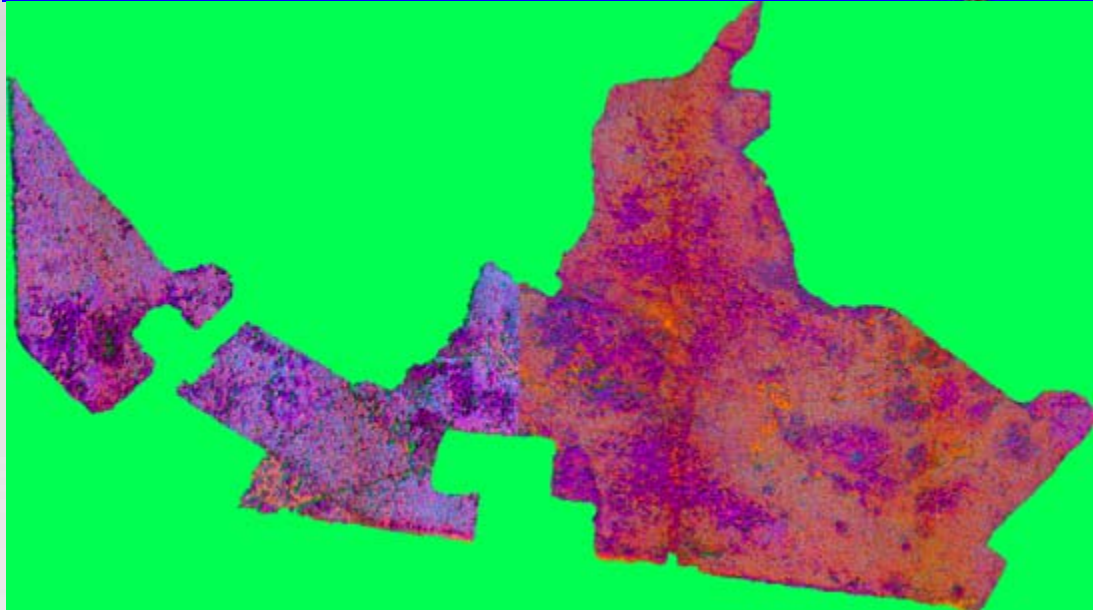
Principal Component Analysis (PCA) WRA 1



Principal Component Analysis (PCA) 2012 SPOT Imagery

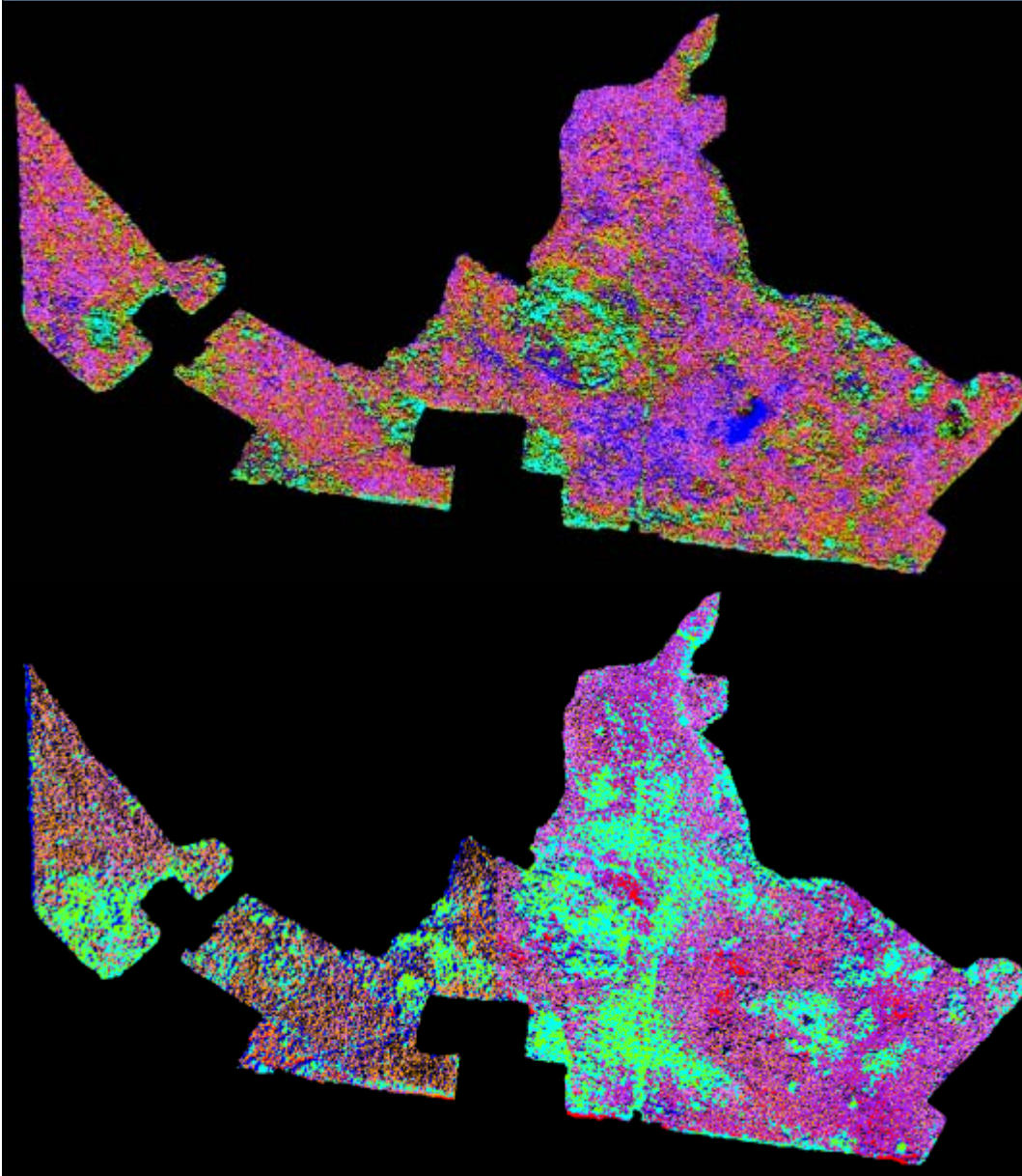
PCA enhances image:

- Compresses redundant data
- Enhances 3 color spectrums (Red, Green, Blue)
- Improves visual interpretation



Principal Component Analysis (PCA) 1999 CIR DOQQ Imagery

Isodata Clustering, Unsupervised Classification



2012 SPOT Image PCA Unsupervised Classification 9 classes

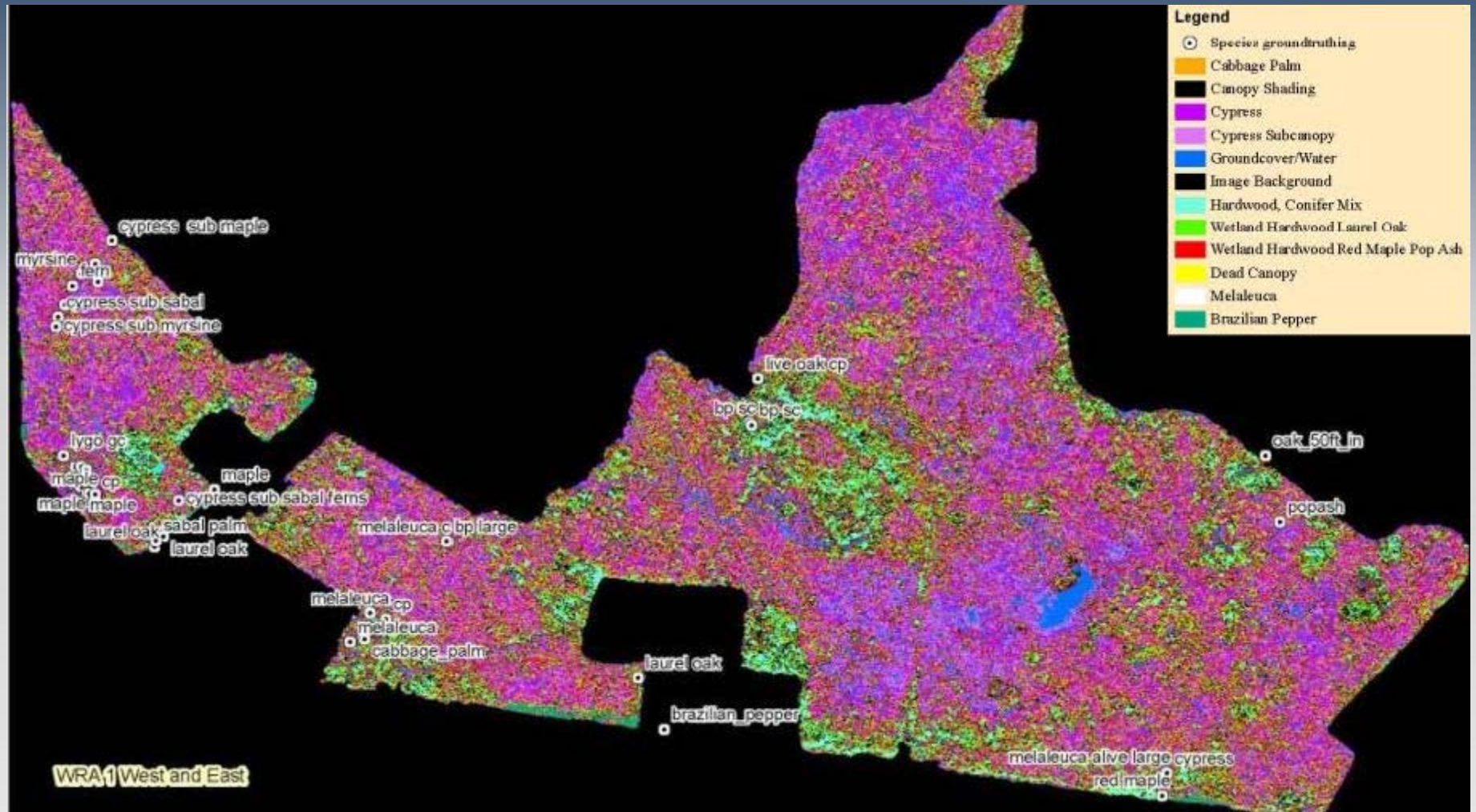
Isodata Clustering

- Determines # of classifications
 - Cypress
 - Hardwood, Conifer Mix
 - Wetland Hardwood, Red Maple & Pop Ash
 - Wetland Hardwood, Laurel Oak
 - Cabbage Palm
 - Brazilian Pepper
 - Melaleuca
 - Canopy Shading
 - Groundcover/ Water
 - Dead or Moribund Canopy

1999 CIR DOQQ Image PCA Unsupervised Classification 9 classes

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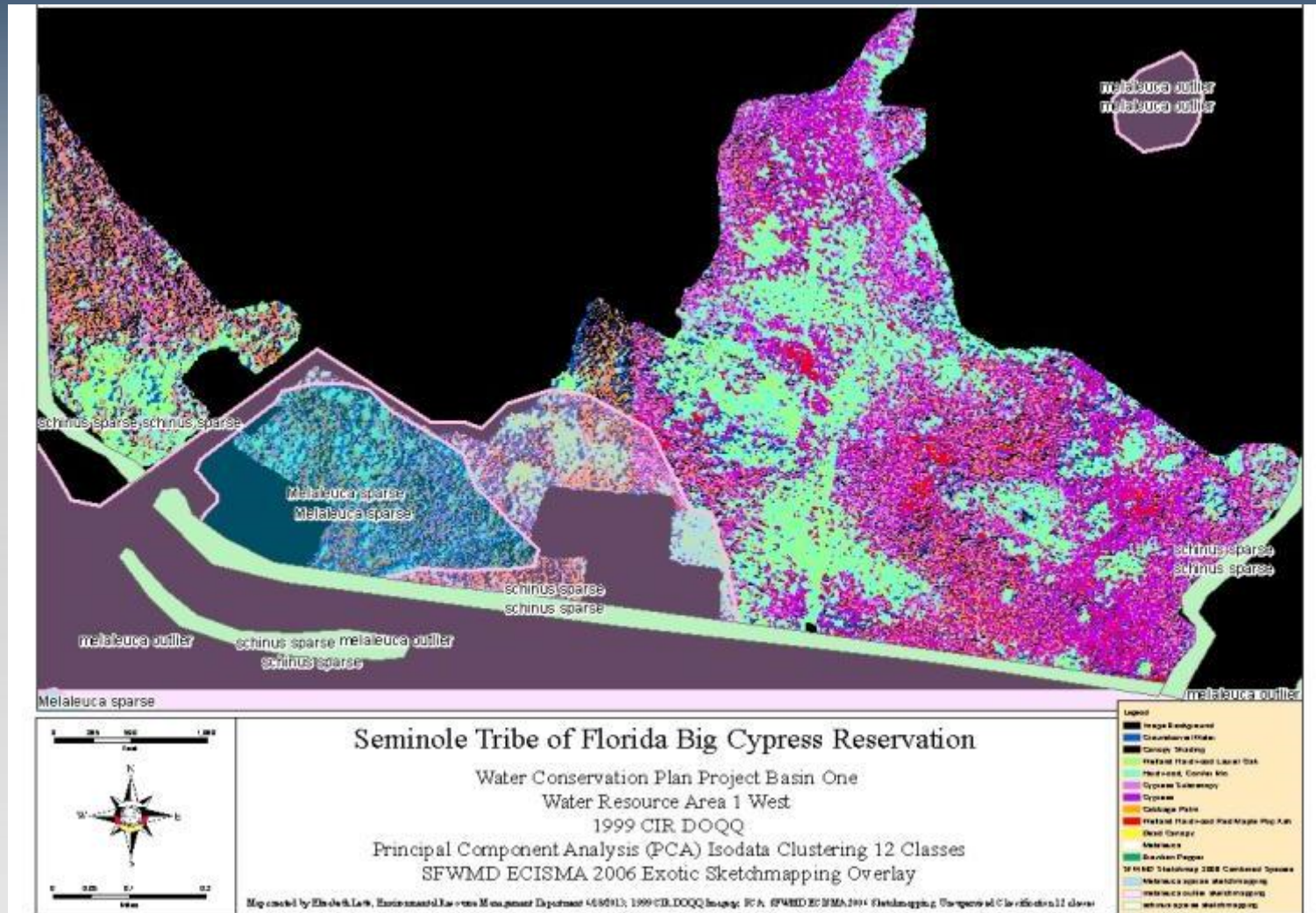
Ground Truth Field Verifications



- Once PCA and Unsupervised Classification was completed, 2012 image field verification commenced to validate signatures
- Trimble GeoXT units selected to collect canopy species data points
- Shapefiles were created in NAD 1983 HARN StatePlane Florida East FIPS 0901 (US Feet)

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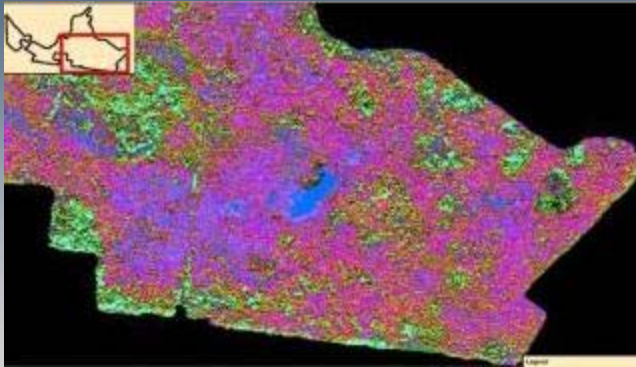
Visual interpretations Isodata Clustering 1999 Imagery



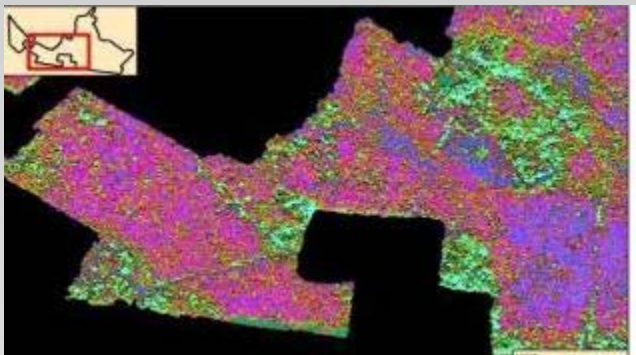
- South Florida Water Management District exotic species sketchmapping 2006 event utilized to determine the areas of infestation for the 1999

Change Detection Results 1999 and 2012 Imagery

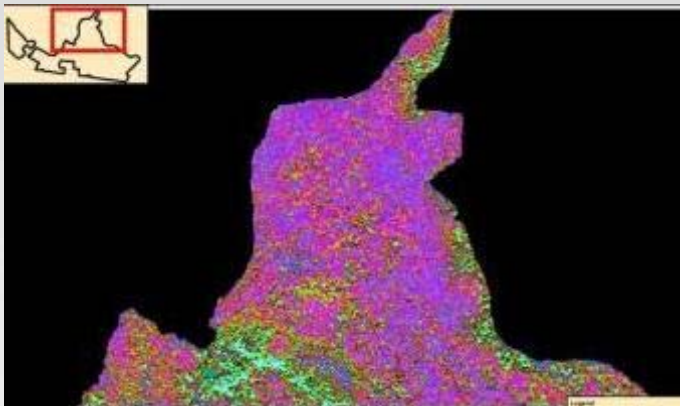
2012 Image



Higher %
Schinus
in 1999 →

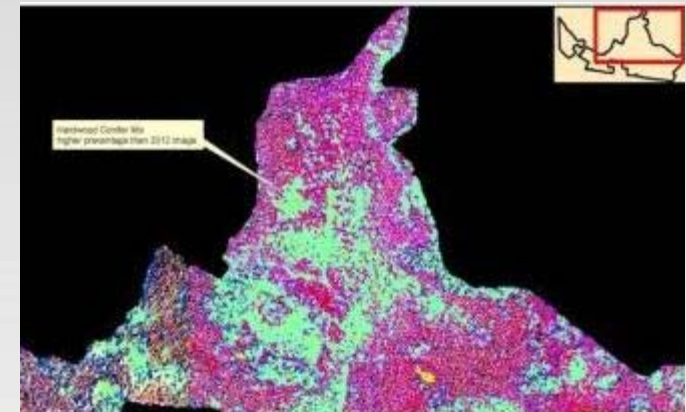
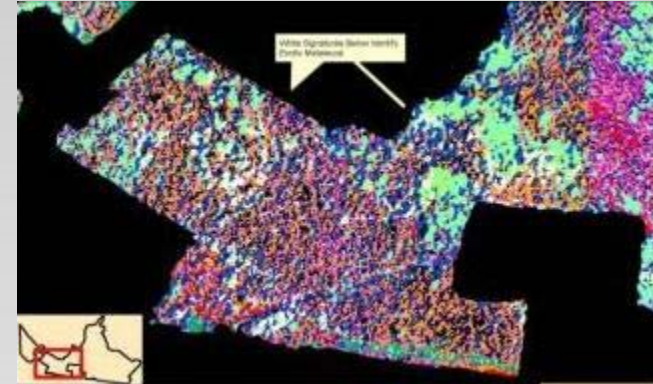
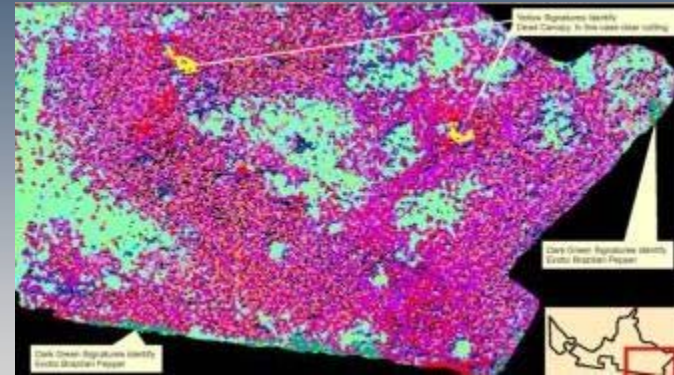


Higher %
Melaleuca
in 1999 →



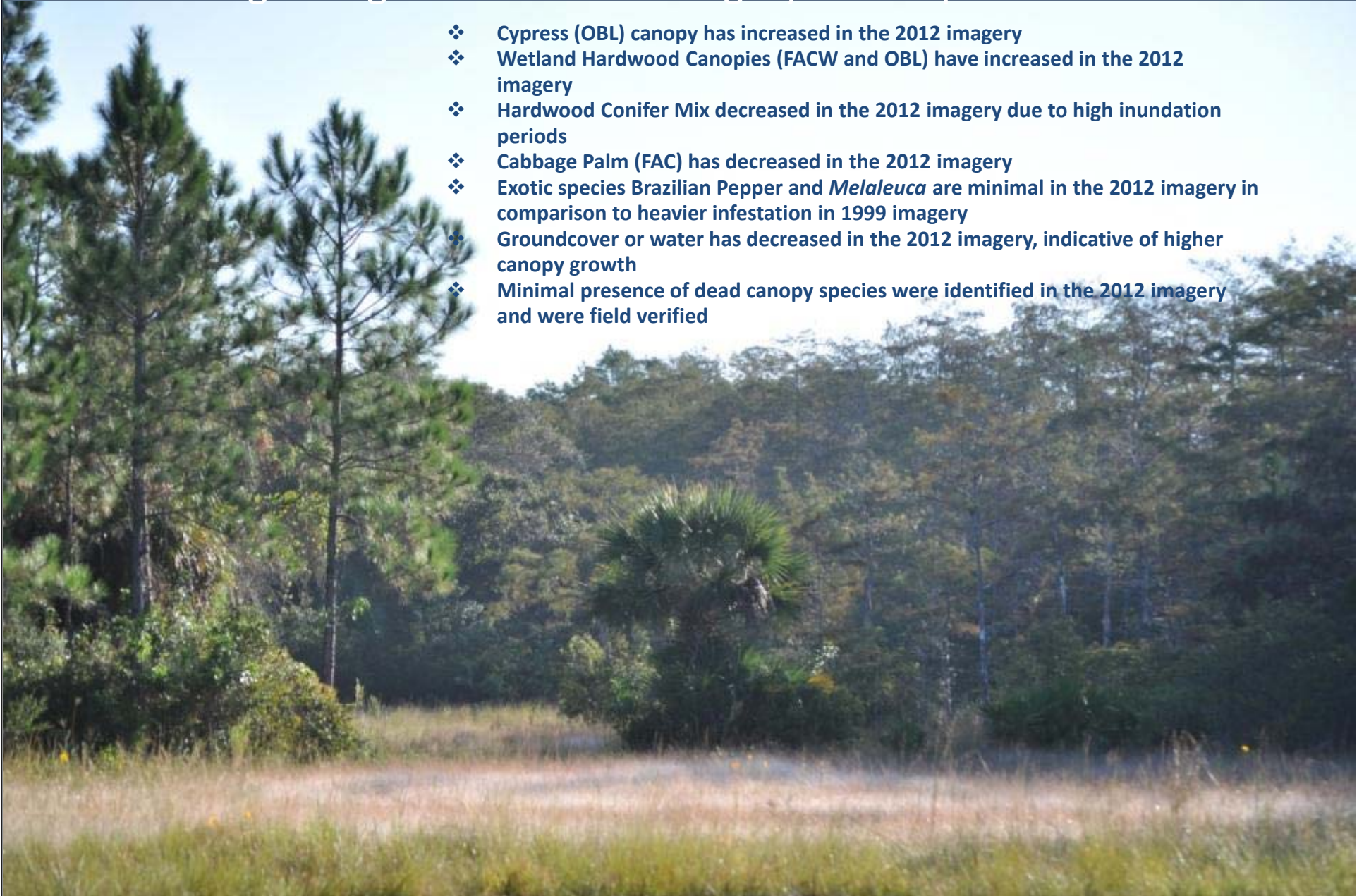
Higher %
Wetland
Hardwood
← in 2012

1999 Image



Spectral analysis combined with photointerpretation noted the following changes in the 2012 imagery as compared to the 1999

- ❖ Cypress (OBL) canopy has increased in the 2012 imagery
- ❖ Wetland Hardwood Canopies (FACW and OBL) have increased in the 2012 imagery
- ❖ Hardwood Conifer Mix decreased in the 2012 imagery due to high inundation periods
- ❖ Cabbage Palm (FAC) has decreased in the 2012 imagery
- ❖ Exotic species Brazilian Pepper and *Melaleuca* are minimal in the 2012 imagery in comparison to heavier infestation in 1999 imagery
- ❖ Groundcover or water has decreased in the 2012 imagery, indicative of higher canopy growth
- ❖ Minimal presence of dead canopy species were identified in the 2012 imagery and were field verified



Other Projects in Progress

Exotic Treatments → Prescribed Burns → Retreatments



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Other Projects in Progress

Laurel Wilt

- Bay species are culturally significant to STOF
- Determining Management Steps for laurel wilt
- Scheduled helicopter surveys to identified stressed or dead trees
- Potential site visits to ground zero locations in Georgia
- Determine resources and Tribal funding for resistant Bay tree stock
- Laurel wilt not yet identified on Big Cypress reservation



Exotic Vegetation Biological Controls

- Working to approve release of:
 - *Neomusotima* moth *Lygodium microphyllum* and
 - *Lilioceris* beetle *Dioscoria bulbifera* bio-controls
- Visits to USDA laboratory w/ STOF cultural representatives
- USDA presentations to Tribal representatives



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Everglades CISMA

Thank you to all who work so hard to restore and preserve our native habitats



Questions?

Thanks to STOF ERMD, Forestry, & THPO Staff:

Grant Steelman – Forester

James Phillips – Environmental Technician

Pauline Haas – Wildlife Biologist

Mandy D’Andrea – Biological Technician

**Stacy Myers – Environmental Sciences
Section Head**

Maureen Mahoney – Tribal Archeologist

Juan Cancel – THPO Chief Data Analyst

Contact:

**Elizabeth Letts – Environmental
Protection Specialist**

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EVE

Everglades National Park

Hillary Cooley



EVERGLADES CISMA

Up-date of Invasive Plant List

Whiteaker and Doren, 1989. Exotic Plant Species Management Strategies and List of Exotic Species in Prioritized Categories for Everglades National Park.

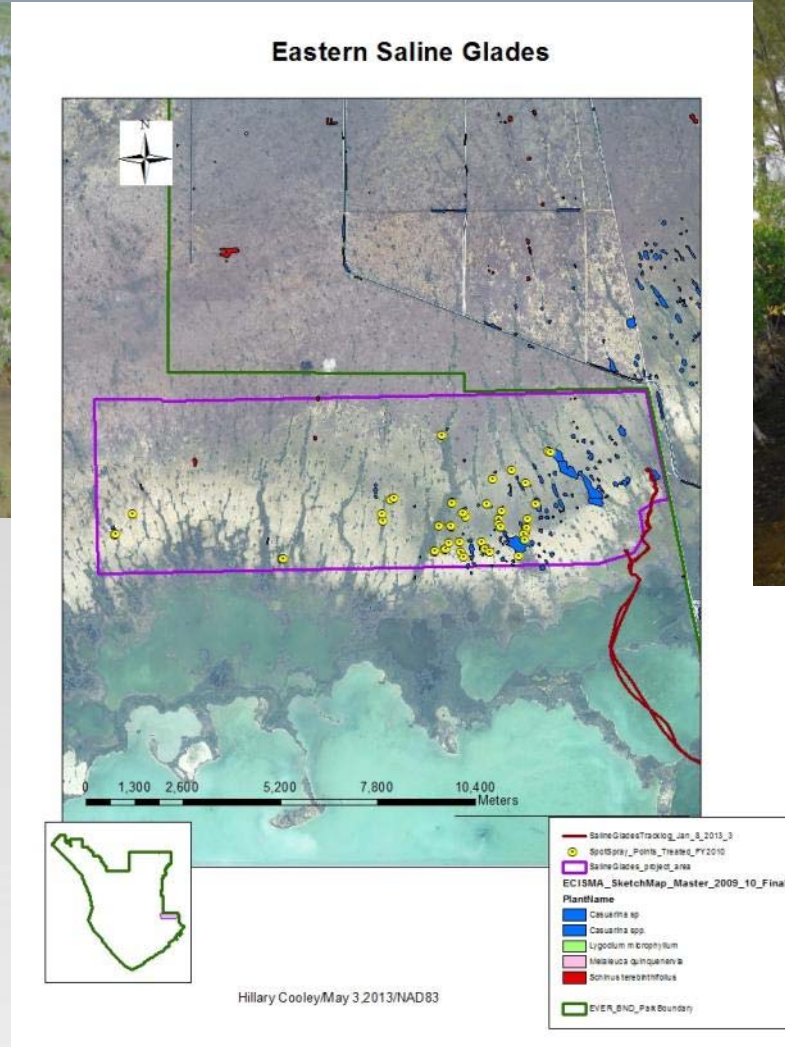
Update list and ranked new species.



Most of the new species not ranked as high priority.

Spot spray of Australian Pine

Monitoring ~ 1 year later and ~20% re-leaf.



Lygodium Bio-control

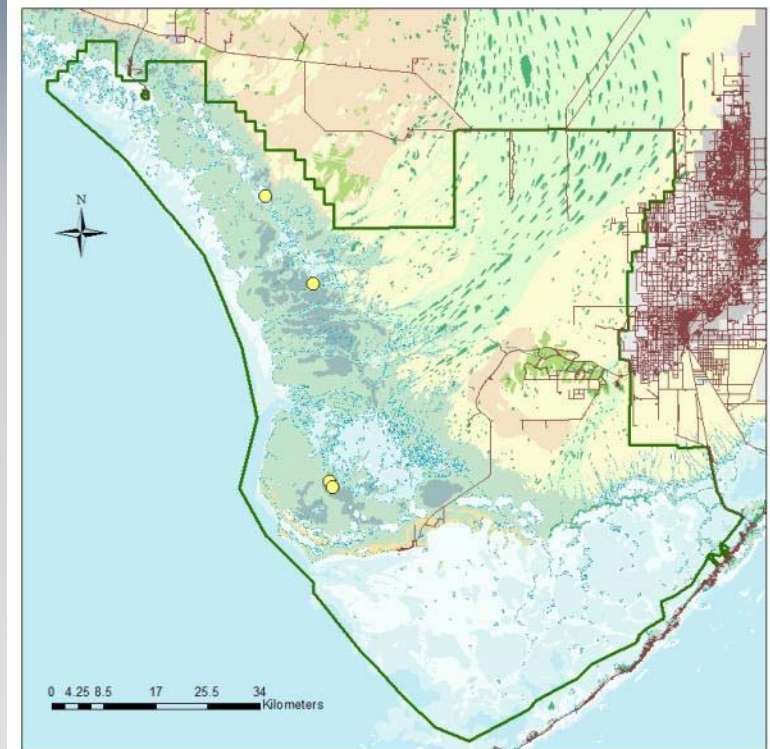
-Re-release of brown Lygodium Moth in April and May of 2013.

-Found evidence of mite in the Field at Cape Sable location.

*Later Confirmed in the lab.



Landscape Photo_NPS: Staff photo

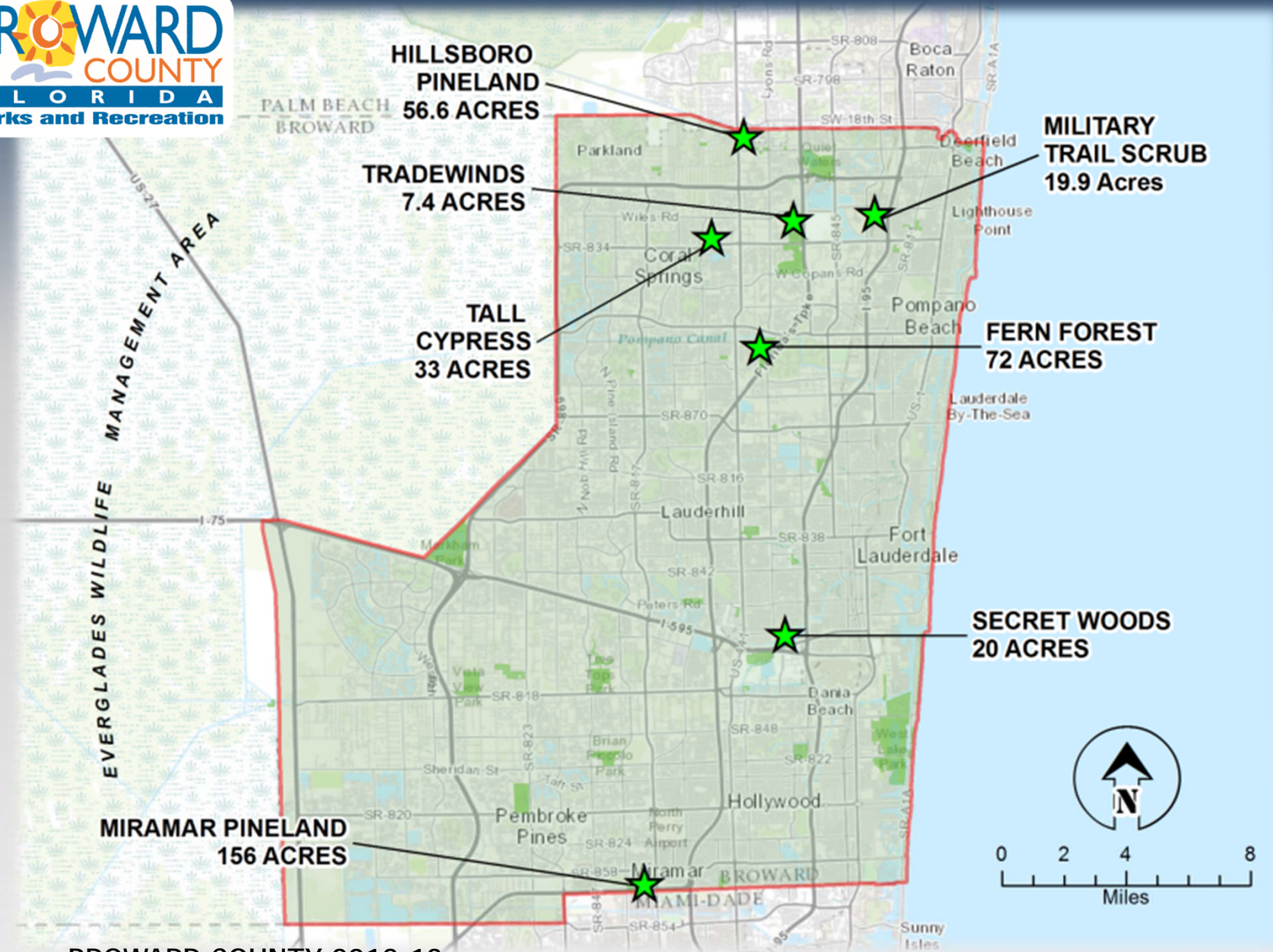


Hillary Cooley/July 16, 2013/NAD83



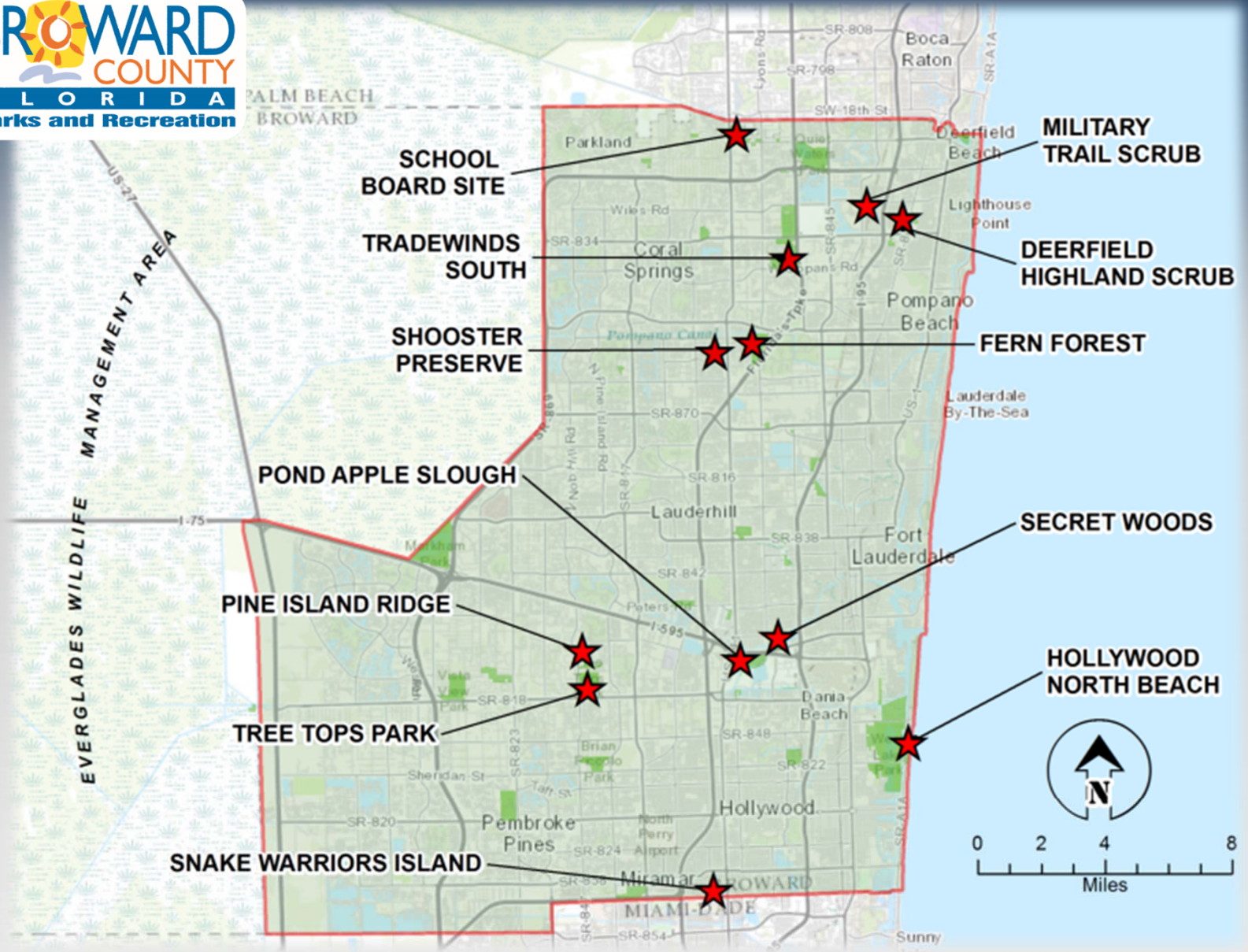
Brown Lygodium Photo: USDA-ARS_Melissa Smith

EVERGLADES CISMA



**BROWARD COUNTY 2012-13
ERADICATION PROJECTS
357.6 TOTAL ACRES - \$409,240**

EVERGLADES CISMA



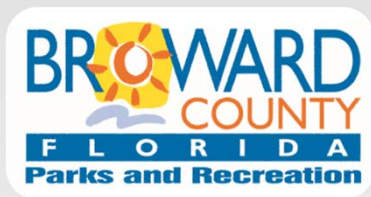
**BROWARD COUNTY 2013-14
UPCOMING ERADICATION
PROJECTS
12 CAT 1 PRIORITY PROJECTS**



EVERGLADES CISMA

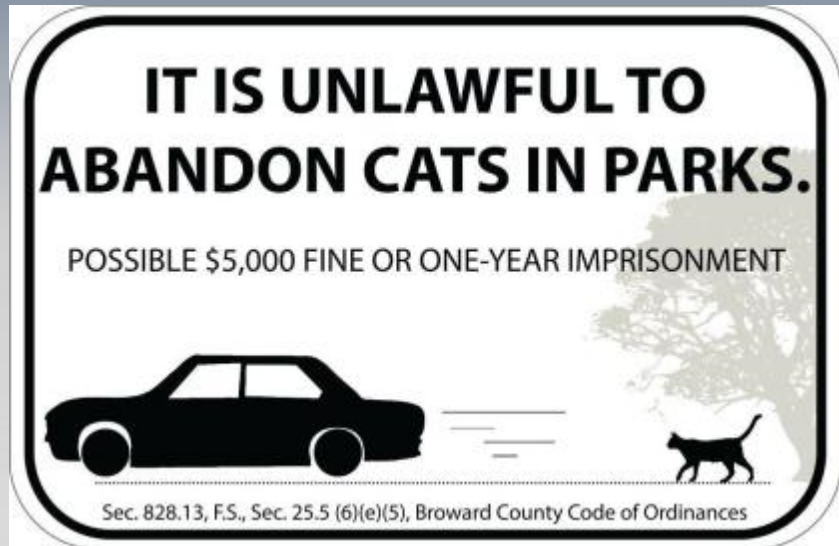
Innovations and Successes

- Free-Ranging/Feral Cat Policy
- New Equipment: FECON Forestry Mower
- Smart Phone Fire Weather App



EVERGLADES CISMA

Innovations and Successes



Free-Ranging/Feral Cat Policy

Innovations and Successes



FECON Forestry Mower FTX148-L

EVERGLADES CISMA

Innovations and Successes



	Day	Night	SAT
Surface Winds:	SE	S	S
Transport Winds (mph):	9	6	18
Mixing Height (ft):	4500	300	4500
Dispersion Index b/t:	28	1	52
Max LVORI:		7	
Temperature (F):	89	74	89
Relative Humidity:	54	93	56
Chance of Rain (%):	60	40	70



WiFire - Fire Weather App
Smart Phones



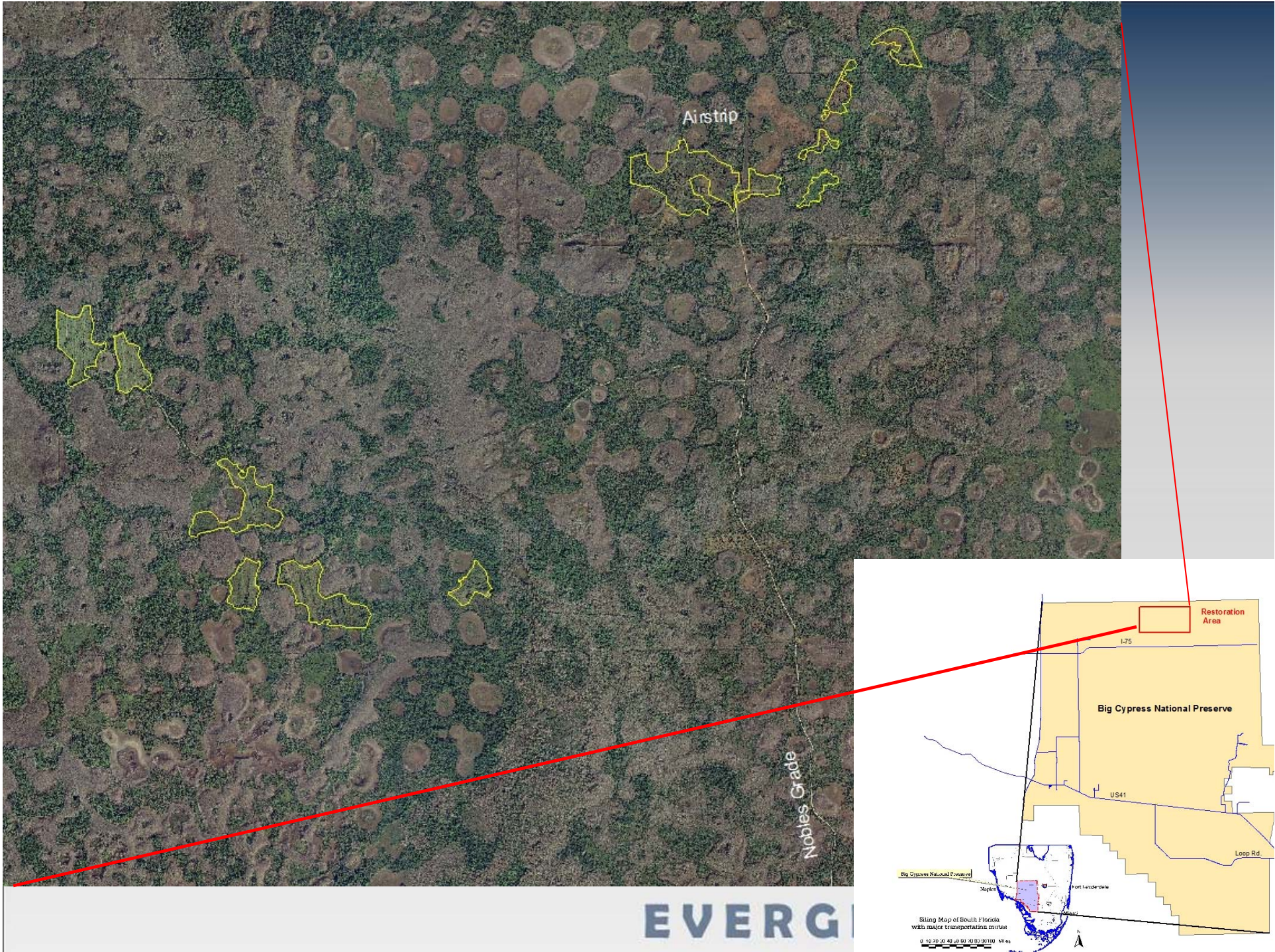
EVERGLADES CISMA



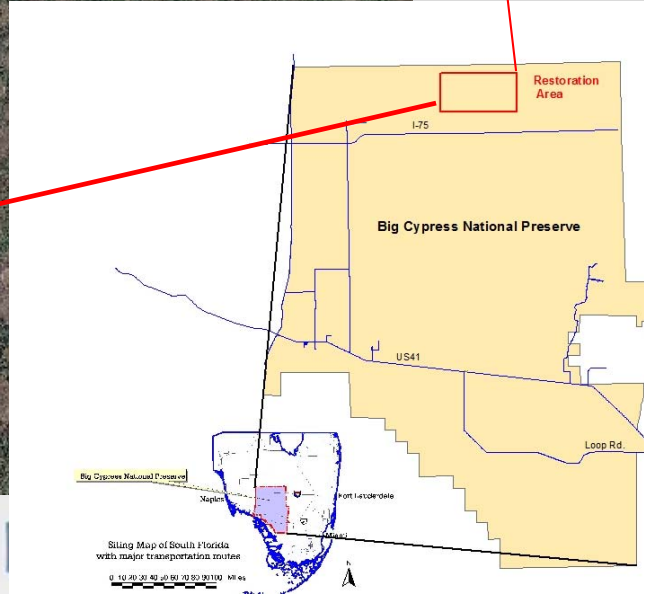
Exotic Plant Management in Big Cypress National Preserve


Restoring Native Slash Pine Communities

James N. Burch, PhD. Big Cypress National Preserve
William A. Snyder, Big Cypress National Preserve



EVERGLADES



An aerial photograph showing a vast, dense forest landscape. The terrain is hilly, with the forest covering the slopes. The vegetation is a mix of green and brownish-green, suggesting a diverse ecosystem. In the upper right quadrant, the text "June 2006" is overlaid in a black, serif font.

June 2006

September 2006

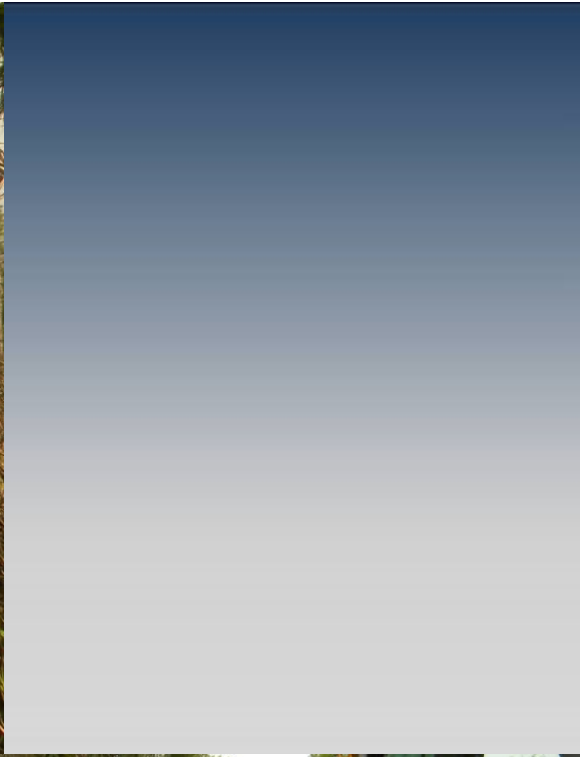


May 2007





February 2012



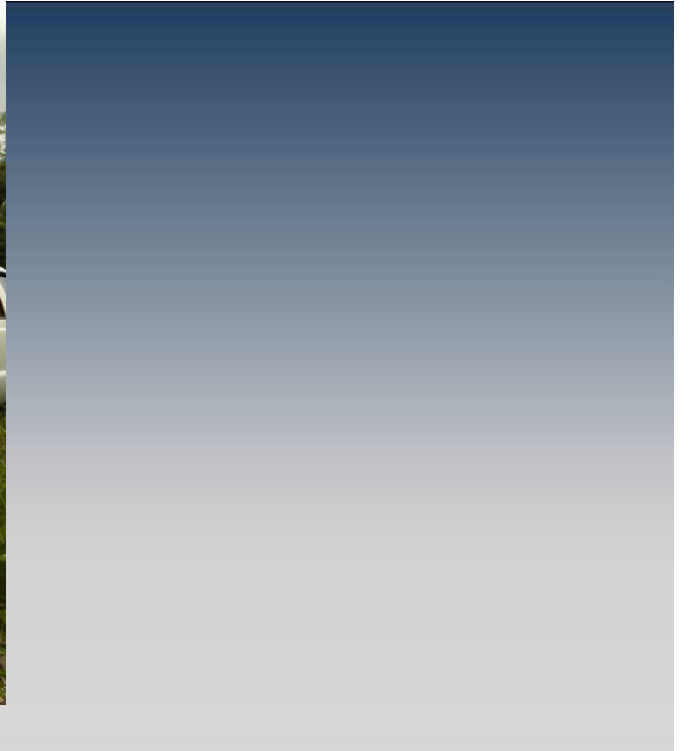
Roller-chopper





EVERGLADES CISMA







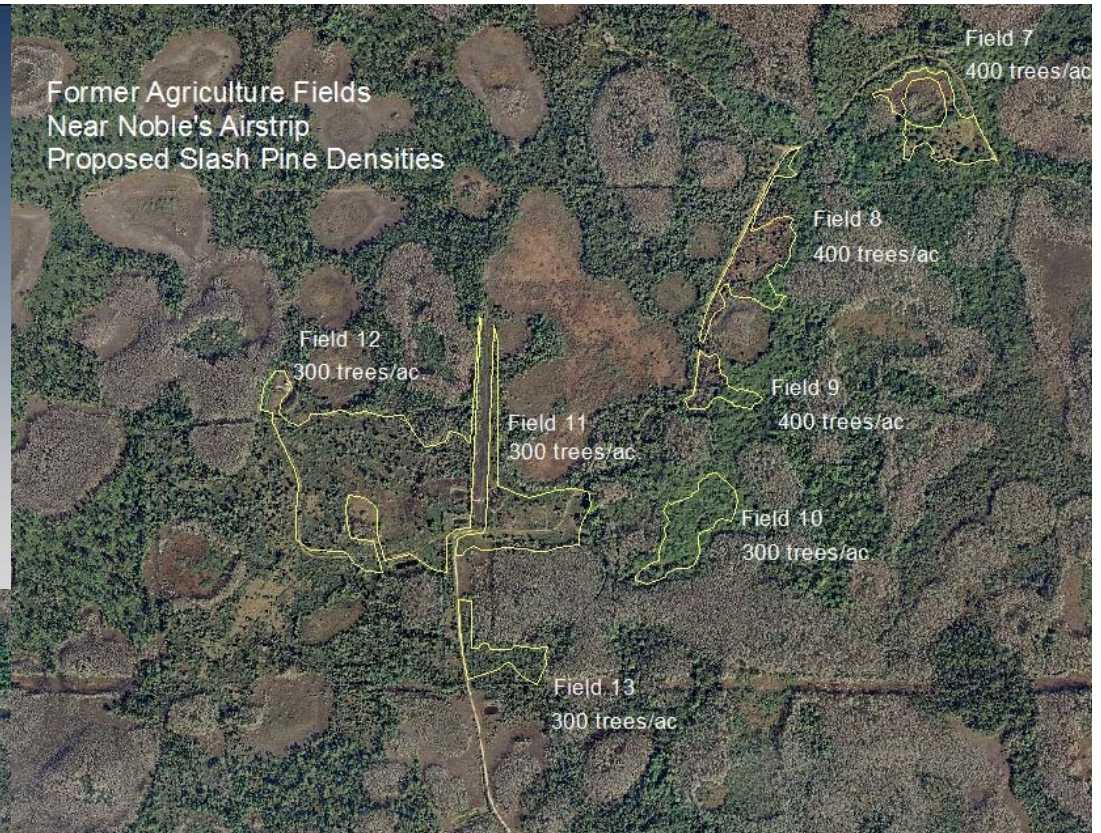
Slash pine trees after
one growing season



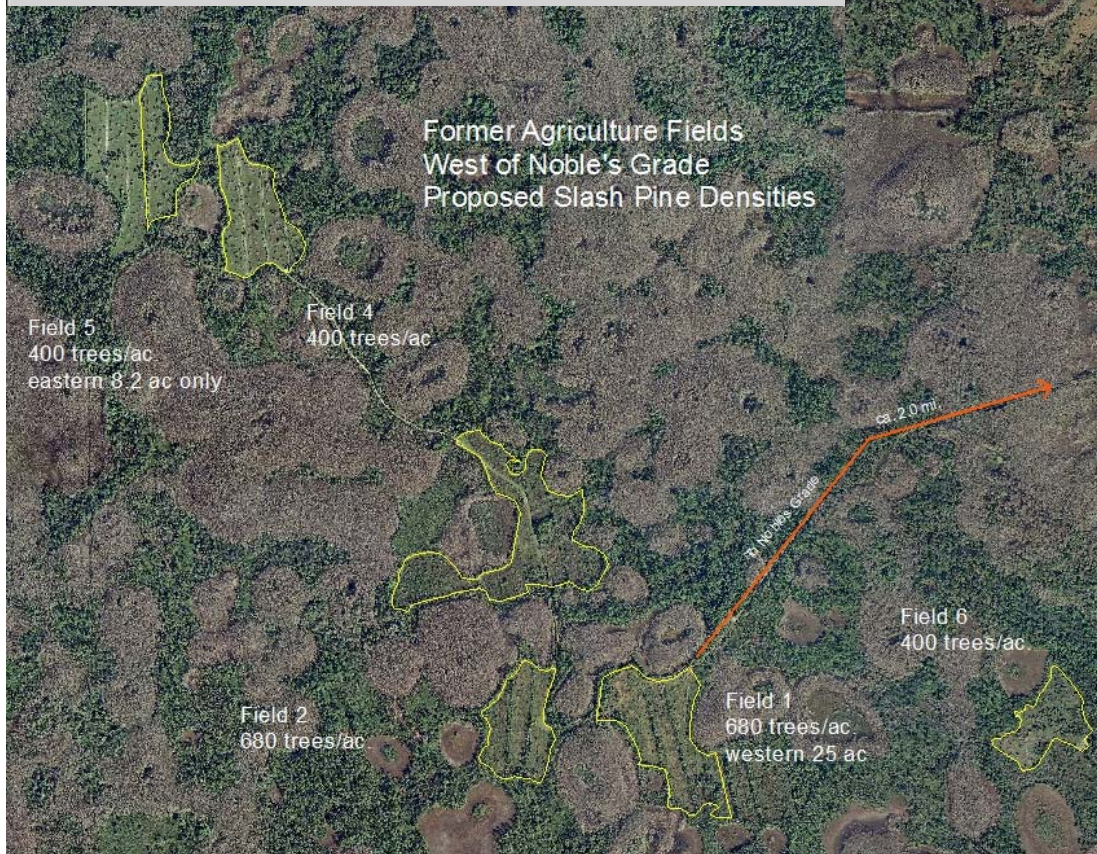
LADES CISMA

Areas selected for restoration

Former Agriculture Fields
Near Noble's Airstrip
Proposed Slash Pine Densities



Former Agriculture Fields
West of Noble's Grade
Proposed Slash Pine Densities



Restoration of former agriculture, intermediate results:

150 acres (2011 - 12):

- Schinus cleared
- prepared for tree introduction
- 67,000 slash pine trees planted

Planned restoration:

- about 500 ac. former agriculture

Questions?



© Ralph Arwood

Brazilian pepper (*Schinus terebinthifolius*) with Florida panther (*Puma concolor coryi*)

EVERGLADES CISMA