



# Everglades Cooperative Invasive Species Management Area

2018 EVERGLADES INVASIVE SPECIES SUMMIT

## Invasive Plant Operations Overview

LeRoy Rodgers, SFWMD



# ECISMA Priority Plant Species

## Long-term Management

- Air potato (*Dioscorea bulbifera*)
- Australian pine (*Casuarina* spp.)
- Brazilian pepper (*Schinus terebinthifolia*)
- Burma reed (*Neyraudia reynaudiana*)
- Cogongrass (*Imperata cylindrica*)
- Earleaf acacia (*Acacia auriculiformis*)
- Melaleuca (*Melaleuca quinquenervia*)
- Napiergrass (*Pennisetum purpureum*)
- Old World climbing fern (*Lygodium microphyllum*)
- Shoebutton ardisia (*Ardisia elliptica*)
  
- Alligator weed (*Alternanthera philoxeroides*)
- American evergreen (*Syngonium podophyllum*)
- Arrowhead vine (*Syngonium podophyllum*)
- Asian sword fern (*Nephrolepis brownii*)
- Black sage (*Cordia curassavica*)
- Catclaw vine (*Dolichandra unguis-cati*)
- Common Reed (*Phragmites*)
- Day jessamine (*Cestrum diurnum*)

- Golden pothos (*Epipremnum pinnatum*)
- Hawaiian Half-flower (*Scaevola sericea*)
- Inch plant (*Tradescantia zebrina*)
- Japanese climbing fern (*Lygodium japonicum*)
- Jaragua (*Hyparrhenia rufa*)
- Jasmine (*Jasminum* spp.)
- Java plum (*Syzygium cumini*)
- Jeweled maiden fern (*Thelypteris opulenta*)
- Kalanchoe (*Kalanchoe* spp.)
- Latherleaf (*Colubrina asiatica*)
- Mother in-law's tongue (*Sansevieria trifasciata*)
- Oyster plant (*Tradescantia spathacea*)
- Paragrass (*Urochloa mutica*)
- Primrose willow (*Ludwigia peruviana*)
- Rosary pea (*Abrus precatorius*)
- Seaside Mahoe (*Thespesia populnea*)
- Sewer vine (*Paederia cruddasiana*)
- Surinam cherry (*Eugenia uniflora*)
- Thatching grass (*Hyparrhenia hirta*)
- Torpedo grass (*Panicum repens*)
- Tuberous sword fern (*Nephrolepis cordifolia*)

- Umbrella tree (*Schefflera actinophylla*)
- Winged yam (*Dioscorea alata*)

## Containment

- Mile-a-minute vine (*Mikania micrantha*)
- Redwing (*Heteropterys brachiata*)
- West Indian marsh grass (*Hymenachne amplexicaulis*)
- Wright's nutrush (*Scleria lacustris*) – containment

## Eradication (?)

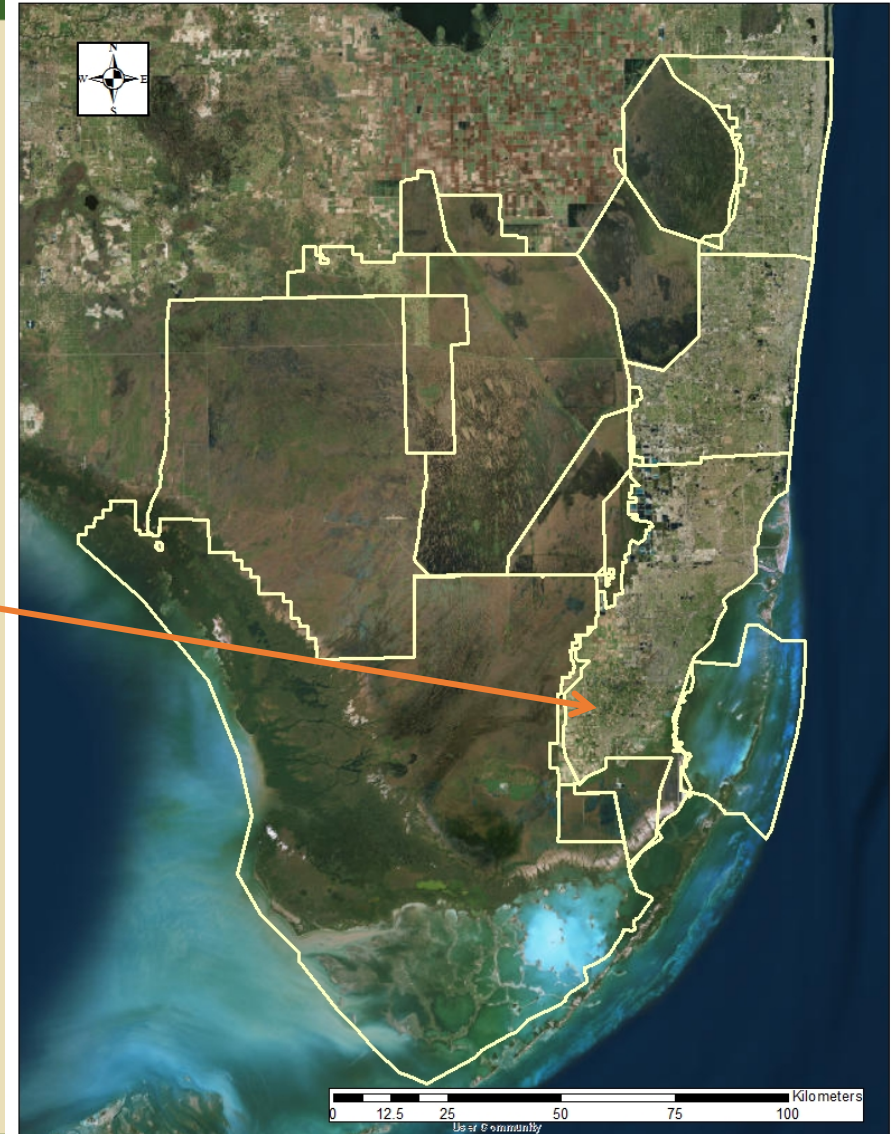
- Dalechampia (*Dalechampia scandens*)
- Exotic black mangrove (*Lumnitzera racemosa*)



# 2017/2018 Newly Detected Plant Species

## Miami-Dade County

*Derris scandens* (hog creeper, jewel vine)  
at Hattie Bauer Hammock

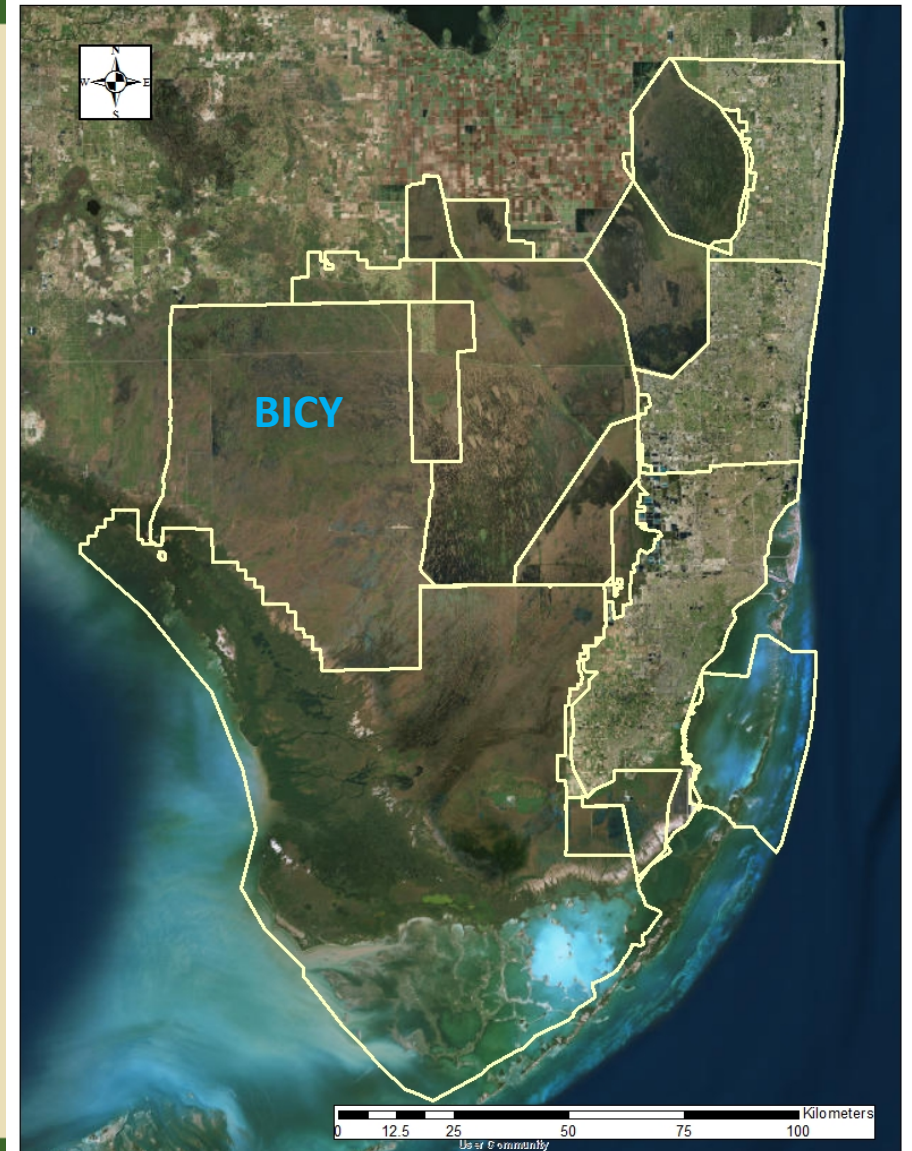




# 2017/2018 Newly Detected Plant Species

## Big Cypress National Preserve

*Spathoglottis plicata* Philippine Ground orchid





# 2017/2018 Newly Detected Plant Species

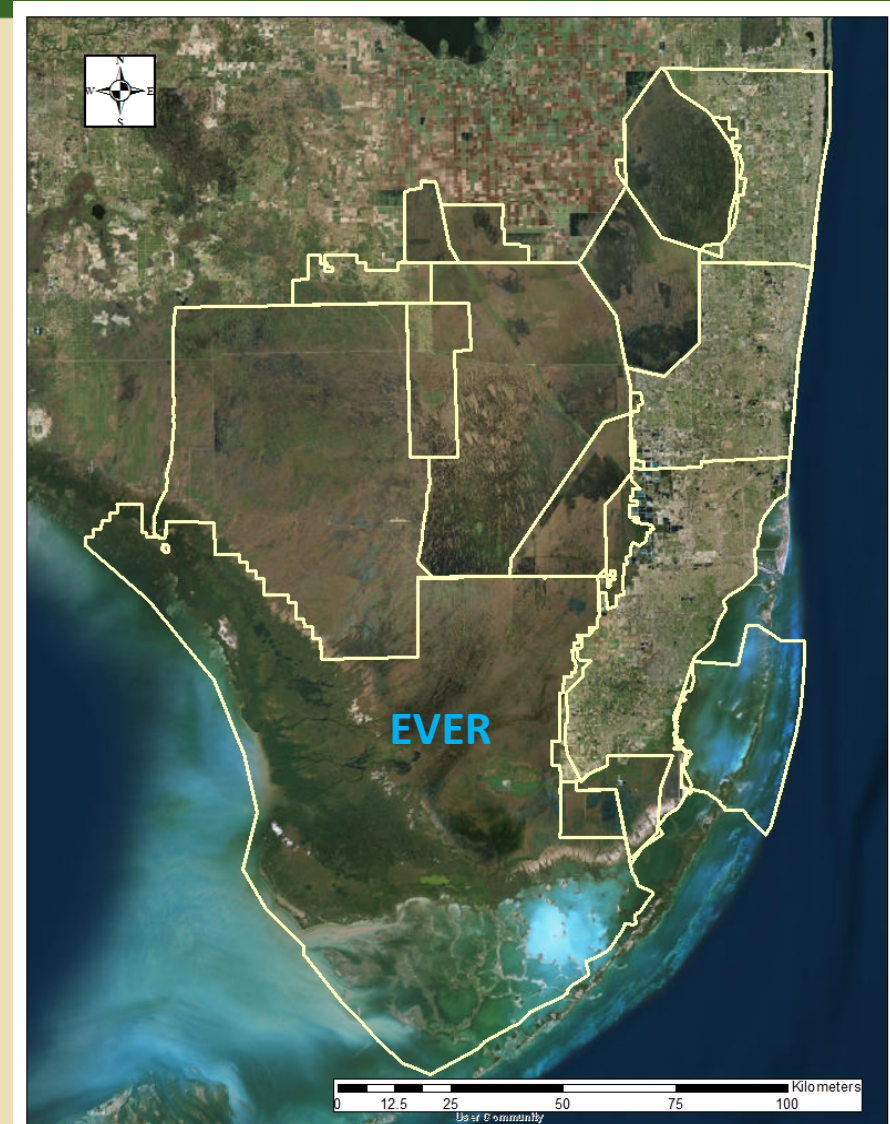
## Everglades National Park

*Ruellia ciliatiflora* (hairyflower wild petunia)

*Tectaria incisa* (incised halberd fern)

*Trimezia steyermarkii* (yellow walking iris)

*Sesbania sericea* (silky sesban)

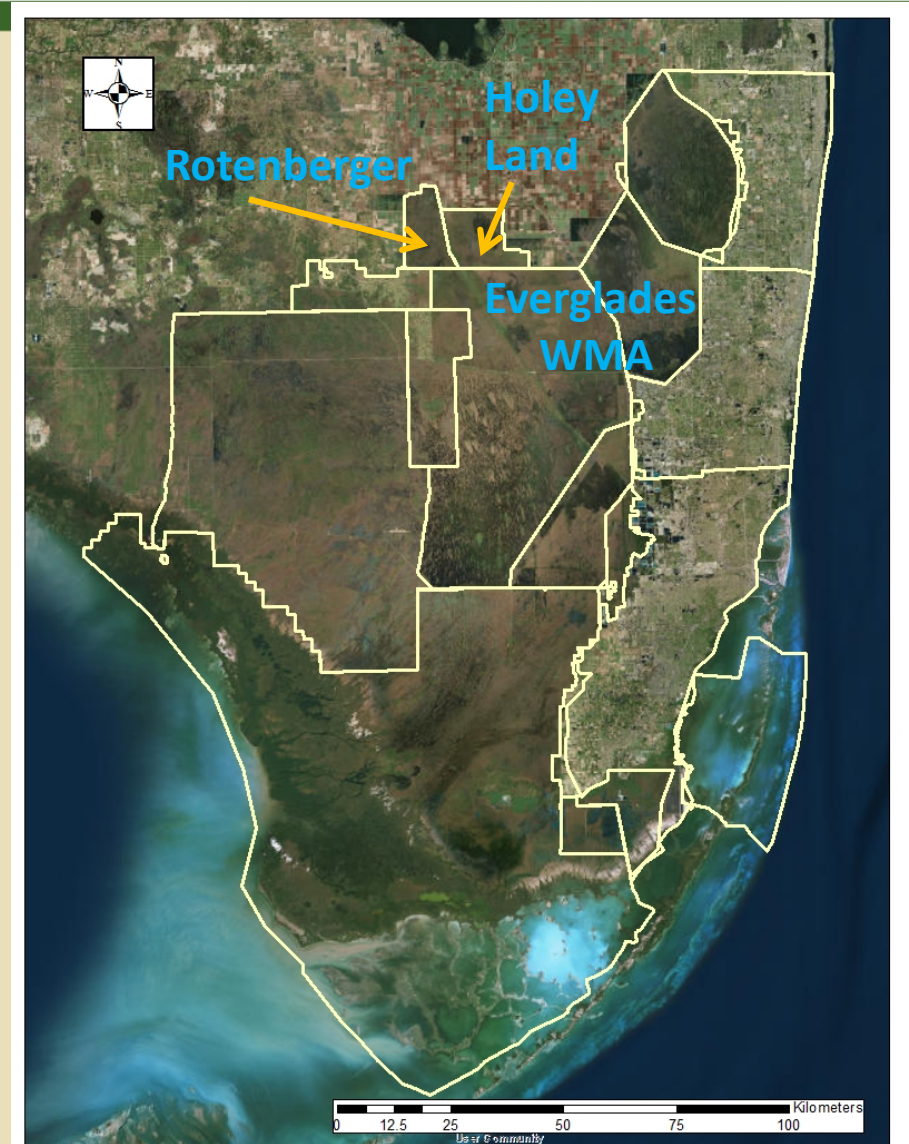




# 2017/2018 Newly Detected Plant Species

## Florida Fish & Wildlife Conservation Commission

- \*Chinese tallow tree (*Triadica sebifera*) – Everglades: WCA 2B
- Asian sword fern (*Nephrolepis brownii*) – Everglades: WCA 2A, WCA 2B
- Para grass (*Urochloa mutica*) – Everglades: WCA 2A
- Wild taro (*Colocasia esculenta*) – Everglades: WCA 2B
- Laurel fig (*Ficus microcarpa*) – Everglades: WCA 2B
- Lead tree (*Leucaena leucocephala*) – Everglades: WCA 2B
- Christmas senna (*Senna pendula* var. *glabrata*) – Everglades: WCA 2B
- Schefflera (*Schefflera actinophylla*) – Everglades: WCA 2B
- Water-lettuce (*Pistia stratiotes*) – Rotenberger
- Australian pine (*Casuarina equisetifolia*) – Rotenberger
- Water hyacinth (*Eichhornia crassipes*) – Rotenberger
- Water spangles (*Salvinia minima*) – Holey Land
- Ceaser's weed (*Urena lobata*) – Holey Land
- Lantana (*Lantana strigocamara*) – Holey Land





# 2017/2018 Newly Detected Plant Species

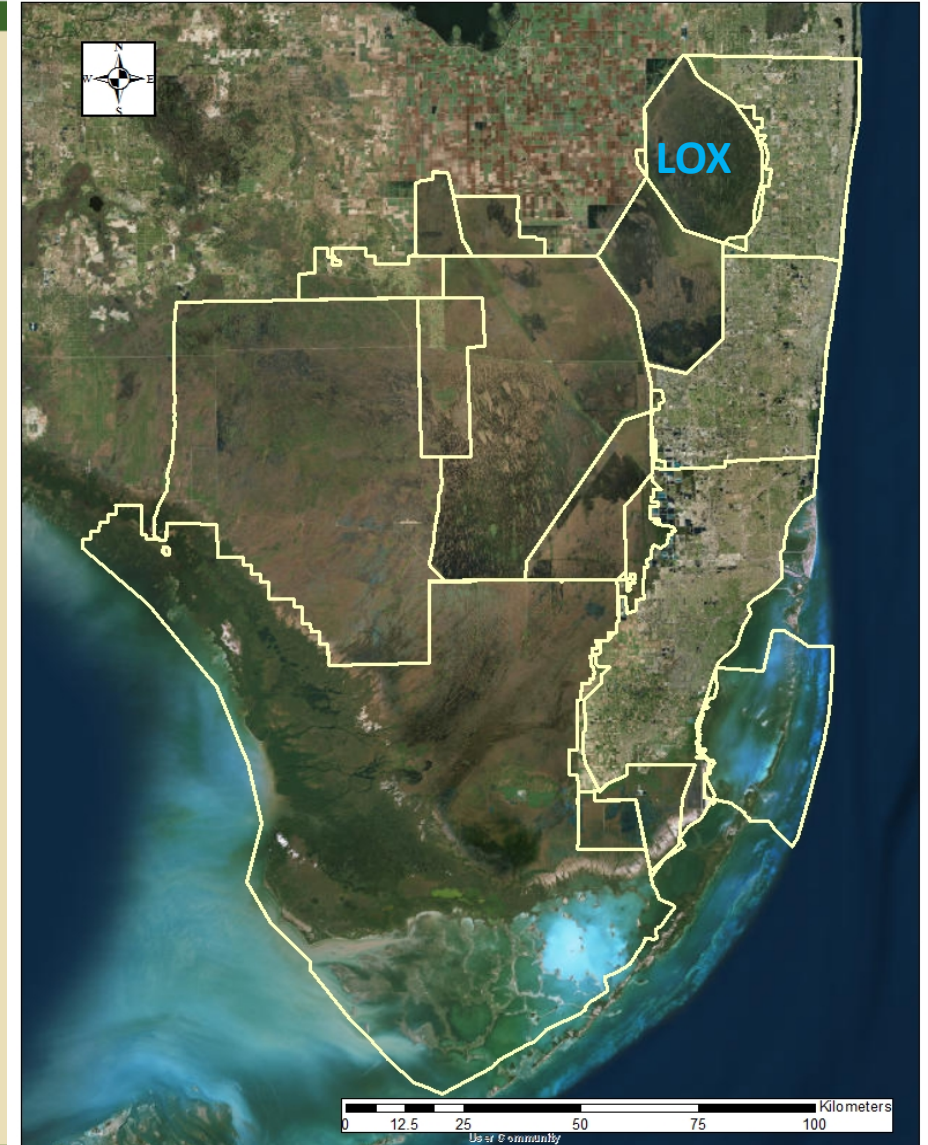
## A.R.M. Loxahatchee National Wildlife Refuge

*Ficus microcarpa* (Laurel fig)  
*Schefflera actinophylla* (Umbrella tree)

*First documented occurrence in the Refuge Interior*



*Ficus microcarpa* (Laurel fig)

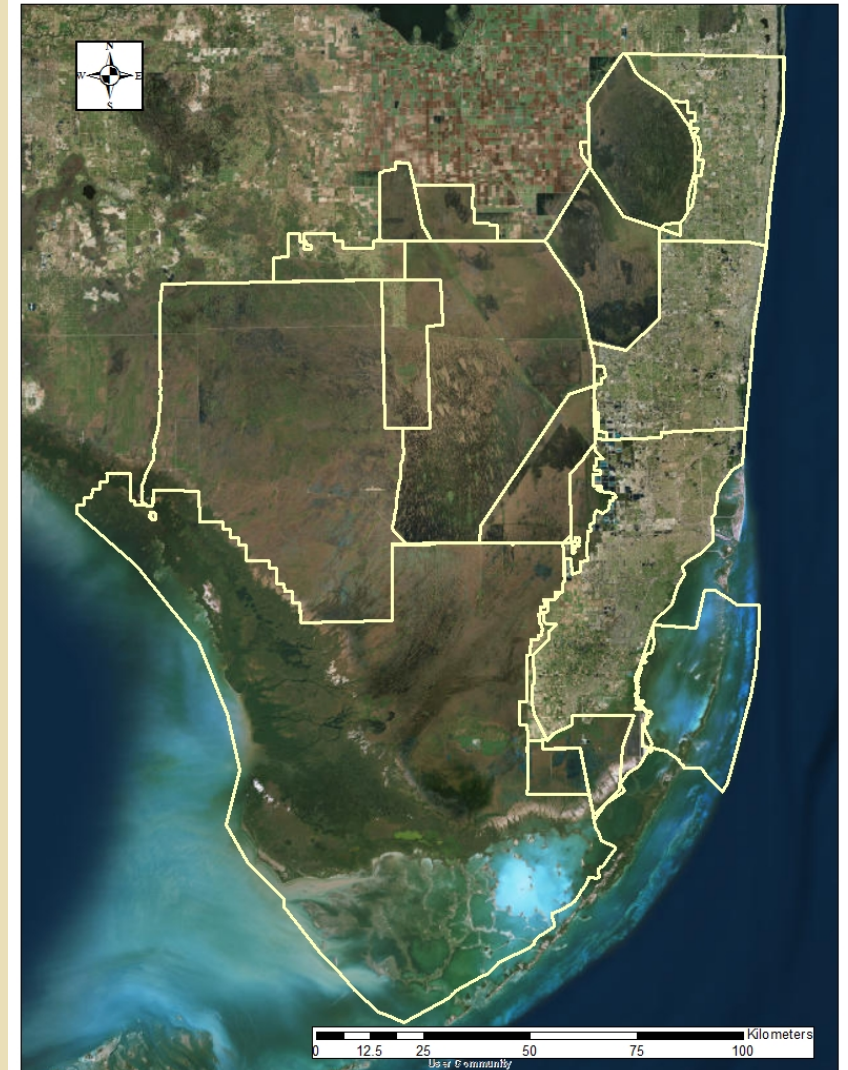




# 2017/2018 Newly Detected Plant Species

## Nothing new to report

- South Florida Water Management District
- Broward County
- Florida Department of Transportation
- Biscayne National Park

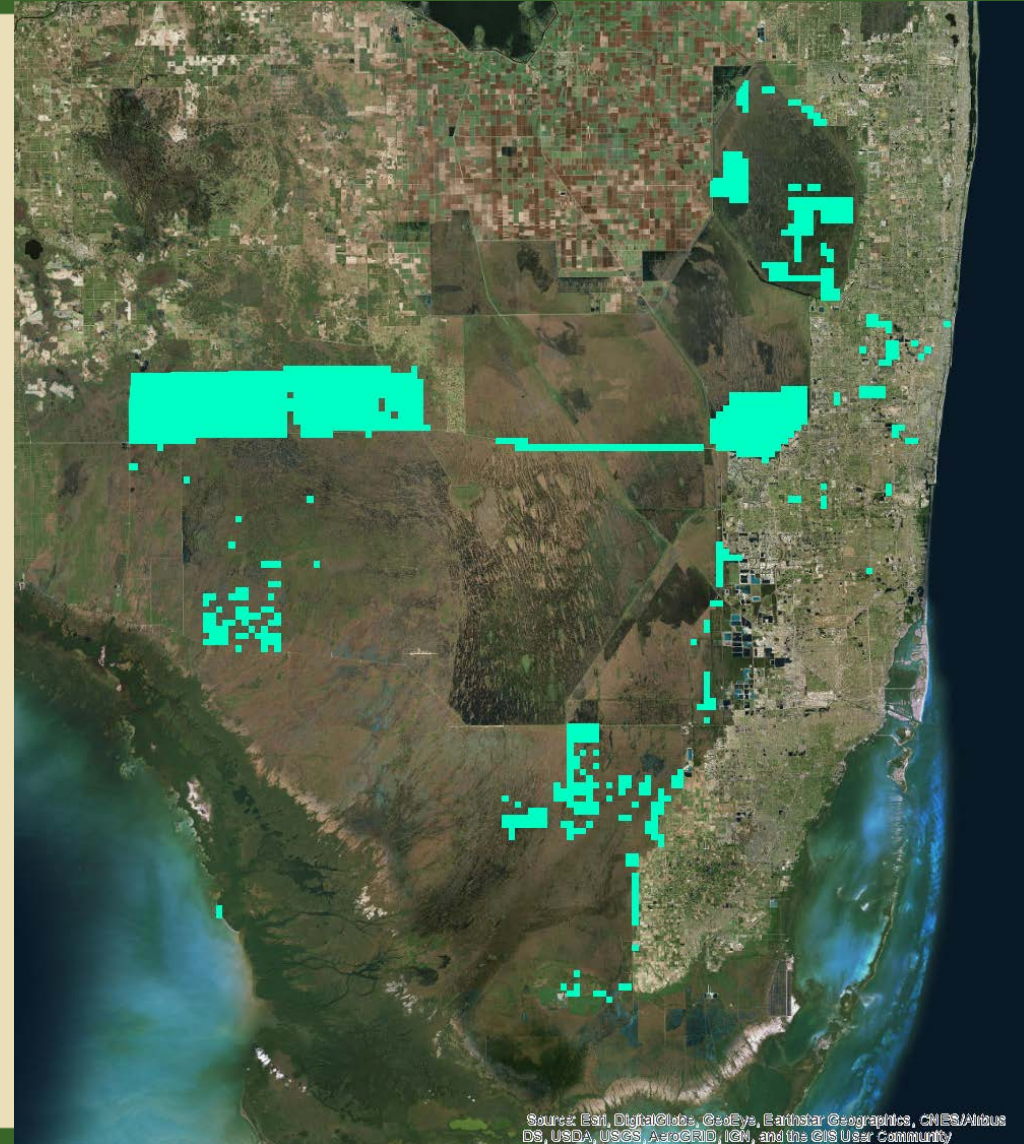




# 2017/2018 Treatments: Melaleuca

## Melaleuca

- Predominantly re-treatment and maintenance control work in all areas
- Some initial treatment at:
  - Everglades NP
  - ARM Loxahatchee NWR
  - East Coast Buffer

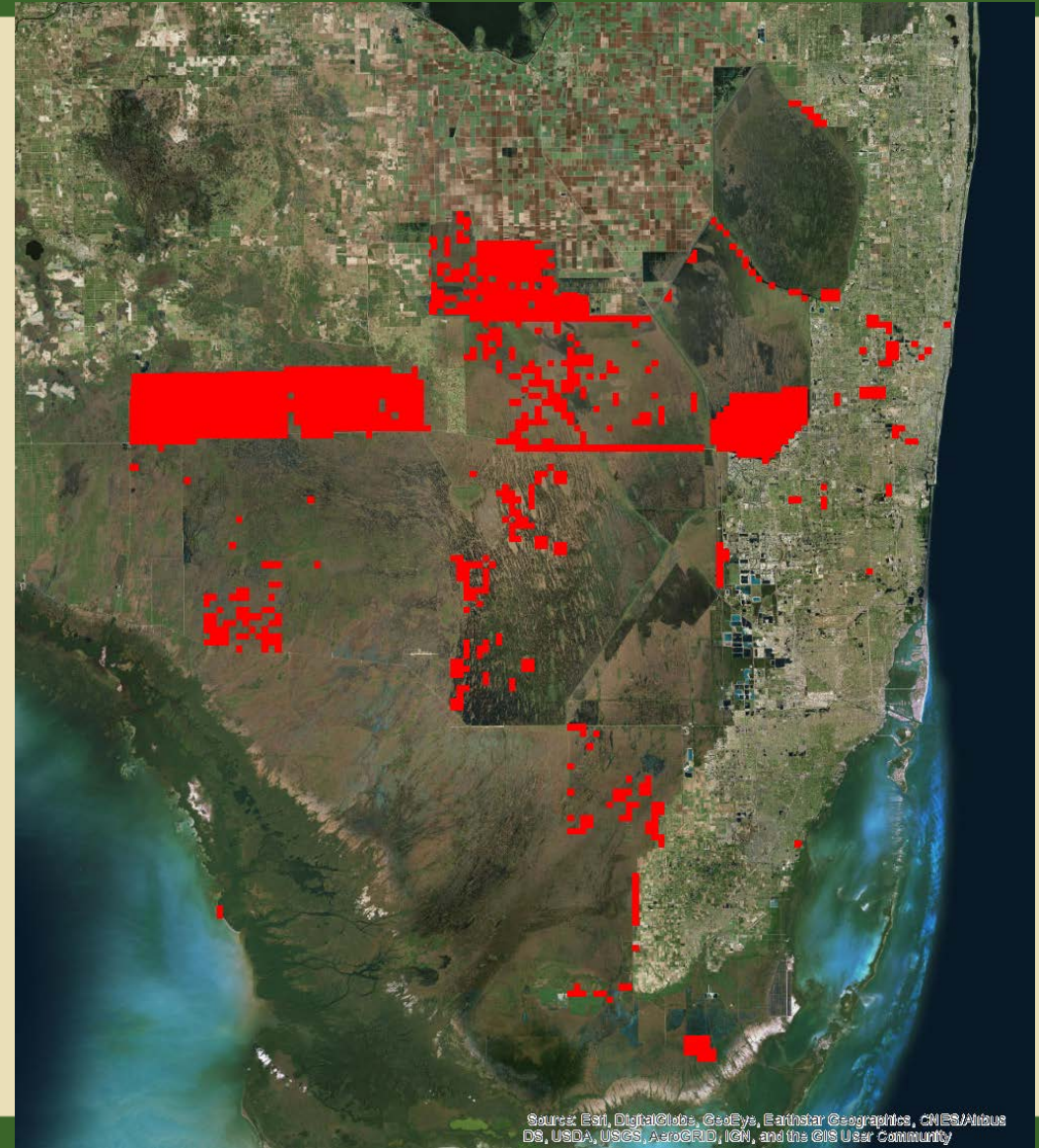




# 2017/2018 Treatments: Brazilian pepper

## Brazilian Pepper Treatments

- Most or all areas had some treatment.
- Majority of treatment in:
  - Big Cypress NP
  - Rotenberger, Holey Land and Everglades WMA's

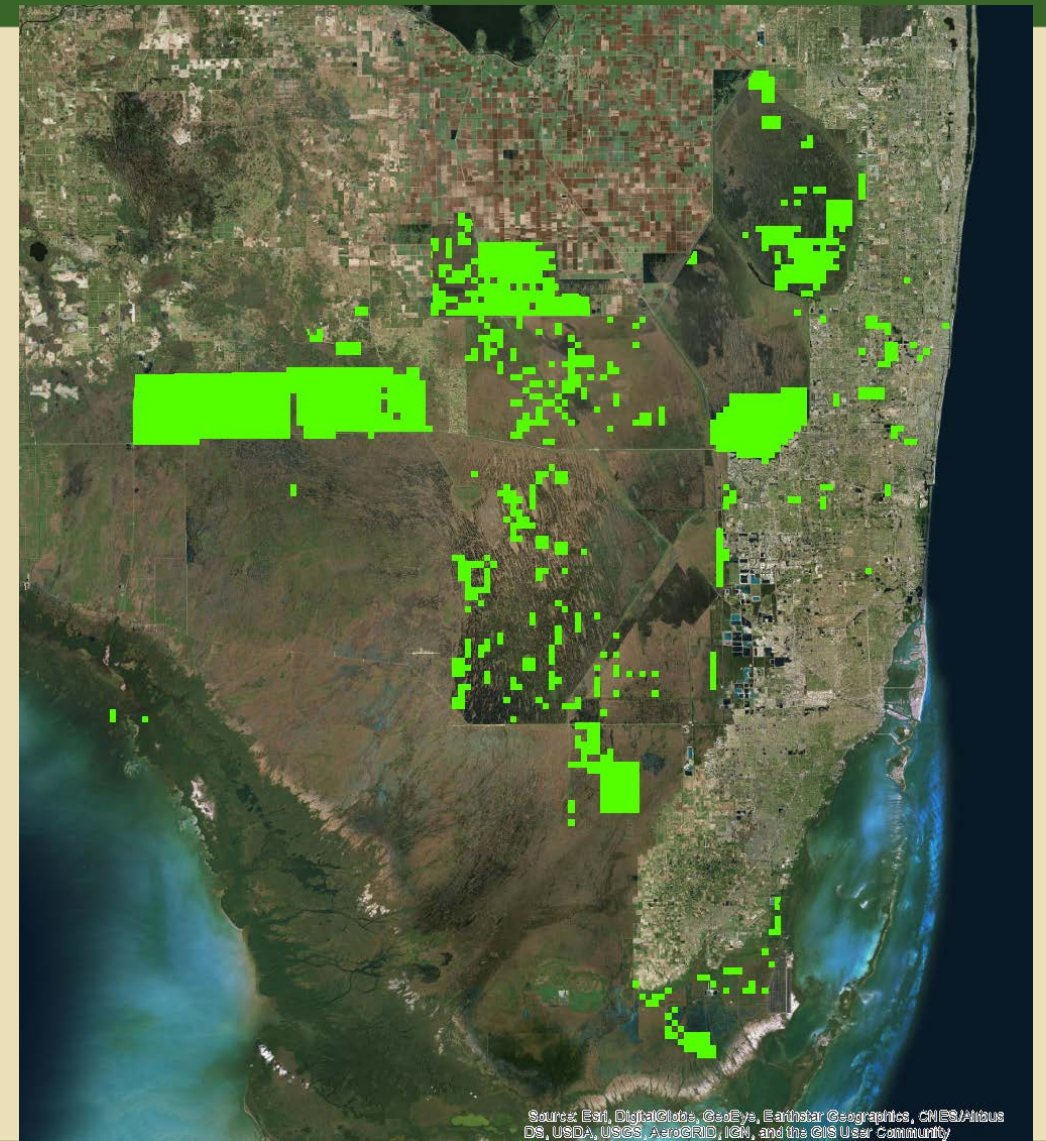




# 2017/2018 Treatments: Old World Climbing Fern

## Old World Climbing Fern Treatments

- Most or all areas had some treatment.
- Majority of treatment in:
  - ARM Loxahatchee NWR
  - Big Cypress NP
  - Southern Glades, Rotenberger, Holey Land and Everglades WMA's.

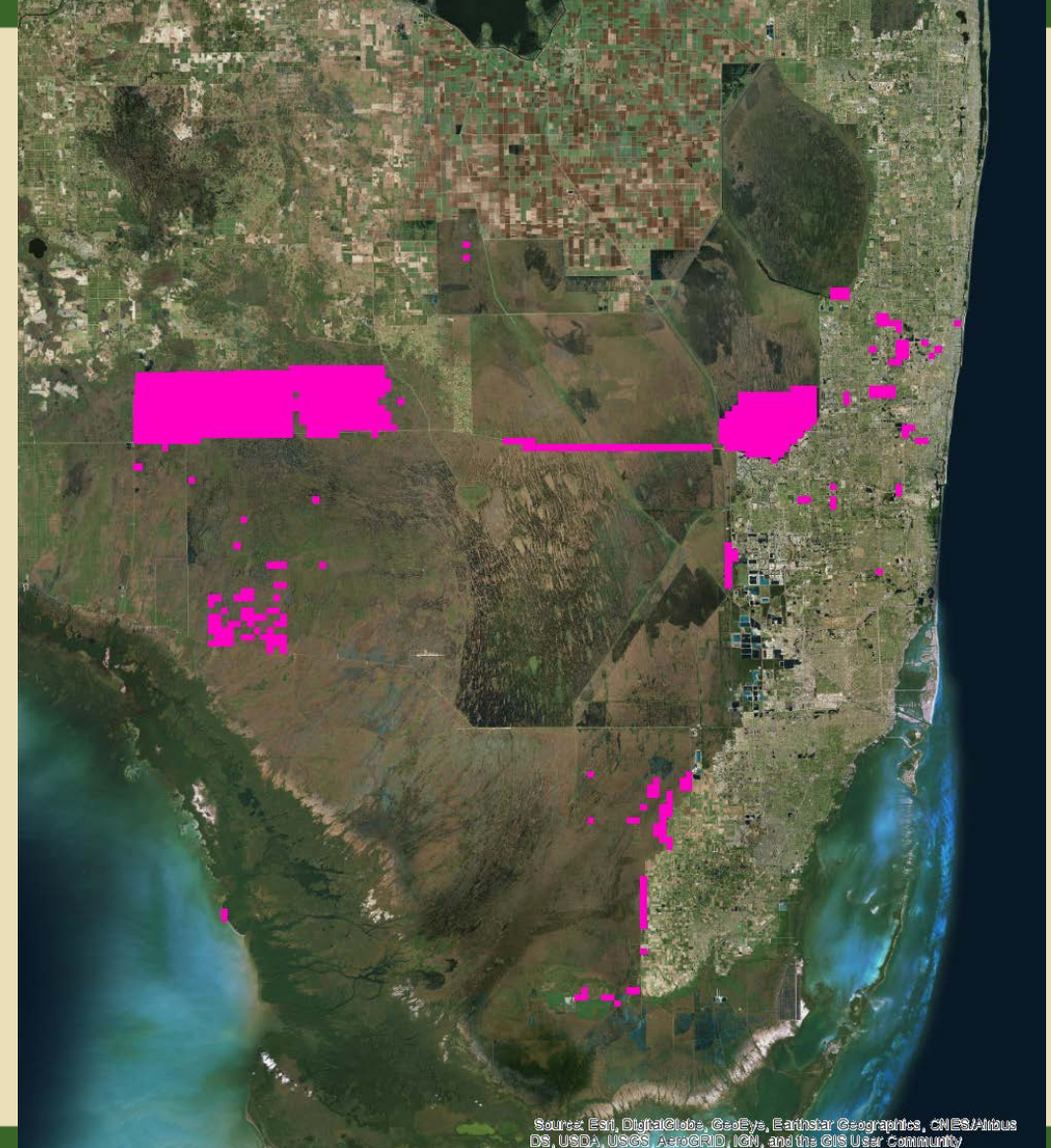




# 2017/2018 Treatments: Australian pine

## Casuarina Treatments

- Generally a minor component of invasive plant communities
- More common in northeastern Everglades NP and fragmented natural areas in developed areas





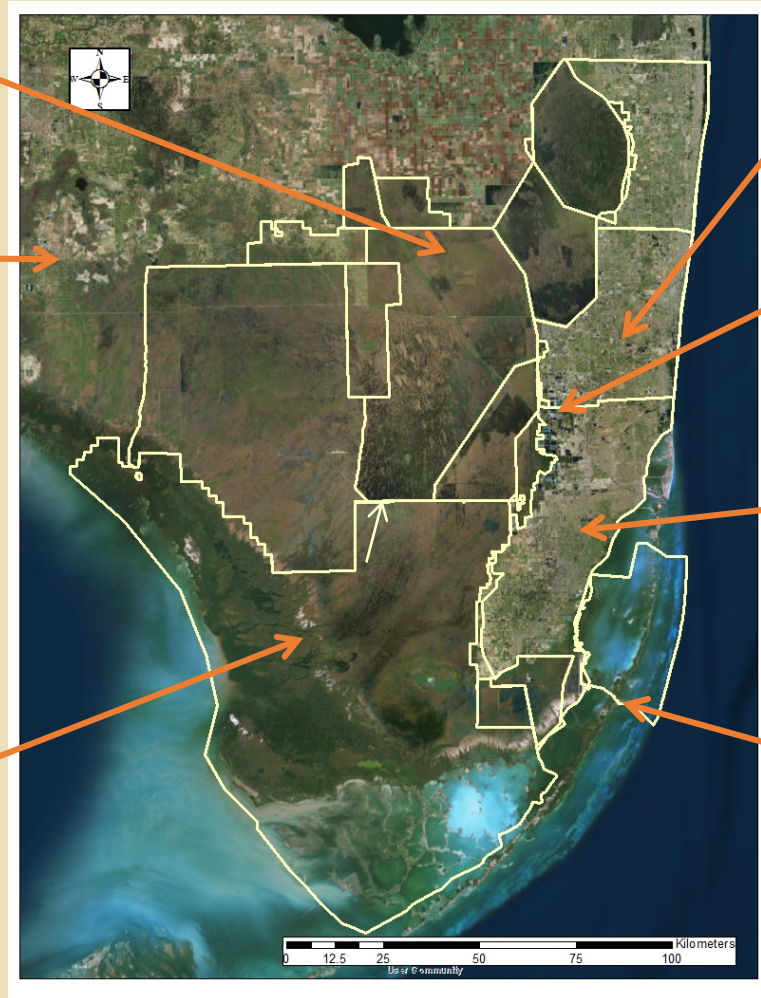
# 2017/2018 Treatments: Other Plant Species

**FWC-WCA 3A, Holey Land and Rotenberger WMAs**  
*para grass, torpedo grass, and West Indian marsh grass*

**FDOT-District One**  
*Torpedograss*  
*Alligator weed*

**BICY NP**  
*Shoebuttan Ardisia*  
*Guava*  
*Java plum*  
*Crested floating heart*

**EVER NP**  
*Syngonium podophyllum.*,  
*Colubrina asiatica,*  
*Leucaena leucocephala*



**Broward Co.**  
*Golden pothos*  
*Oyster plant*  
*Surinam Cherry*

*Earleaf Acacia*  
*Shoebuttan Ardisia*  
*Air potato*

**SFWMD**  
*Bishopwood*  
*Shoebuttan Ardisia*  
*Lead Tree*

*Mission grass*  
*exotic canre grasses*

**Miami-Dade**  
*Shoebuttan Ardisia*  
*Elephant Grass*  
*Mile-a-minute*

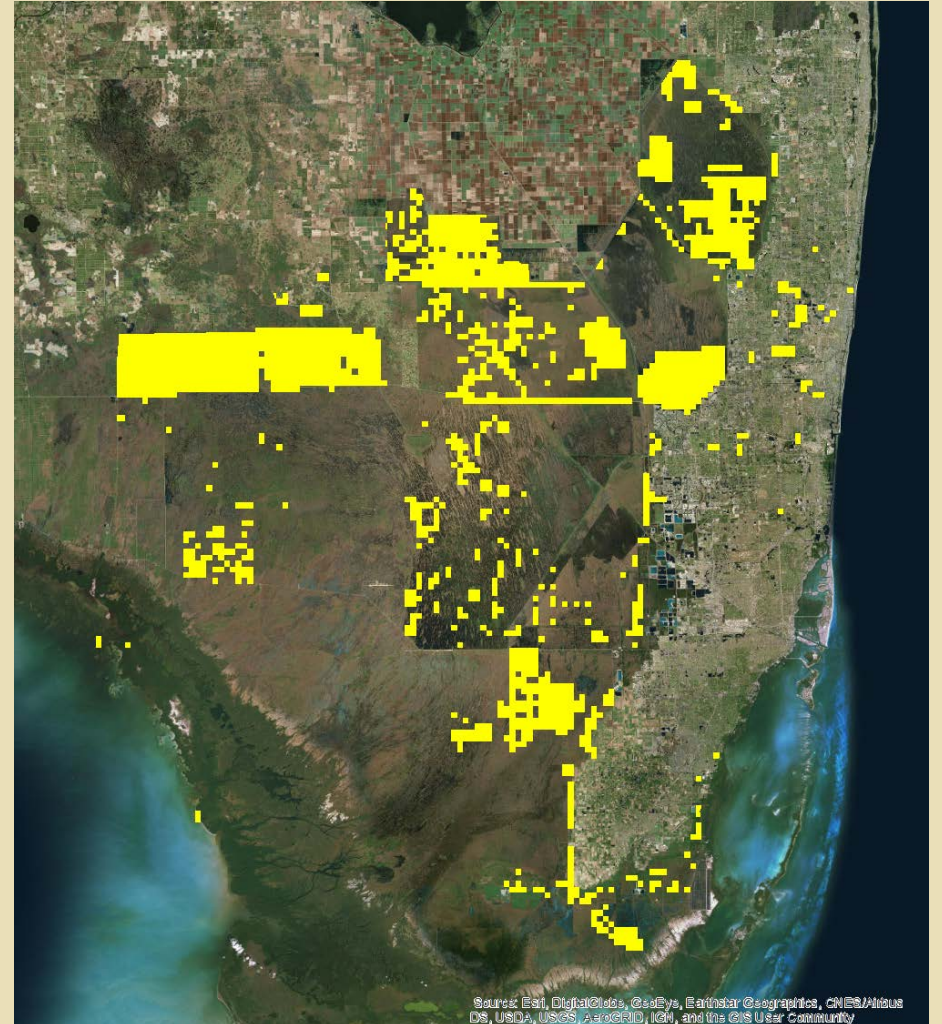
*Exotic Black Mangrove*  
*Red wing*

**BISC NP**  
*Seaside Mahoe*  
*Latherleaf*  
*Scaevola*



## 2017/2018 Treatments: Combined

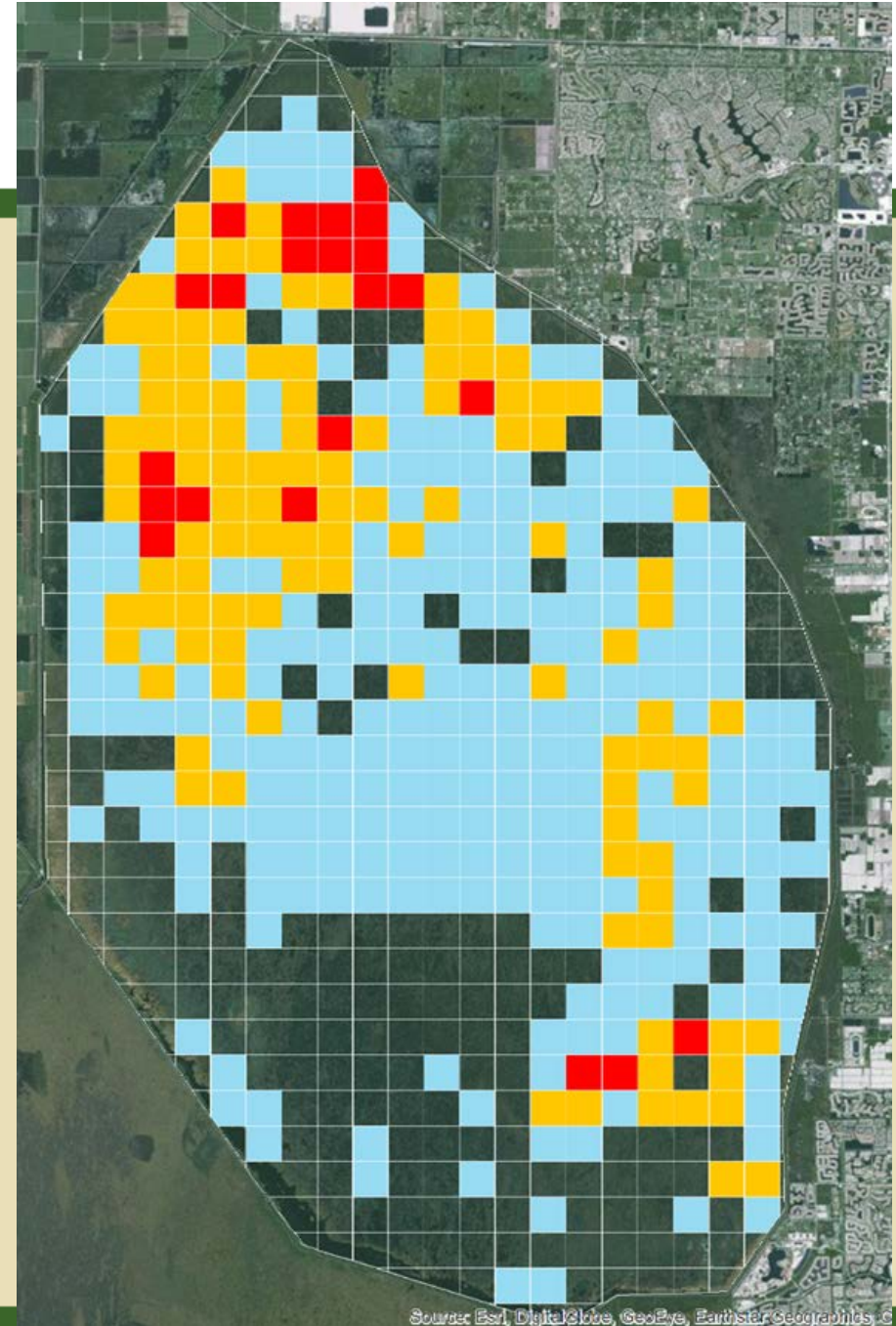
- ECISMA partners and cooperators swept well over 120,000 acres for invasive plant treatment between 1 July 2017 and 30 June 2018  
*(not too shabby!)*
- >\$7 million expended for contractual services





# ECISMA Monitoring

- Systematic Reconnaissance Flights – 4 km transects
  - *ARM Loxahatchee National Wildlife Refuge*
- Detailed mapping—250 m grid
  - *Everglades National Park*
  - *Miccosukee Reservation*
  - *Big Cypress National Preserve*





# Big Cypress National Preserve

Aerial “spot treatments” on remote tree islands

- ~250 canopy acres treated
  - Old World climbing fern
  - Melaleuca
  - Brazilian pepper

Low non-target damage





# SFWMD Canegrass Reduction Evaluations

## Frog Pond

- Objective: determine effective cane grass management techniques
- Numerous combinations of aerial herbicide, disking/mowing, and prescribed fire





# Everglades National Park

## NE Everglades NP

- Ground based herbicide treatments of melaleuca, Australian pine, Brazilian pepper, Old World climbing fern
- Contractual Services provided by FWC and USNPS
- 26,899 acres covered





# Everglades Wildlife Management Area

## FWC Tree Island Restoration

- Herbicide treatments
- 5700 existing tree plantings maintained
- 1360 new trees planted



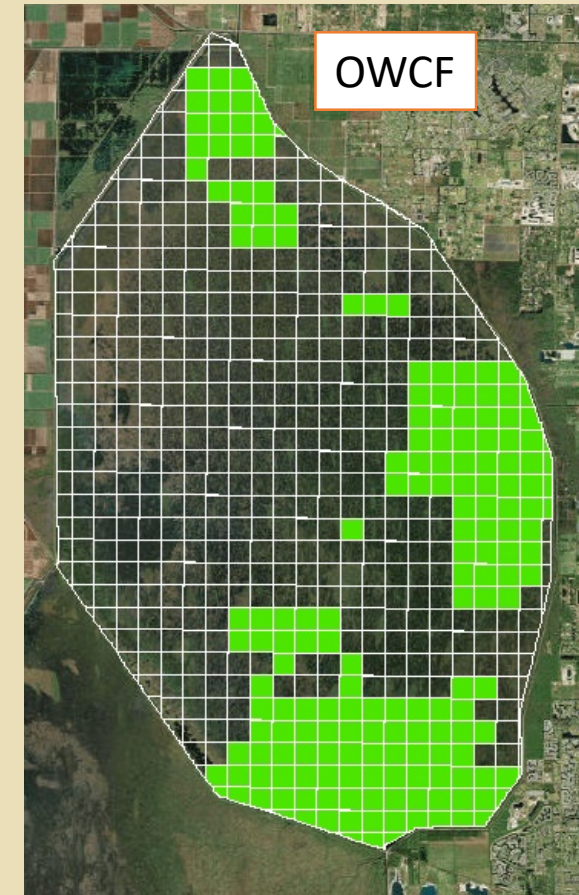
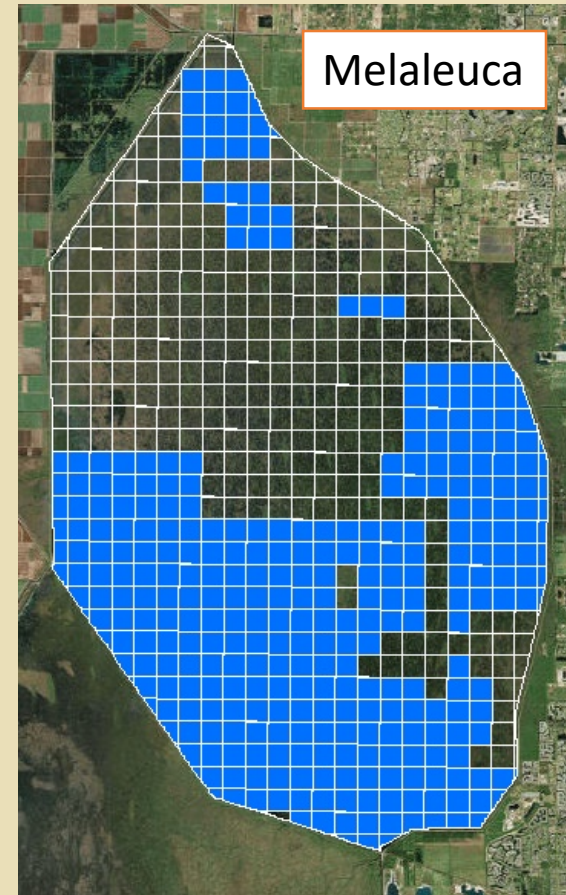


# A.R.M. Loxahatchee National Wildlife Refuge



- New license agreement with SFWMD
- WCA 1 remains a National Wildlife Refuge
- USFWS provides SFWMD with a minimum of \$1.25 million/year for invasive plant management
- SFWMD will seek other sources of funding to achieve \$5 million/year goal
  - FWC
  - Lease Revenues

## Treatments since 2014





# Cooperation Thanks



Ryan Brown (SFWMD)  
Christen Mason (SFWMD)  
Hillary Cooley (ENP)  
Andrew Eastwick (USFWS)  
Billy Snyder (USNPS)  
Tony Pernas (USNPS)  
Shelby Moneysmith (USNPS)  
Brooke Shamblin (USNPS)  
Jimi Sadle (USNPS)  
Marsha Ward (FWC)  
Ellen Allen (SFWMD)  
Jane Dozier (Miami Dade Co.)  
Shea Bruscia (USNPS)  
Gwen Burzycki (Miami Dade Co.)  
Erik Eckles (Broward Co.)  
Steven Kelly (FLDOT)  
Lauren Kowalski (FLDOT)



All the others that made this work possible



# Everglades Cooperative Invasive Species Management Area

2018 EVERGLADES INVASIVE SPECIES SUMMIT

## Promising new herbicide technologies for the management of Old World Climbing Fern

Jonathan Glueckert and Stephen Enloe  
Center for Aquatic & Invasive Plants





# Old World Climbing Fern (*Lygodium microphyllum*)





# Partnerships





# Objectives

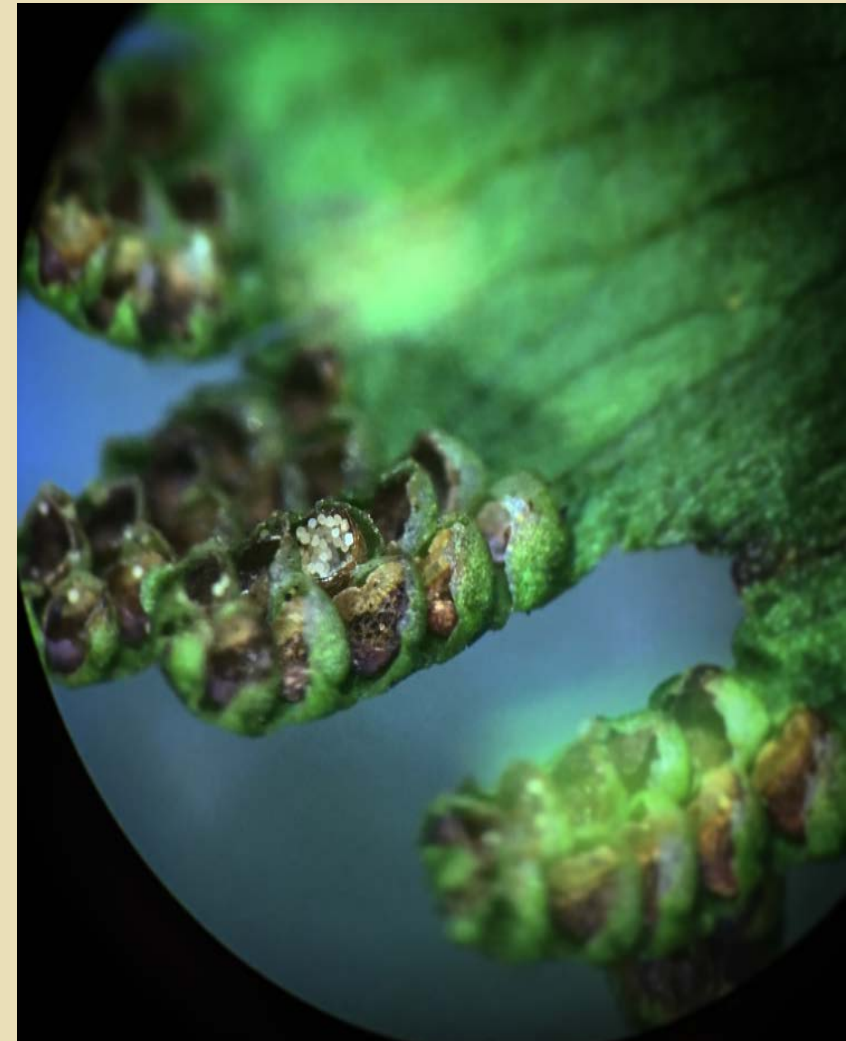
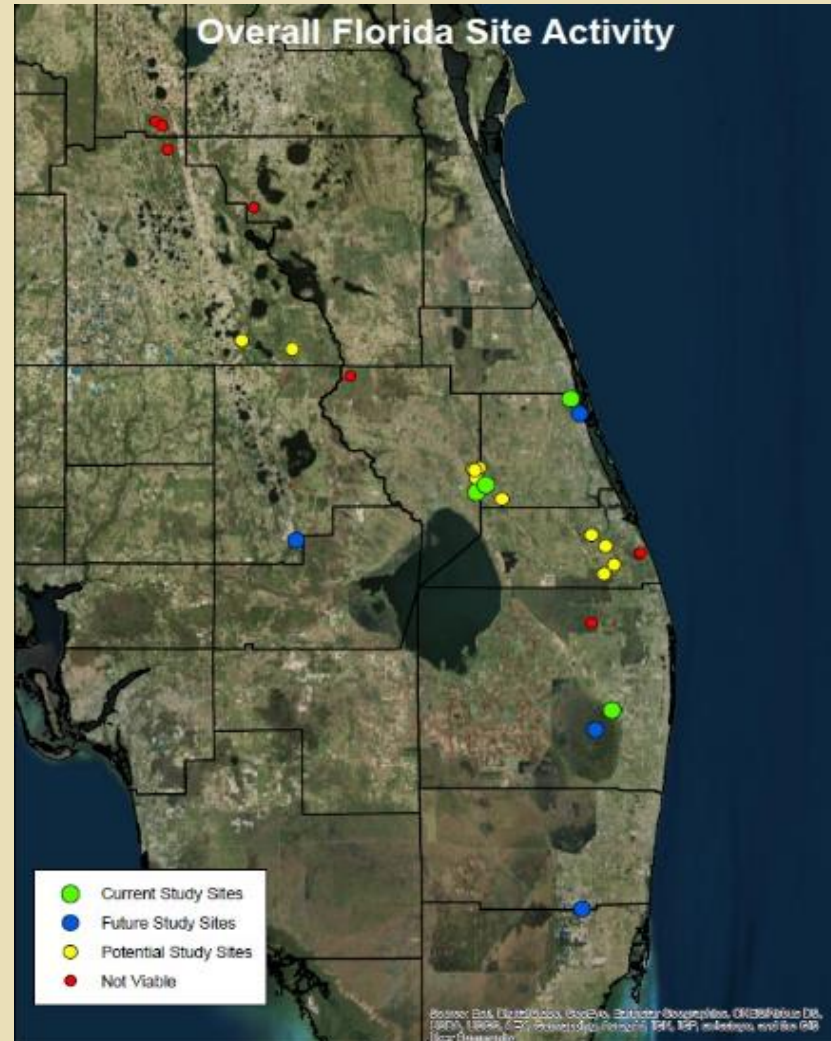
- Implement an aggressive herbicide screening program to develop new OWCF management strategies
- Reduce impact to non target native species
- Re-evaluate the use of Glyphosate and metsulfuron, the most common control treatments
- Evaluate older and more recently labeled aquatic approved and terrestrial herbicides
- Examine the effects of seasonal variation in environmental conditions such as seasonality, hydroperiod, and temperature
- Retreatment Intervals





# Efficacy Trials

- Over 400 plots
- 12 studies
- 15 herbicides
- 33 total treatments with varying rates and tank mixes
- 4 sites
  - Berman Dairy
  - Stokes Cattle
  - Spanish Lakes Blvd
  - Strazzulla





# Methods

- 5m x 5m plots with one center pole
- Established in a grid and block pattern
- Application volume 40GPA
- Sprayed with a CO2 backpack and single adjustable con nozzle
- 4 replicate plots per treatment
- Data was collected at baseline, 30, 60, 90, 180, 365 DAT
- % Visual Cover of live (green) OWCF from 4 quadrats within each plot
- Separate regrowth into recovery from rhizomes and sporeling recruitment





# Treatments

<b>Herbicide / Tank Mixes</b>	
Roundup Custom	Glyphosate
Garlon 3A	Triclopyr (Amine)
Vastlan HL	Triclopyr (Choline)
Trycera	Triclopyr (Acid)
Method	Aminocyclopyrachlor
Escort	Metsulfuron
Method + Escort	Aminocyclopyrachlor + metsulfuron
Procellacor (SX-1552)	SLF9523
Clipper	PPO
Stingray	PPO
[Redacted]	
Roundup Custom + [Redacted]	Glyphosate + PPO
Roundup Custom + Clipper	Glyphosate + PPO
Roundup Custom + Stingray	Glyphosate + PPO
Londax	Bensulfuron
Permit	Halosulfuron
Sharpen	Saflufenacil
Newpath	Imazethapyr
Basagran	Bentazon



# What is Procellacor?

- Florpyrauxifen-benzyl
- New auxin type herbicide by SePRO
- Highly active on SAV (*Hydrilla*, *Myriophyllum*) and floating leaved plants
- Limited data on emergent/riparian species
- Excellent toxicology package
- Active Ingredient EPA approved
- <https://www.regulations.gov/docket?D=EPA-HQ-OPP-2016-0560>

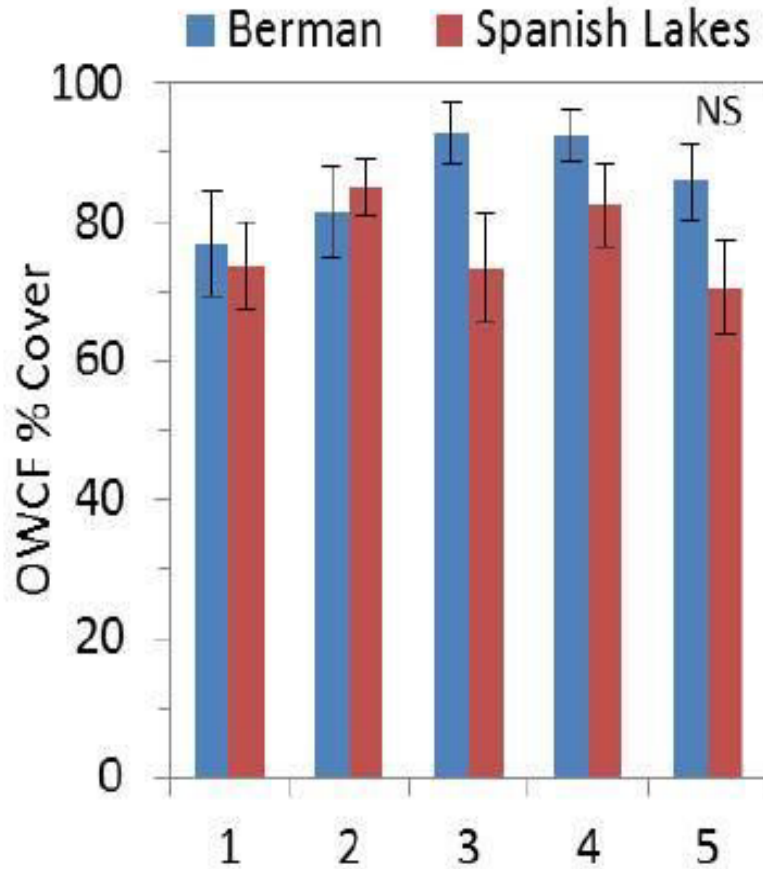


BMD- Plot 182 60 DAT Procellacor 16oz/A

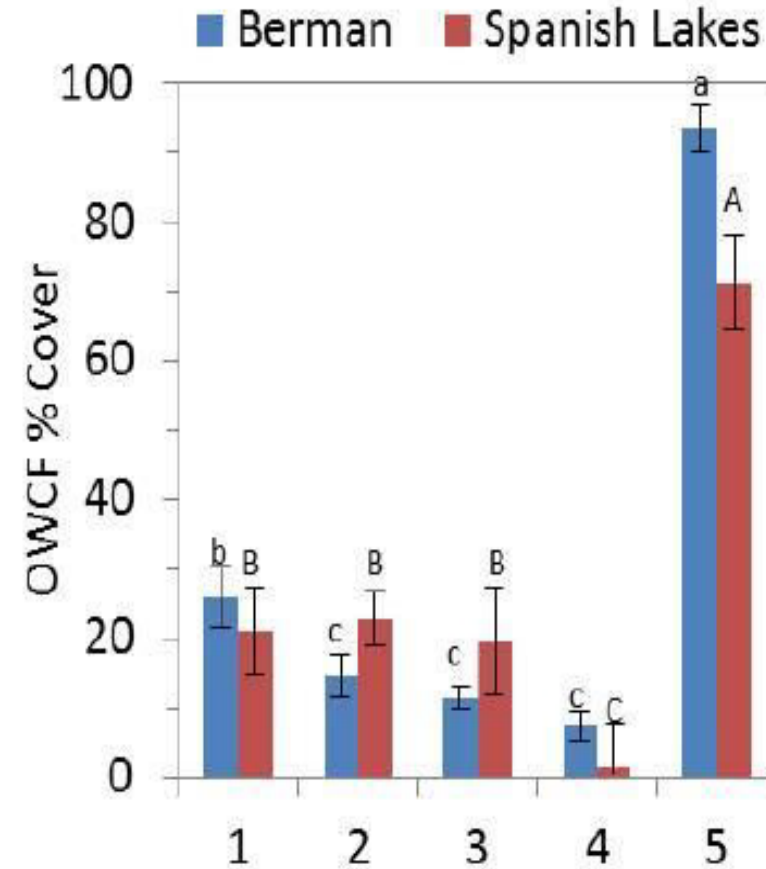


# ProcellaCOR Trials

### A. Baseline



### B. 30 DAT

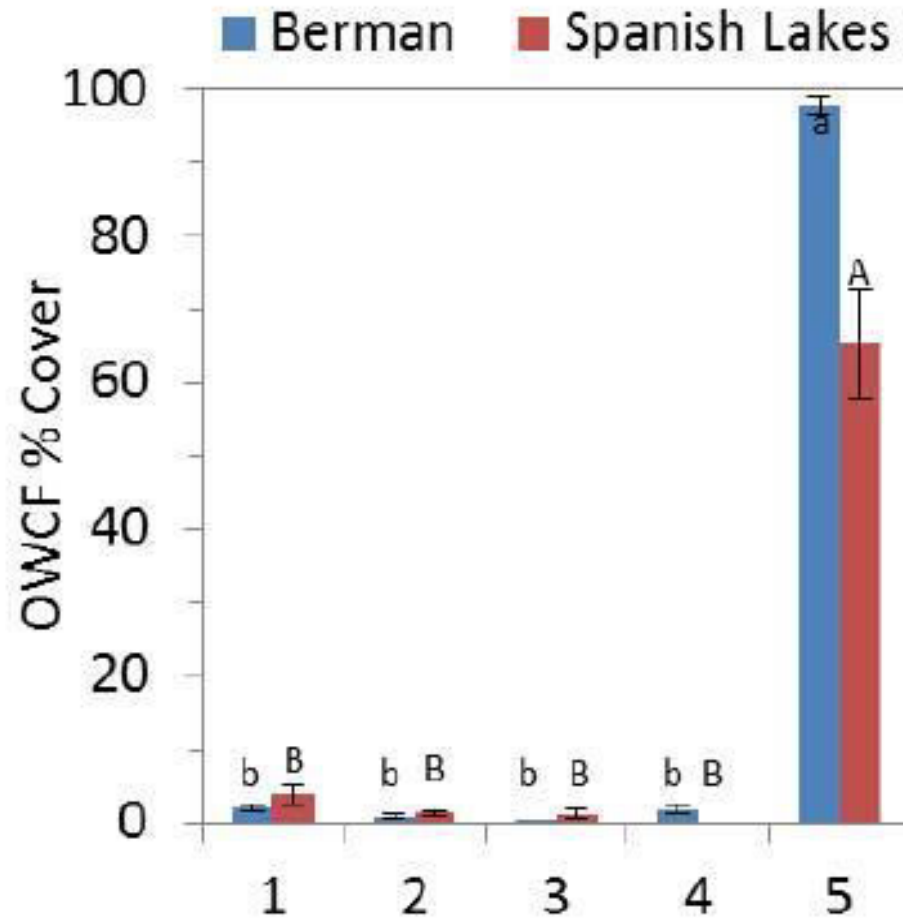


Trt # (Herbicide)	Rate
1 SX-1552	16oz
2 SX-1552	32oz
3 SX-1552	64oz
4 Roundup Custom	3%

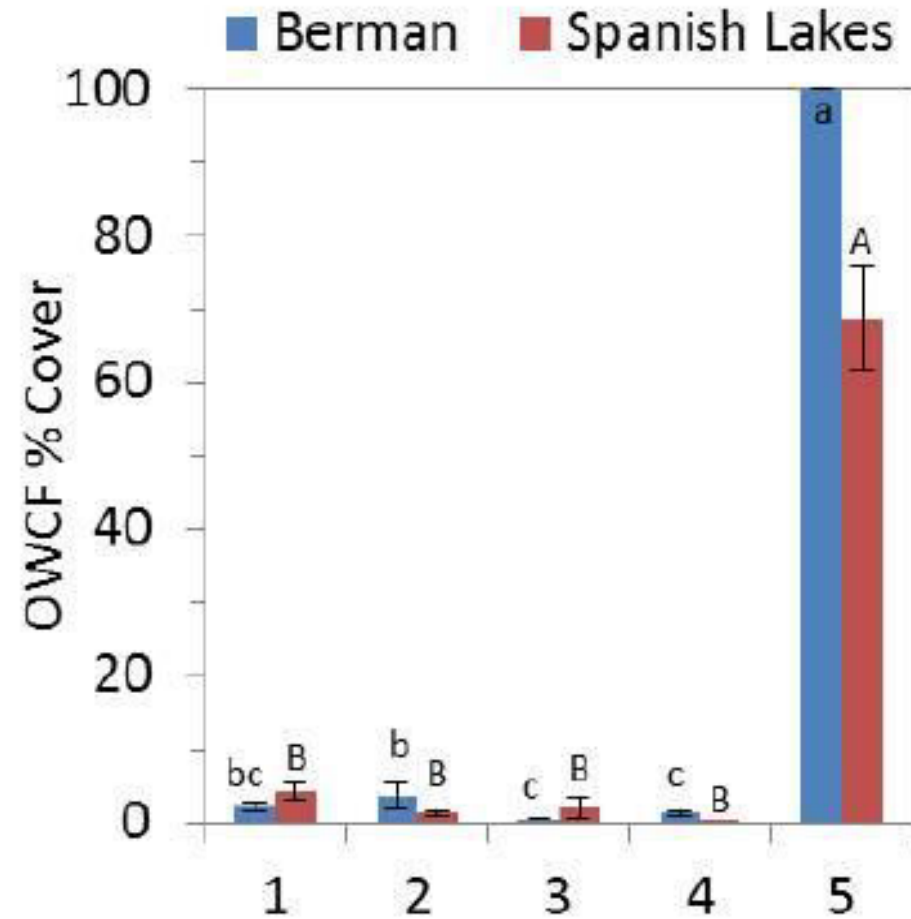


# ProcellaCOR Trials

### C. 60 DAT



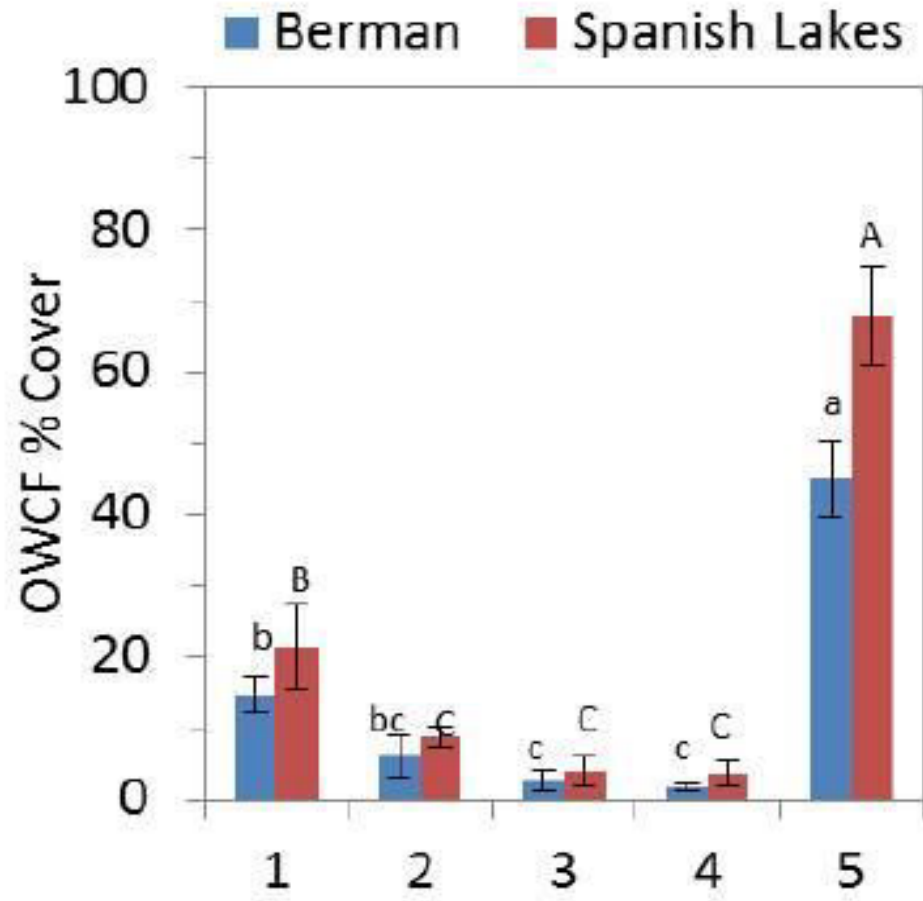
### D. 90 DAT



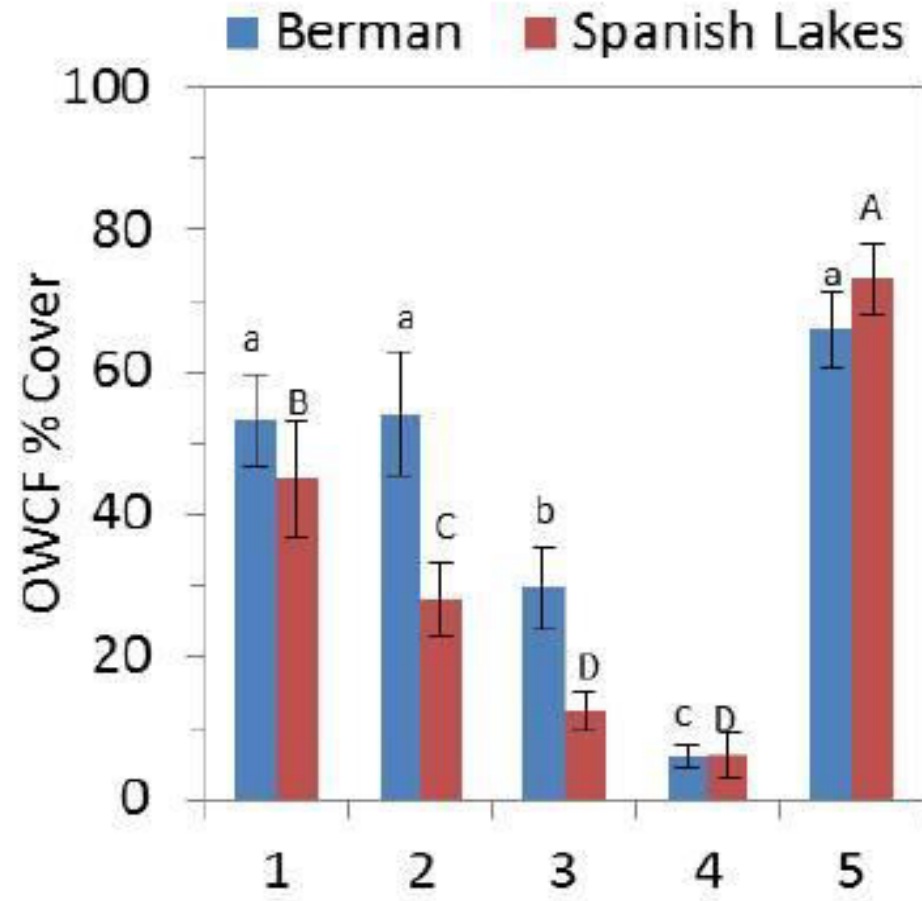


# ProcellaCOR Trials

### E. 180 DAT



### F. 360 DAT





# ProcellaCOR: Take Home Message

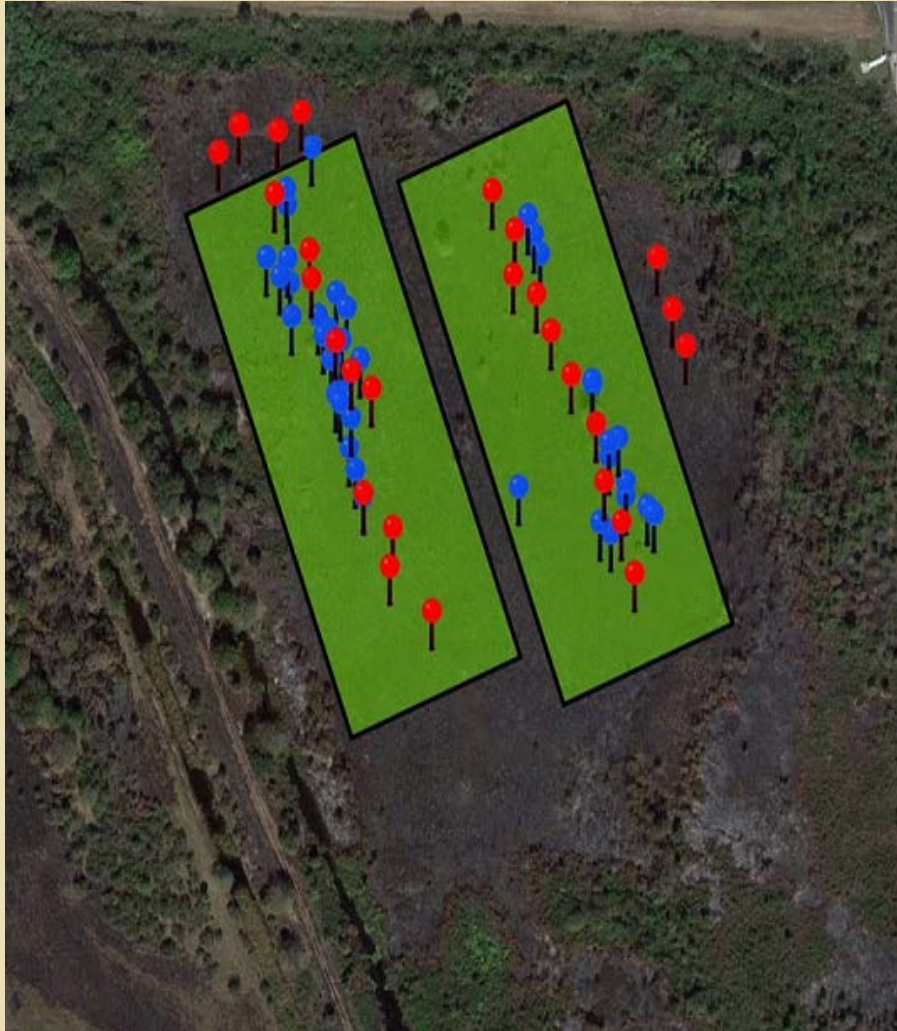
- Procellacor has very good activity on OWCF at all rates tested
- Very promising as an alternative option to Glyphosate
- Still evaluating its non-target damage
- We used the EC formulation, SePro has registered the SC formulation for FL
- We expect there to be similar activity among the SC but have initiated testing to verify the efficacy

Product	Formulation	Recommended Rate per acre for OWCF control	Label specific PDU equivalent <sup>a</sup>
ProcellaCOR EC	0.21 lb ae/gal	16-32 oz/A	5-10 PDU
ProcellaCOR SC	2.5 lb ae/gal	1.35-2.7 oz/A	1-2 PDU

<sup>a</sup>PDU's differ by herbicide label.



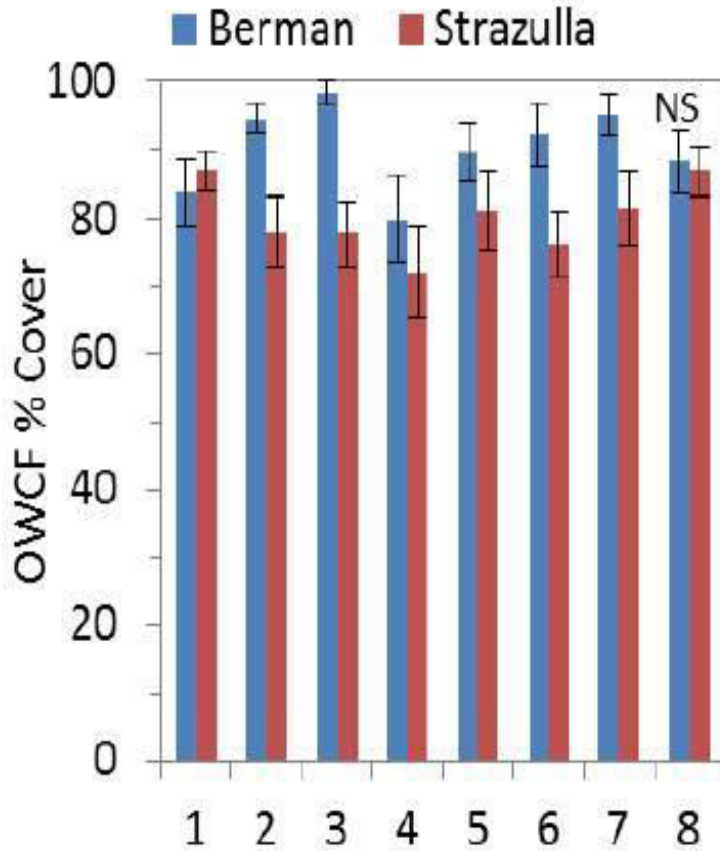
# Procellacor SC Efficacy Trials



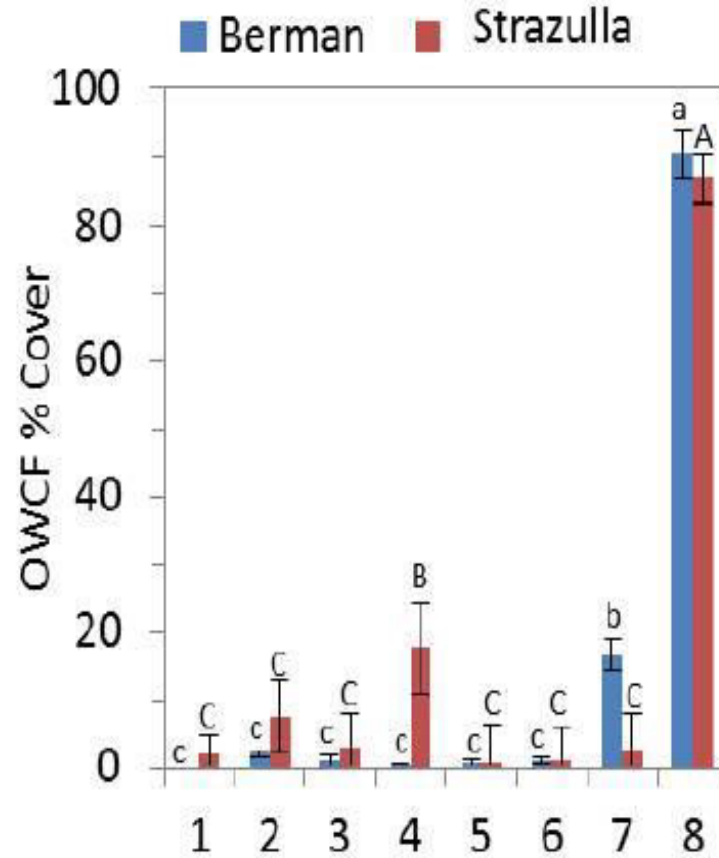


# Triclopyr Formulations

A. Baseline



B. 30 DAT

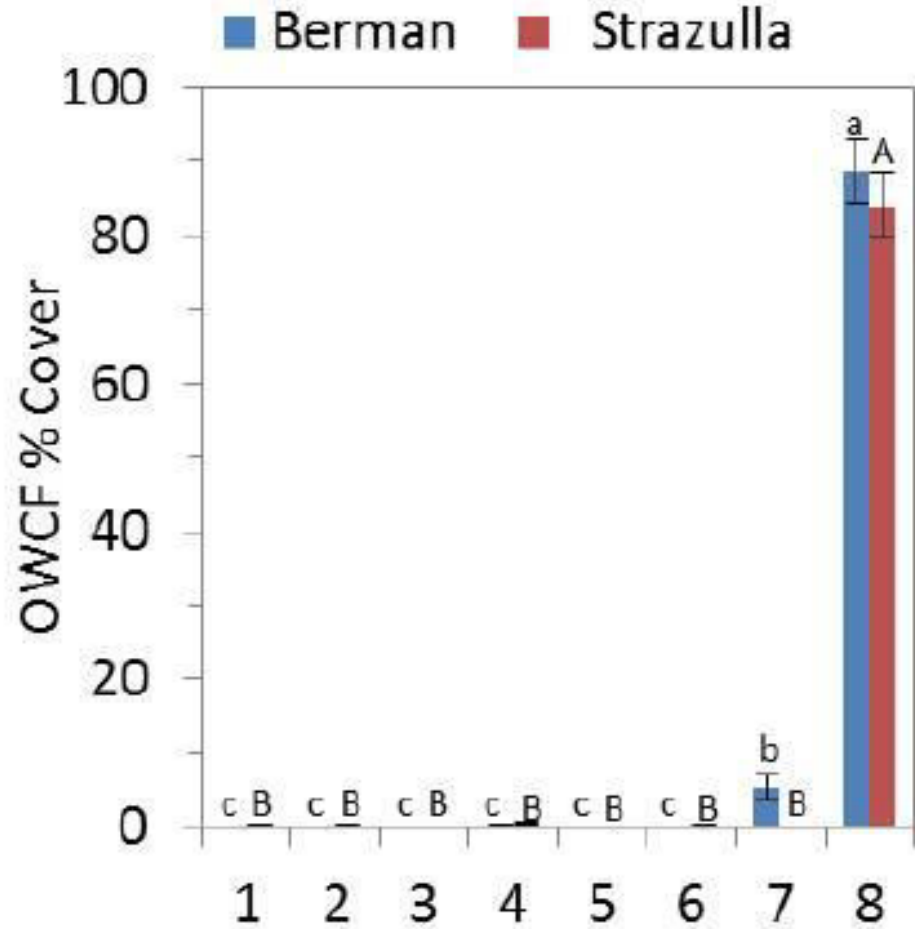


Trt# (Herbicide)	%v/v
1 (G3A)	3%
2 (G3A)	1.5%
3 (VastlanHL)	2.25%
4 (VastlanHL)	1.12%
5 (Trycera)	3.14%
6 (Trycera)	1.57%
7 (Roundup Custom)	3%
8 (untreated)	---

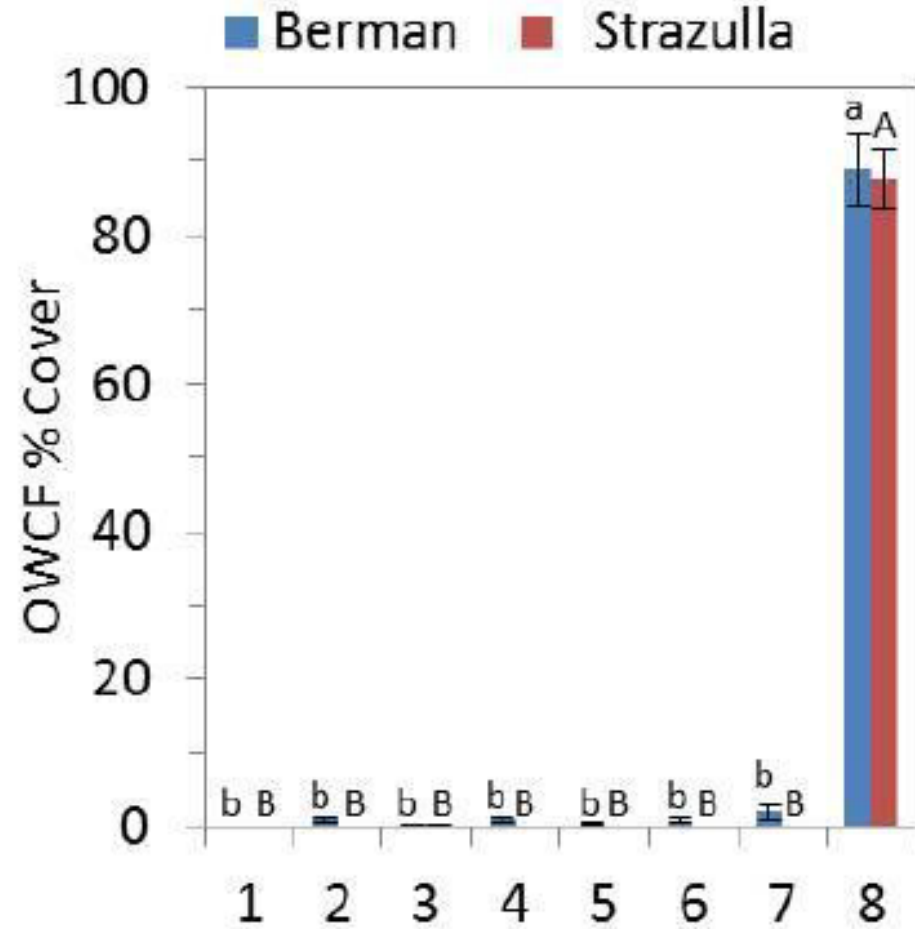


# Triclopyr Formulations

### C. 60 DAT



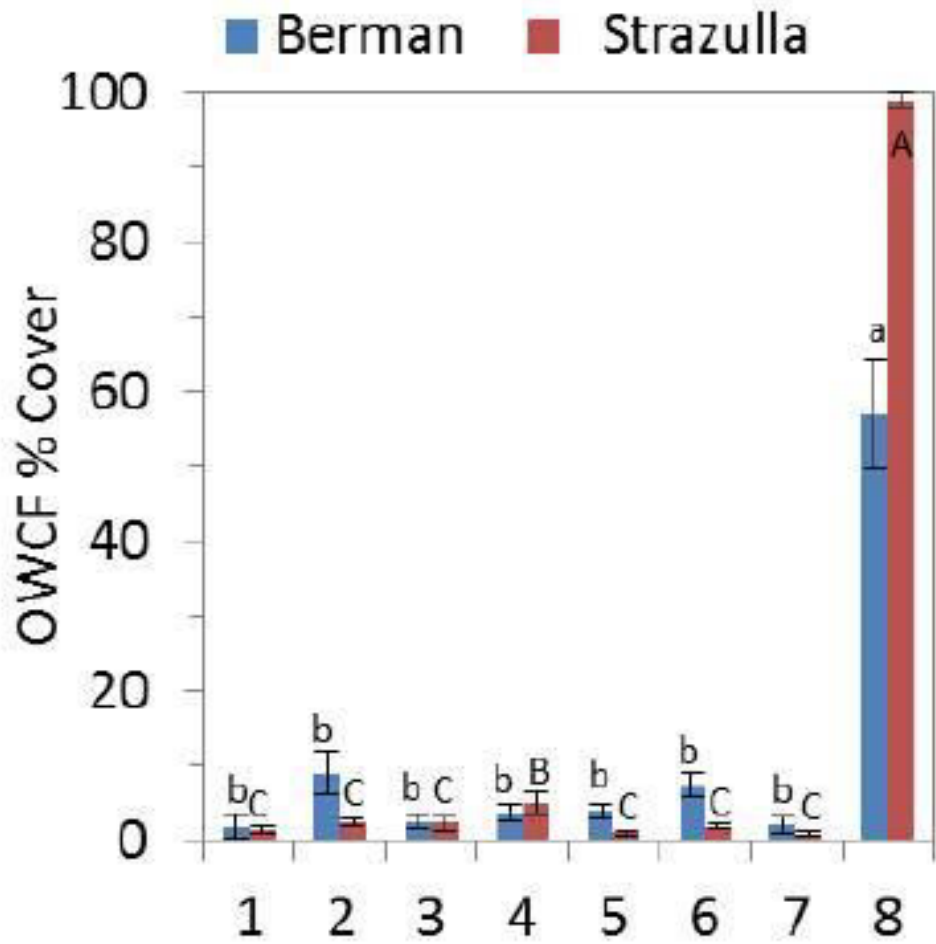
### D. 90 DAT



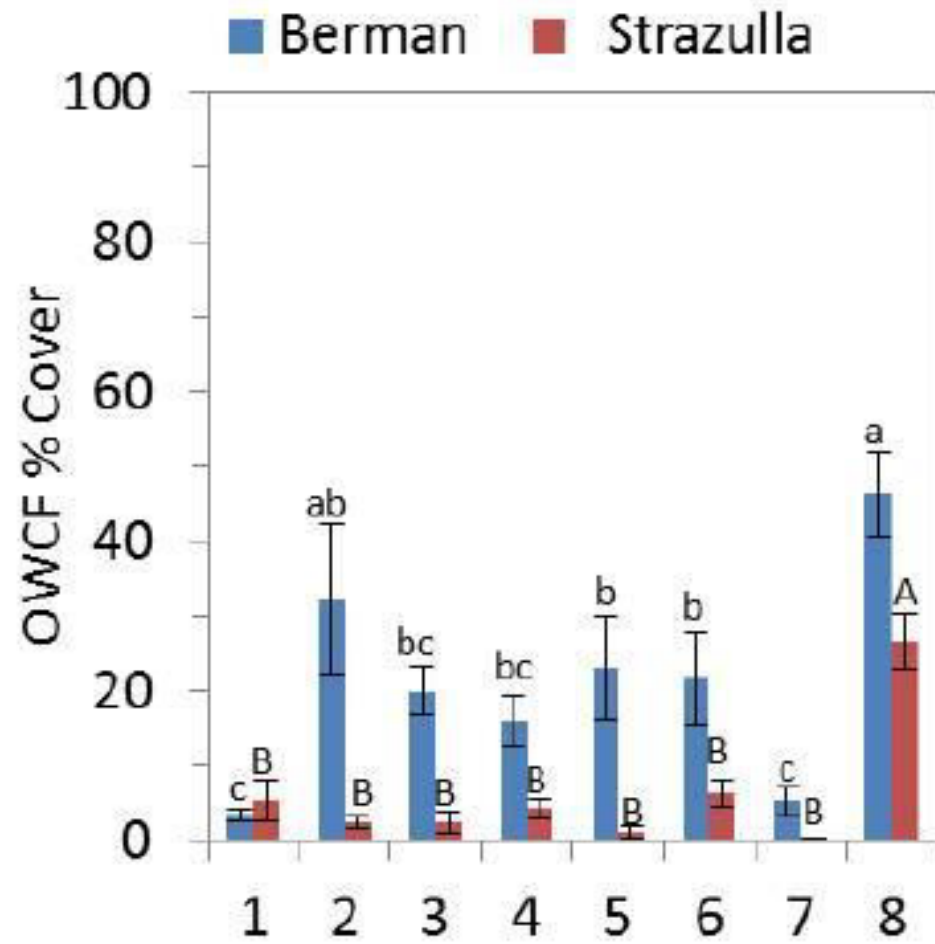


# Triclopyr Formulations

### E. 180 DAT



### F. 360 DAT





# Triclopyr: Take Home Message

- All three triclopyr formulations control OWCF and may be alternatives to Glyphosate
- Concentrations from any of these formulas equivalent to Garlon 3A at 1.5 and 3.0 %v/v may be useful
- Applicators exhibit preference to some formulations due to safety considerations and product odor.
- Long term variation (1 year) in efficacy is likely as conditions vary amongst sites



BMD- Plot 111 60DAT: Garlon 3A 1.5%



# Herbicide Treatment Summary

- ProcellaCOR has excellent activity
- Two newer triclopyr formulations effective
- Method did not substantially improve Escort
- PPO herbicides did not improve glyphosate activity but can be used if burn down time is of interest
- Data confirmed reduced efficacy of Escort when mixed at 2oz/A
- Rice herbicides were not effective but testing will be expanded to include new treatments during 2018

# A.R.M. Loxahatchee NWR





# Tree Island Studies



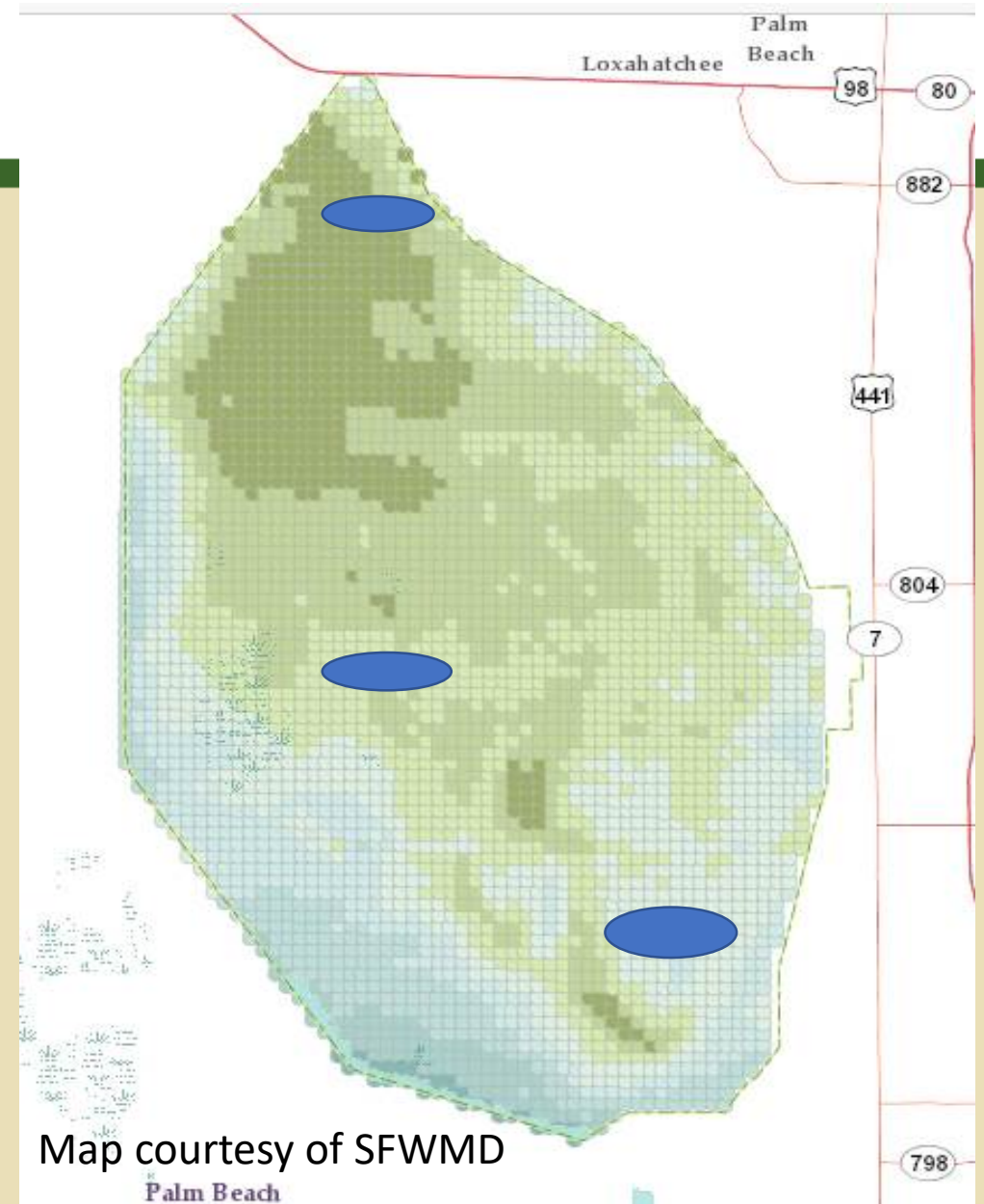
- 20 Tree Islands are currently being monitored after a Triclopyr study was initiated. Each island is an experimental unit.
- ProcellaCOR has been approved for use in Lox and 20 islands will be chosen this month to begin efficacy and non target damage studies with the SC formulation





# Hydrology Studies

- Place plots within OWCF infestations in the North, Central, and Southern sections of the refuge.
- Test the theory that when submerged, Lygodium is more difficult to kill
- 16 plots per region
- 3 Treatments





# Mesocosm Studies





# Moving Forward

- Continue to monitor Triclopyr testing on OWCF infested tree islands in Loxahatchee NWR, examine efficacy and non-target damage
- Tree island studies initiated as herbicides are evaluated and approved within Loxahatchee NWR
- Continue to implement and monitor water depth studies at Loxahatchee NWR
- Evaluate Procellacor efficacy and non-target damage
- Mesocosm studies
- Evaluate treatments to possibly replace poodle cutting
- Expand rice herbicide testing
- Retreatment Intervals
- Examine seasonality of treatment, spore biology, wildlife surveys with Lox NWR, IPM possibilities.



Thanks! Questions?  
jglueckert@ufl.edu; sfenloe@ufl.edu

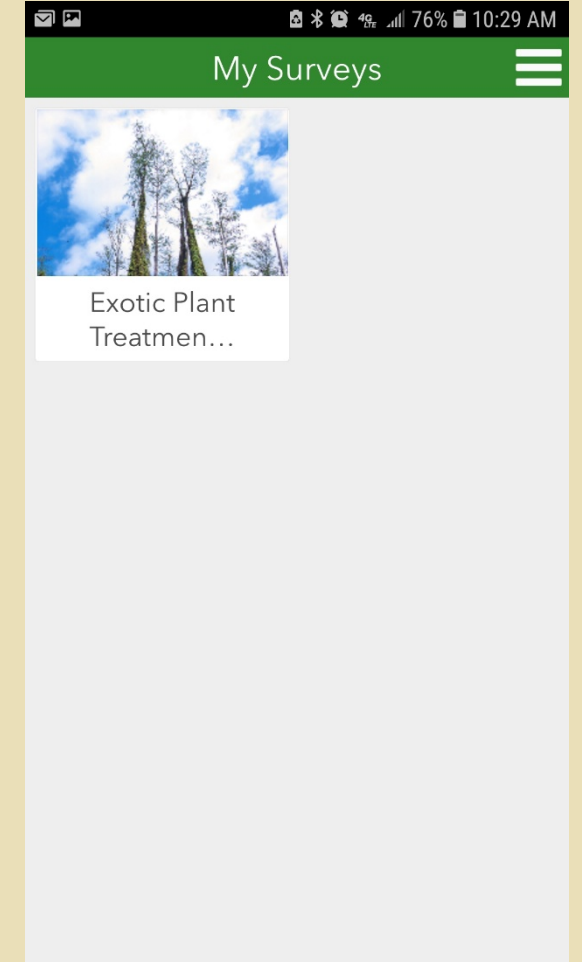
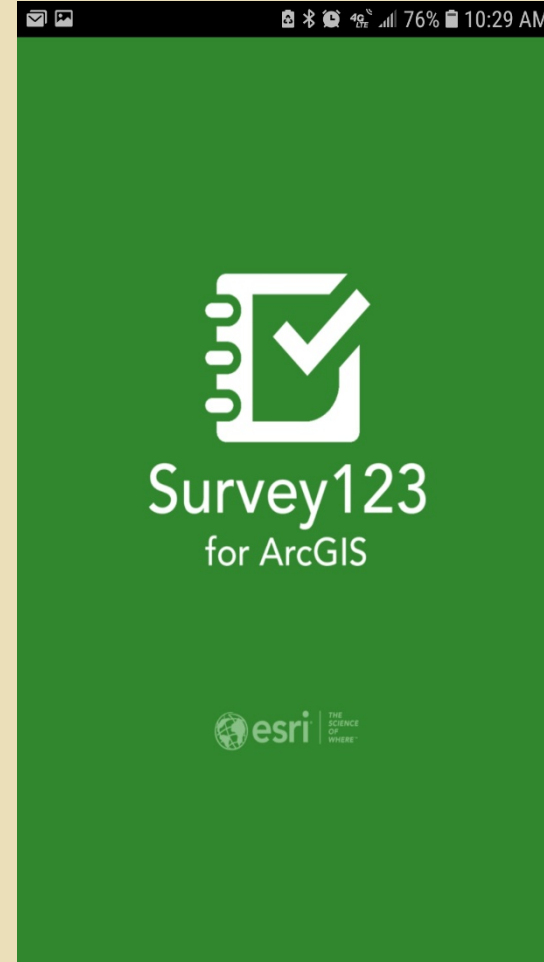




# Everglades Cooperative Invasive Species Management Area

2018 EVERGLADES INVASIVE SPECIES SUMMIT

## SURVEY 123 for Contract Inspection





# SURVEY 123 for Contract Inspection

- ESRI product which allows creation of custom forms with advance features
  - Text Fields
  - Conditional Fields
  - Pre-populated Drop Down Lists
  - Radio Buttons and Check Boxes
  - Multi Select
  - Coordinates
  - Image Attachments

Exotic Vegetation Inspection Report

Observations and Notes \*

Free Text Field. Can be character limited.

Add Picture or Document

Image Description

Add another attachment?

Yes

No

Create Point \*

26°41'N 80°6'W ± 24.118 m

Exotic Vegetation Inspection Report

Phase \*

Pre Treatment

During Treatment

Post Treatment

Other

Other

Secondary Response

Inspection Date \*

Monday, July 9, 2018

Inspection Time \*

3:44 PM

Tracking Number

Contract Company Name \*

Property \*

Example: WCA1; CREW; Dupuis

Supervisor's Name

Example: John Smith



# SURVEY 123 for Contract Inspection

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Exotic Vegetation Inspection Report

Contract Company Name \*

- AAM
- APM
- AVC
- EQI
- ERC
- FBI
- .....

Property \*

Example: WCA1; CREW; Dupuis

Supervisor's Name

Example: John Smith

FDACS #

# of Laborers on Site

# of Boats/Watercraft on Site

Exotic Vegetation Inspection Report

PPE?

- Yes
- No

Contractor Phone?

- Yes
- No
- Other

Contractor GPS?

- Yes
- No
- Other

Weather Conditions

- Sunny
- Partly cloudy
- Cloudy
- Light rain
- Rain
- Wind <5 mph
- Wind <10 mph
- Wind >10 mph

Additional Weather Info.

Example: Radar shows rain passing soon. Crews waiting to resume work.

Dissolved Oxygen Value



# SURVEY 123 for Contract Inspection

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  - Multi Select
  - Coordinates
  - Image Attachments

Exotic Vegetation Inspection Report

Treatment Method  
method1; method2

Basal Bark,Cut Stump,Girdle

- Aerial
- Basal Bark
- Cut Stump
- Foliar
- Girdle
- Hand Pull
- Harvesting
- Poodle Cut
- Submerged
- Other

Herbicide/Rate/Units  
Glyphosate 3 qt/ac; Imazypr 2 pt/ac

Exotic Vegetation Inspection Report

Add Picture or Document

field\_25-20180709-193944.jpg

GPS EXIF Tags

GpsLatitude  
26.6761634

GpsLongitude  
-80.09442349999999

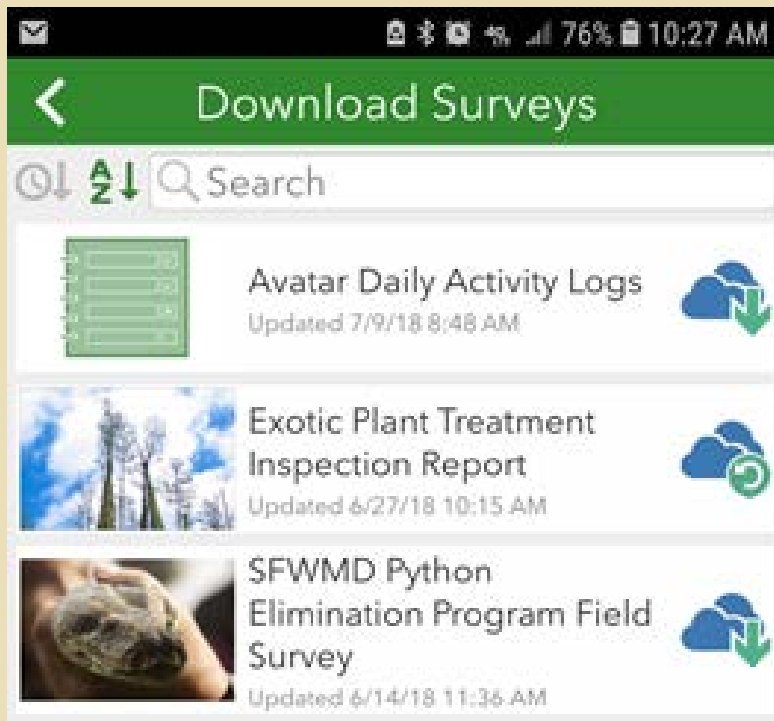
Image Description

Add another attachment?  
 Yes

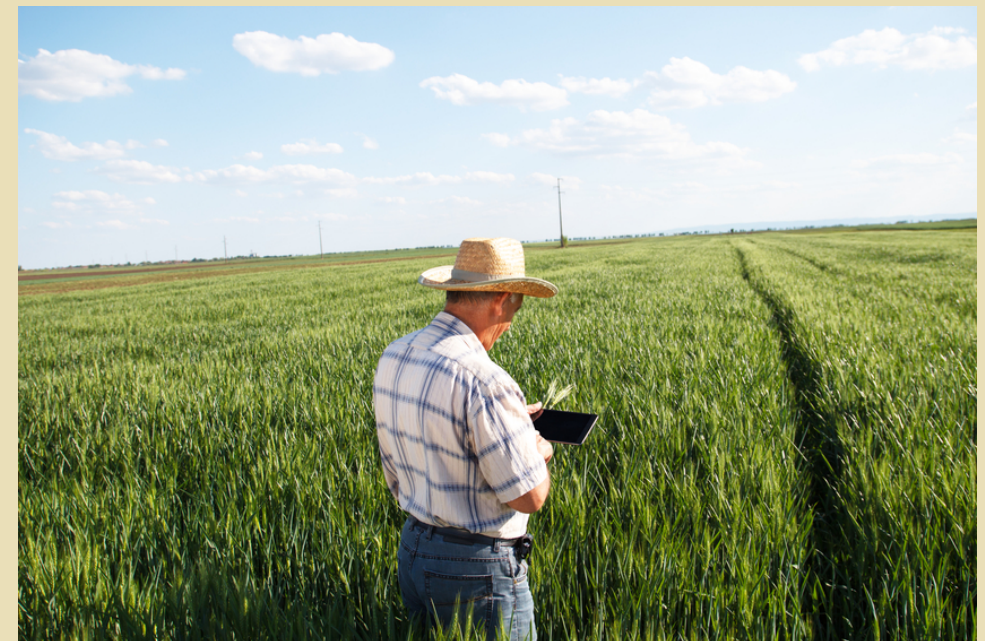


# SURVEY 123 for Contract Inspection

- Custom forms can be downloaded and used on smart devices



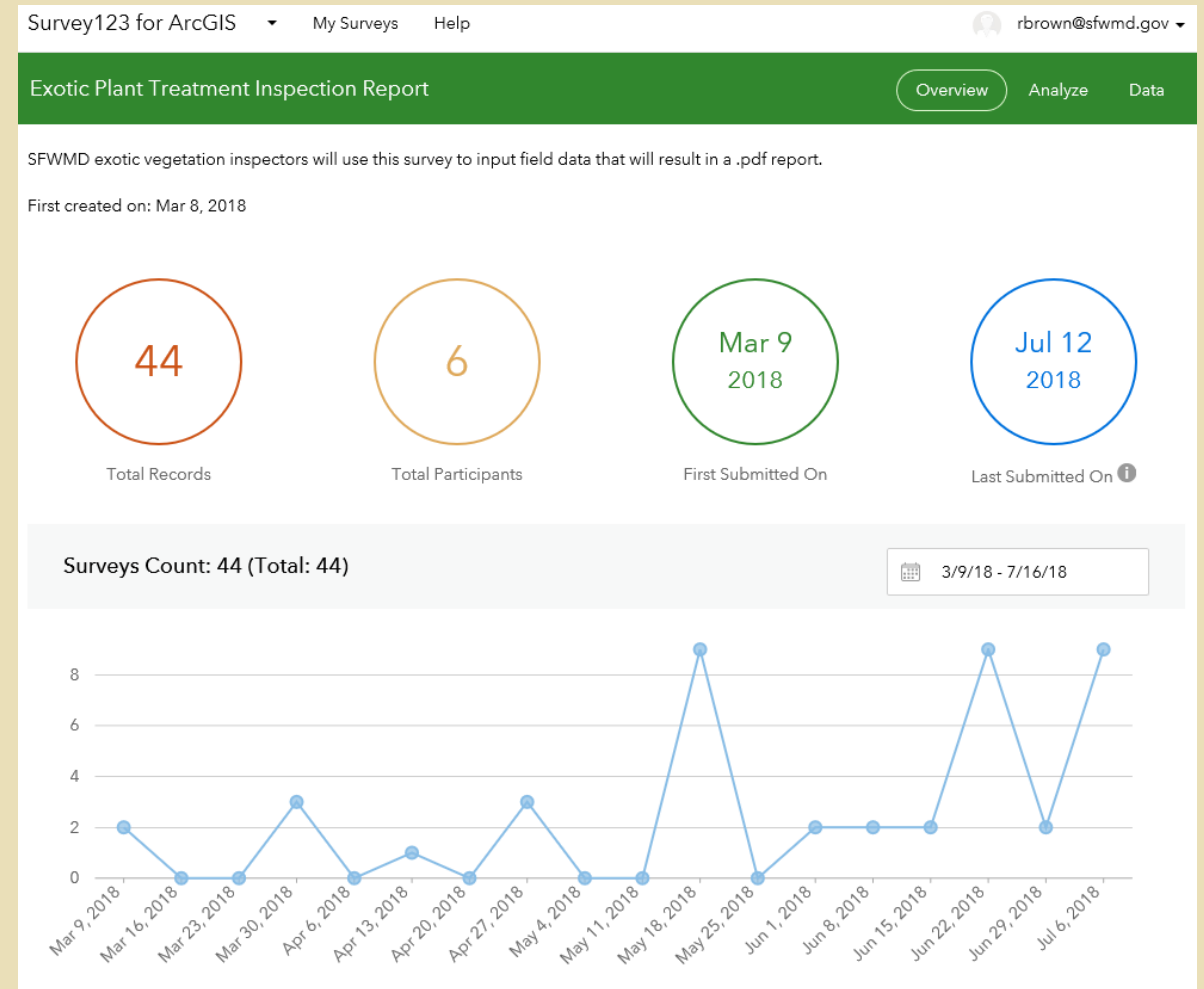
Smart devices do not require service/connection to function in the field





# SURVEY 123 for Contract Inspection

- Data is stored on ESRI's cloud
- Custom Dashboards can be designed to summarize important information



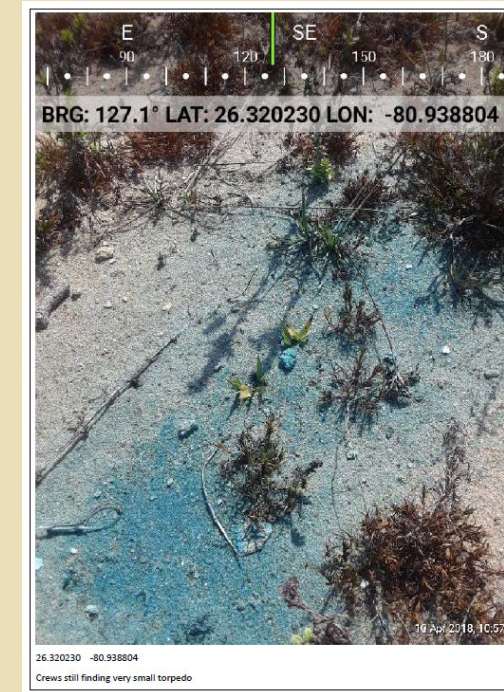


# SURVEY 123 for Contract Inspection

- Custom report templates can be loaded into the website for publishing
- Reports can be generated from ESRI's website or by custom scripting

**Vegetation Management Inspection Report**  
 Inspector: rbrown@sfwmd.gov\_sfwmd  
 Submitted: 2018-05-21

Property: C139	
Phase: During Treatment	
Inspection Date: 2018-04-10	Inspection Time: 15:33
Weather Conditions: Partly Cloudy	Weather Notes:
Dissolved Oxygen Value: 0.0	
Contractor: AAM.	Tracking Number: W081AAM18
Supervisor: Mike Coffee, John Kovlovsky, 1 more	FDACS #
# Laborers: ~15	# Boats/Watercraft: 0
# Trucks: 0	# ATV/Buggies/Other Equip: 3
PPE? Yes	
Supervisor Phone? Yes.	
GPS? Yes.	
Species: torpedograss	
Treatment Methods: Foliar	
Herbicides/Rates/Units: 1.5% imazapyr hand crew, 0.75% imazapyr spray gun	
Overall Treatment Coverage and Efficacy: Acceptable.	
<p><b>Observations and Notes:</b> Before this site visit a modified strategy was given to AAM to implement on site to increase efficiency, 2 supervisors are responsible for spraying ahead of crews with a hand gun. Crews are following in subgroups of 5 and gridding parallel to orchard rows in order to increase walking time before they line up again. The strategy seems to be implemented effectively and crews are covering more ground. I asked the supervisors what they thought and they agreed it was working well. I did see a few more misses compared to previous site visit, which is probably due to Mike being the only 1 ferrying herbicide and not having as much time to check. still the coverage is over 99% and is sufficient.</p>	
Inspection Location: (-80.92933855187306, 26.329317029404535)	





# Everglades Cooperative Invasive Species Management Area

2018 EVERGLADES INVASIVE SPECIES SUMMIT

## FFWCC Uplands SubSection Update

Jackie Smith

South Region Biologist

772.678.5106



# New & Old Information

- New Contractor List with 20 Contractors
- We are still funding research for better treatment of grasses
- We are still funding research for better treatment of other species that are harder to control
- More compliance and the Trackenator
- TIERS still makes us cry but getting better
- Once again the WMAs and WEAs received all the funding they need
  - So we do not have to fund them from our monies

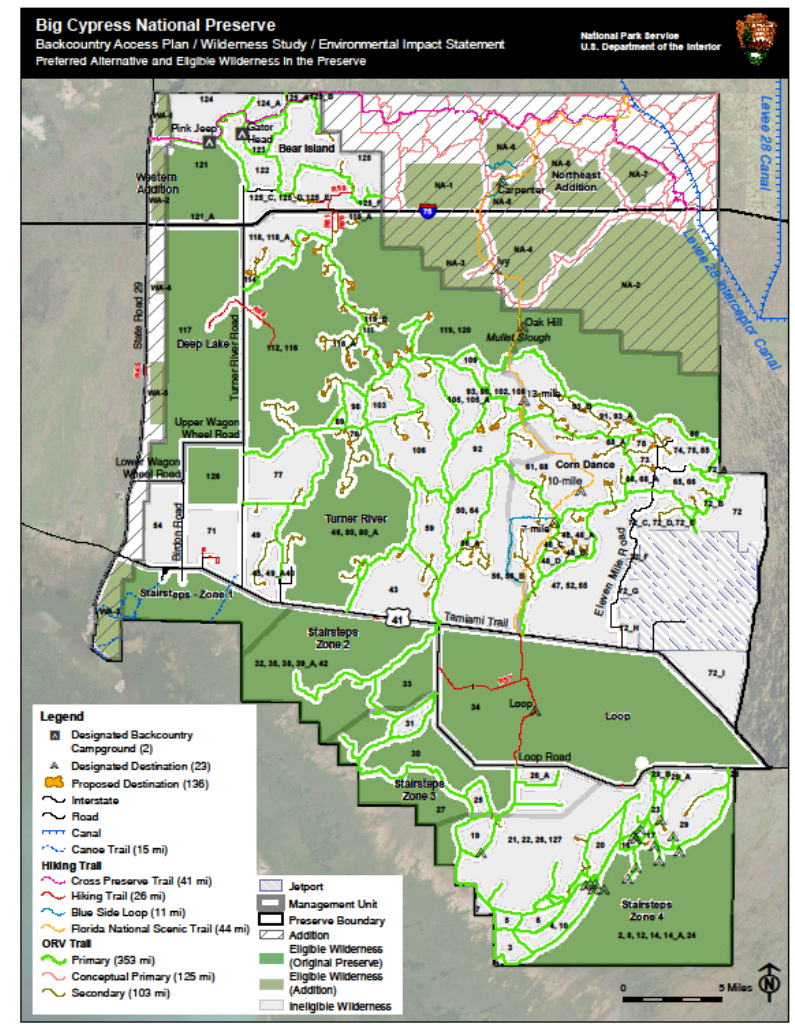
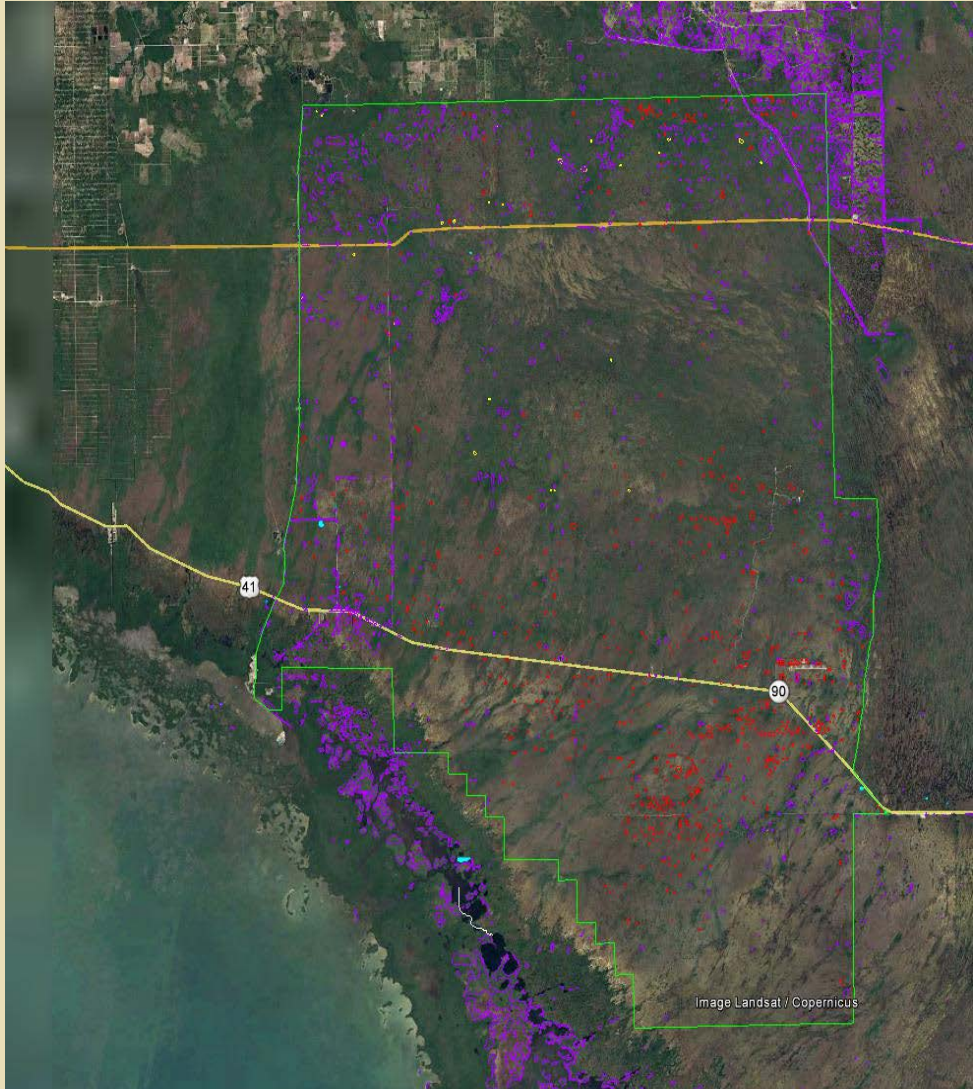


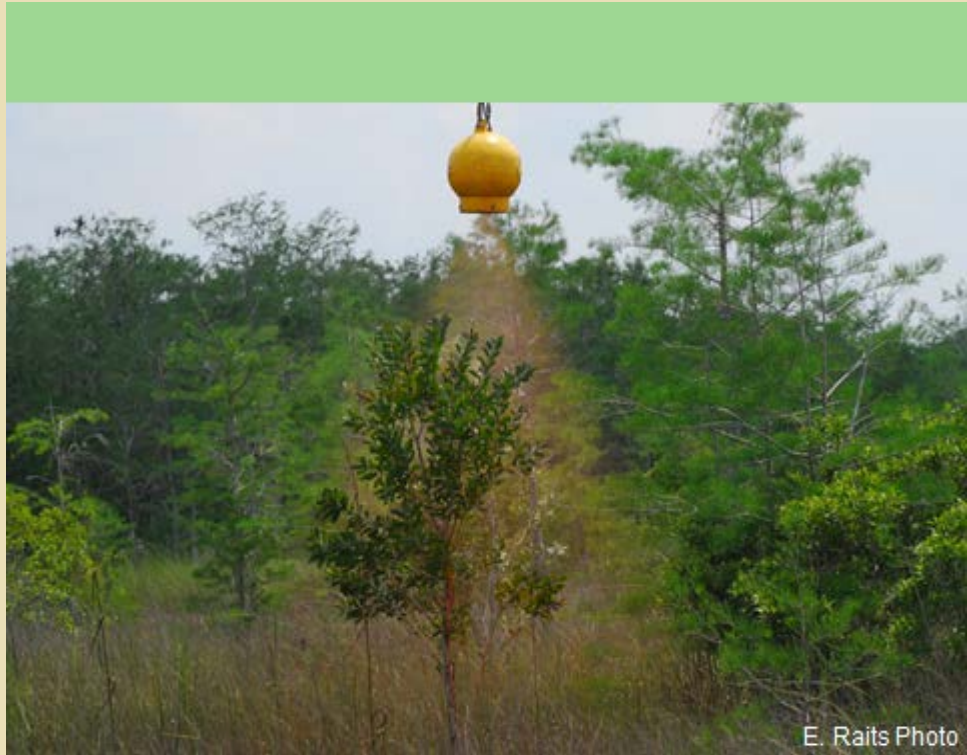
# Everglades Cooperative Invasive Species Management Area

2018 EVERGLADES INVASIVE SPECIES SUMMIT

## Big Cypress National Preserve

Aerial Spot Spraying 2018







# Aerial Spot Spray System



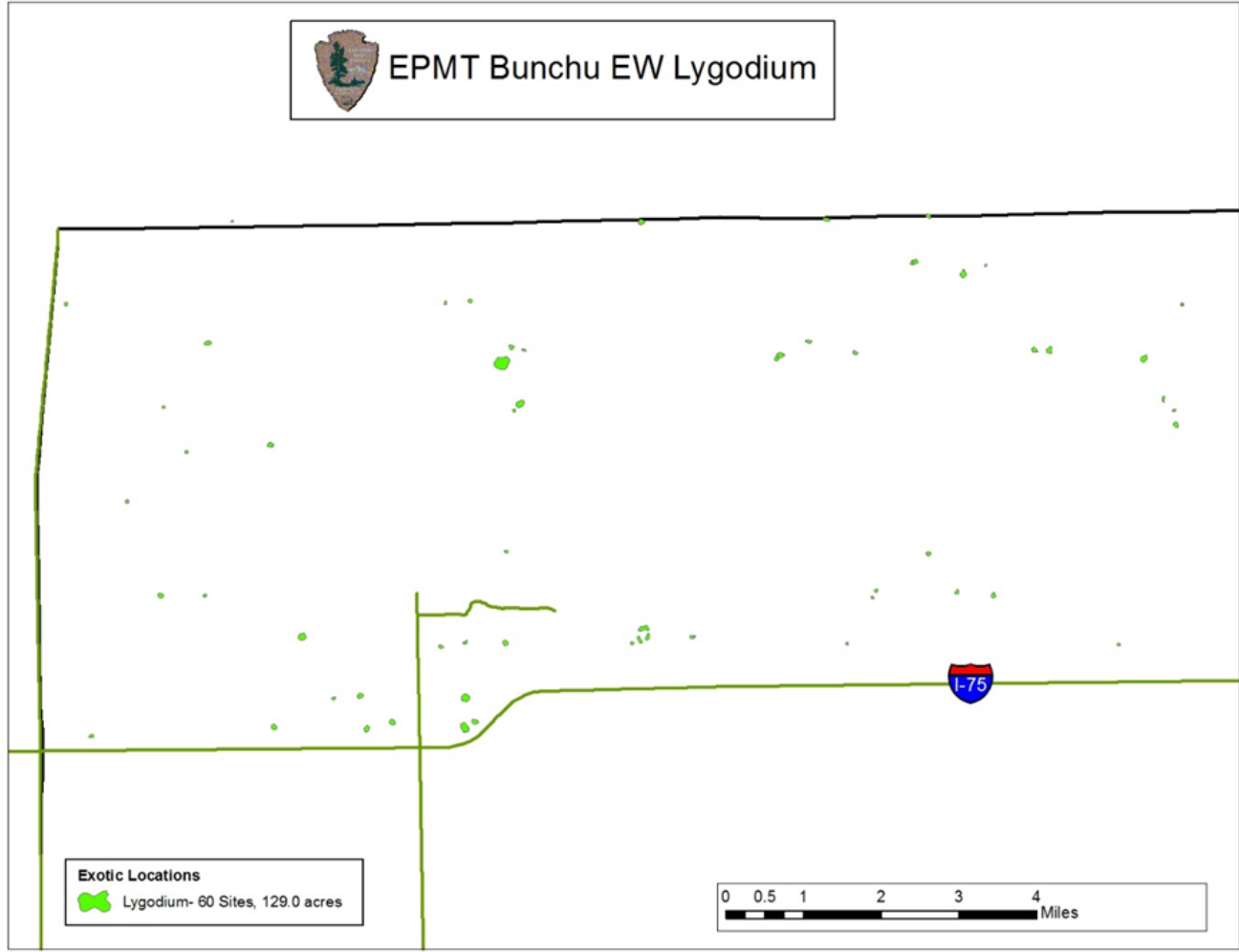


# 2018 Aerial Spot Spray Projects

- CowParBun:
  - Bunchu: \$150k (Florida/Caribbean EPMT)
  - Cowbell BAR: \$145k (DOI)
  - Parliament BAR: \$20k (DOI)




### EPMT Bunchu EW Lygodium









**Exotic Locations**  
Lygodium- 60 Sites, 129.0 acres

0 0.5 1 2 3 4 Miles



 Cowbell BAR  
Proposed Aerial Treatment Sites

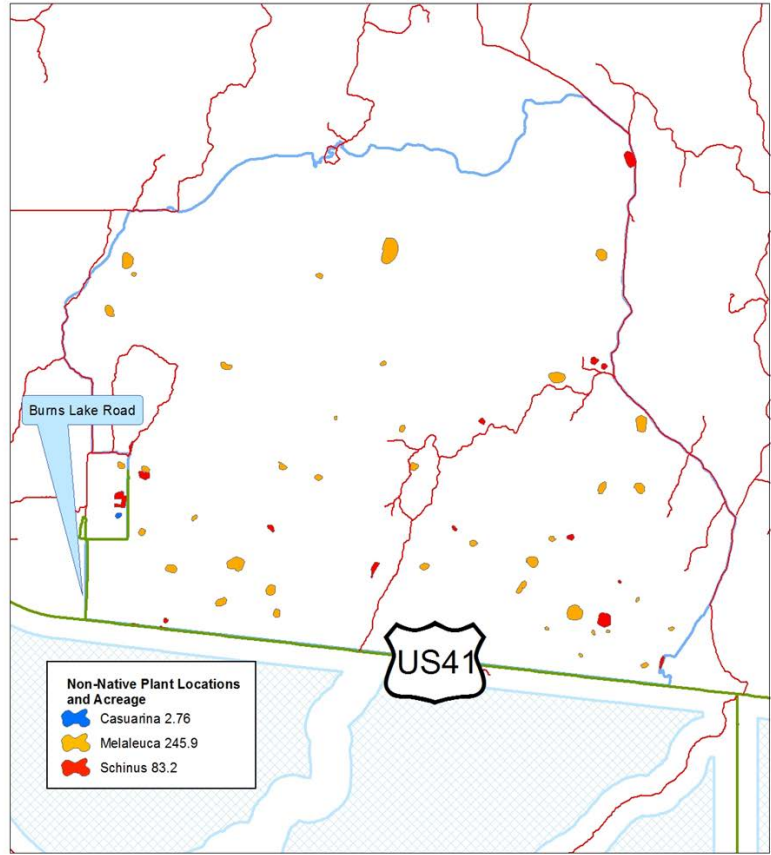


-  Cowbell Fire Perimeter
- Cowbell Fire Non-Native Plant Locations**
-  Lygodium 32.0 acres
-  Melaleuca 42.1 acres
-  Schinus 34.5 acres
-  Pre-Award Treatments made, 2018
-  Roads and Highways





 Parliament Fire BAR 2018  
Aerial Spray Sites





- Herbicide: (50 gal mix)
  - 2% Garlon 3a/Renovate
  - 2% MSO
  - Water Conditioner (1 pt)
  - Brandt Red Dye (1 pt)





# Lygodium





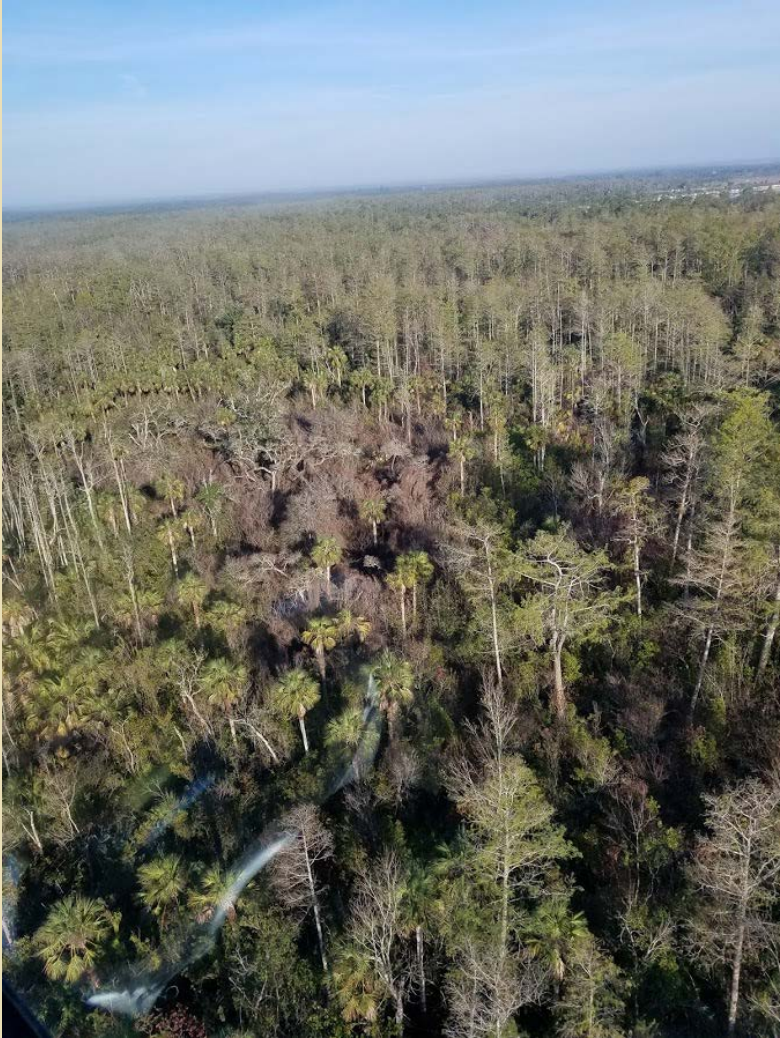








# Lygodium 2017





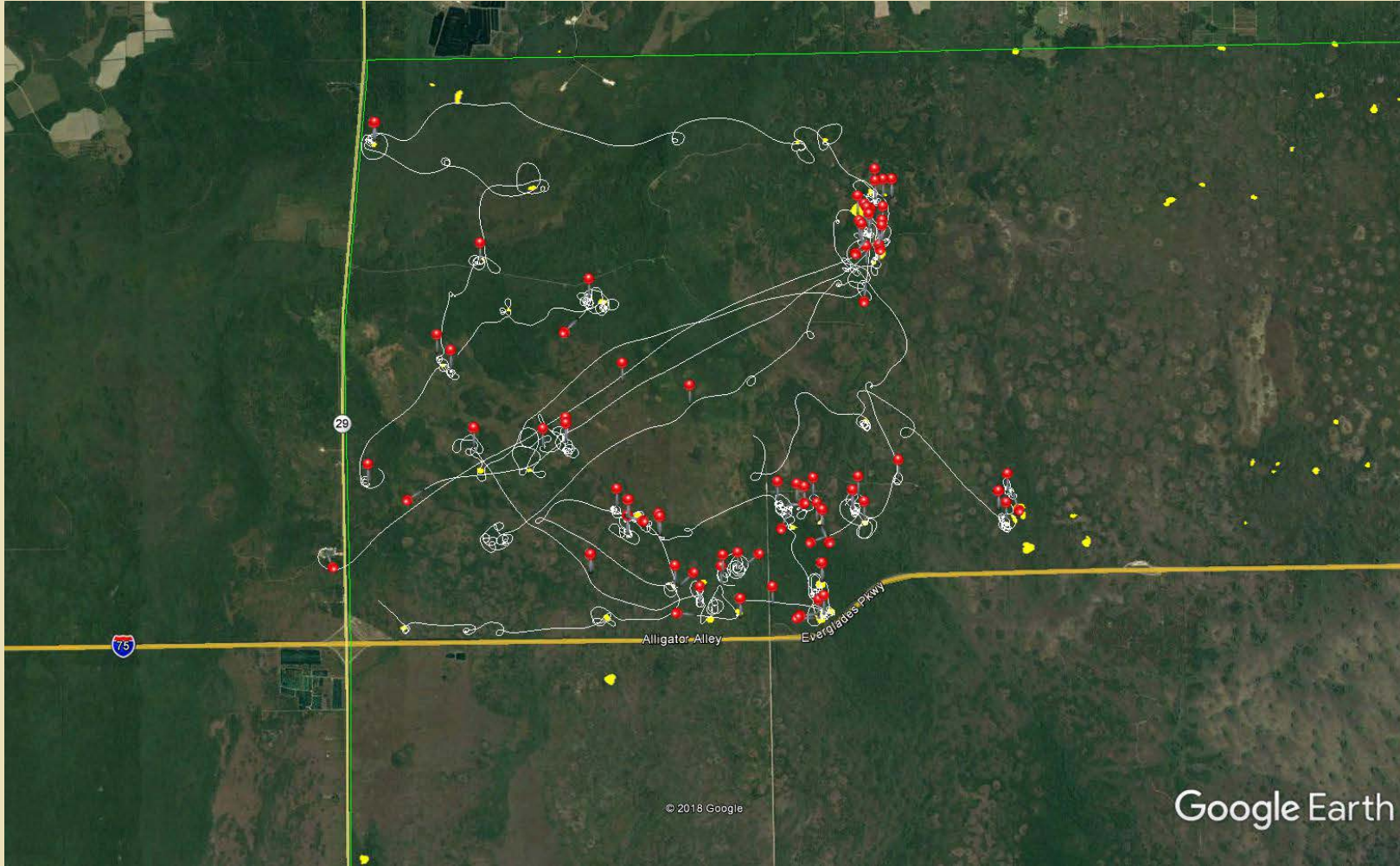
# Melaleuca 2017





# Melaleuca 2017







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