Evaluation of New Herbicides and Techniques for Management of Old World Climbing Fern (*Lygodium microphyllum)* in Arthur R. Marshall Loxahatchee National Wildlife Refuge

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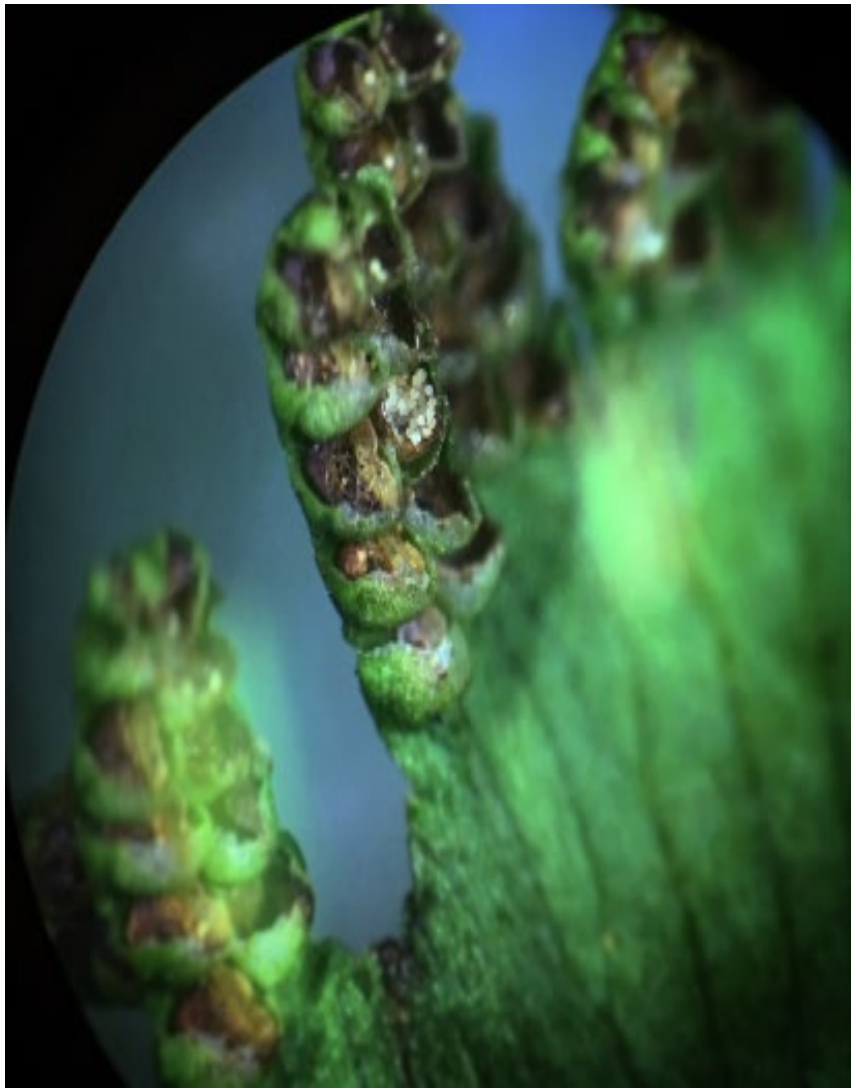
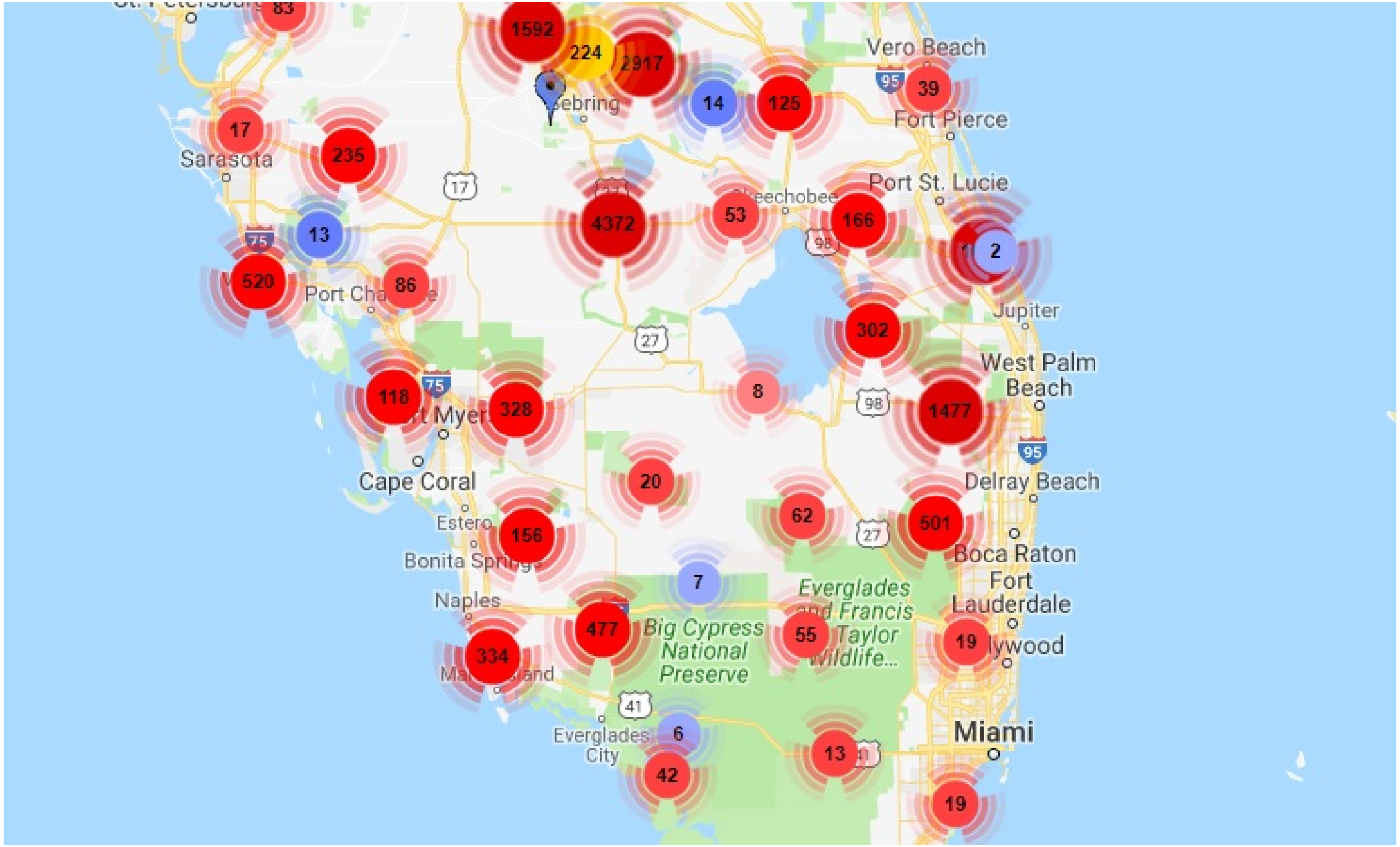
Old World Climbing Fern (*Lygodium microphyllum)*




1592
224
2917
14
125
39
Vero Beach
Fort Pierce
Sebring
17
Sarasota
235
17
Port St. Lucie
4372
53
166
13
75
98
2
520
86
Port Cha
Jupiter
302
27
West Palm
Beach
118
75
328
8
98
1477
Cape Coral
95
20
Delray Beach
62
501
Estero
156
27
Boca Raton
Bonita Spri
Fort
Lauderdale
7
Naples
Everglades
and Francis
Taylor
Wildlife...
477
Big Cypress
National
Preserve
55
19
334
41
Everglades
City
6
Miami
13
42
19

Issues with *Lygodium*

- Aggressive, blanketing, growth habit
- Year round spore production and dispersal
- Tolerance to flooding and fire

Management

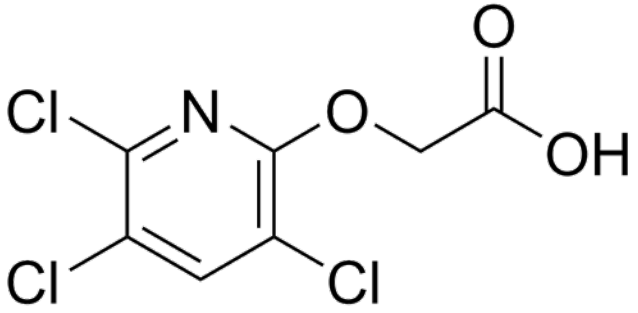
- Ground treatments
  - Backpack application
    - Glyphosate (3% v/v)
- Aerial treatments
  - Metsulfuron-methyl
- Biocontrol
  - *Neomusotima conspurcatalis*
  - *Floracarus perrepae*

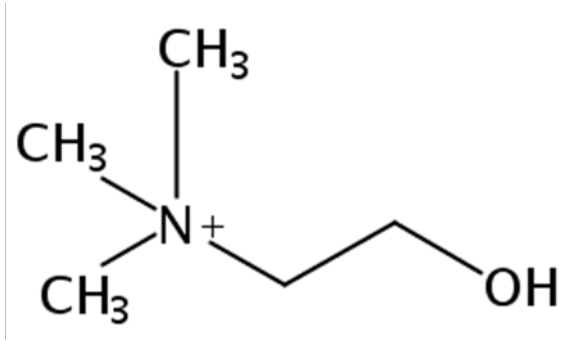
(Hutchinson and Langeland 2007)

Herbicides/ Tank Mixes	
Roundup Custom	Glyphosate
Garlon 3A	Triclopyr (Amine)
Vastlan HL	Triclopyr (Choline)
Trycera	Triclopyr (Acid)
Method	Aminocyclopyrachlor
Escort	Metsulfuron
Method + Escort	Aminocyclopyrachlor + metsulfuron
ProcellaCOR EC	Florpyrauxifen benzyl
ProcellaCOR SC	Florpyrauxifen benzyl
Clipper	Flumioxazin
Stingray	Carfentrazone
Roundup Custom + Clipper	Glyphosate + Flumioxazin
Roundup Custom + Stingray	Glyphosate + Carfentrazone
Londax	Bensulfuron
Permit	Halosulfuron
Sharpen	Saflufenacil
Newpath	Imazethapyr
Basagran	Bentazon

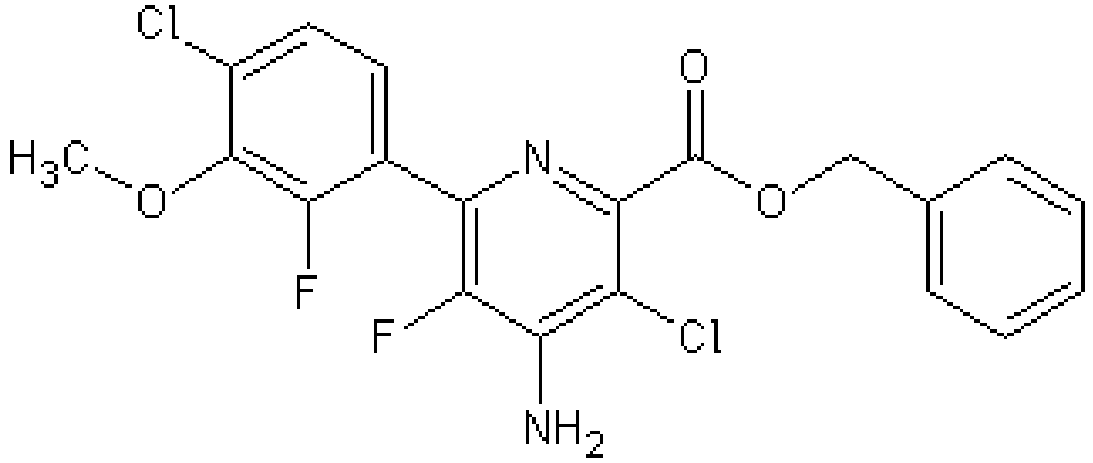
Advances in herbicide technology warrant testing on OWCF

- New triclopyr formulations
  - Acid and choline forms





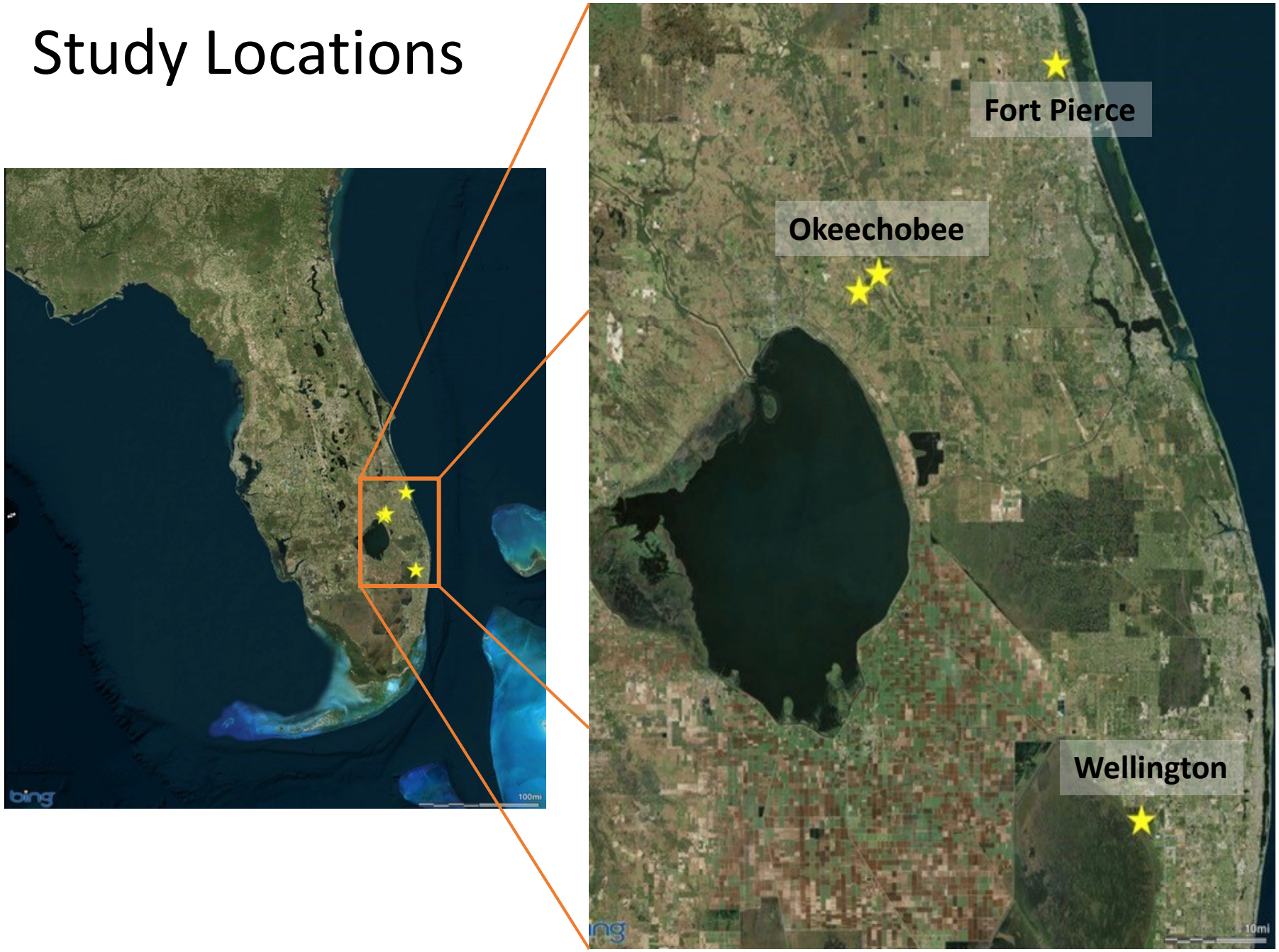
- New aquatic active ingredient
  - Florpyrauxifen-benzyl



Objectives

- Evaluate triclopyr formulations for OWCF control against glyphosate in ARM Lox NWR
- Examine potential efficacy of florpyrauxifen-benzyl on OWCF in ARM Lox NWR
- Long term goal of increasing the tools for managers

Study Locations

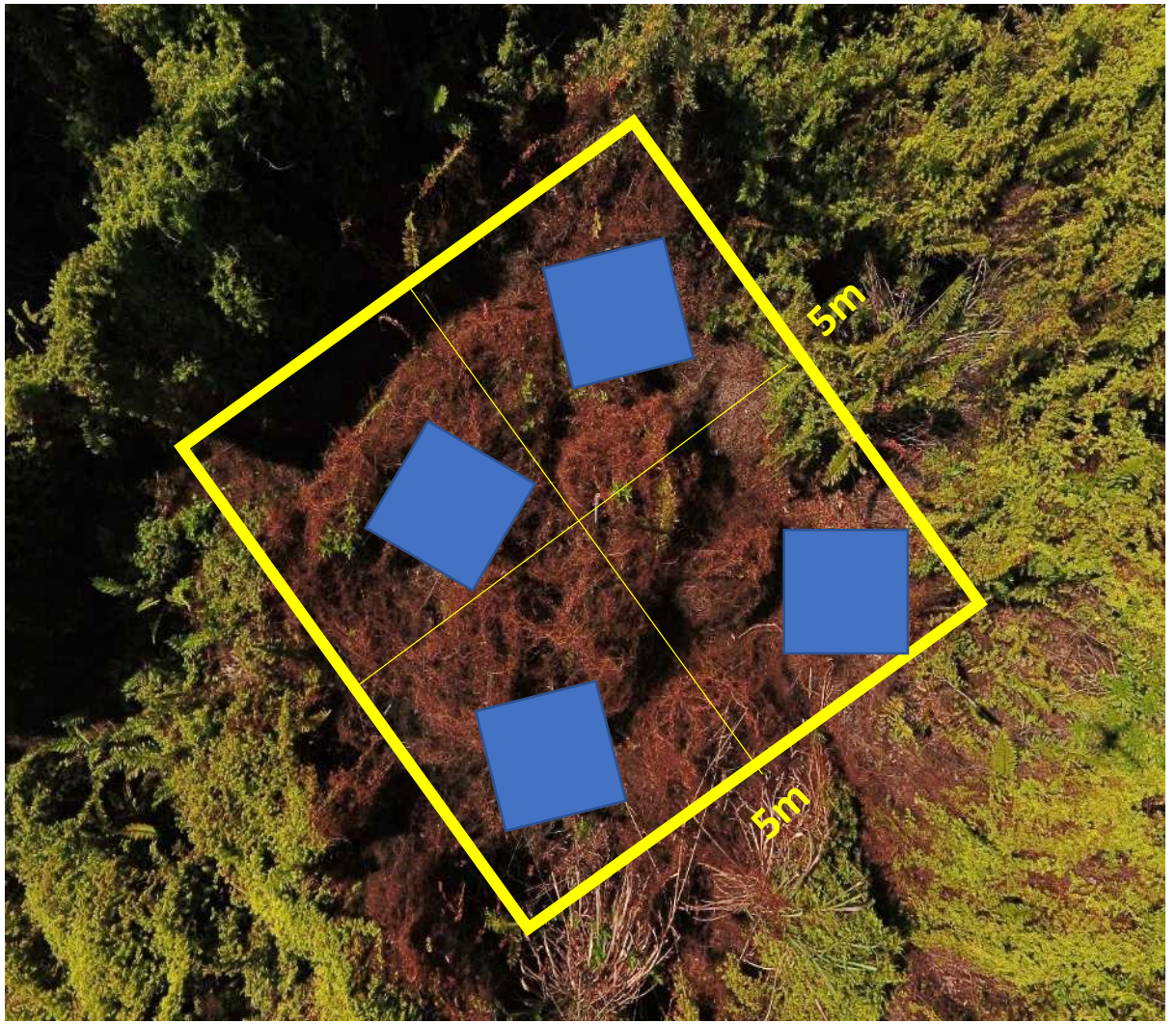


Study	Active ingredient/formulation	Application Dates	%v/v or rate g/ha	Rate (kg ae/ha)
1	Triclopyr amine	Wellington: December 2016 Okeechobee: May 2017	3.0%, 1.5%	4.0, 2.0
	Triclopyr choline		2.2%, 1.1%	4.0, 2.0
	Triclopyr acid		3.1%, 1.6%	4.0, 2.0
	Glyphosate		3%	5.4
	Untreated		---	---
2	Florypraxifen-benzyl (EC)	Ft. Pierce: March 2017 Okeechobee: May 2017	29 g/ha	0.03
	Florypraxifen-benzyl (EC)		58 g/ha	0.06
	Florypraxifen-benzyl (EC)		87 g/ha	0.09
	Glyphosate		3% v/v	5.4
	Untreated		---	---

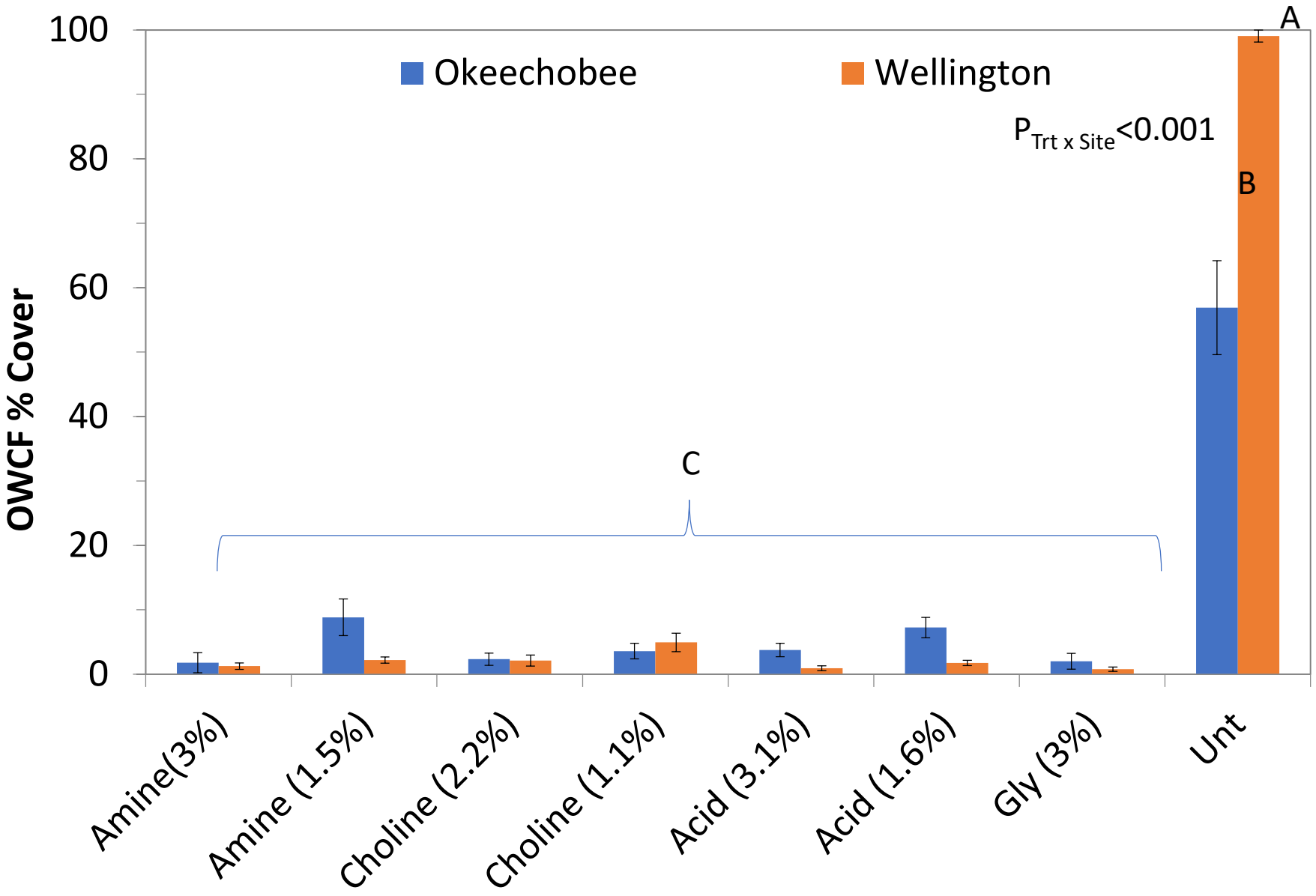
NIS added to each treatment at 0.5% v/v

Data Collection

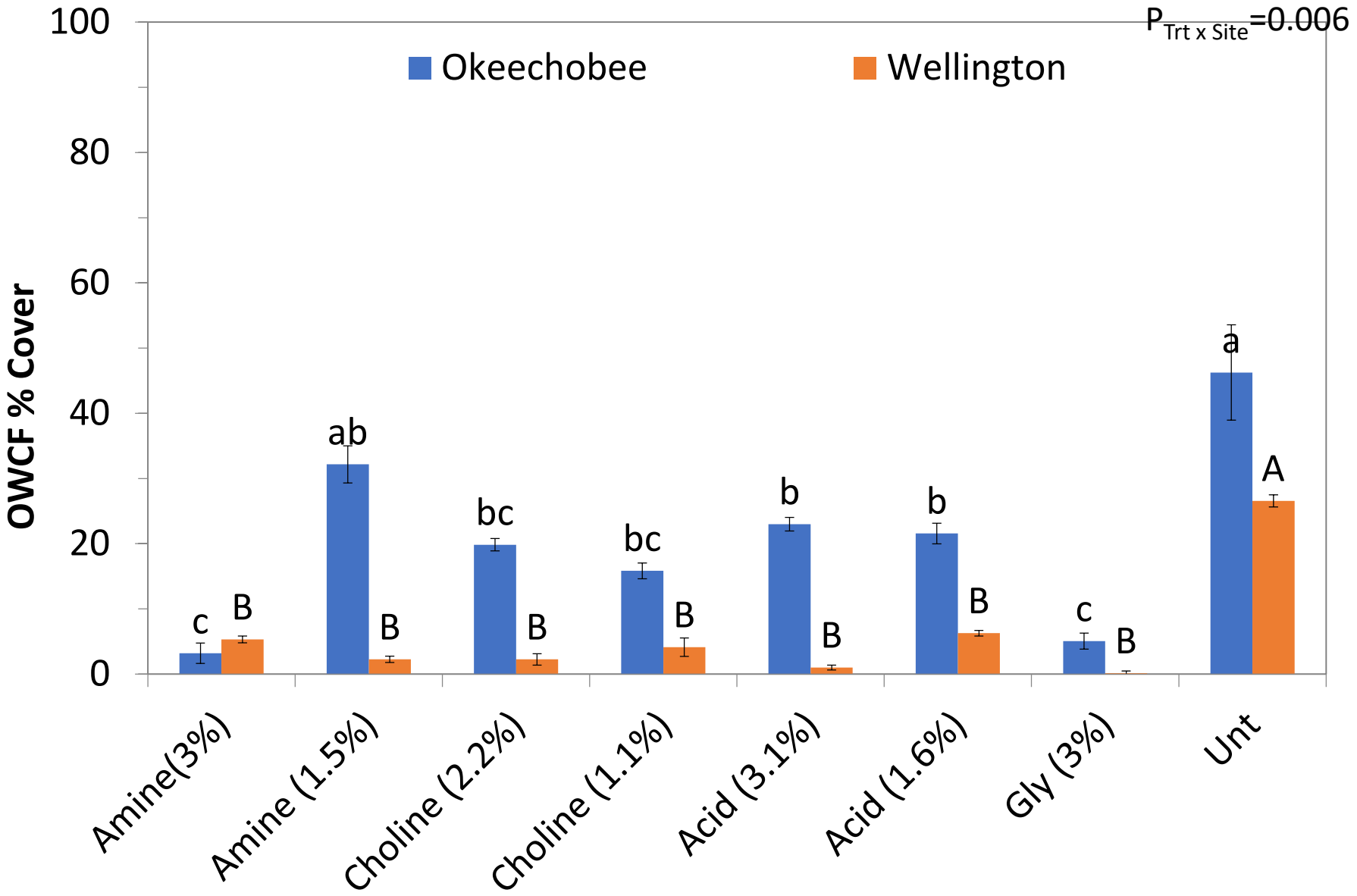
- % Visual Cover of live (green) OWCF
- $1m^2$ sub-samples from 4 quadrats within each plot
- 0, 60, 180, 360 DAT



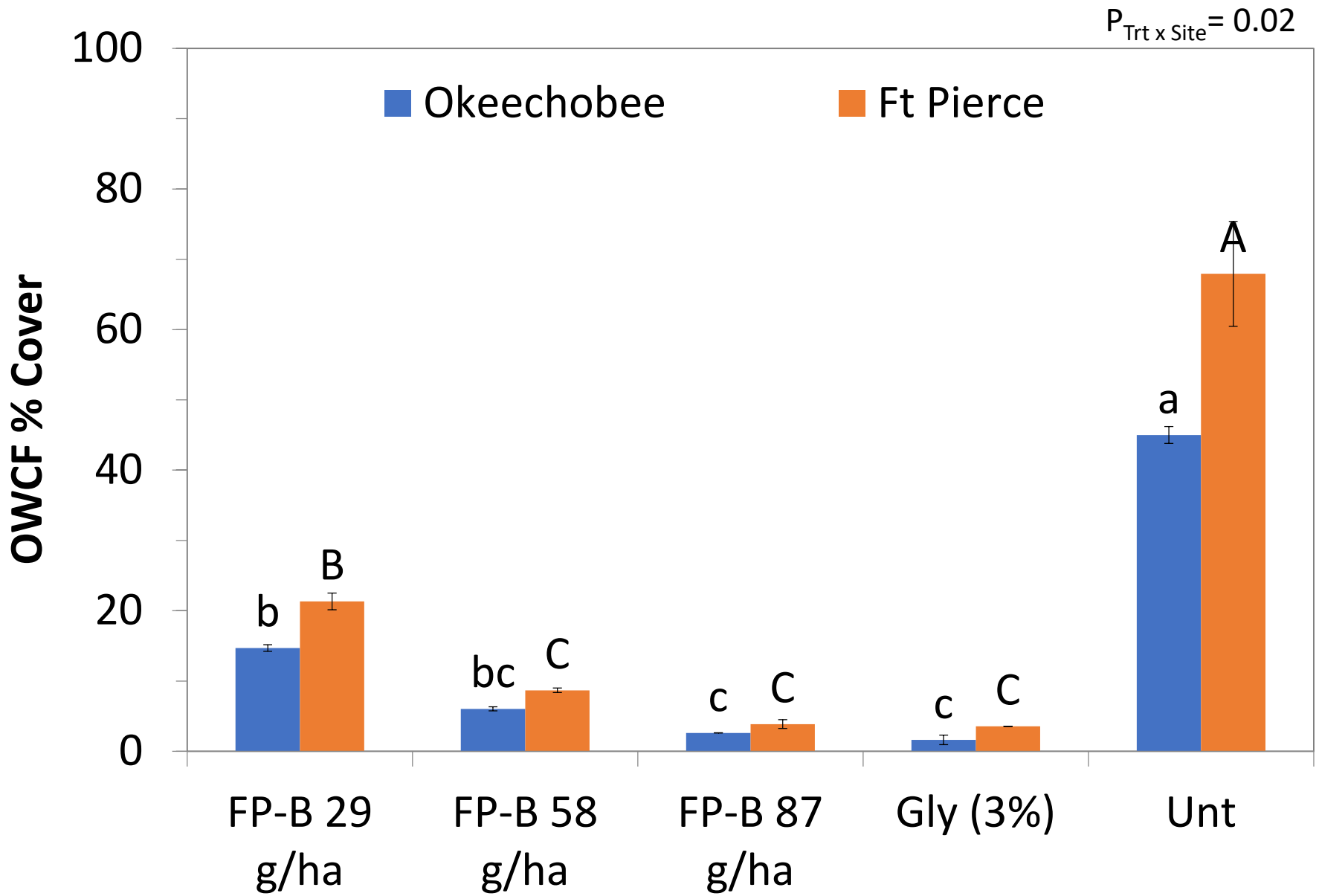
OWCF Response to Triclopyr Formulation (180 DAT)



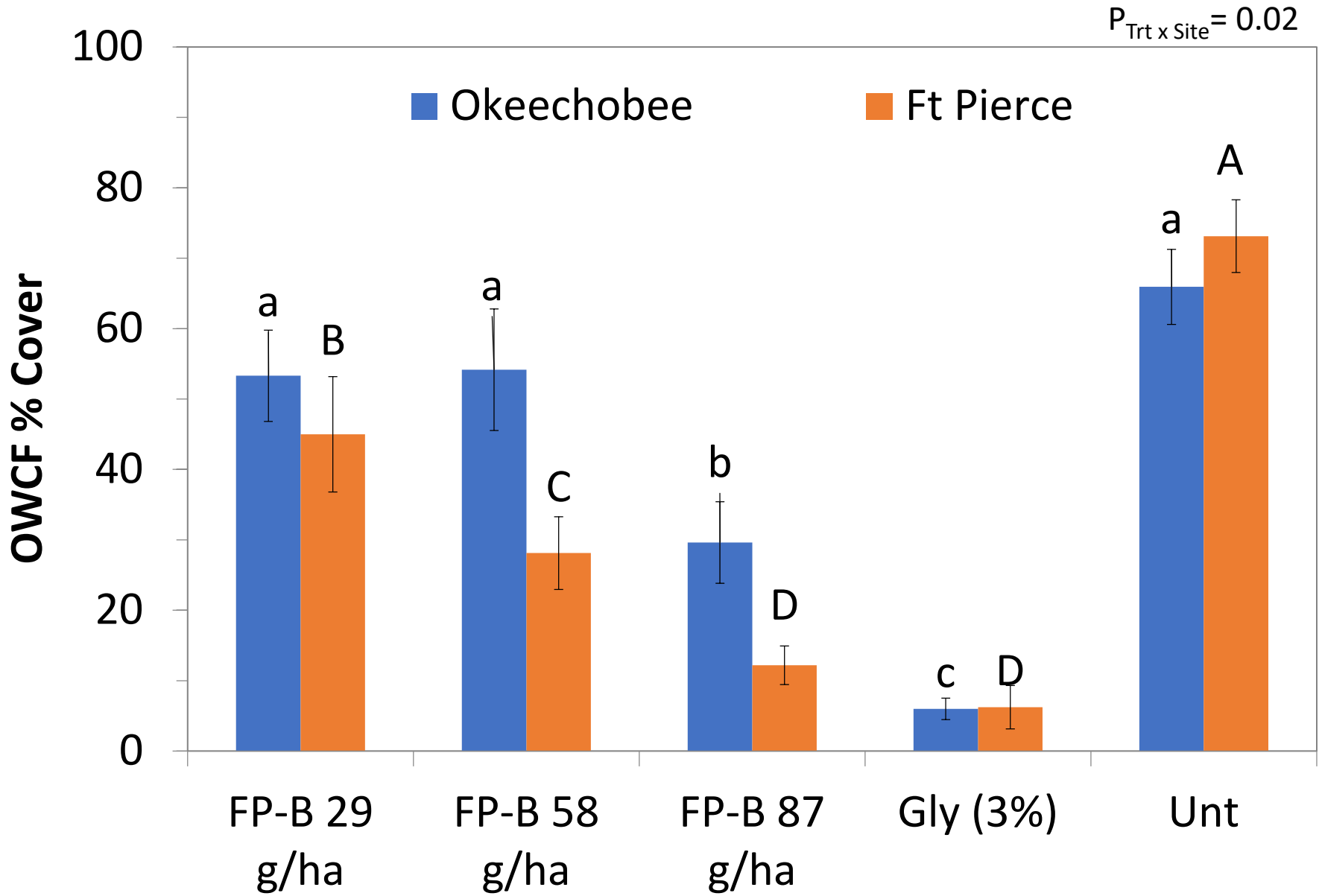
OWCF Response to Triclopyr Formulation (360 DAT)



OWCF Response to Florpyrauxifen-Benzyl (180 DAT)



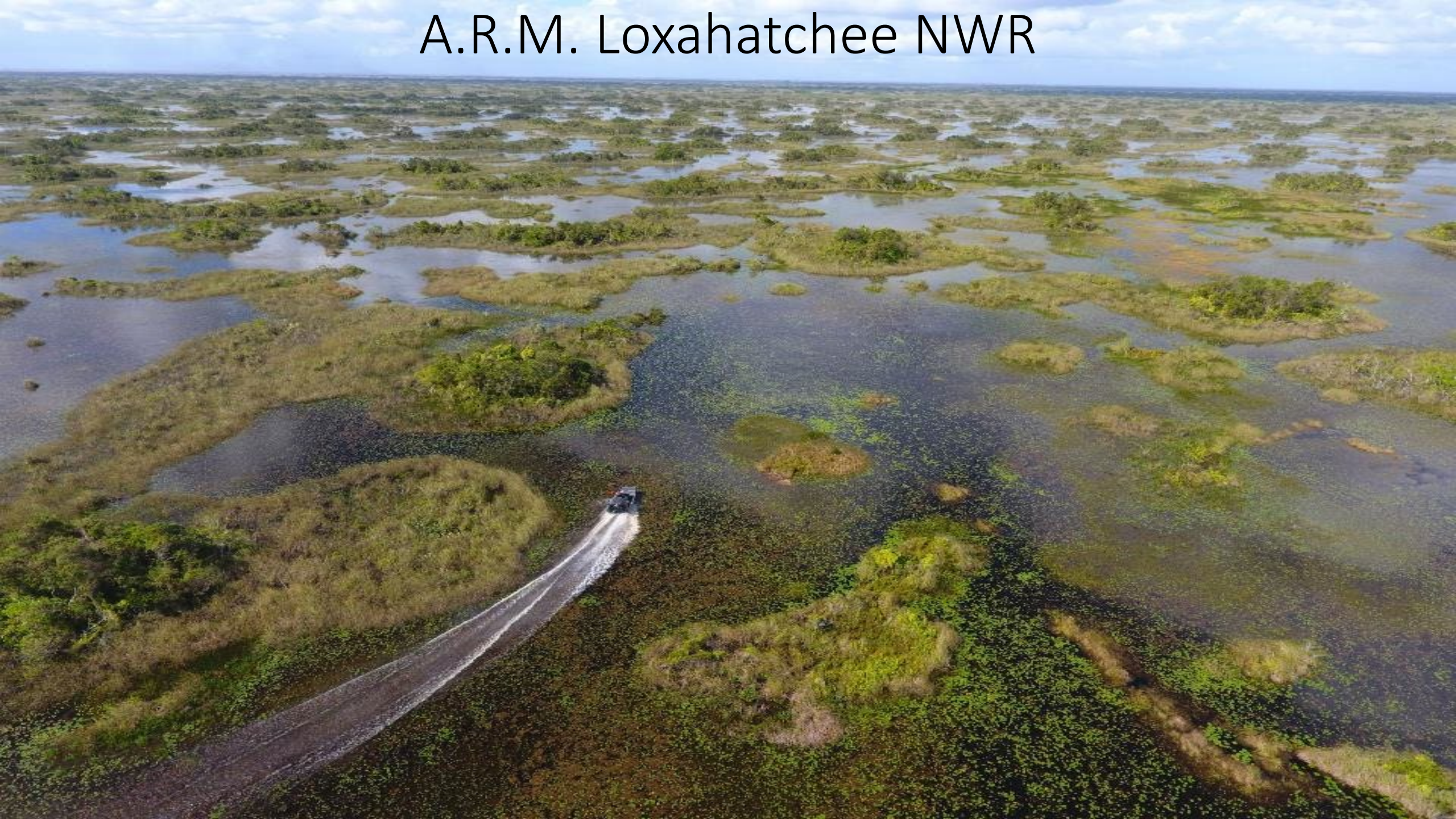
OWCF Response to Florpyrauxifen-Benzyl (360 DAT)



Trial Conclusions

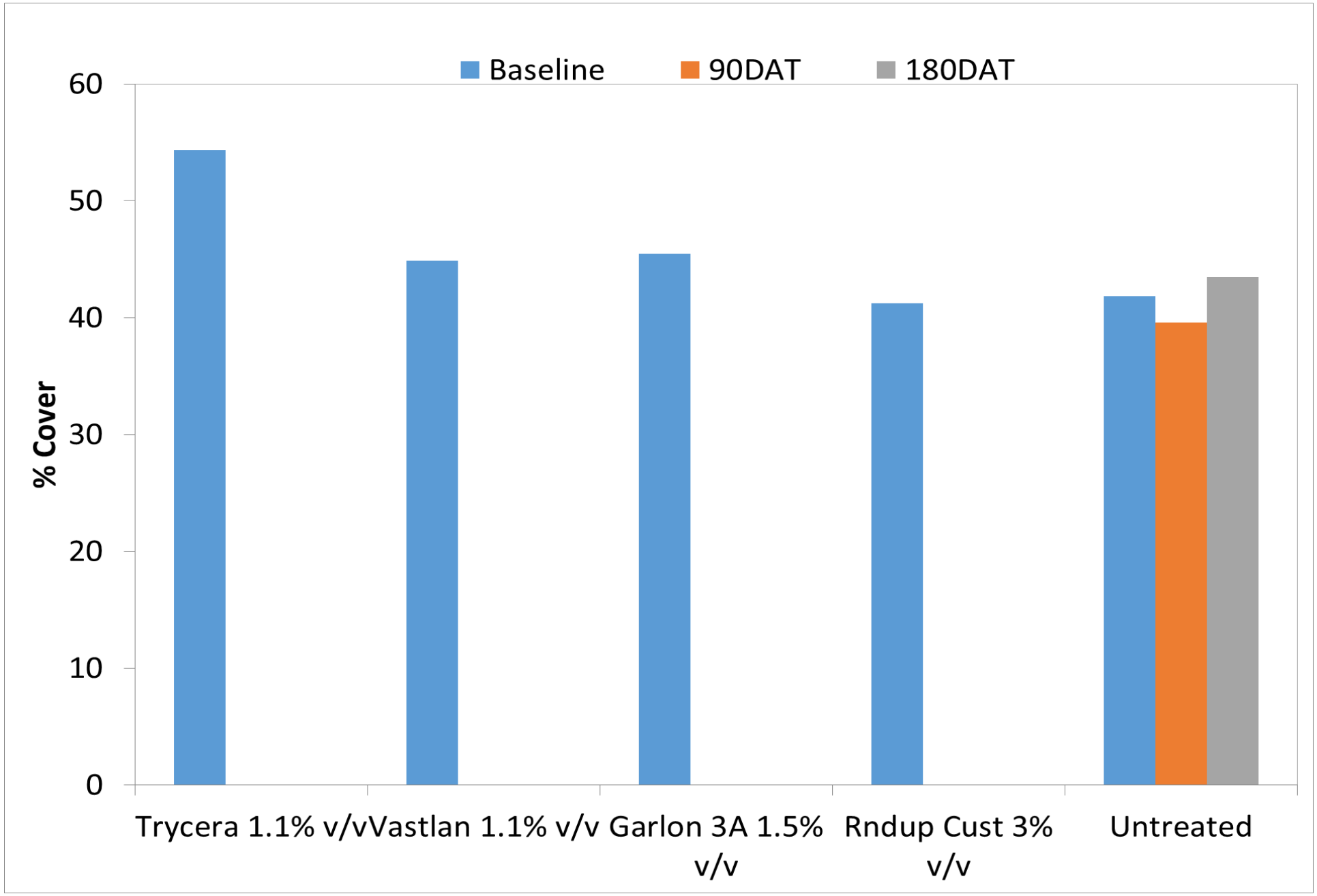
- Multiple triclopyr formulations are potential alternatives to glyphosate
  - Some significant variation in formulation efficacy at 12 MAT between sites
    - Hydrology related
    - Current mesocosm studies addressing this
- Florpyrauxifen-benzyl
  - Documented its efficacy on OWCF
  - Very slow acting
  - Somewhat less consistent than glyphosate
  - Need to refine rates/formulations
  - Evaluate selectivity

A.R.M. Loxahatchee NWR

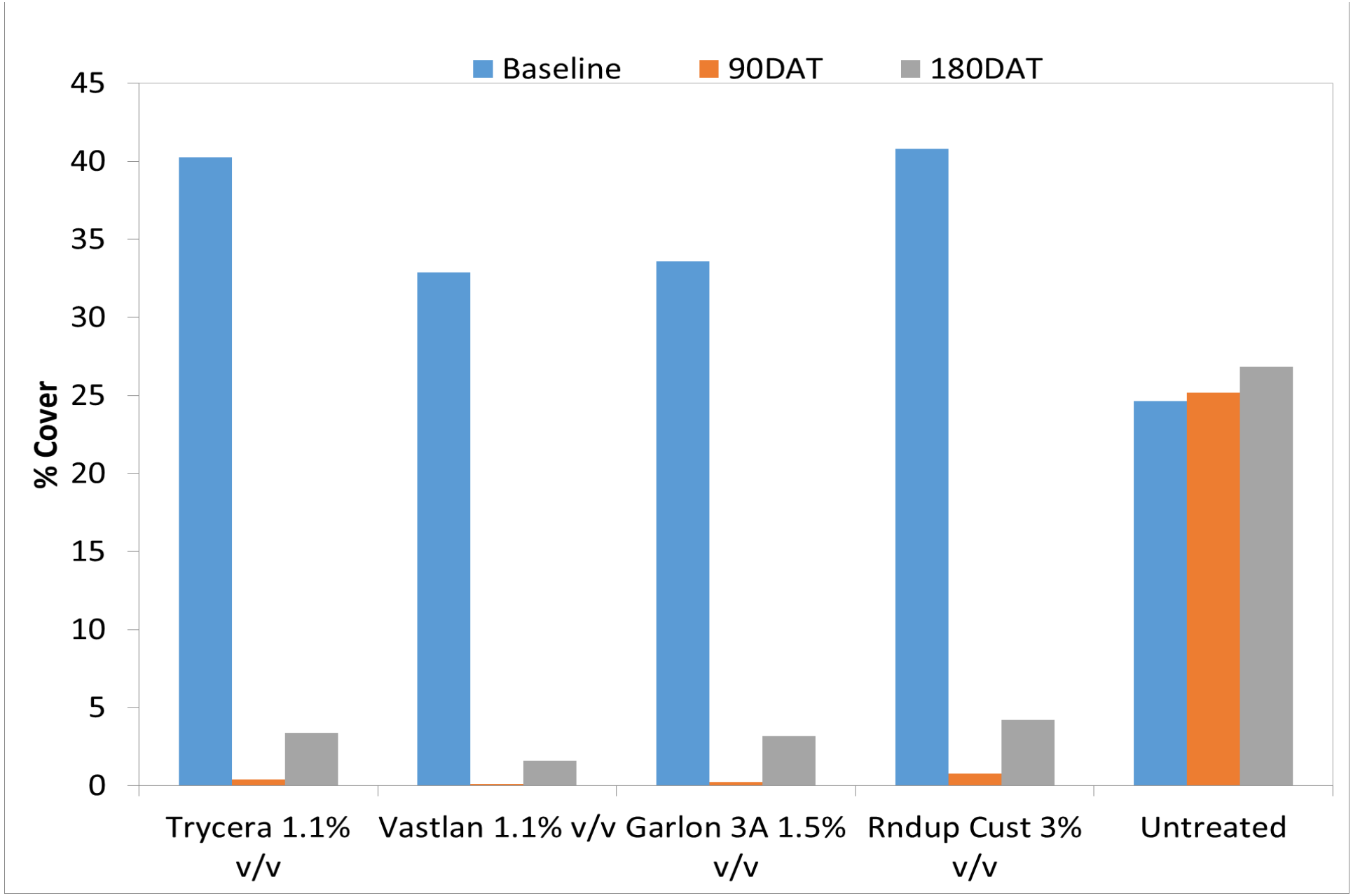



MID LEVEL DATA
GROUND LEVEL DATA

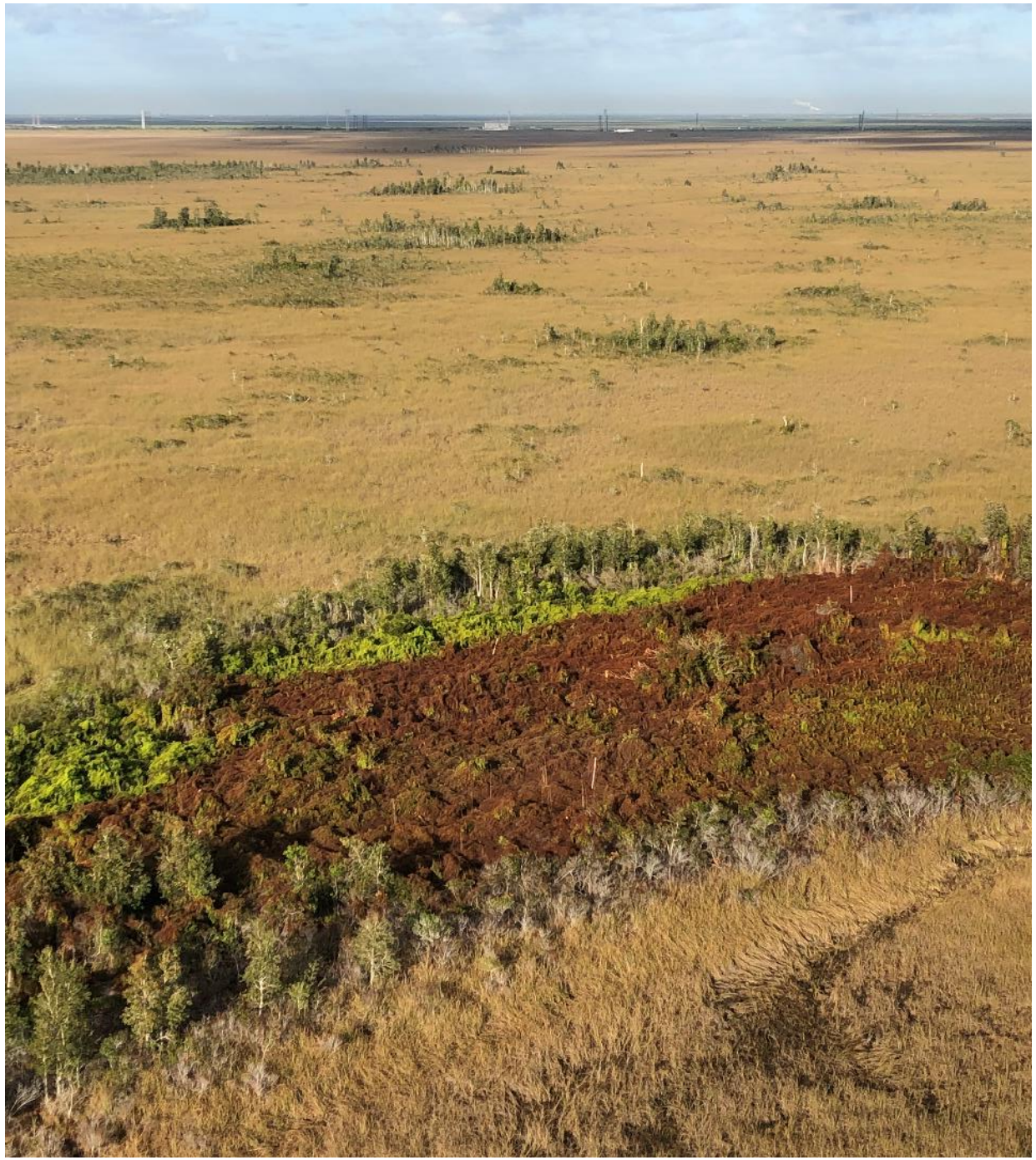
Mid Level Data



Ground Level Data



Aerial Treatments Florpyrauxifen-benzyl

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Ongoing and Future Research

- Tree Island Ground Treatments- Currently 40 Islands
  - Florpyrauxifen-benzyl
  - Triclopyr
- Tree Island Aerial Treatments- Currently 20 Islands
- Tree Island Retreatment Intervals- Currently 80 Islands
- Kissimmee River Floodplain Aerial Treatments- 10 acres
- Poodle cutting
  - Florpyrauxifen- benzyl
  - Triclopyr Acid
- Mesocosm studies
  - Hydrology
  - Seasonality
- Herbicide Efficacy and Tank Mixes
- Evaluation of UAS for mapping and treating OWCF
- IPM Studies with USDA

Acknowledgements

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Thanks! Questions?

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