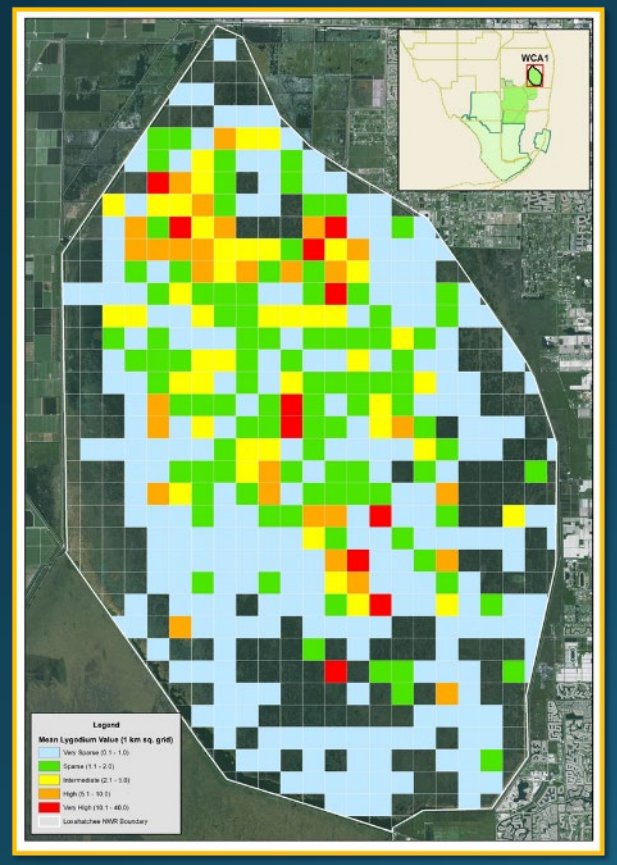
Enhancing Invasive Plant Management Through Multi-Scale Monitoring:

Update from the the A.R.M. Loxahatchee National Wildlife Refuge



LeRoy Rodgers

South Florida Water Management District

GEER 2025

Coauthors: *Alex Onisko*[1], *Brendon Hession*[1], *Rebekah Gibble*[2]

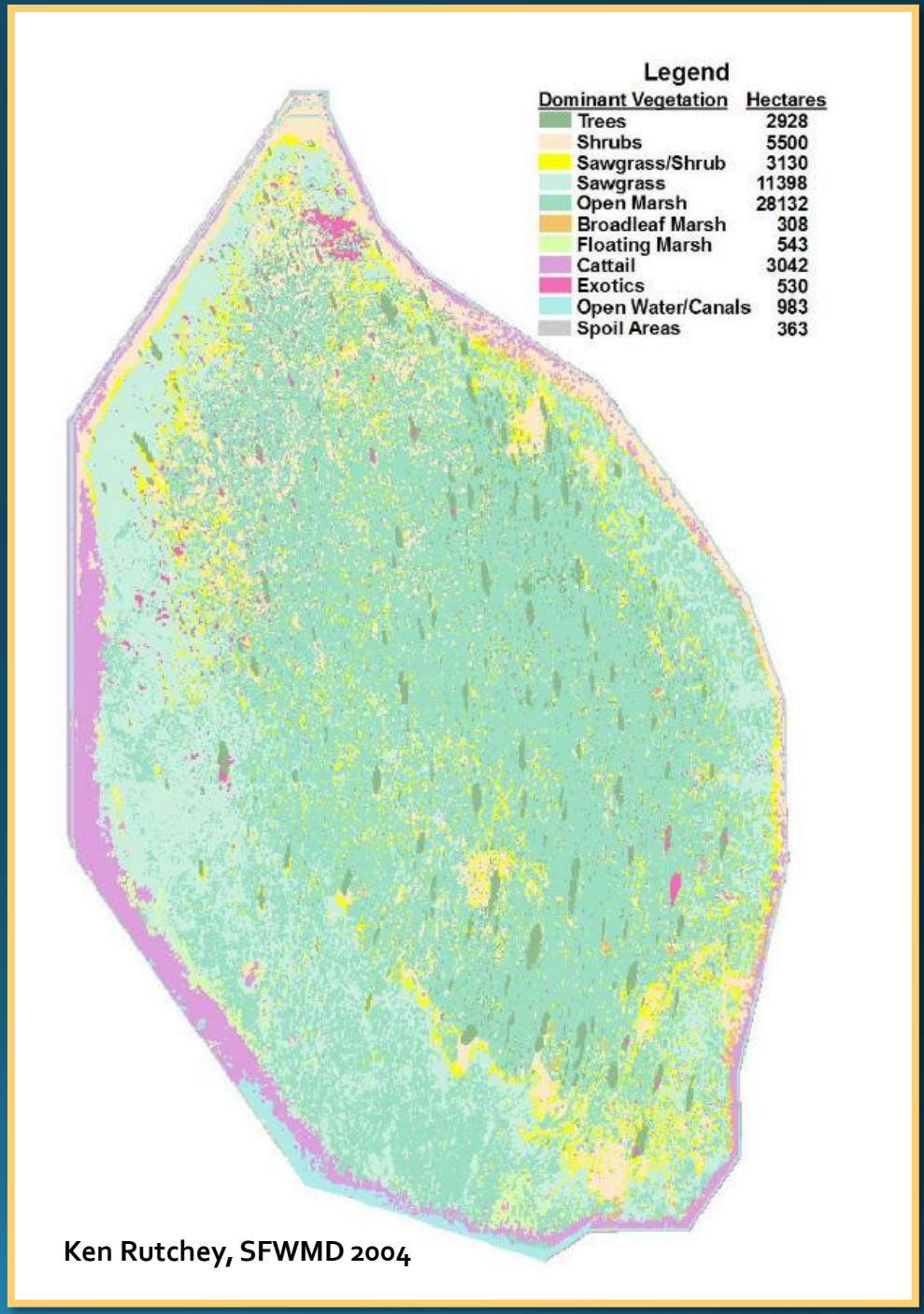
[1]SFWMD, [2]USFWS

A. R. M. Loxahatchee National Wildlife Refuge

- aka Water Conservation Area 1
- South-central Palm Beach County
- 221 square miles

Mosaic Landscape

- Sawgrass Ridge / Slough mosaic
- Tree Islands



Ken Rutchey, SFWMD 2004

Dominant Invasive Plants at LNWR

Melaleuca
(*Melaleuca quinquenervia*)

Old World climbing fern
(*Lygodium microphyllum*)

Old World Climbing Fern
(*Lygodium microphyllum*)

OWCF trellising into tree island canopy (plus laurel wilt on swamp bays)

Canopy collapse

Melaleuca
(*Melaleuca quinquenervia*)

Melaleuca invading sawgrass ridge

Mature melaleuca stand with lygodium understory

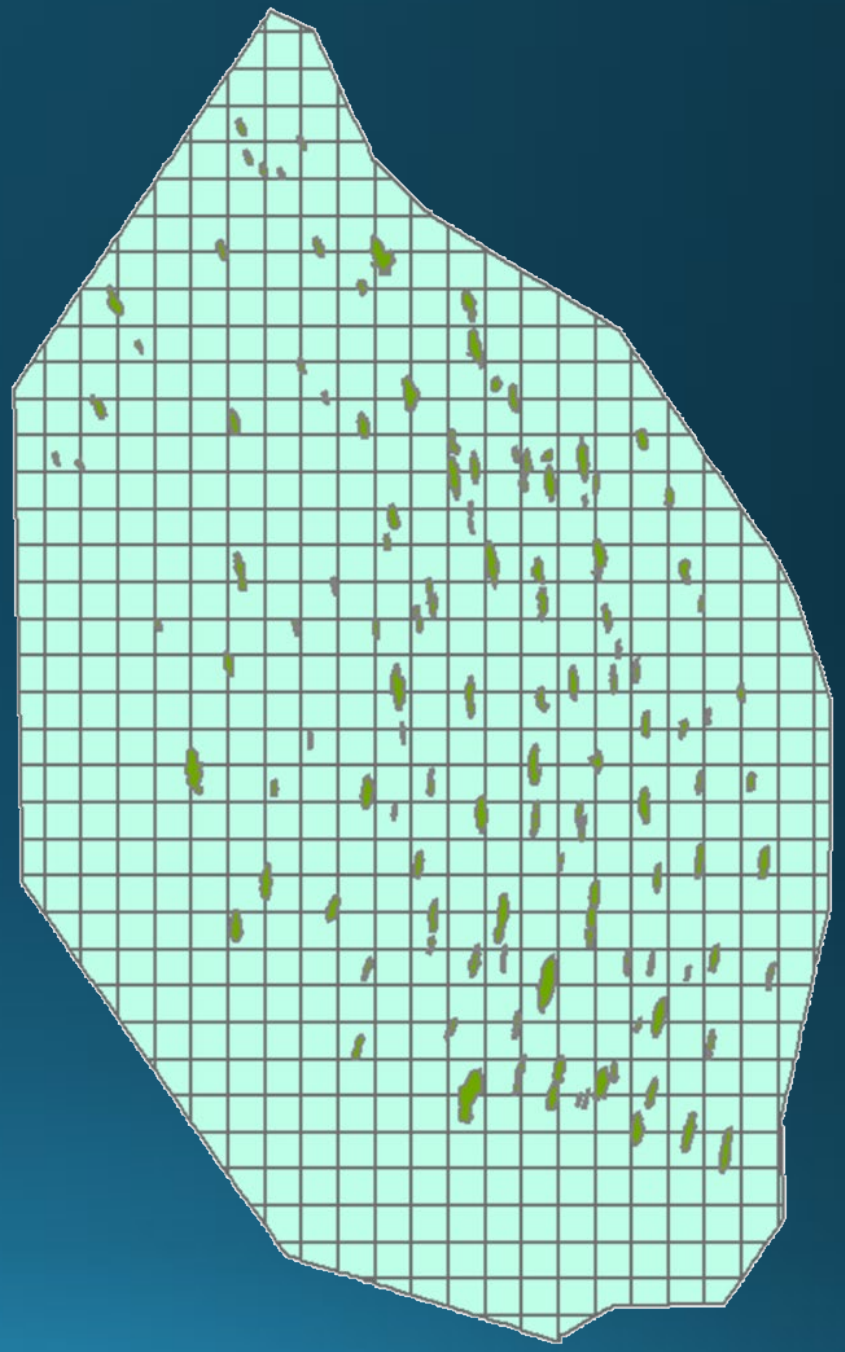
Cooperative Invasive Plant Management Effort

- 2018 License Agreement between FWS and SFWMD
  - FWS manages WCA 1 as NWR
  - SFWMD implements invasive plant management
- Funding support from FWS, FWC and SFWMD
- Funding target = $6.5 million/ yr. (*contractual services*)

sfwmd.gov

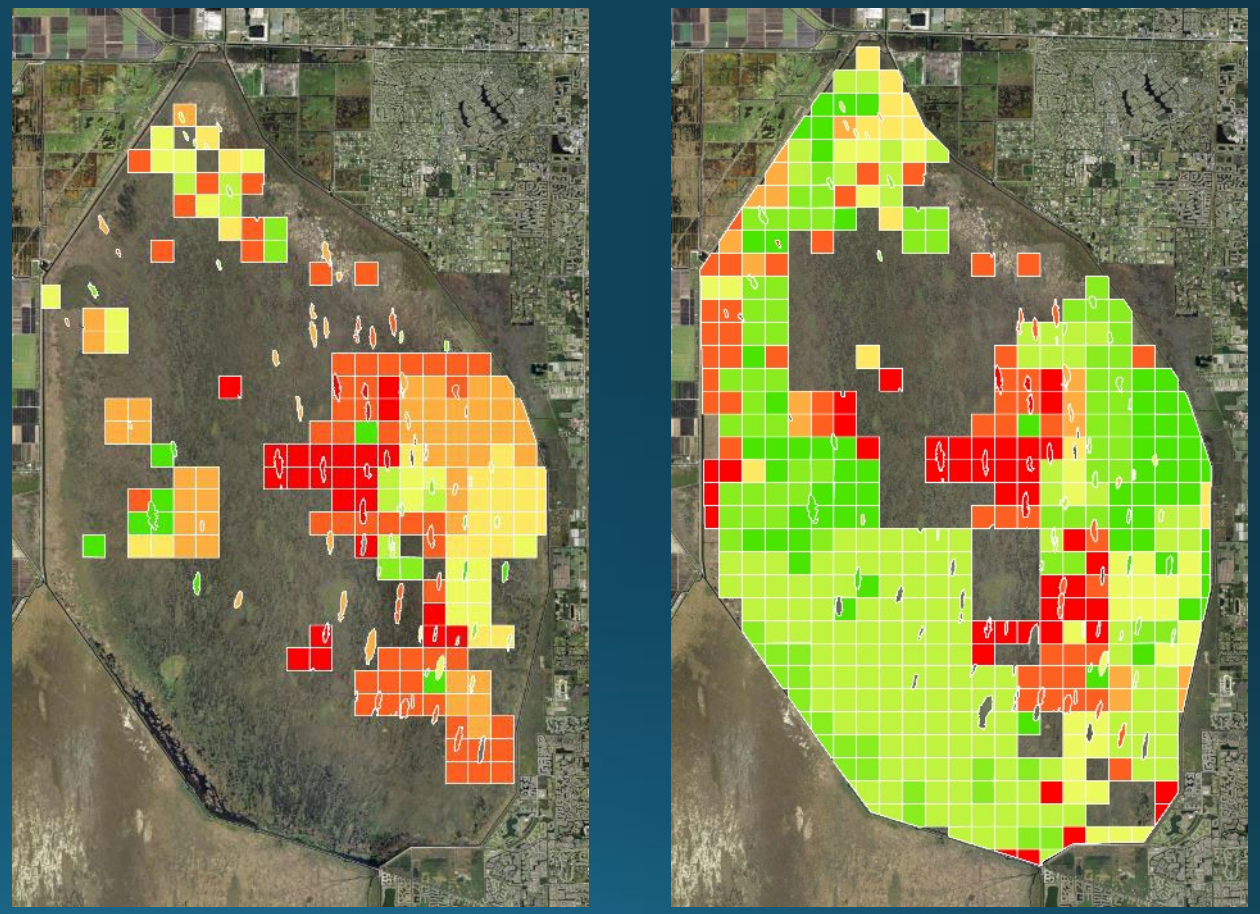
Strategy

- 1 km grid used to for inventory and management prioritization
  - Planning, operations, monitoring and reporting
  - Follow systematic containment strategy
- Large tree islands tracked separately
  - Triage strategy
- Utilize herbicides, fire, biological controls
- Seasonal site access



Progress to Date: 2018-2025

- 111,190 ac. swept
- 27,975 ac. treated
- Retreatments (2-6 years)
- Biological Control Agents
  - USDA-ARS
  - Neomusotima (347k)
  - Floracarrus (20.7 M)
  - Pseudophilothrips (29k)

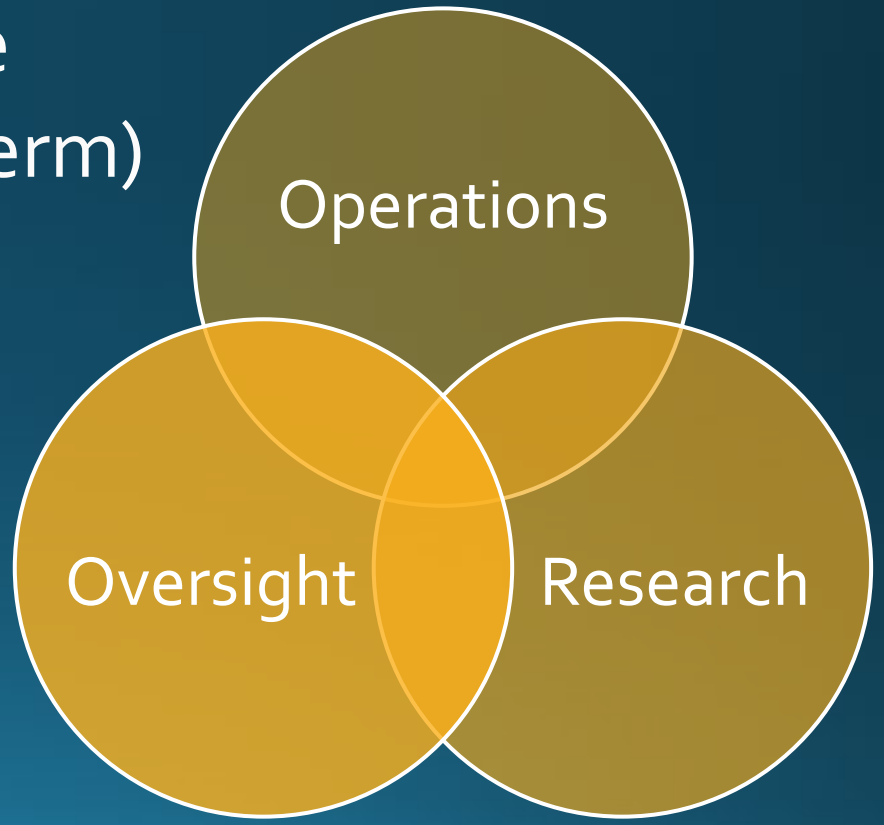


Lygodium

Melaleuca

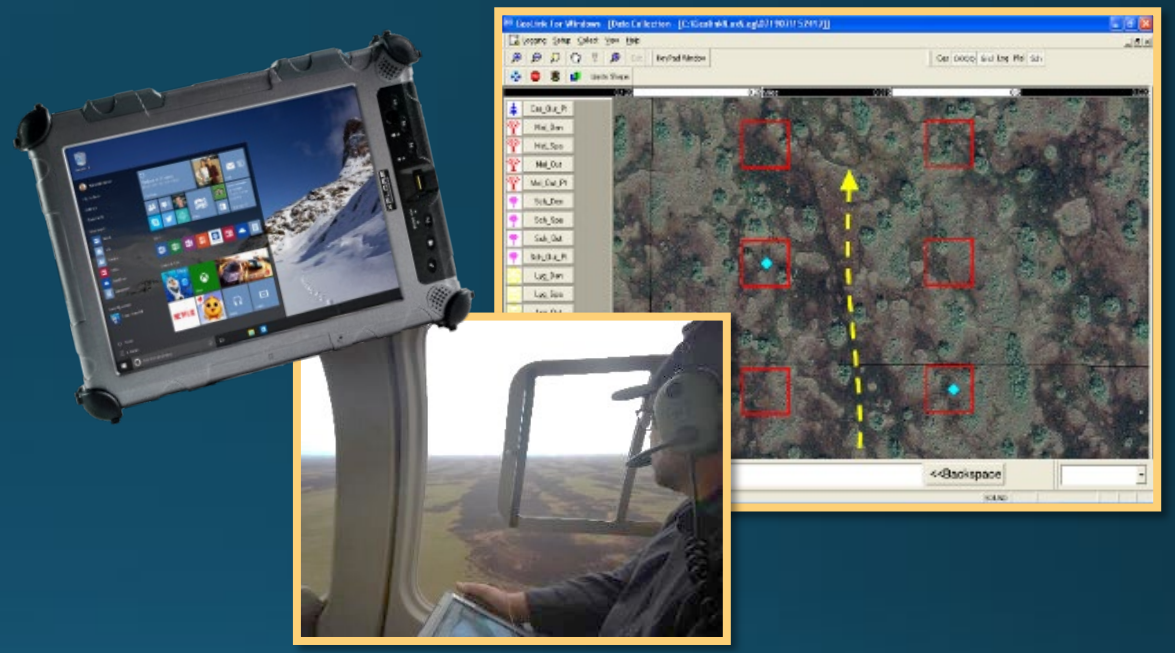
LNWR Monitoring Program

- Objectives
  - Document distribution and abundance
  - Demonstrate progress (short & long-term)
  - Information input for
    - strategies/budget
    - directing control efforts
    - adaptive management
    - improving efficiency



Monitoring Tools and Methods

- Aerial Monitoring
  - Systematic Reconnaissance Flights
  - Tree Islands
  - DMSM – Digital Mobile Sketch Mapping
    - Custom ESRI application
- Ground-based Assessments
  - Rapid grid cell surveys
  - Survey 123



Weed Technology

cambridge.org/wet

Symposium

Multiscale Invasive Plant Monitoring: Experiences from the Greater Everglades Restoration Area

LeRoy Rodgers[1], Tony Pernas[2], Jed Redwine[3], Brooke Shamblin[4] and Shea Bruscia[5]

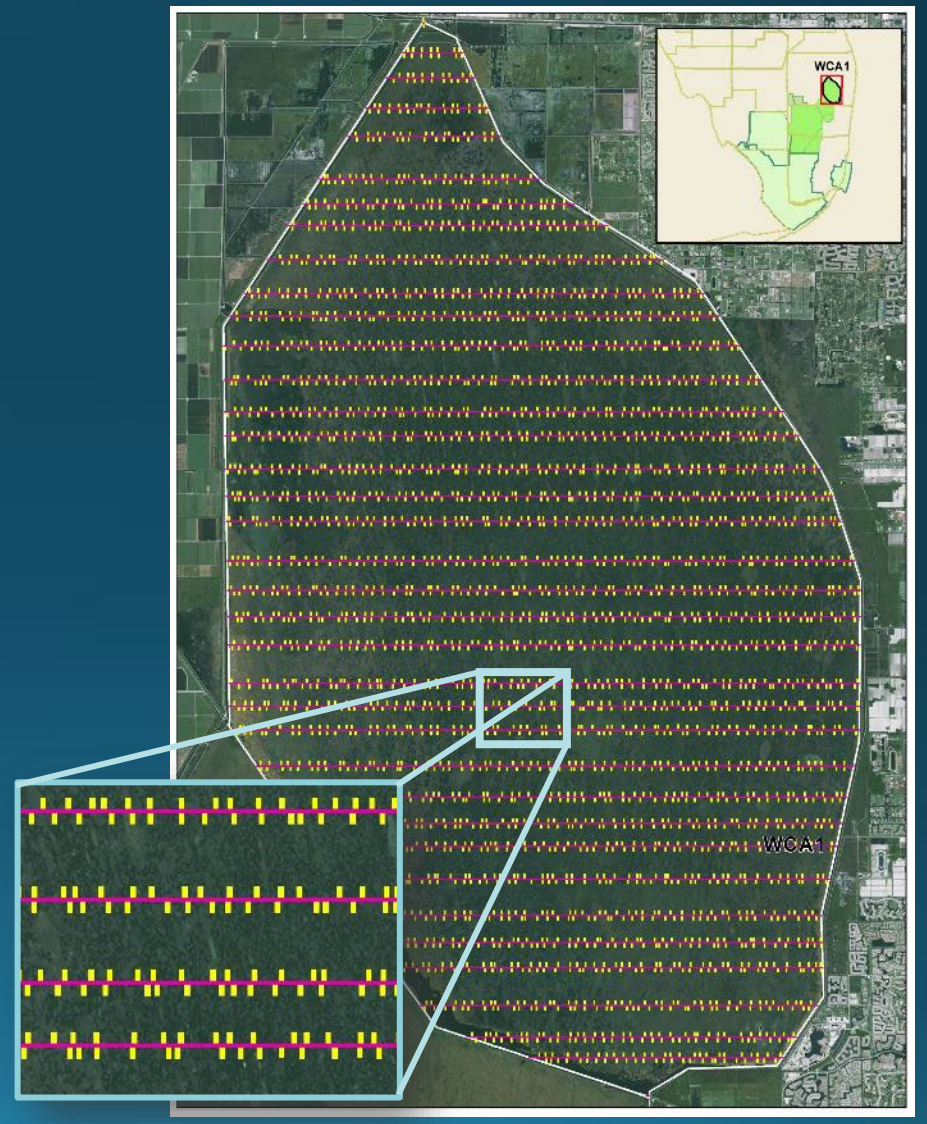
BioOne RESEARCH EVOLVED

Mapping Invasive Plant Distributions in the Florida Everglades Using the Digital Aerial Sketch Mapping Technique

Author(s): LeRoy Rodgers, Tony Pernas, and Steven D. Hill
Source: Invasive Plant Science and Management, 7(2):360-374. 2014.
Published By: Weed Science Society of America
DOI: http://dx.doi.org/10.1614/IPSM-D-12-00092.1
URL: http://www.bioone.org/doi/full/10.1614/IPSM-D-12-00092.1

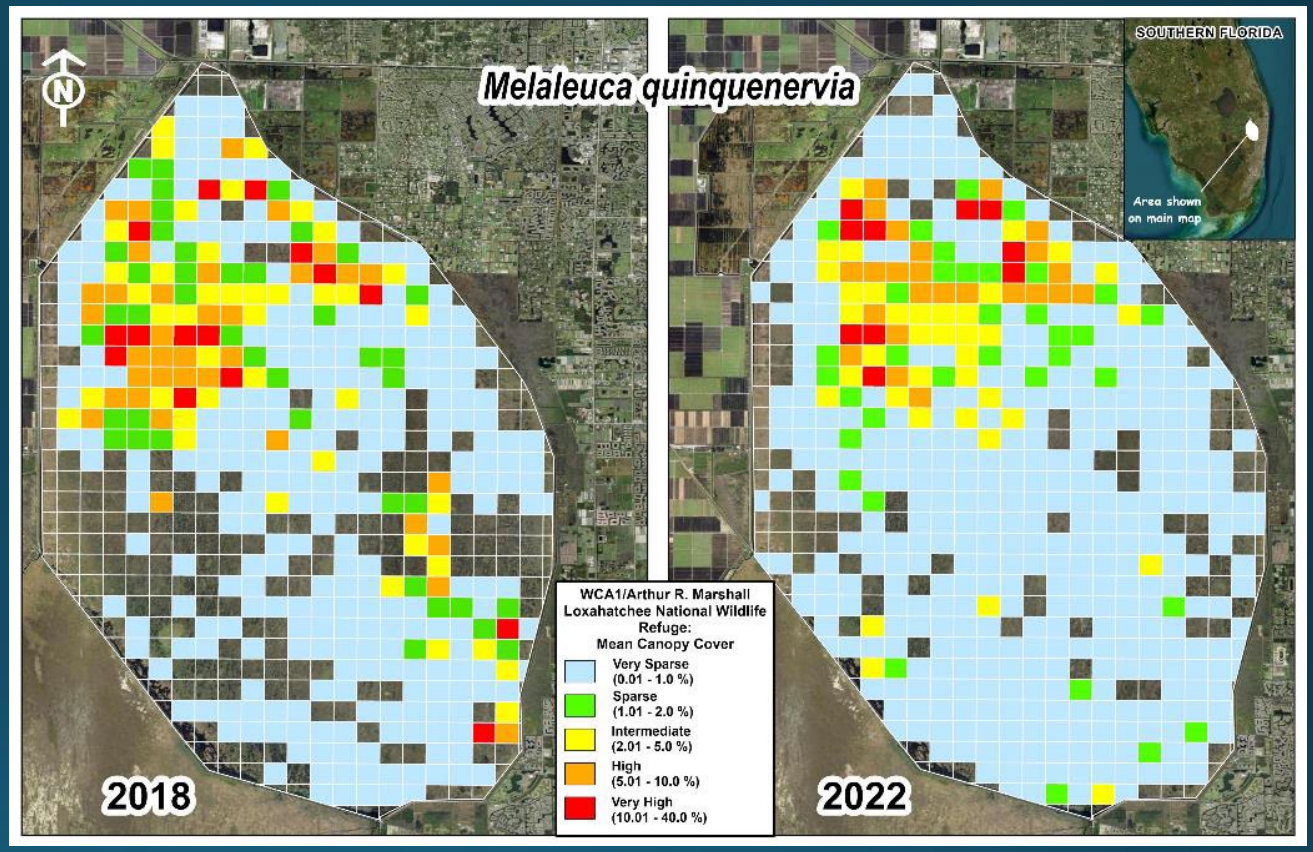
Systematic Reconnaissance Flights

- 1k transect intervals
  - One transect per 1 km grid row
  - 3375 samples (3% of area)
- ~4-year cycle
- Landscape scale distribution and abundance
- Long term trend assessments



Systematic Reconnaissance Flights

	Cover Class	Area Occupied 2025 (ac)	Percent Change 2018 - 2022
Melaleuca	>25%	700	-32%
	5-25%	3,911	-33%
	1-5%	17,825	-1%
	<1%	52,488	+68%
	Undetected	64,014	-23%



- Reductions in dense stands
- Low level recovery throughout southern half
- Melaleuca expansion in the north

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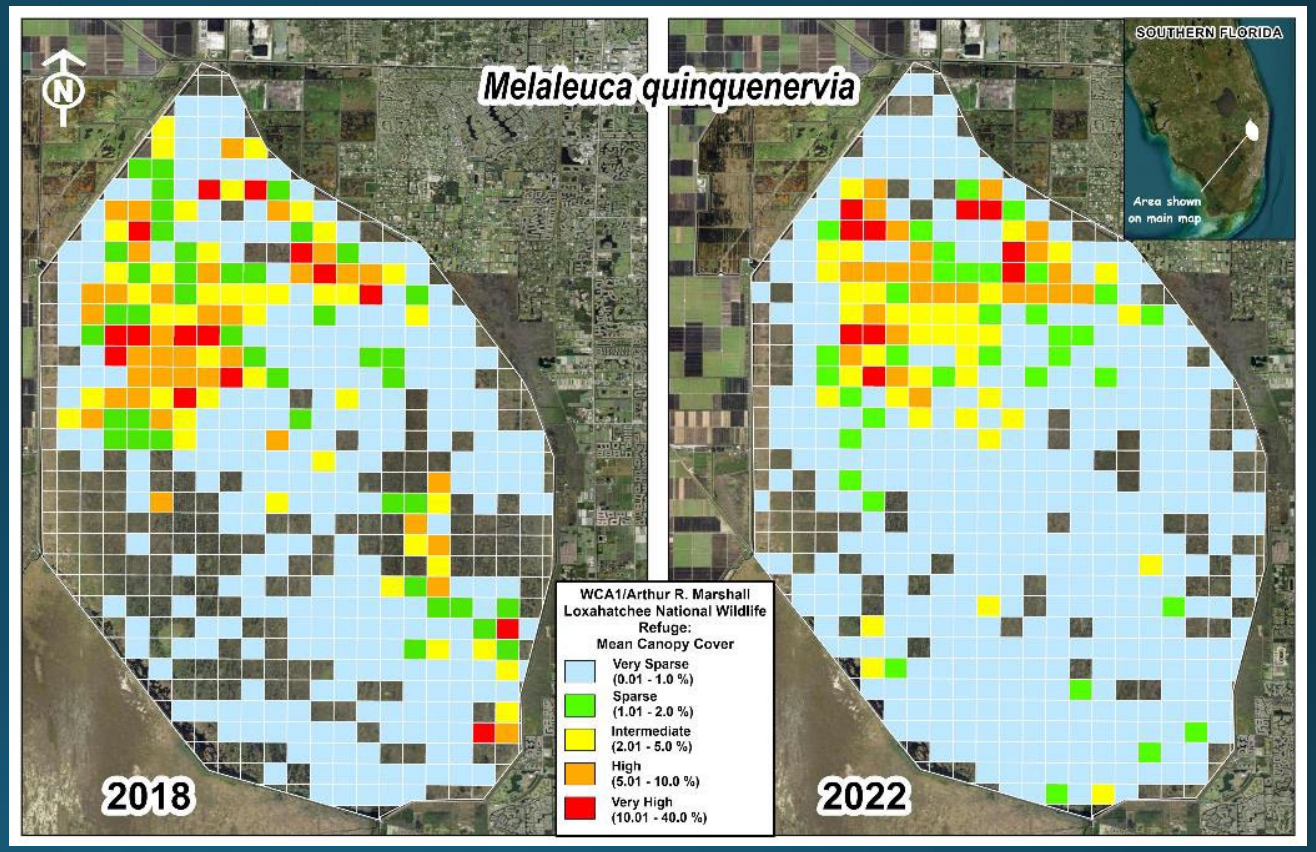

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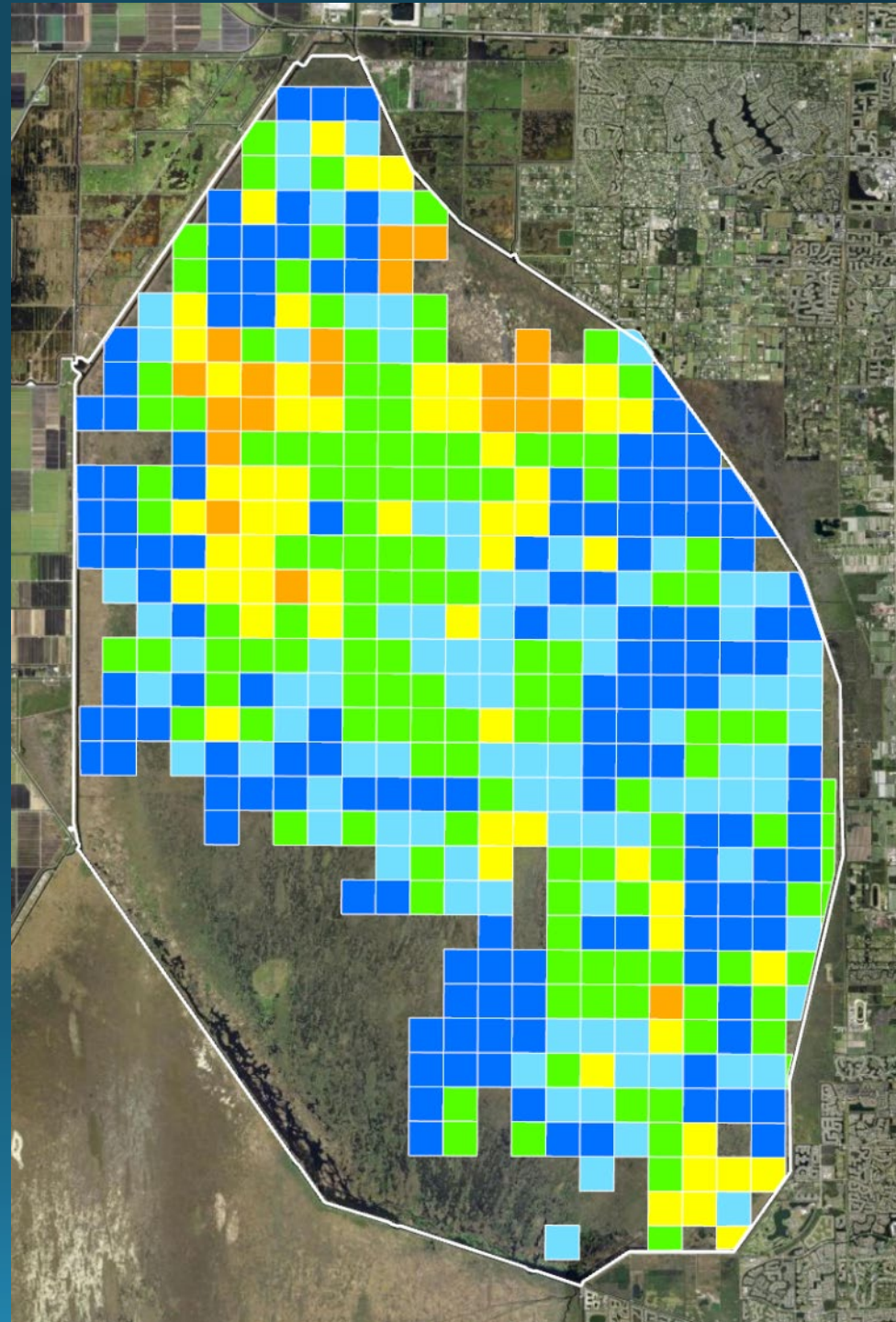
Ground Assessments

- Airboat-based survey of each 1k grid cell
  - Categorical abundance estimate by species
  - Recommend years until retreatment
  - If retreatment need = 1-2 years, best crew configuration
  - Repeated annually
- Rapid, cost-effective tool to plan treatments



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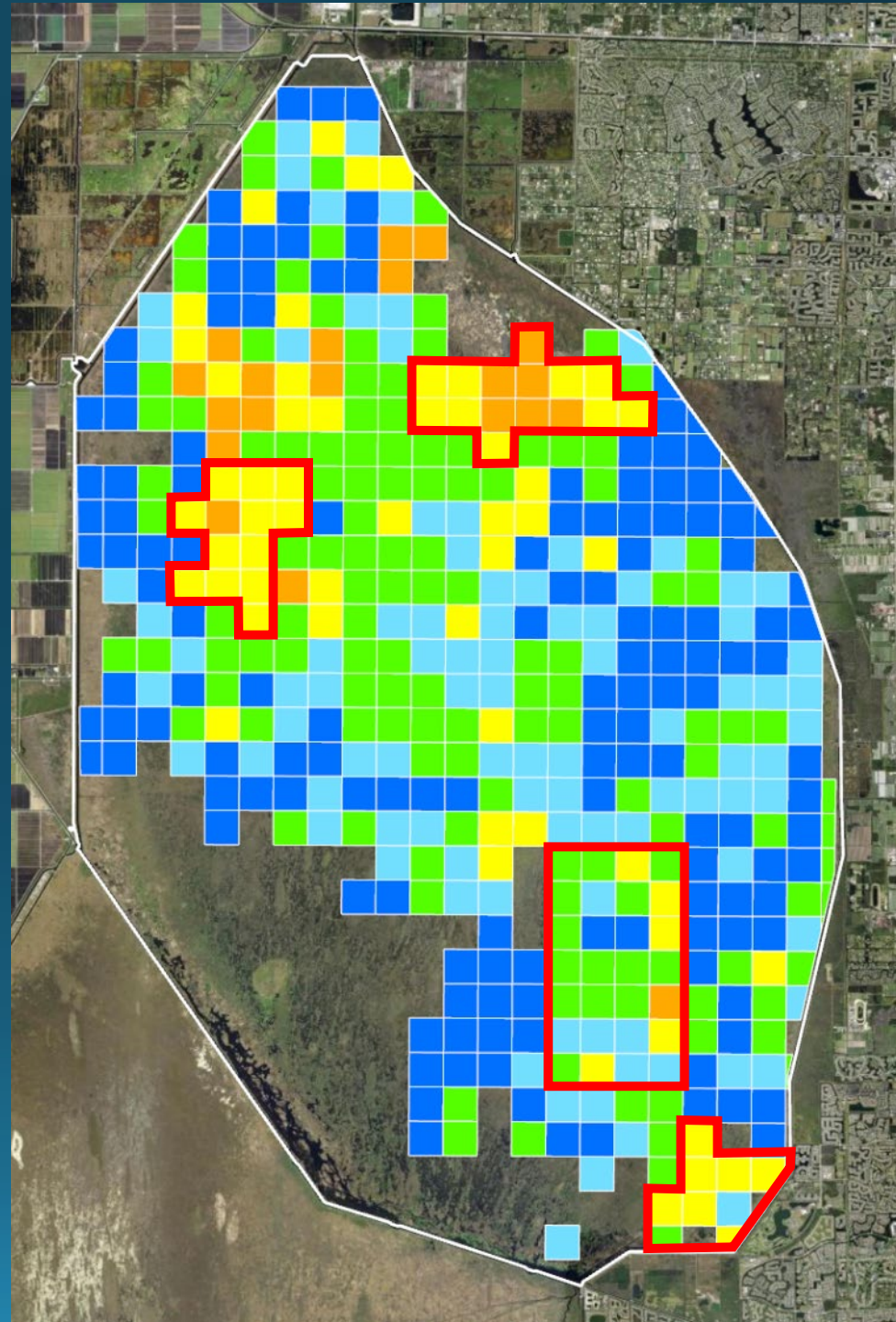
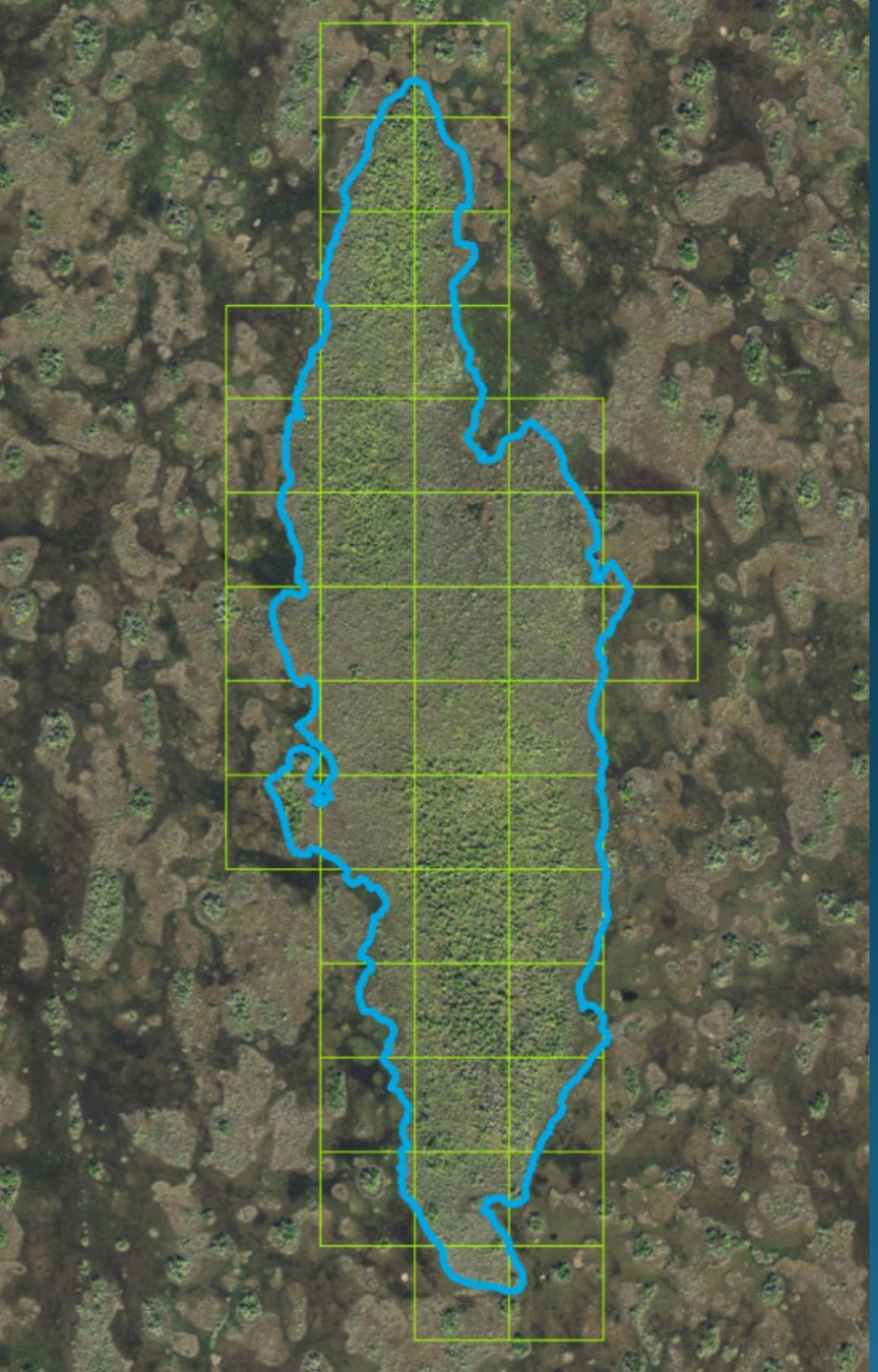
Hypothetical annual work areas

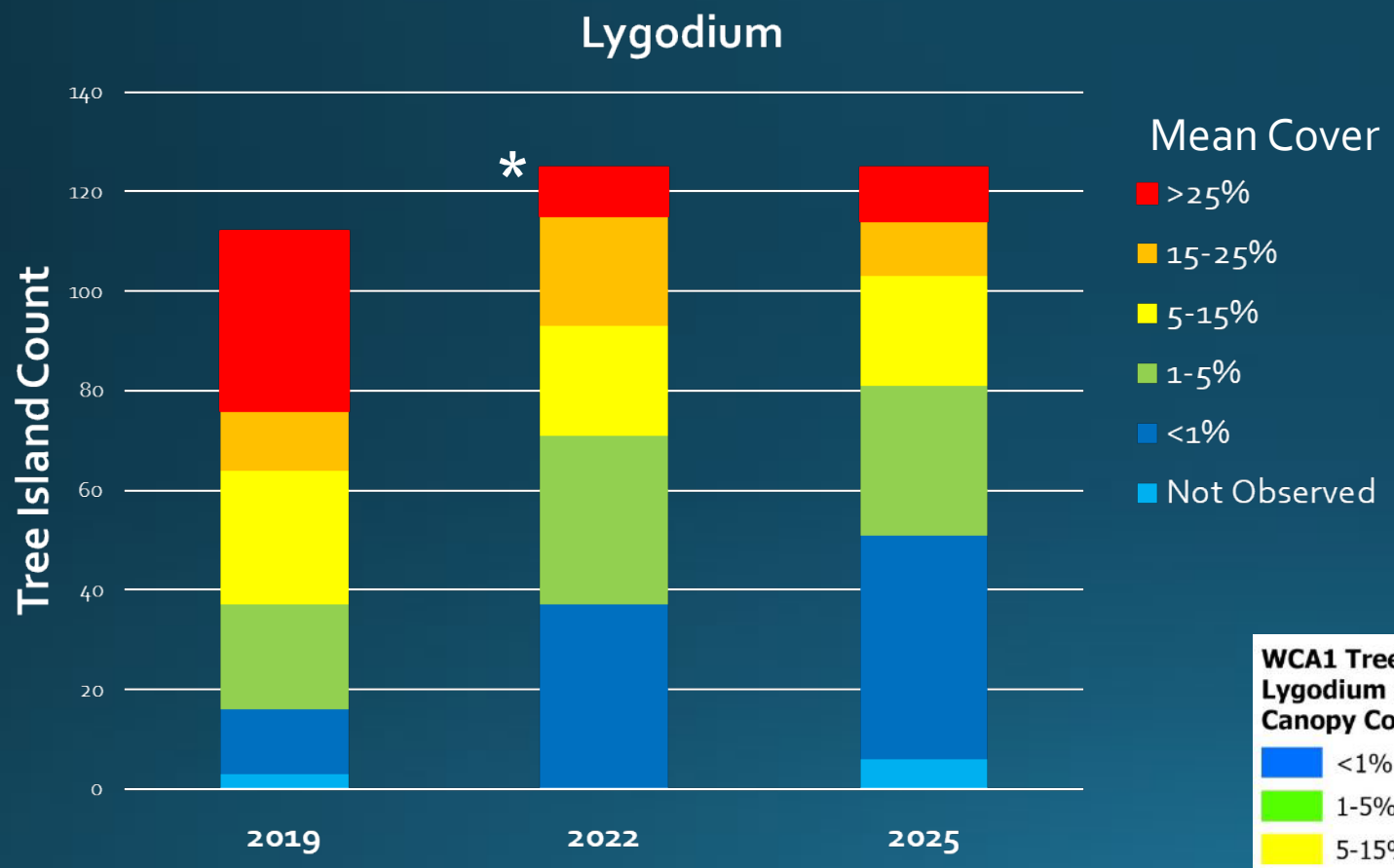




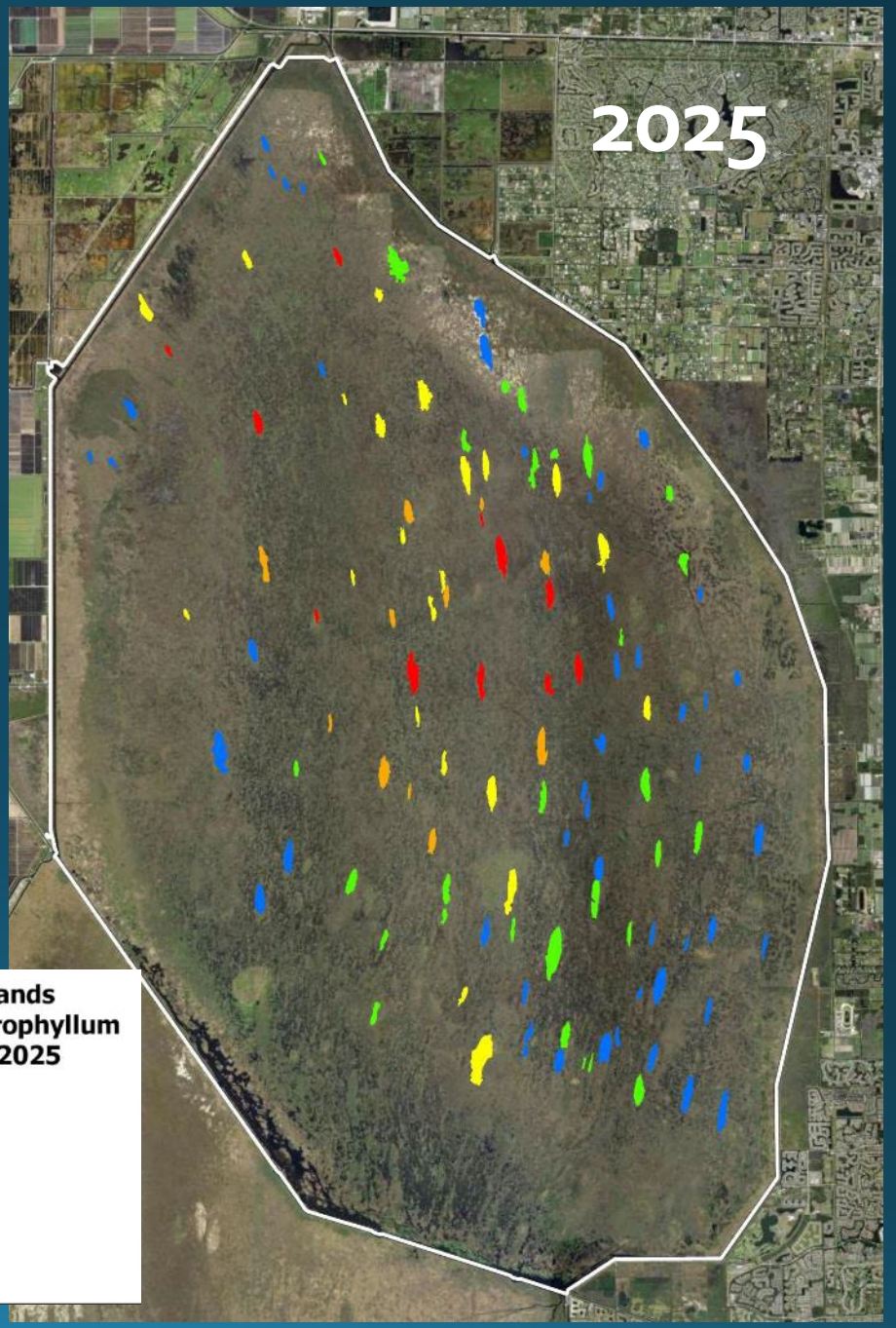
Strand Tree Island Monitoring

- Detailed assessments of invasive plant cover on strand tree islands
- Assessed all islands >8 ac.
  - Invasive species cover
  - Canopy integrity
  - 126 strand islands
- 100 m grid
- Two independent observations

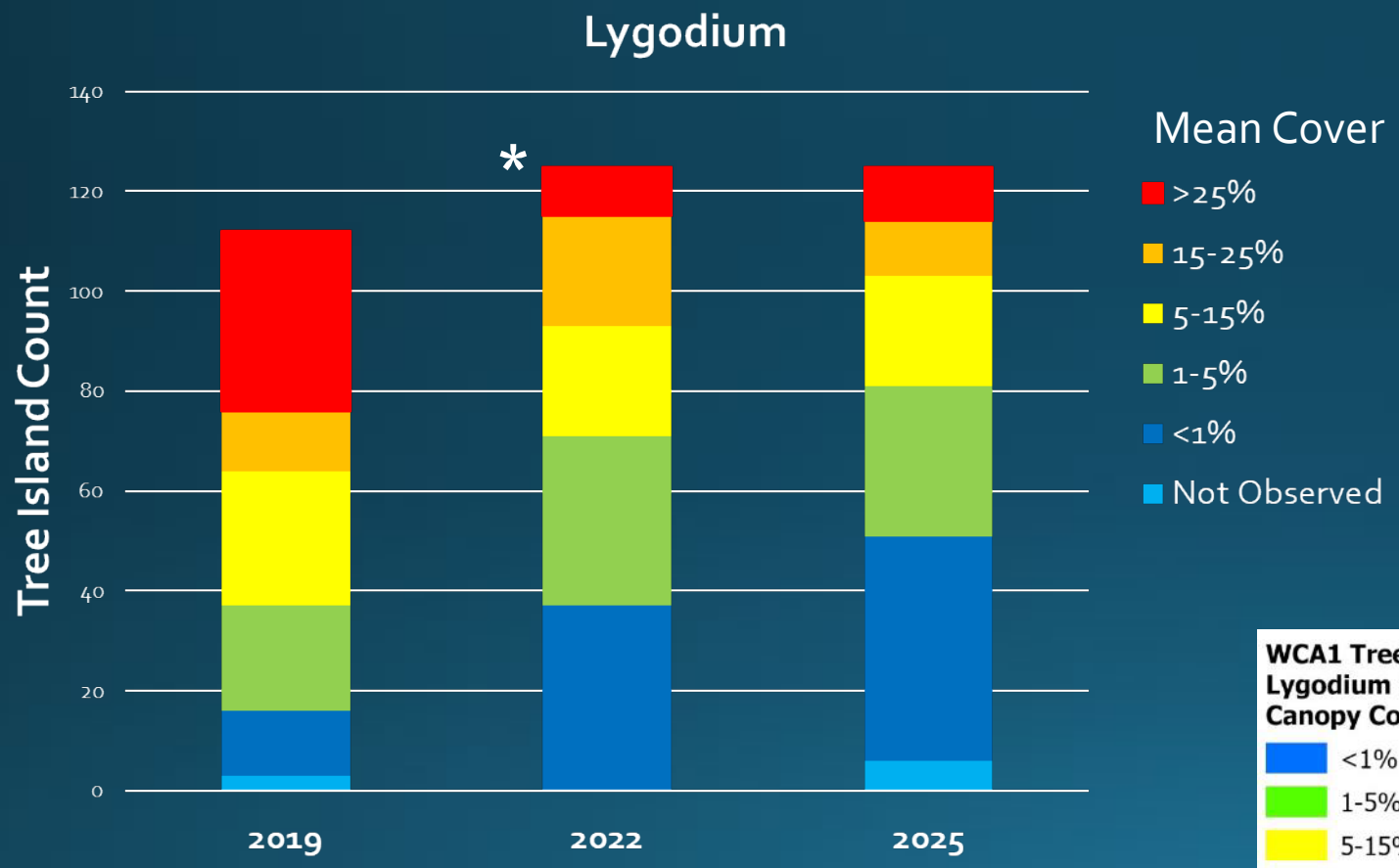
Tree Island Monitoring



*13 islands added in 2022



Tree Island Monitoring



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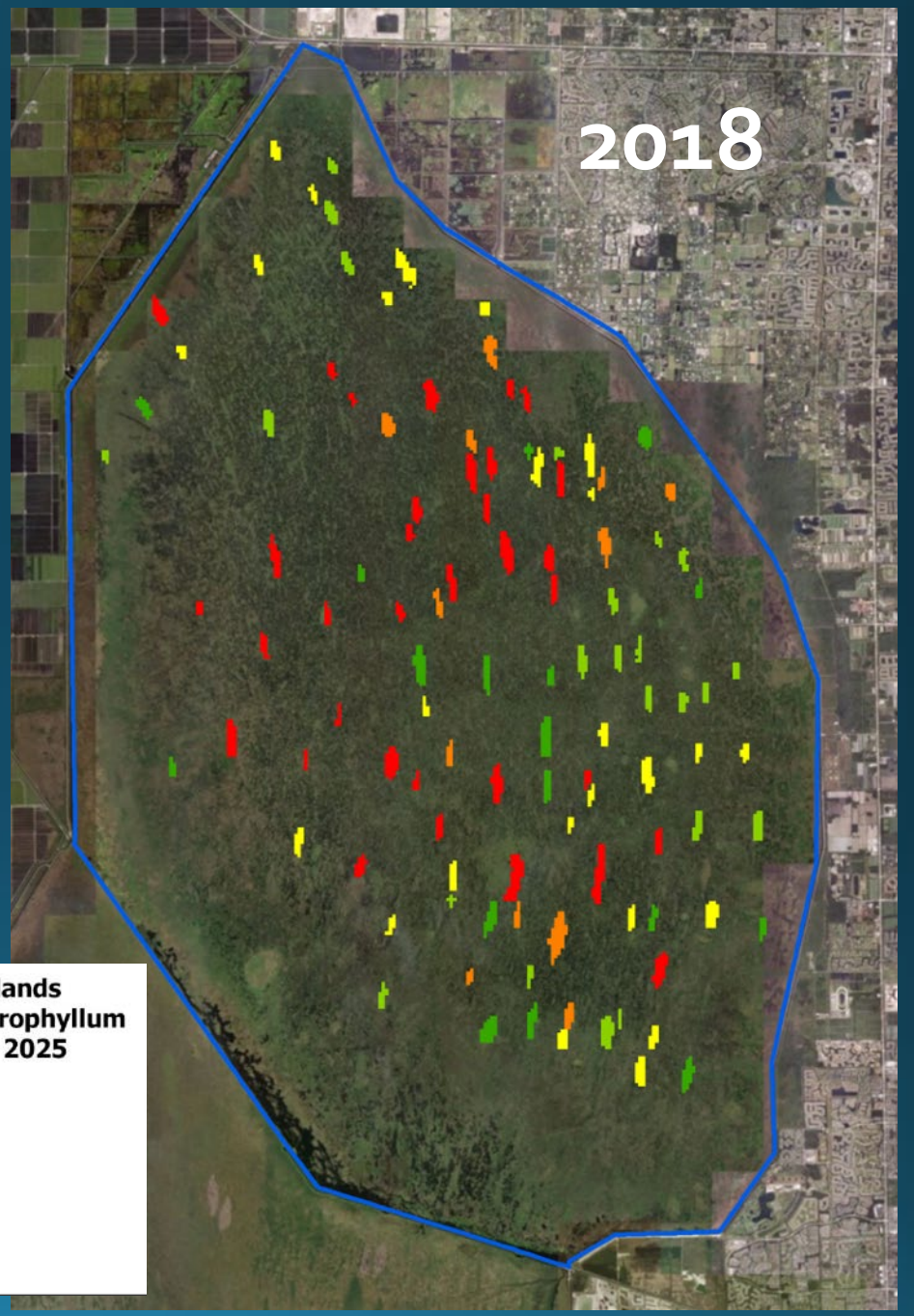
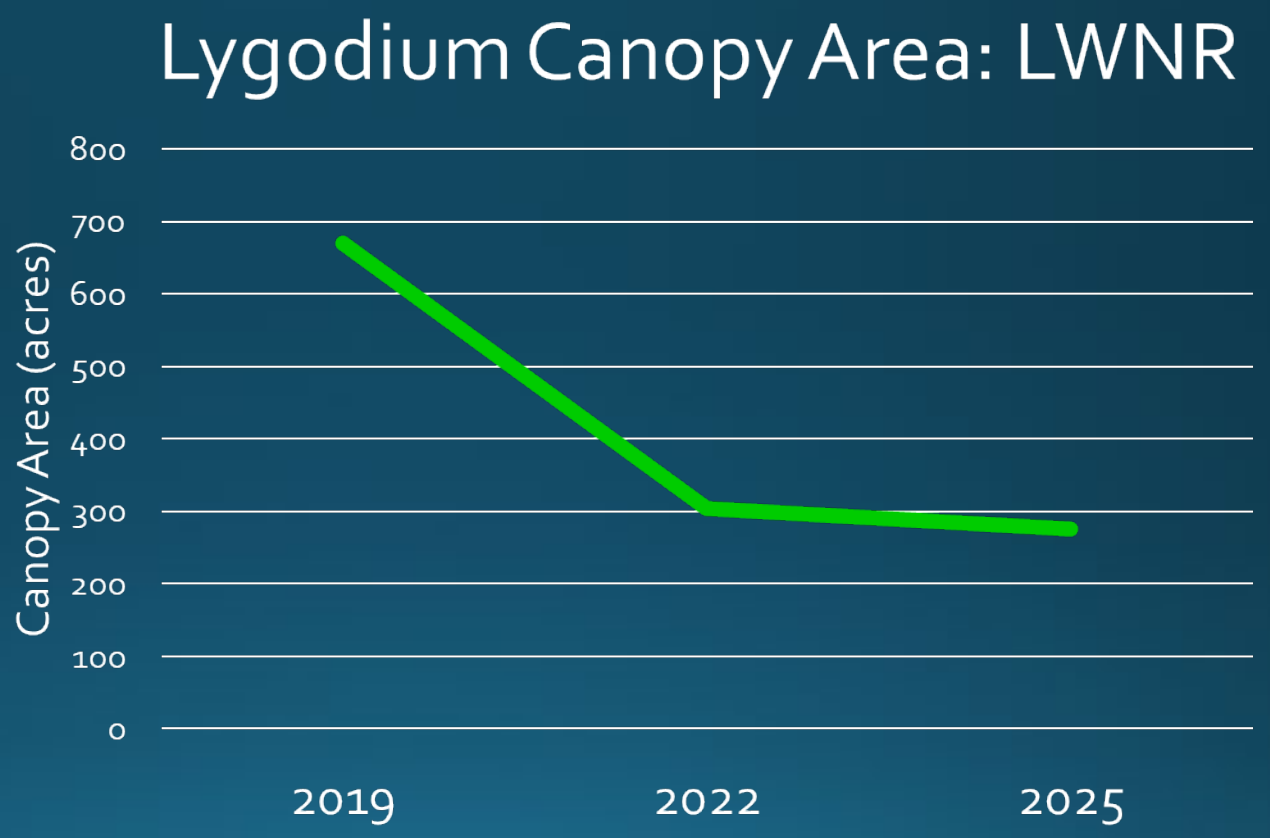


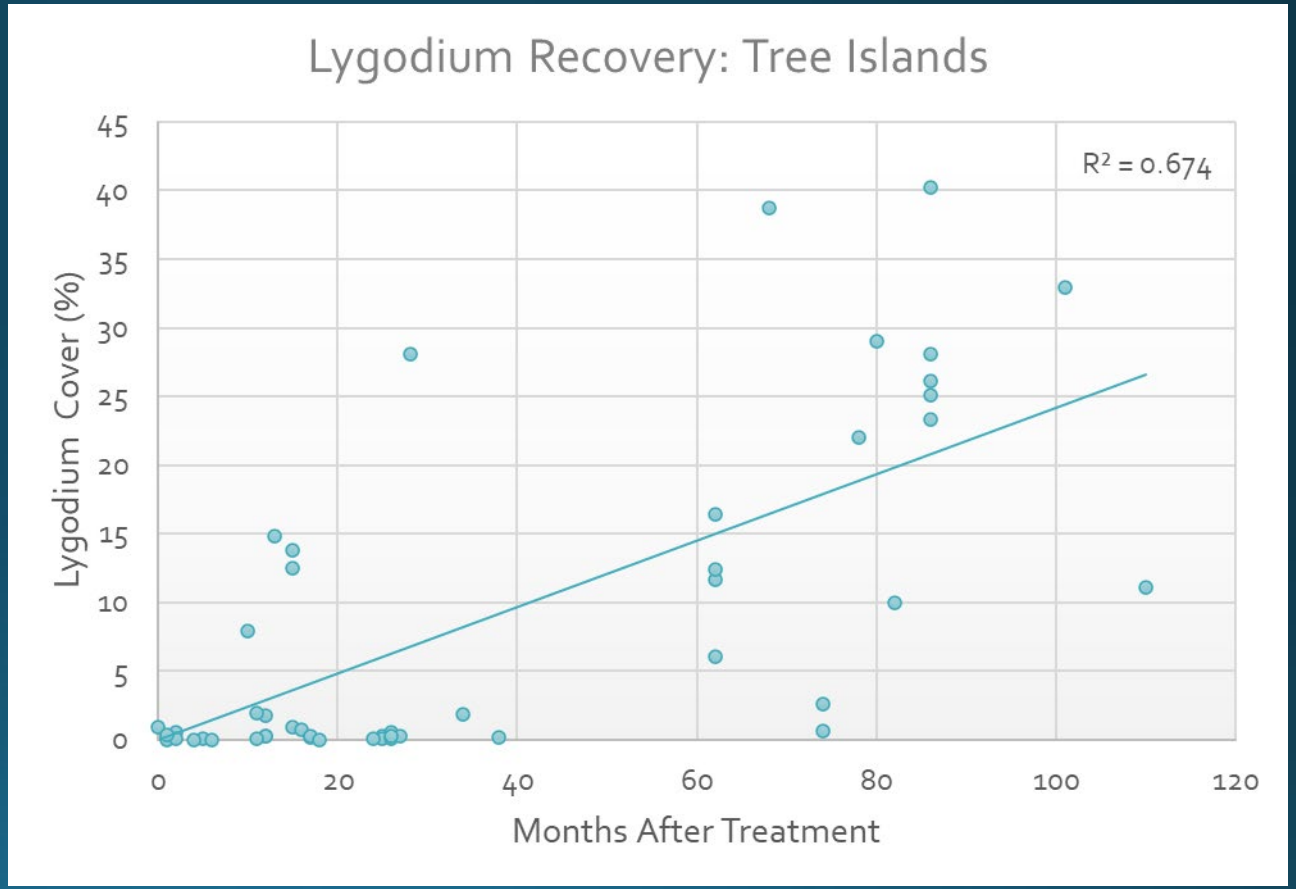
Tree Island Monitoring

- 59% decrease in Lygodium canopy cover on strand tree islands (2018- 2025)
- Leveling off between 2022 and 2025 reflects emphasis on retreatments



Lygodium Recovery

- Post-herbicide treatment recovery rates highly variable
- Retreatment generally recommended within three years
  - But not always necessary. Why?
- Factors influencing recovery?
  - Previous treatment history
  - Hydroperiod
  - Plant community factors



Take Aways

- Encouraging trends for Melaleuca and Lygodium at LNWR, but we have a long way to go
- Integrating monitoring designs is meeting multiple monitoring objectives
- Tree island monitoring program informs triage strategy and is facilitating sustained maintenance control
- Next Monitoring Steps
  - Investigate recolonization drivers
  - Assess post-herbicide native vegetation recovery patterns
  - Drone-based tree island monitoring

Many Thanks

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Jackie Smith, FWC
Tony Pernas, USNPS