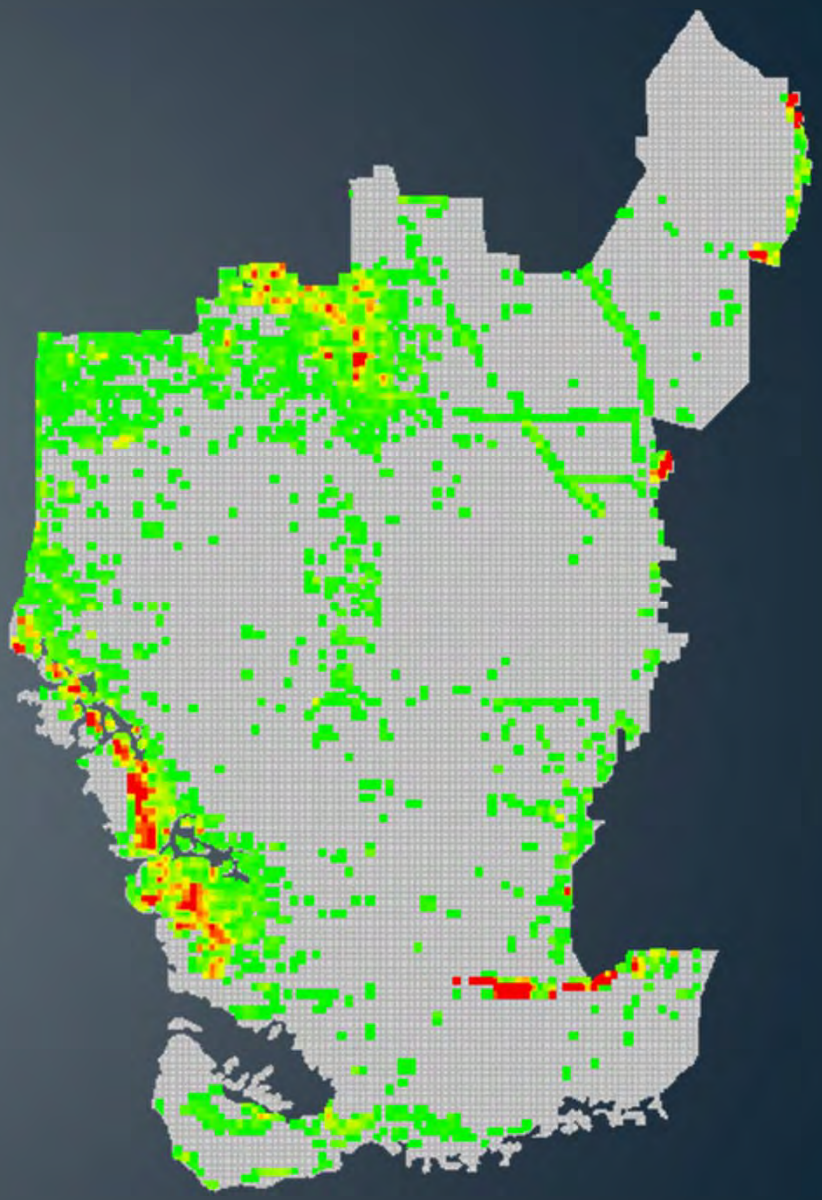
# Monitoring Invasive Exotic Plant Species in the Everglades Ecosystem

LeRoy Rodgers, Brooke Shamblin, and Jed Redwine



# State and Federal laws require accountability and monitoring

## State:

## Everglades Forever Act

- "The district shall …prepare a survey of exotic species every two years"

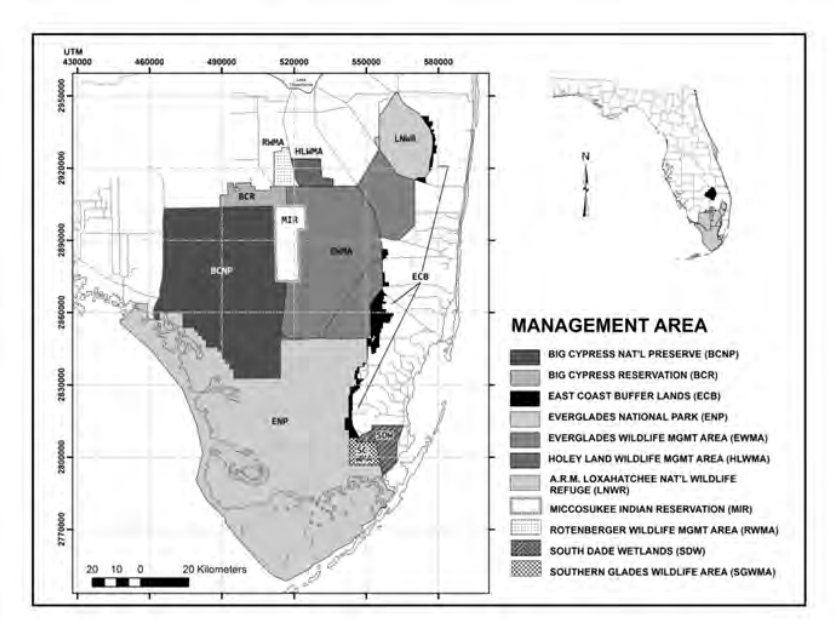
## Federal:

Government Performance and Results Act (GPRA)

- General goals and objectives, including outcome-oriented goals, for the major functions and operations of the agency

GPRA text: http://www.gpo.gov/fdsys/pkg/BILLS-111hr2142enr/pdf/BILLS-111hr2142enr.pdf

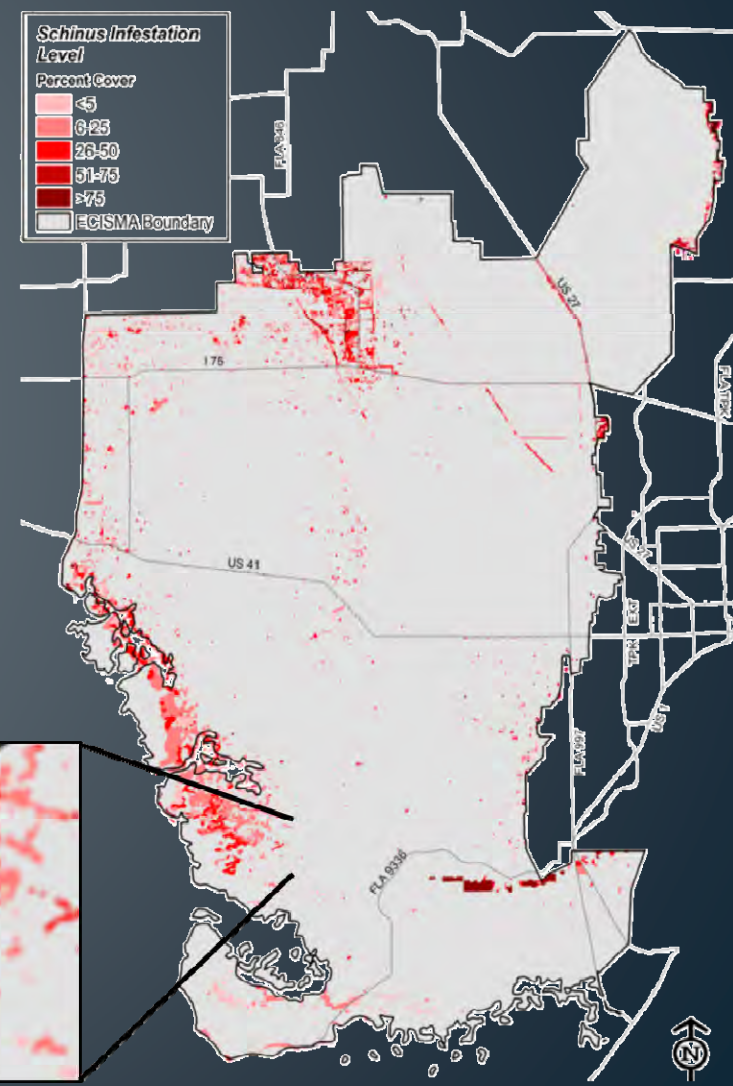
# Challenges

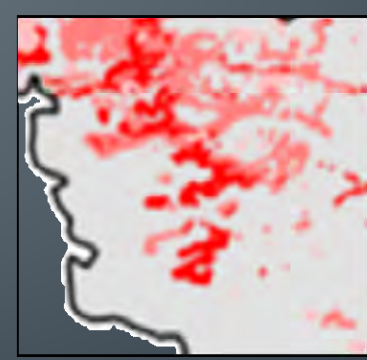



- The Everglades is big! (~14,000 km$^2$)
- Landscape is complex
- Multiple jurisdictions
- Numerous monitoring objectives
- Over 70 Category I invasive plant species
- New species continue to establish

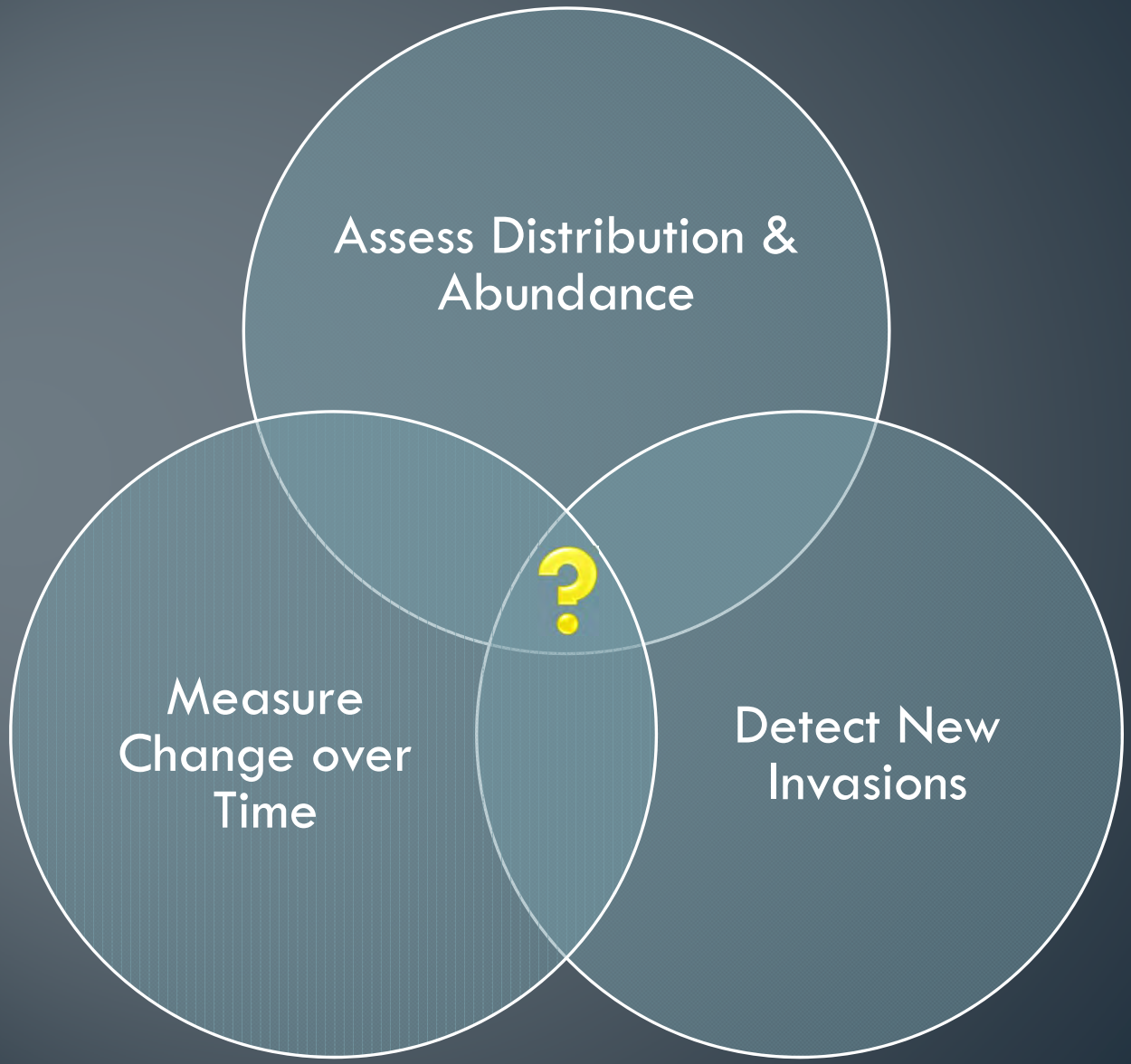
# Digital Aerial Sketch Mapping

- Landscape-scale inventory
- 2-year cycle
- Four priority species
- Best current estimates of abundance and distribution for these species
- Not all objectives met

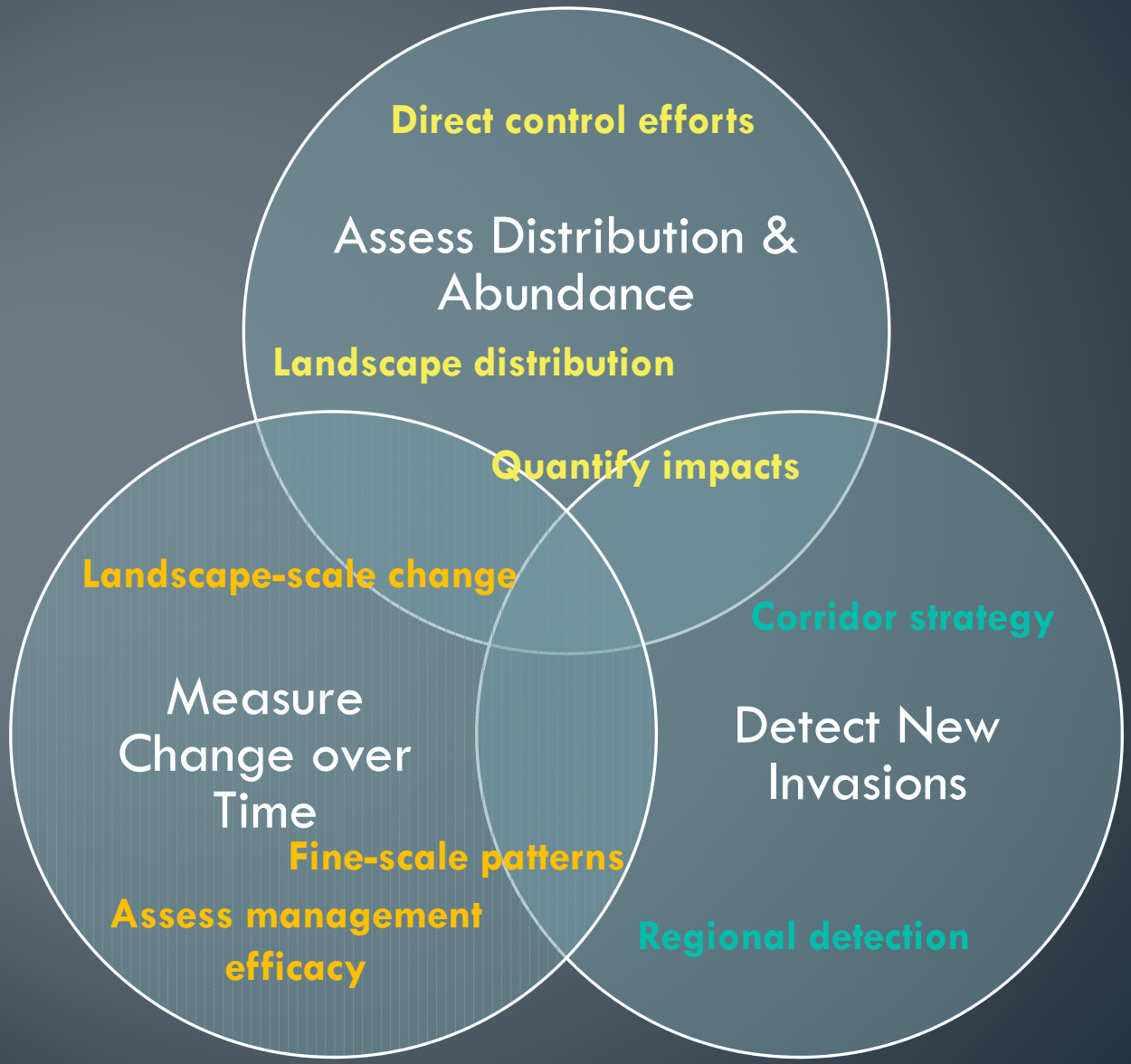


# ECISMA Invasive Plant Monitoring Objectives

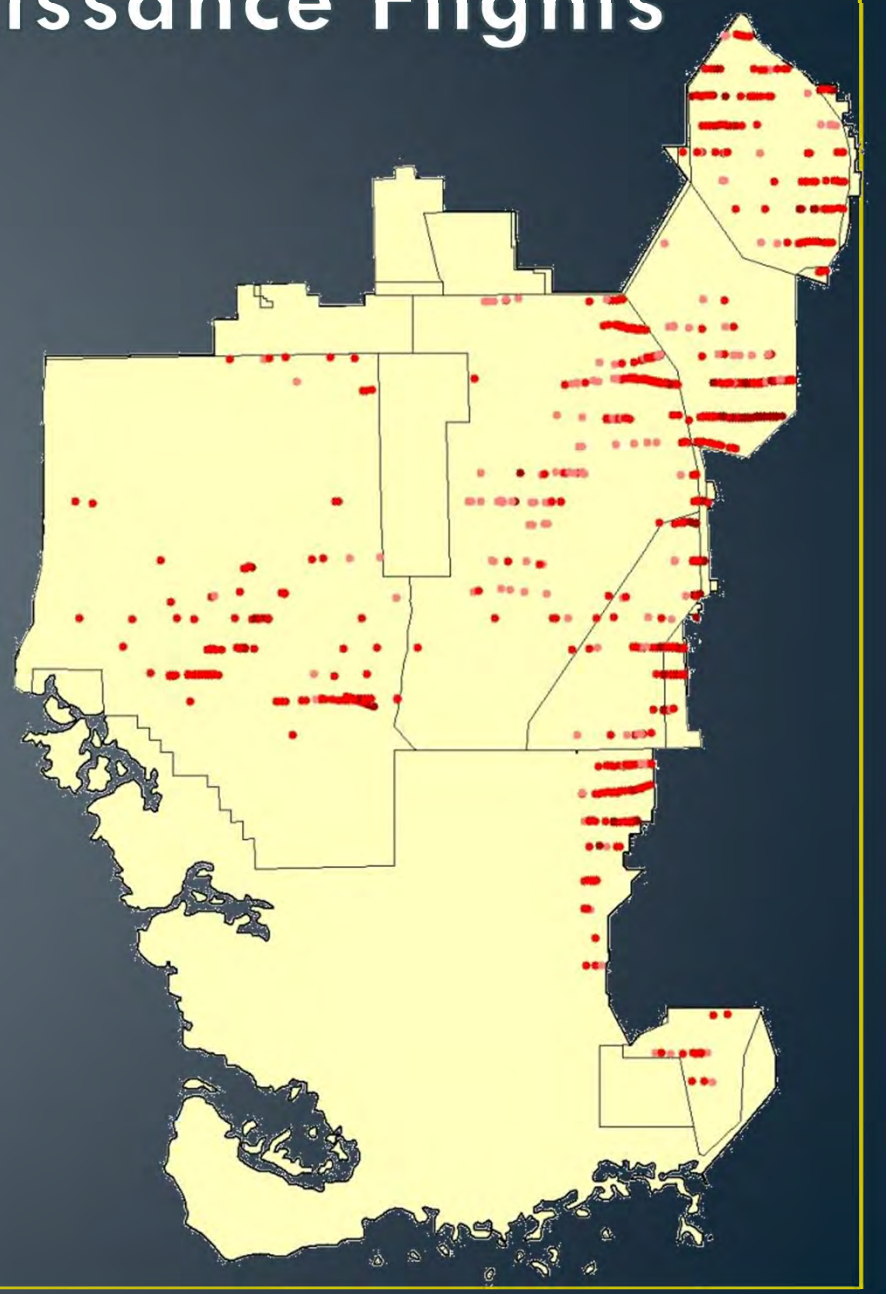


# ECISMA Invasive Plant Monitoring Objectives

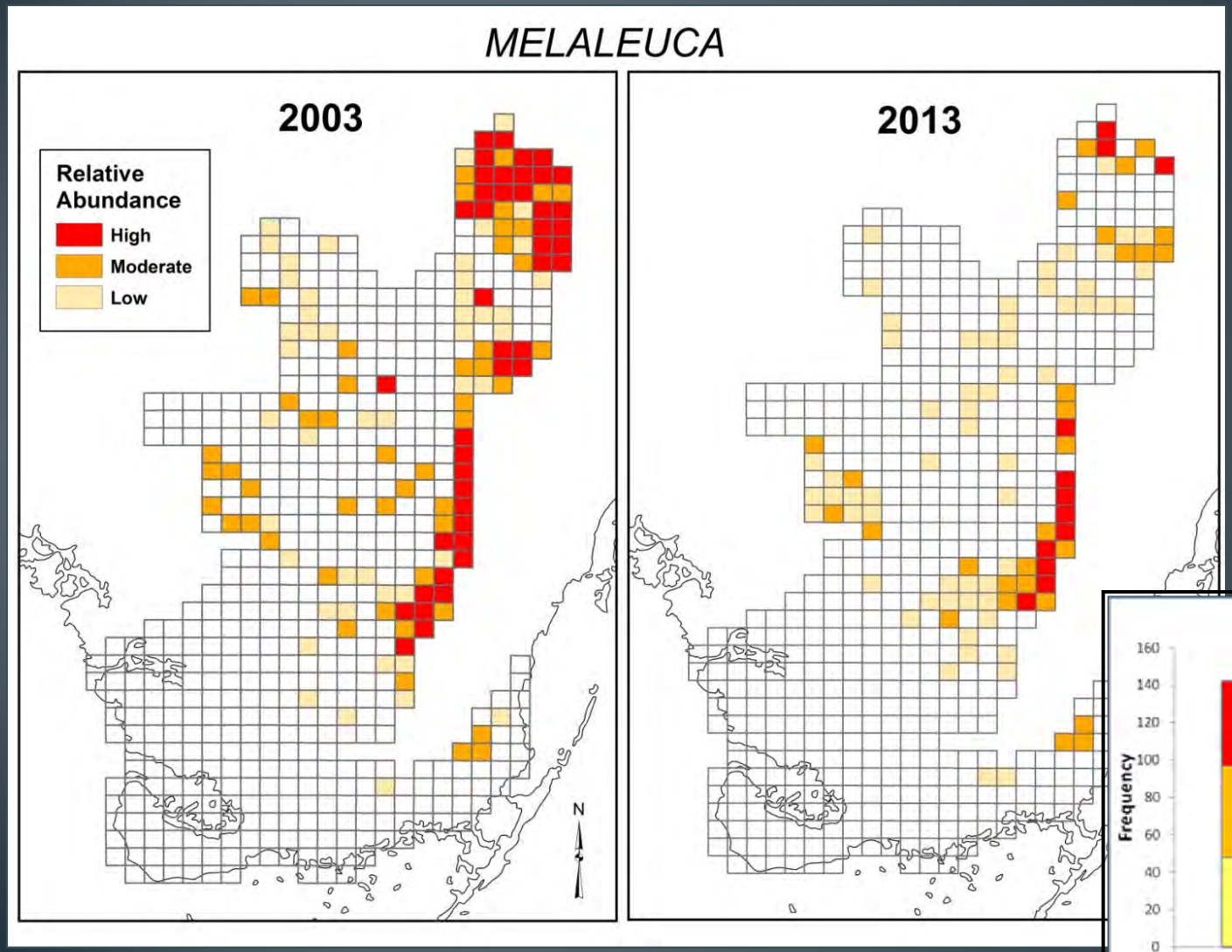


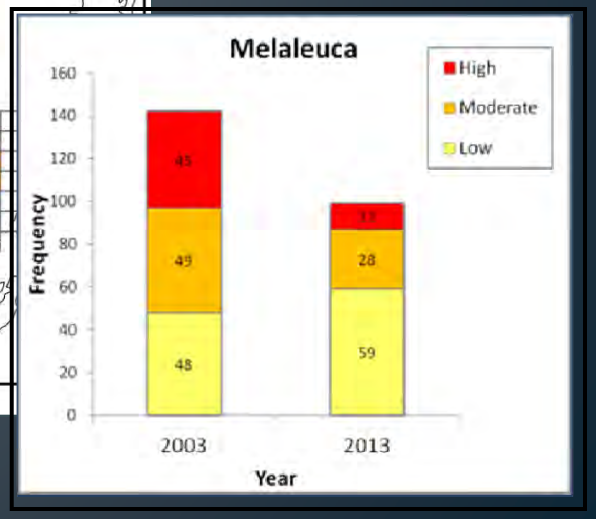
# Systematic Reconnaissance Flights

- Landscape level assessment
- Abundance estimated on fixed intervals along transects
- Provides sample-based abundance estimates
- Cost-effective



# Measuring Effects of Management

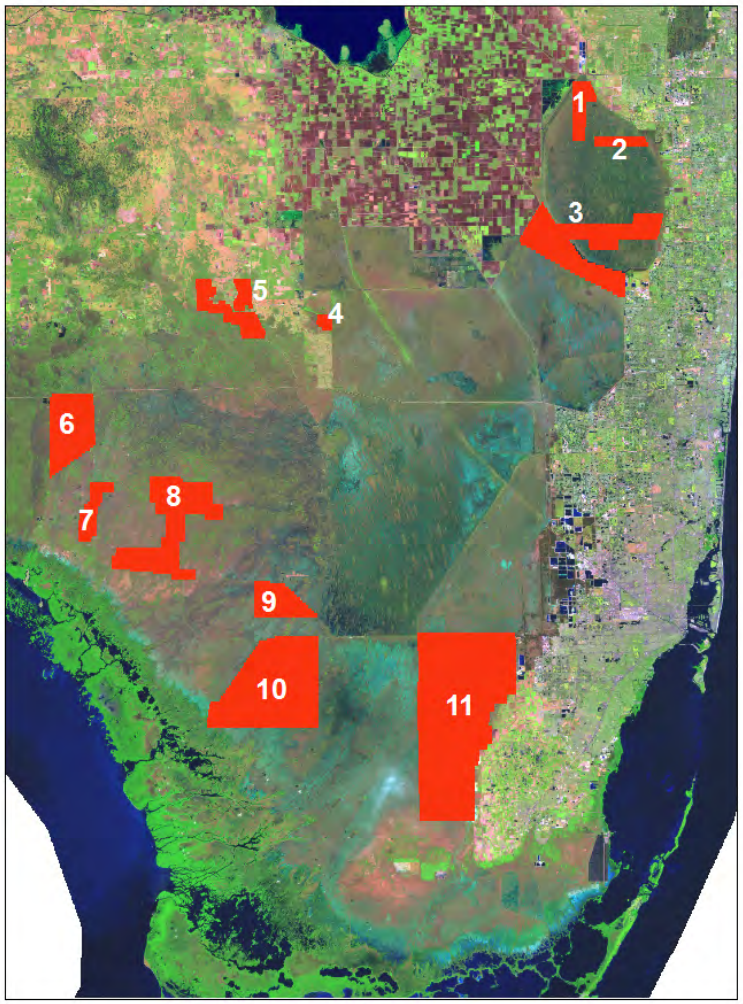


# Detailed Mapping of Work Areas

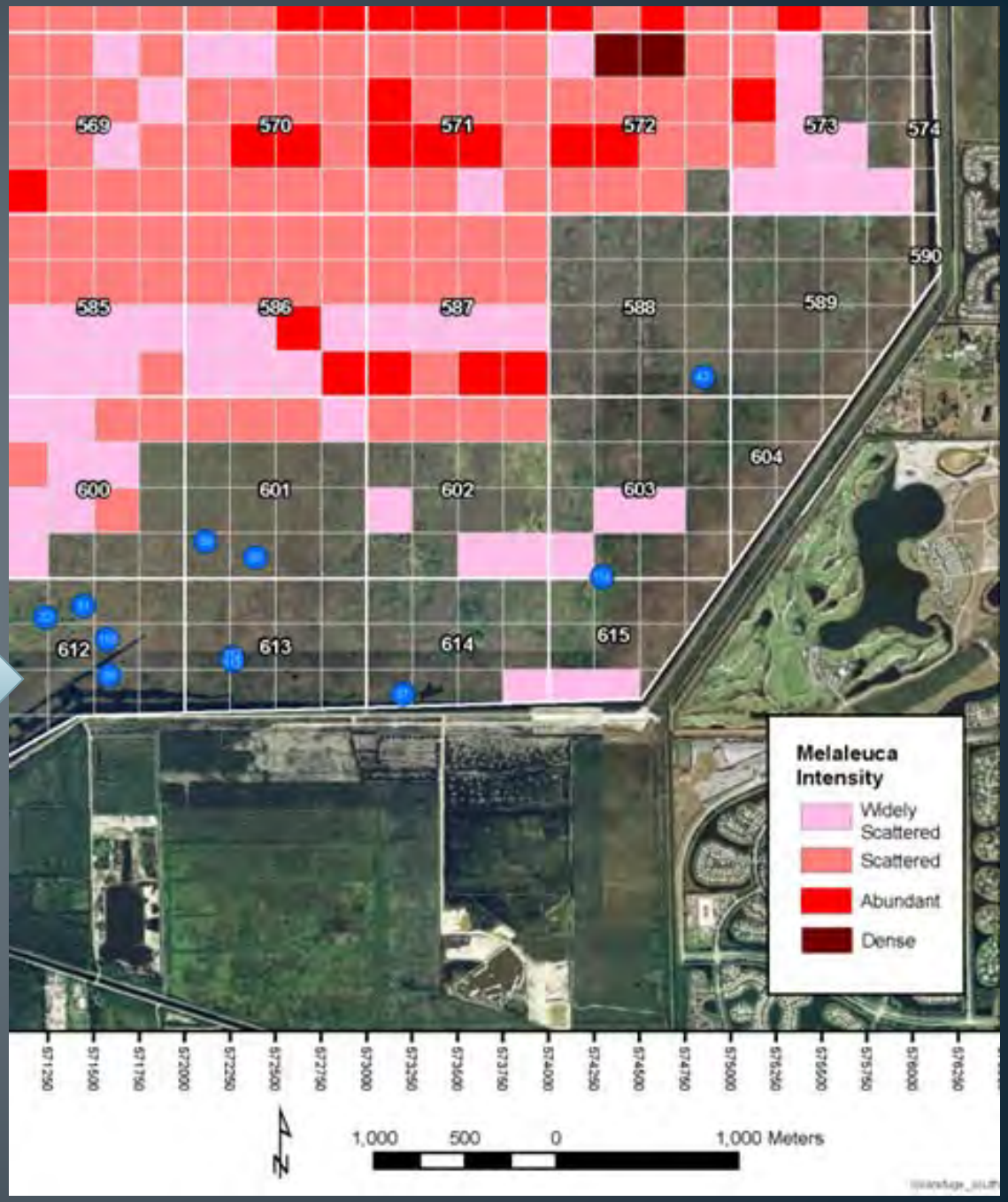
- Objective: Provide precise, accurate, timely data for
  - Directing management efforts
  - Planning
  - Management efficacy

- Aerial sketch mapping
  - "low and slow"
  - 250 meter grid system
  - Increase positional accuracy
  - Improved detection
  - Improved cost efficiency

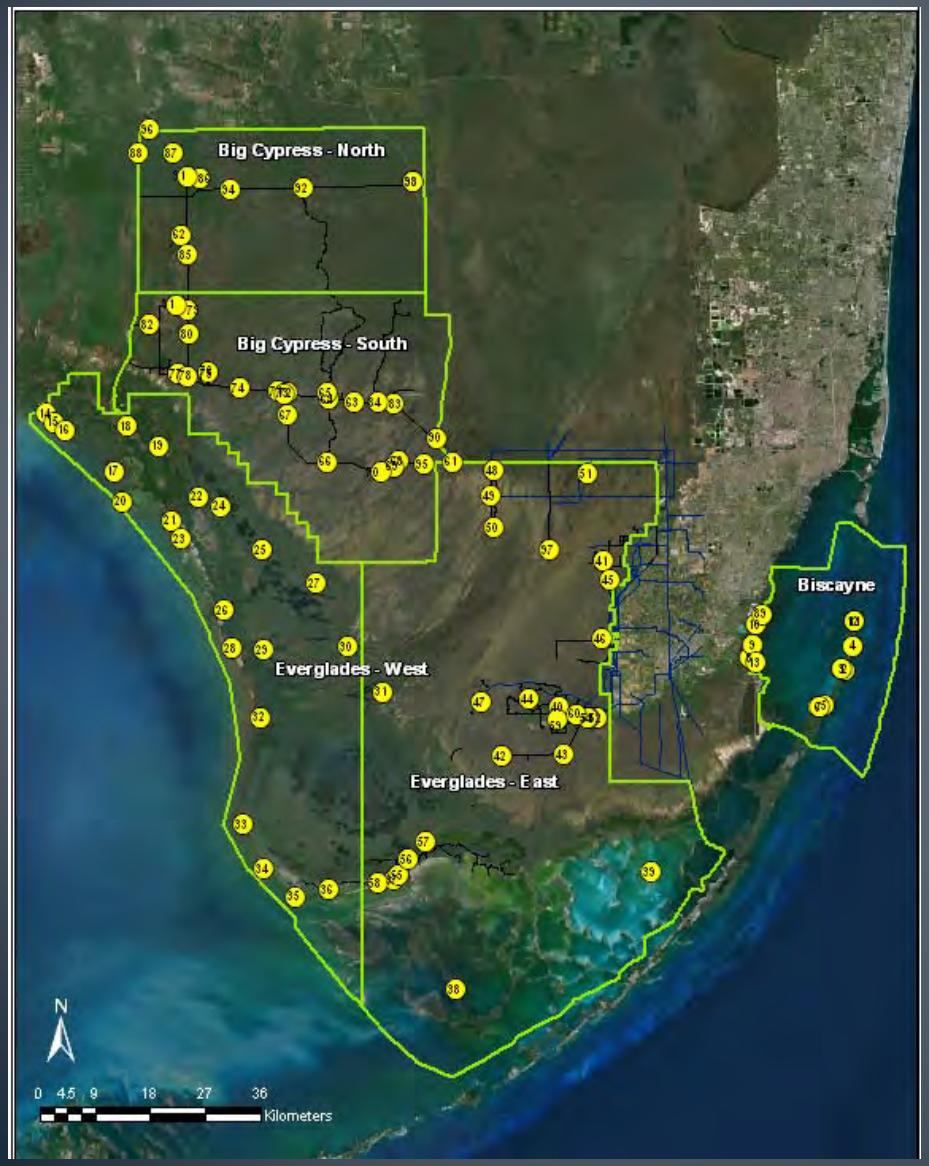


Widely scattered to abundant

Outliers



# Corridors of Invasiveness




## A NPS initiative focused on <u>Early Detection and Rapid Response</u>

- There are 99 sites in three National Parks (BICY, BISC, EVER).
- All sites are surveyed in a five year period.

# PURPOSE

- Corridors of Invasiveness are areas that allow or facilitate the introduction of exotic species by functioning as in-roads or access into natural areas, allowing for a seed source for colonization.

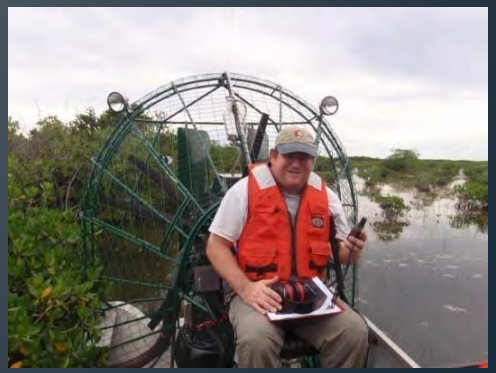
- Survey corridors (park roads, trails, canals) and known problem locations (campgrounds, boat launches, trailheads) for newly emerging and existing exotic plant species.

- Treat small infestations of exotic plants on the spot.

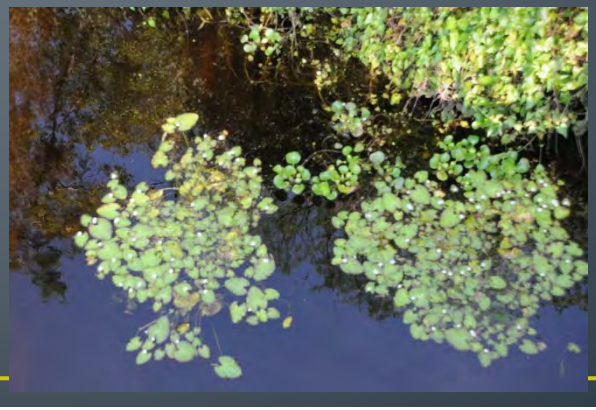
- Report findings in a timely matter to the parks for rapid response.

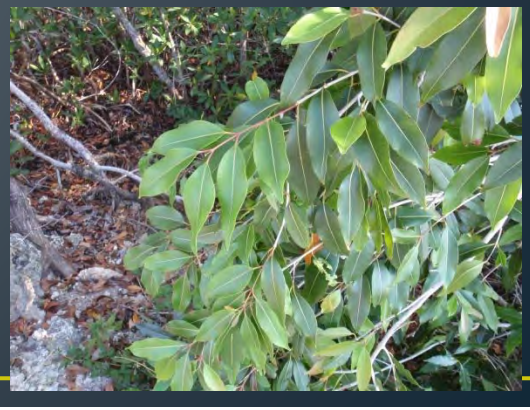
# SURVEY METHODS – TWO PERSON CREW

One member is a SFCN trained botanist familiar with the native and exotic flora of South Florida, and the other is One member has received an Applicator License, and Natural Area Weed Management training.



| | BISC 2011 | EVER East Region 2012 | BICY South Region 2013 |
|---|---|---|---|
| **Exotics found** | 32 | 51 | 65 |
| **Highest infestation area (m2)** | *Schinus terebinthifolius* | *Schinus terebinthifolius* (77,190) | *Schinus terebinthifolius* (10,036) |
| | *Scaevola sericea* | ***Alternanthera philoxeroides* (67,309)** | *Lantana camara* (2,720) |
| | *Thespesia populnea* | *Sporobolus indicus* (58,597) | *Sporobolus indicus* (2,563) |
| | *Colubrina asiatica* | *Eleusine indica* (33,690 | *Imperata cylindrica* (1,447) |
| | *Neyraudia reynaudiana* | *Indigofera spicata* (3,581) | *Eichornia crassipes* (1,367) |
| | | | |
| **Highest number of infestations** | *Thespesia populnea* | *Schinus terebinthifolius* (39) | *Schinus terebinthifolius* (58) |
| | *Scaevola sericea* | *Melaleuca quinquinervia* (24) | ***Syzygium cumini* (32)** |
| | *Schinus terebinthifolius* | *Panicum repens* (15) | *Lantana camara* (31) |
| | *Colubrina asiatica* | *Sporobolus indicus* (13) | *Neyraudia reynaudiana* (19) |
| | *Neyraudia reynaudiana* | *Ardisia elliptica* (11) | *Wedelia trilobata* (12) |
| | | | |
| **New species found** | *Ficus religiosa* | *Indigofera suffruticosa* | *Nymphoides cristata* |
| | *Pongamia pinnata* | *Ficus microcarpa* | *Eulophia graminea* |
| | ***Syzygium cumini*** | | *Bambusa vulgaris* |
| | | | *Aloe vera* |
| | | | *Cycas revoluta* |
| | | | *Asparagus aethiopius* |
| | | | *Phoenix reclinata* |





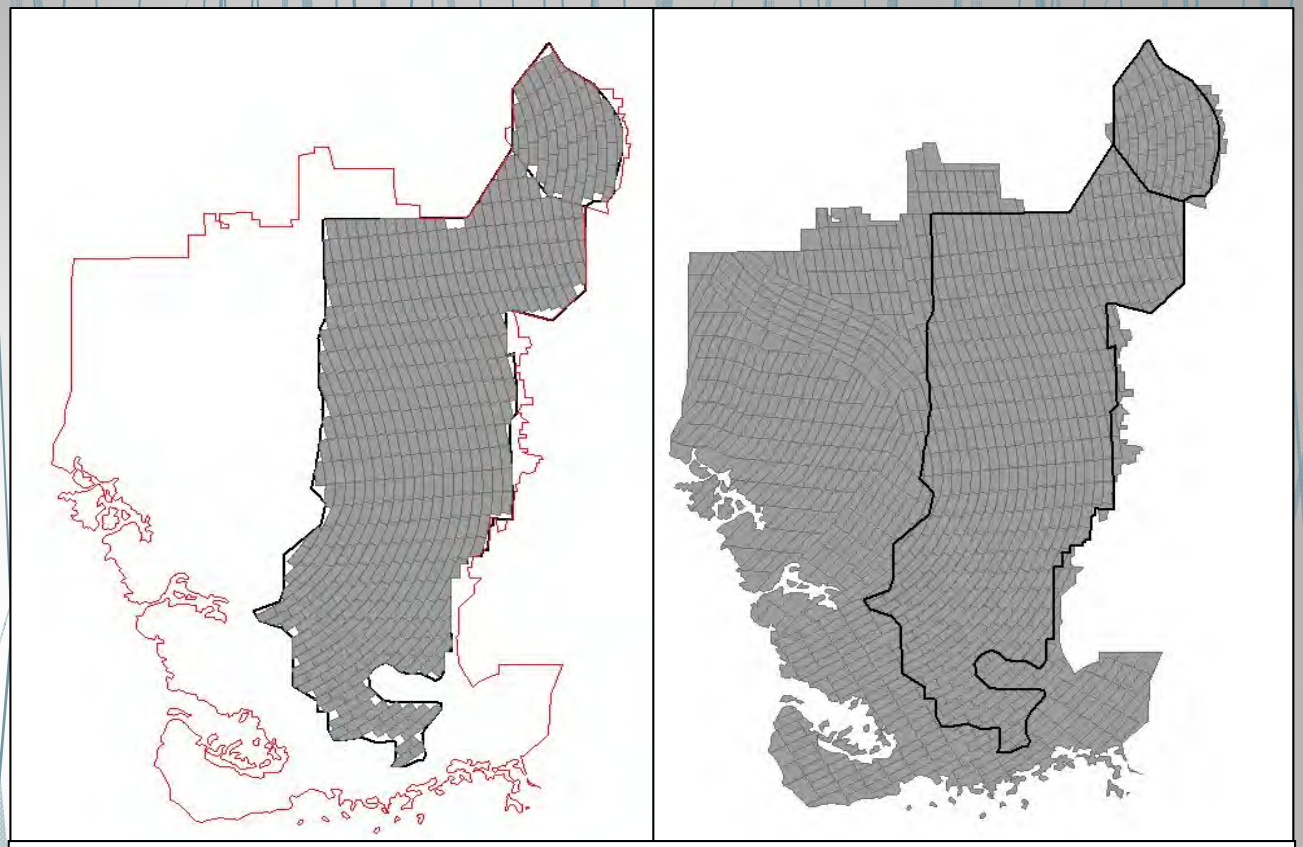


**Figure 3.** Left: The ridge, slough, and tree island GRTS tiles as developed by Philippi 2007 within the ECISMA boundary. Right: The extension of the GRTS tiles within the entire ECISMA boundary developed by Jed Redwine.

# Evolution of monitoring system

ECISMA sampling design expands the themes driving CERP landscape sampling design to the expanded ECISMA area (doubling sampled area)

# Complementing CERP monitoring with Exotic plant monitoring allows…

- **<u>Enhanced monitoring precision:</u>**
  - **A source of information to identify monitoring challenges associated with habitat type**
  - **Population trends may be more easily detected using landscape panels.**

- **A basis for identifying <u>causal mechanisms</u> to focus management on specific areas.**

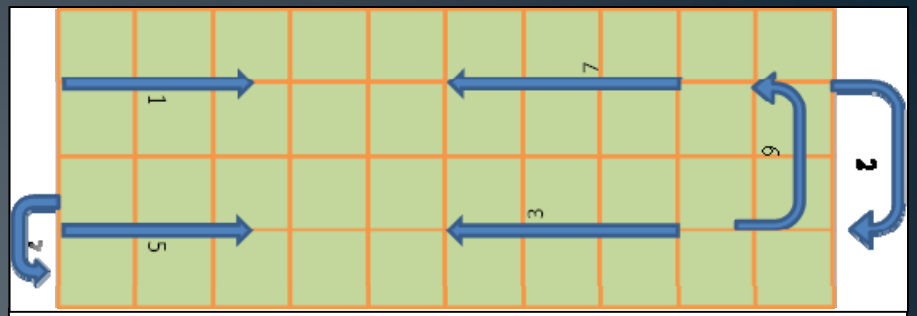
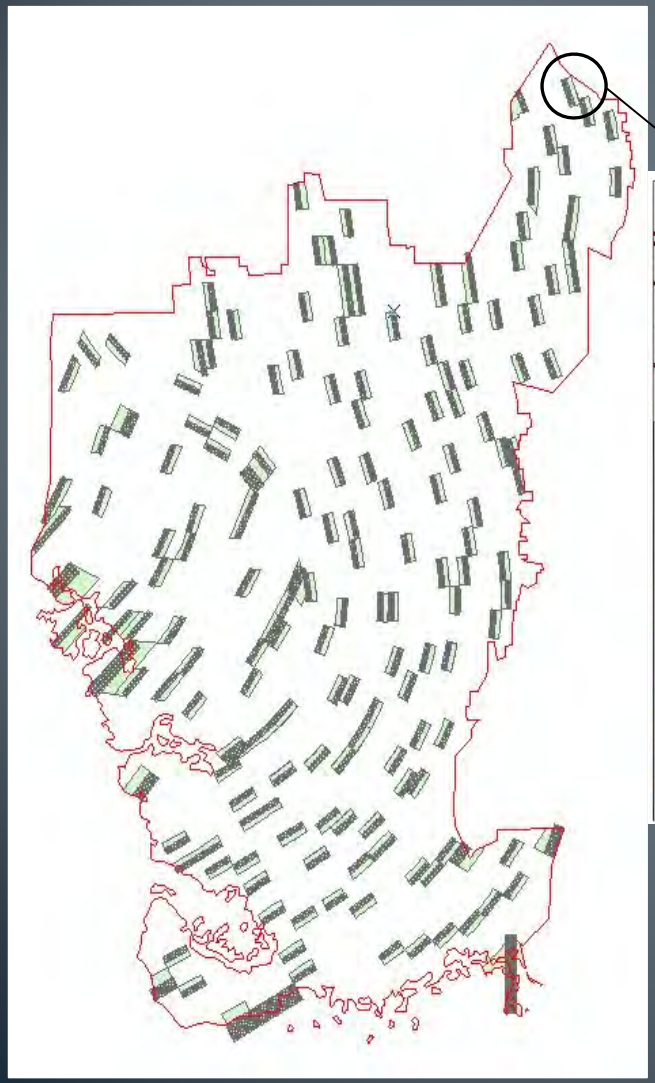



**Figure 9:** The flight path taken for each of the selected tiles.



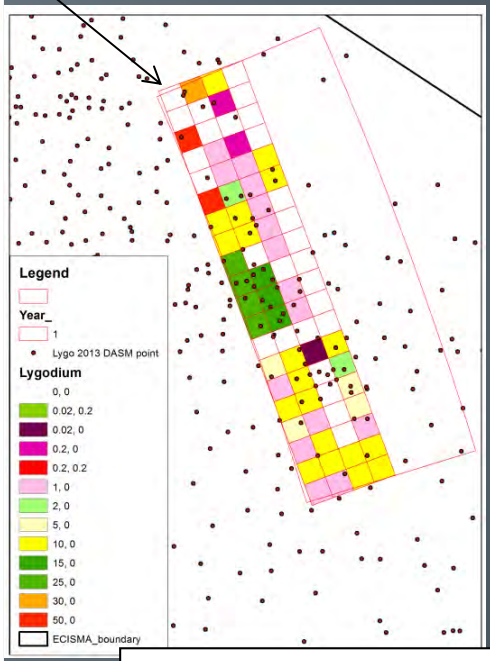
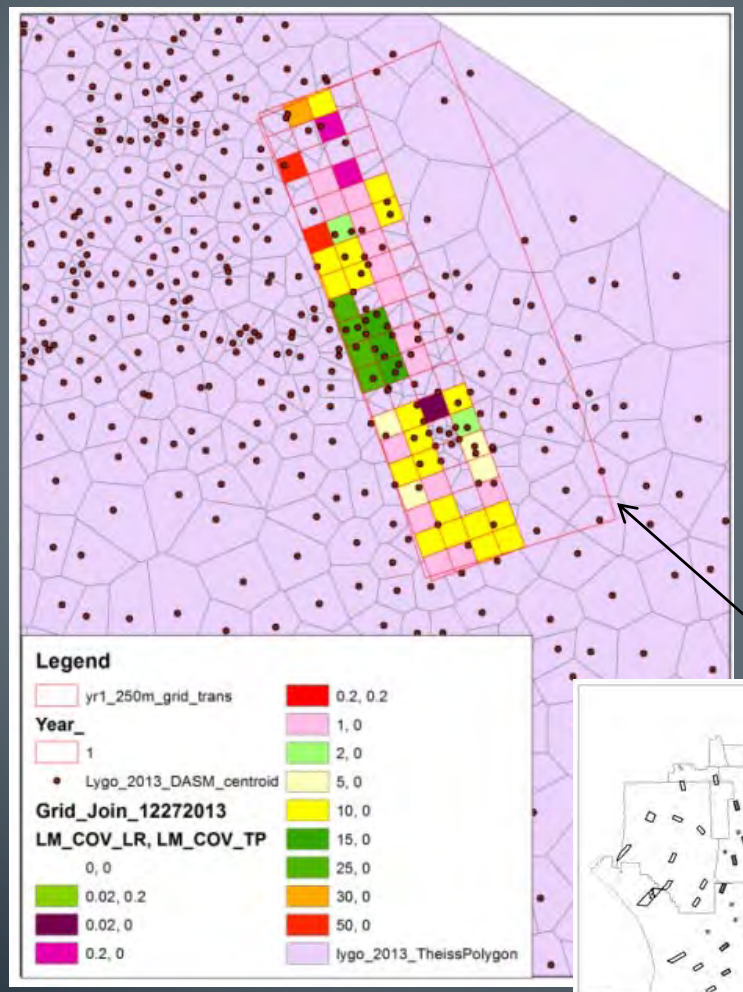
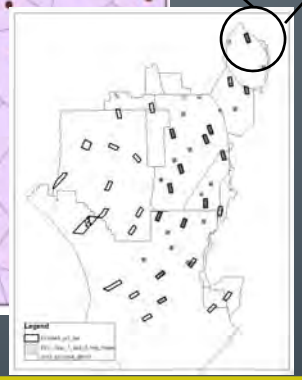


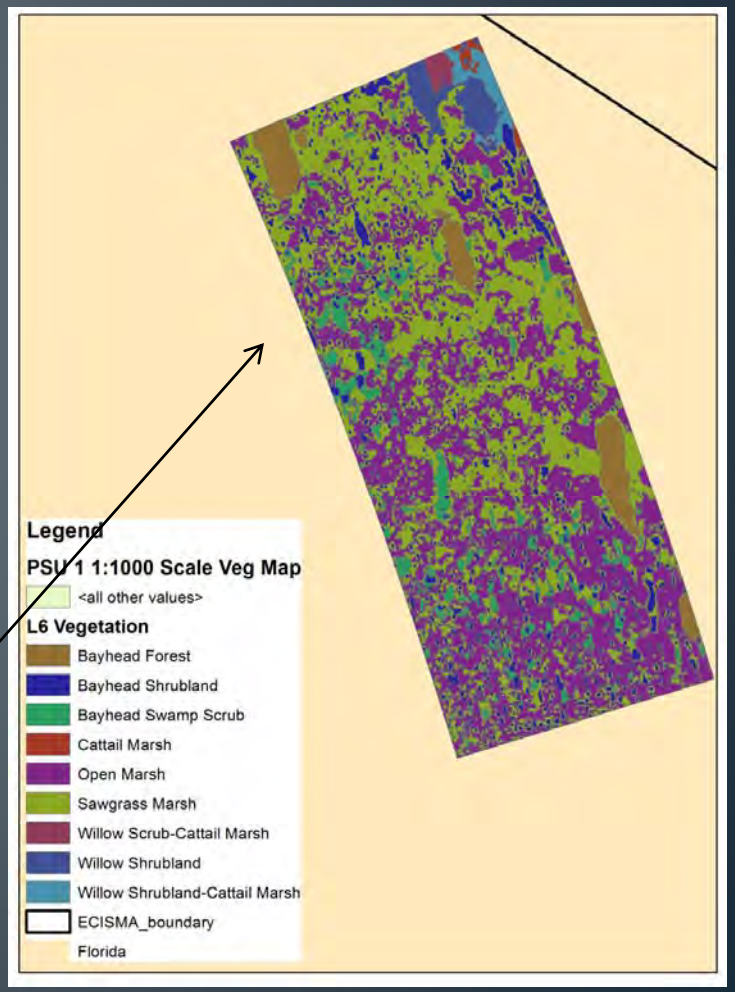

**Figure 7:** The left figure represents all of the 168 selected panels within the ECISMA boundary and the gridded transects associated with the tiles. The right figure is a close up of one panel with a 5 x 20 grid (250 m wide cells) applied for sampling.

# Panel Vegetation Maps

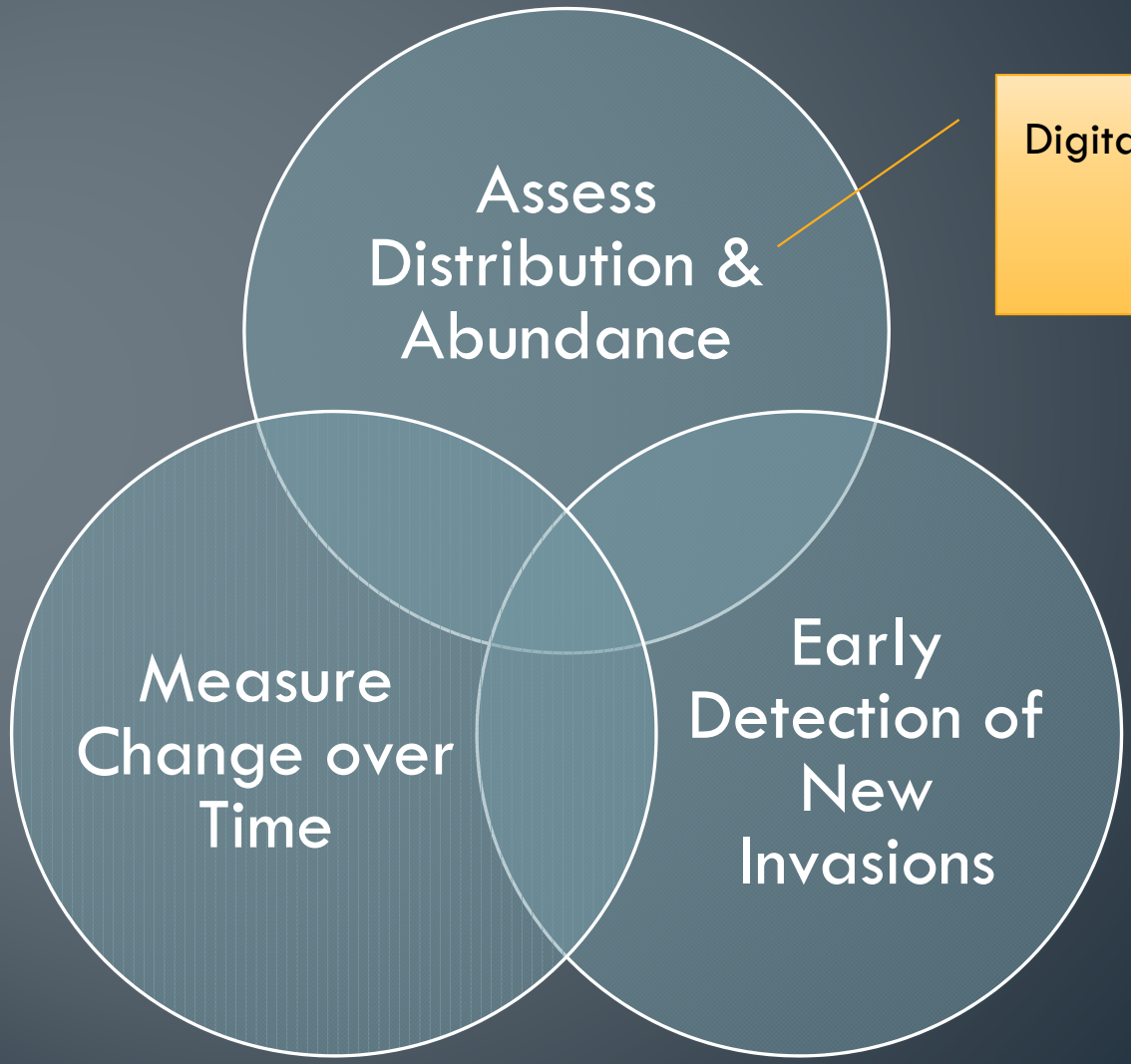
**Vegetation maps are developed for CERP panels and are useful for supporting analysis of infestation patterns**



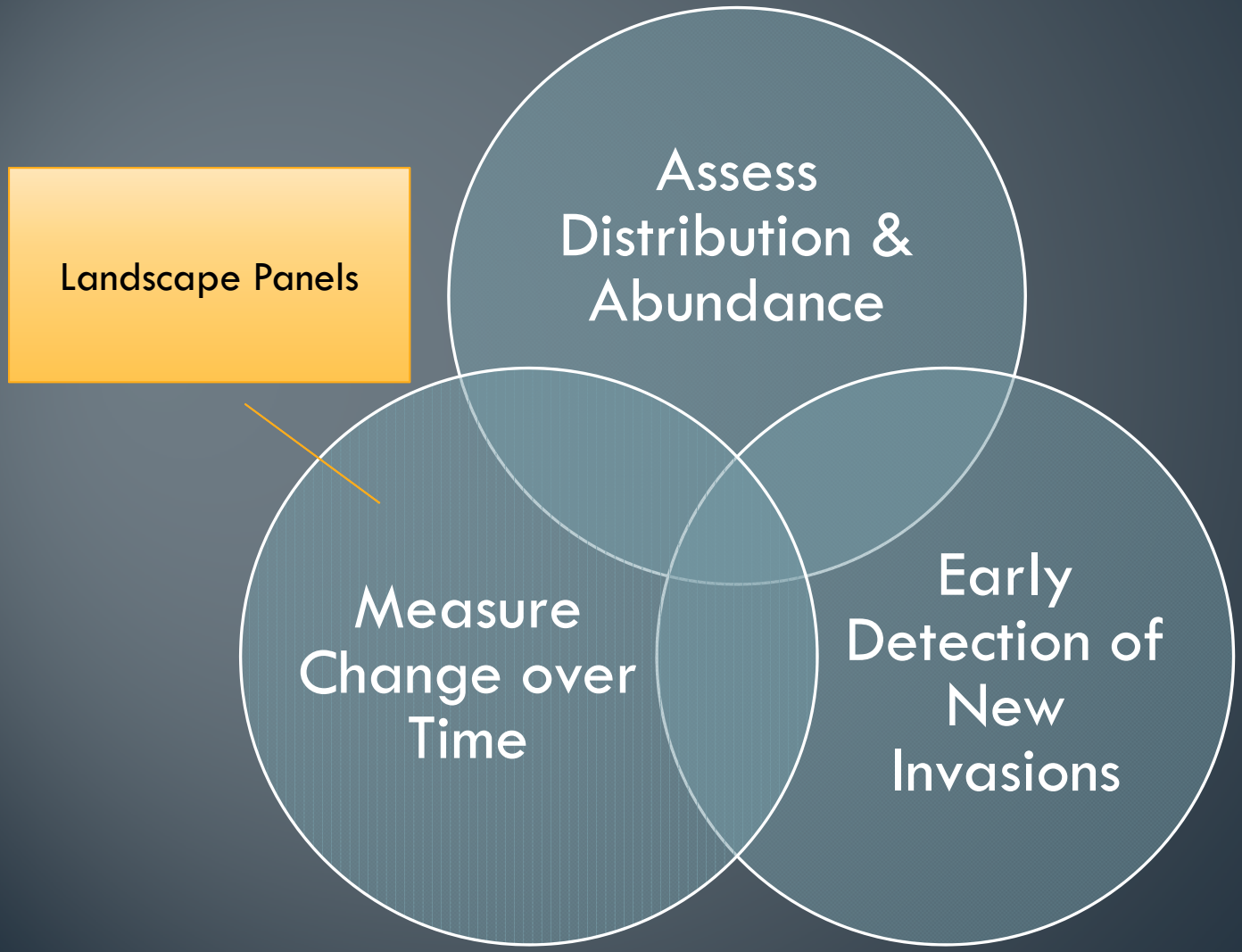


# ECISMA Exotic Plant Monitoring Objectives

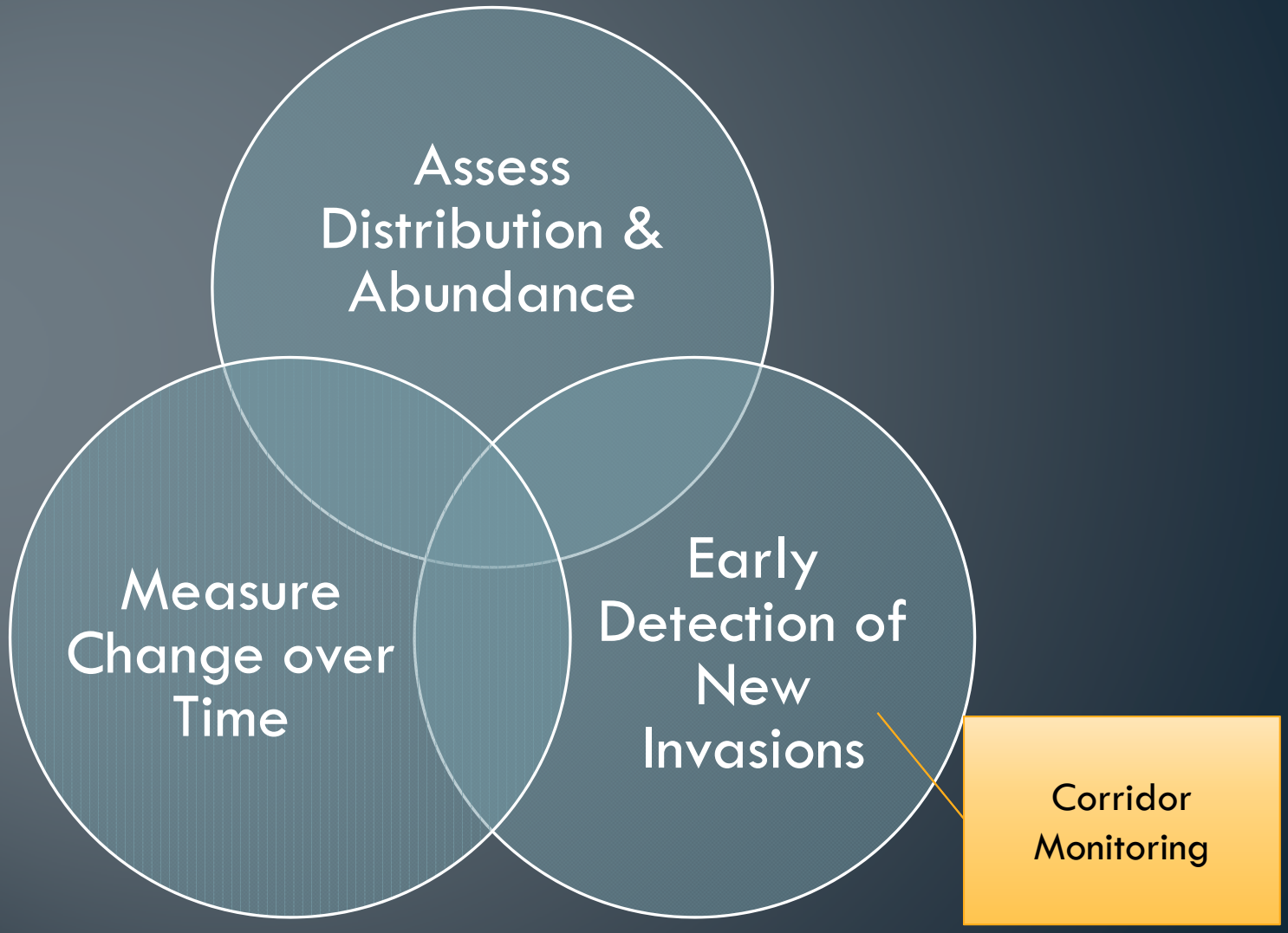



Digital Aerial Sketch Mapping & SRF

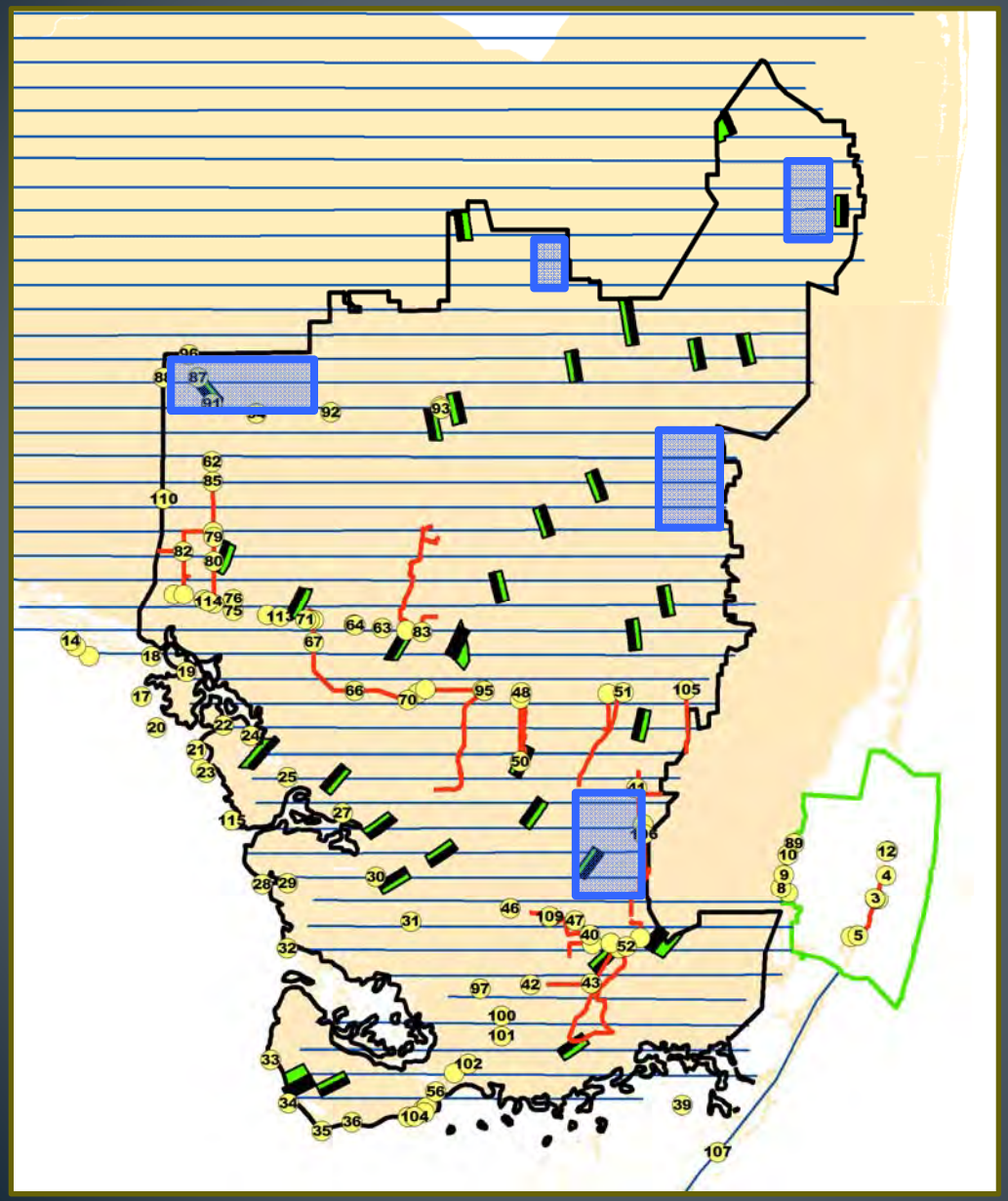
# ECISMA Exotic Plant Monitoring Objectives



# ECISMA Exotic Plant Monitoring Objectives



# Multi-scale Approach for Multiple Objectives



Measure landscape distribution and abundance — 5-yr Interval

Direct contractors — Annual

Detect new invasions — Annual

Detect change and Assess impacts — Annual

# Questions?