

# Coastal Habitat Integrated Mapping and Monitoring Program (CHIMMP)

*2<sup>nd</sup> CHIMMP workshop  
September 14-15, 2015*

*Florida Fish and Wildlife Conservation Commission  
Fish and Wildlife Research Institute  
St. Petersburg, Florida*



# CHIMMP introduction

- CHIMMP is funded by Florida's State Wildlife Grants (SWG) Program in order to support the study of high priority coastal habitats and meet requirements of the State Wildlife Action Plan





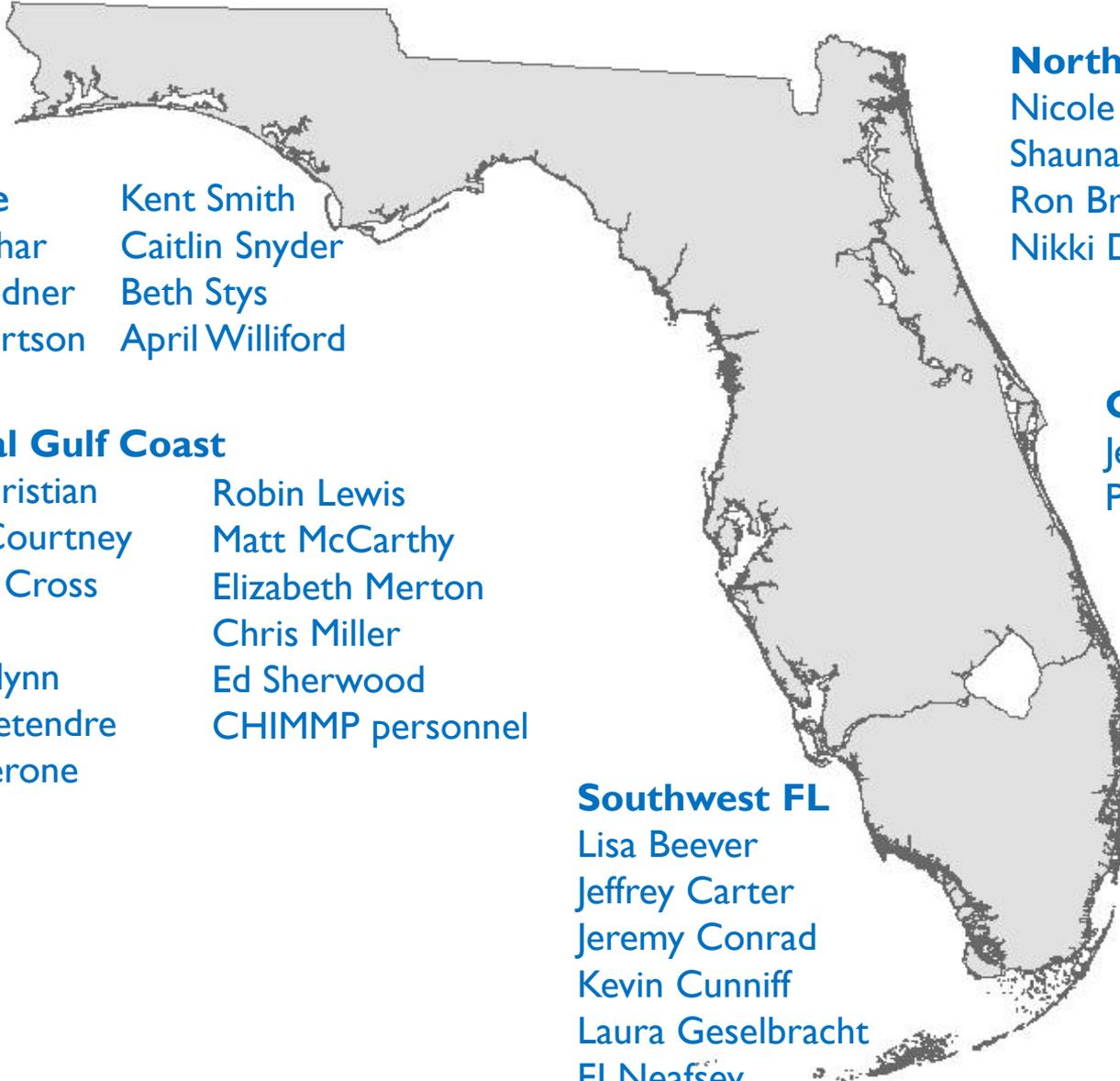
# CHIMMP team

- **Ryan Moyer** (PI)
- **Kara Radabaugh** (Coordinator, Co-PI)
- **Amber Whittle** (Co-PI)
- **Christina Powell** (Coastal wetlands technician)
- **Christi Santi** (GIS specialist)
- **Kathleen OKeife** (GIS support)

# Workshop attendee introductions

## Mississippi

Kristine Evans



## Panhandle

Katie Konchar

Jennylyn Redner

Chris Robertson

Kent Smith

Caitlin Snyder

Beth Stys

April Williford

## Central Gulf Coast

Julie Christian

Frank Courtney

Lindsay Cross

Bill Ellis

Laura Flynn

Jamie Letendre

Jay Leverone

Robin Lewis

Matt McCarthy

Elizabeth Merton

Chris Miller

Ed Sherwood

CHIMMP personnel

## Northeast FL

Nicole Adimey

Shauna Allen

Ron Brockmeyer

Nikki Dix

## Central Atlantic coast

Jeff Beal

Patrick Pitts

## Southwest FL

Lisa Beever

Jeffrey Carter

Jeremy Conrad

Kevin Cunniff

Laura Geselbracht

EJ Neafsey

Judy Ott

## Southeast FL

Craig van der Heiden

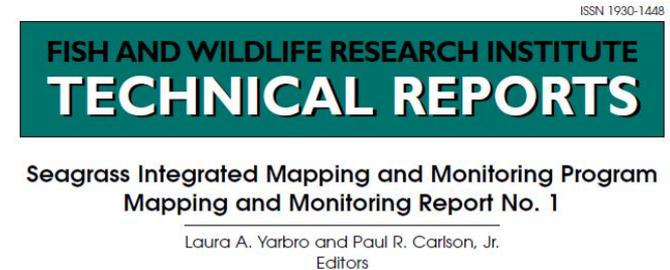
# Day 1 Itinerary

- **12:30-1:30 pm** Introductions, results and status of statewide CHIMMP report
- **1:30-1:50 pm** FWC GIS resources
- break
- **2:00-2:45 pm** Mapping Presentations
- **2:45-3:30 pm** Status and Restoration Presentations
- break
- **3:40-4:25 pm** Monitoring Presentations
- **4:25-4:45 pm** Conclusions from Day 1
- **6:00-7:00 pm** Optional Social Hour at Hollander Hotel Tap Room

# CHIMMP origins

- Modeled after the Seagrass Integrated Mapping and Monitoring Program (SIMM)
  - Compiles statewide knowledge
    - Current mapping and monitoring programs
    - Regional status, threats, and recommendations
- SIMM report located at:

<http://myfwc.com/research/habitat/seagrasses/projects/active/simm-report-1/>



Florida Fish and Wildlife  
Conservation Commission



# 2014 CHIMMP workshop

- April 2014 workshop with 43 in-person attendees
- 12 presentations



# CHIMMP workshops

- **Designed to bring together representatives from mapping and monitoring programs from across Florida**
  - CHIMMP workshops to increase communication and coordination, pinpoint gaps and needs
  - Information and 2014 workshop presentations available on CHIMMP website:

<http://ocean.floridamarine.org/CHIMMP/>

## Coastal Habitat Integrated Mapping and Monitoring Program

*CHIMMP Goals*   *Proposed Regions Map*   *Presentations*   *Resources*

### CHIMMP Goals

Coastal Habitat Integrated Mapping and Monitoring Program (CHIMMP) is funded by Florida's State Wildlife Grants (SWG) Program in order to support the study of high priority coastal habitats and meet requirements of the State Wildlife Action Plan. CHIMMP's goals include bringing together representatives from mapping and monitoring programs across the State in order to increase communication, minimize duplicate efforts and identify data gaps, needs, and priorities. Additional goals are to create a statewide report on the status of mangroves and salt marshes in Florida modeled after the Seagrass Integrated Monitoring and Mapping Program (SIMM).

*Full Agenda*

*Workshop Presentation*

*Regional Suggestions*

*Workshop Conclusions*



# Common feedback on FL gaps and needs from 2014 Workshop

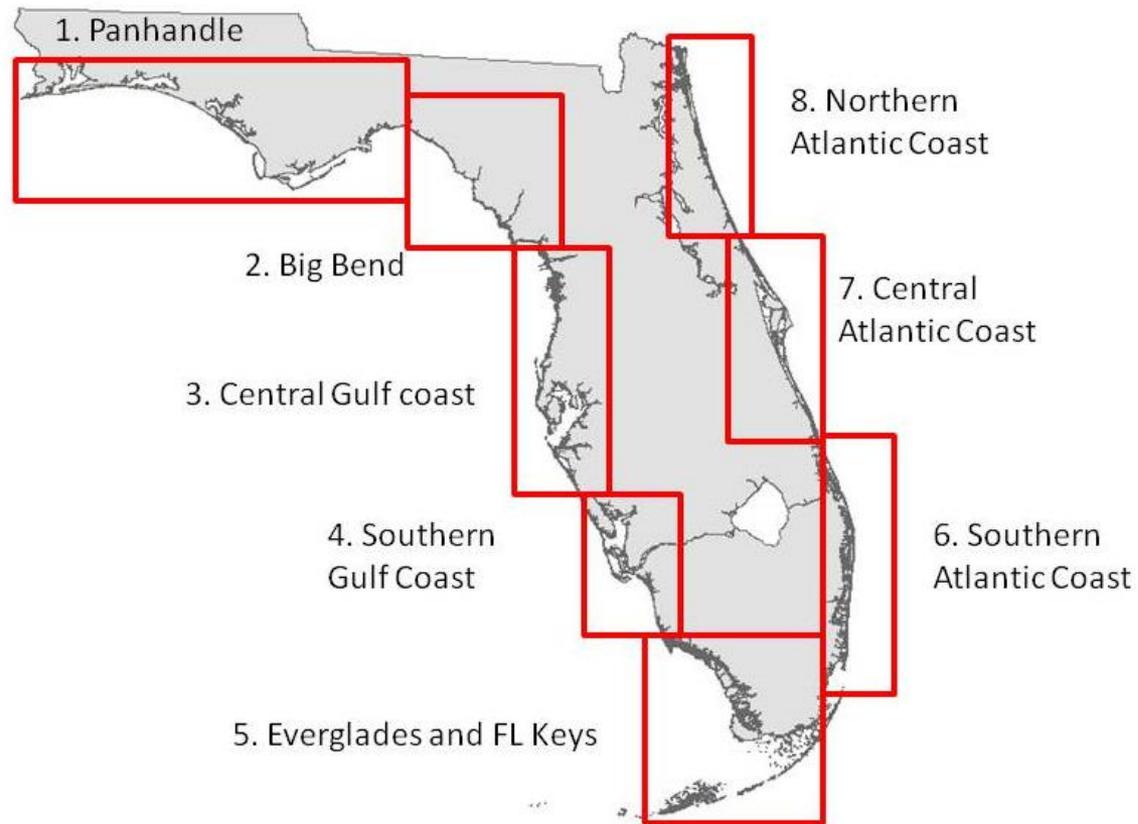
- Need coordination among agencies
- Coastal wetlands monitoring often follows variable methodology
- Mapping more extensive than monitoring, but classifications vary widely.
  - Historical/very recent data lacking
- What about oysters?



# Updates since 2014 workshop

- Oyster Integrated Mapping and Monitoring Program proposal
- CHIMMP report
- CHIMMP gaps focus in coming year
- Experimental mapping case studies
- Wetlands monitoring expansion

# 2014 proposed regions





- Regional chapters of CHIMMP report from 2014 workshop
  - South Florida subdivided into Everglades, Keys, and Biscayne Bay subsections

# 2014 Workshop Report Feedback

- Many attendees volunteered to contribute to CHIMMP report
- Contents and regions of CHIMMP report dictated by survey results
- Decision to avoid report card method used in SIMM due to variability in ecosystems and mapping/monitoring methodology

Chapter	Contributor	Affiliation	Chapter	Contributor	Affiliation
All, report editors	Kara Radabaugh	FWC	Collier County	Jill Schmid	RBNERR
	Christina Powell	FWC		EJ Neafsey	University of Virginia
	Ryan Moyer	FWC		Roy "Robin" Lewis	CRG
All, GIS	Christi Santi	FWC		Kathy Worley	CSWF
	Nikki Dix	GTMNERR		Craig van der Heiden	IRC
Introduction	Laura Geselbracht	TNC	Everglades	Pablo Ruiz	USNPS
	Roy "Robin" Lewis	Coastal Resources Group (CRG)		Joseph Smoak	USFSP
				Ryan Moyer	FWC
Northwest Florida	Kim Wren	ANERR	Florida Keys	Randy Grau	FWC
	Caitlyn Snyder	ANERR		Chris Bergh	TNC
	Maria Merrill	FWC		Curtis Kruer	CRG
	Katie Konchar	FWC	Biscayne Bay	Sharon Ewe	FCE LTER
	Beth Fugate	FDEP		Pablo Ruiz	USNPS
	Shelly Marshall	Escambia County	Palm Beach and Broward County	Eric Anderson	Palm Beach County
Big Bend and Springs Coast	Ellen Raabe	USGS		Phyllis Klarmann	Palm Beach County
	Theresa Thom	USFWS		Marion Hedgepeth	SFWMD
	Nicole Rankin	USFWS	Linda Sunderland	Broward County	
	Kris Kaufman	SWFWMD	Indian River Lagoon	Ron Brockmeyer	SJRWMD
Tampa Bay	Lindsay Cross	TBEP		Jeff Beal	FWC
	Kris Kaufman	SWFWMD		Brian Sharpe	FDEP
	Ed Sherwood	TBEP		Marion Hedgepeth	SFWMD
	Bill Ellis	St. Leo University		John Tucker	St. Lucie County
	Chris Miller	St. Leo University		Hyun Jung Cho	Bethune-Cookman University (BCU)
	Frank Courtney	FWC			
Sarasota Bay	Jay Leverone	SBEP	Northeast Florida	Nikki Dix	GTMNERR
	Jon Perry	Sarasota County		Andrea Small	FDEP
	Kris Kaufman	SWFWMD		Ron Brockmeyer	SJRWMD
Charlotte Harbor	Jim Beever	SWFRPC		Hyun Jung Cho	BCU
	Lisa Beever	CHNEP		Shauna Ray Allen	USNPS



# CHIMMP report chapter contents

- Regional map
- Introduction to regional history/ecology
- Threats to salt marshes and mangroves
- Summary of select mapping and monitoring programs
- Recommendations for future protection, management, and monitoring



# CHIMMP report status

- Approved for FWRI Technical Report publication
- Report manuscript draft completed and (nearly) approved by all coauthors and contributors (48!)
- Next steps:
  - Technical review & revisions
  - Science editor review & revisions
  - Copy Editor review & revisions

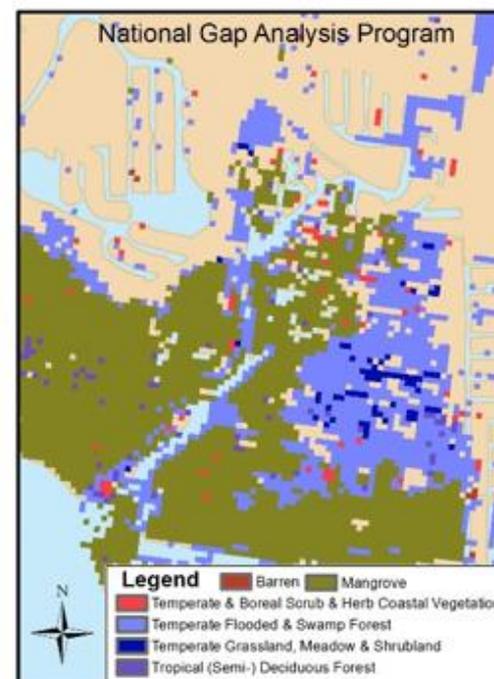
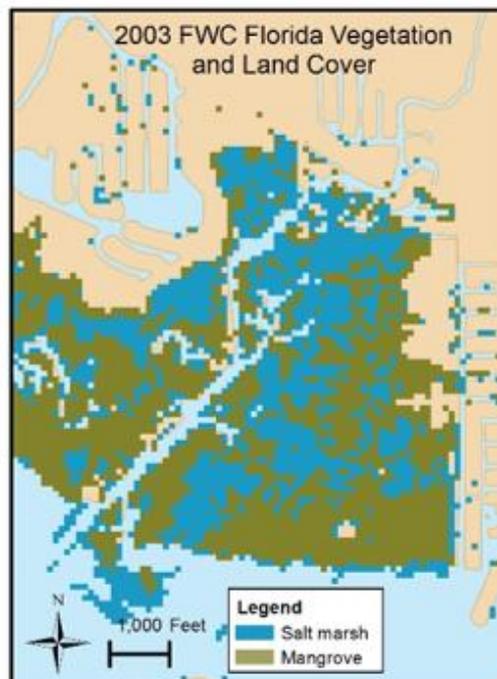
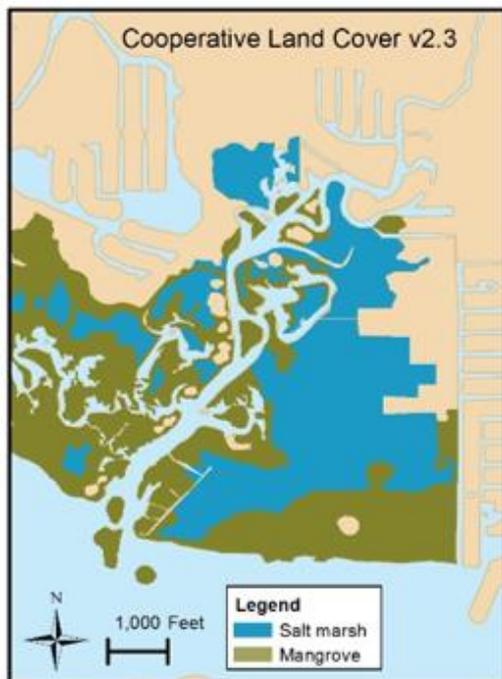
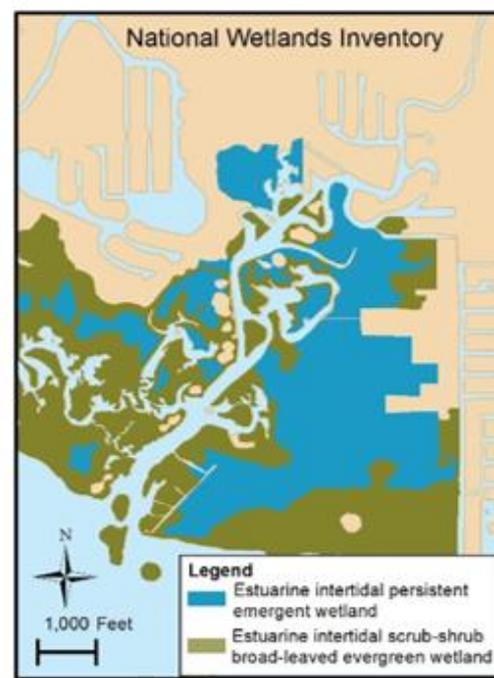
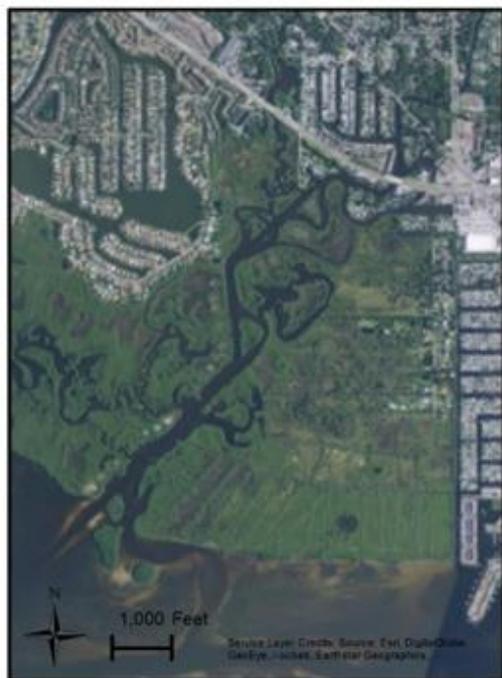
# Mapping data in Florida

- Variety of mapping products available
  - See handout for classification schemes (Table 1) and list of data providers (Table 2)

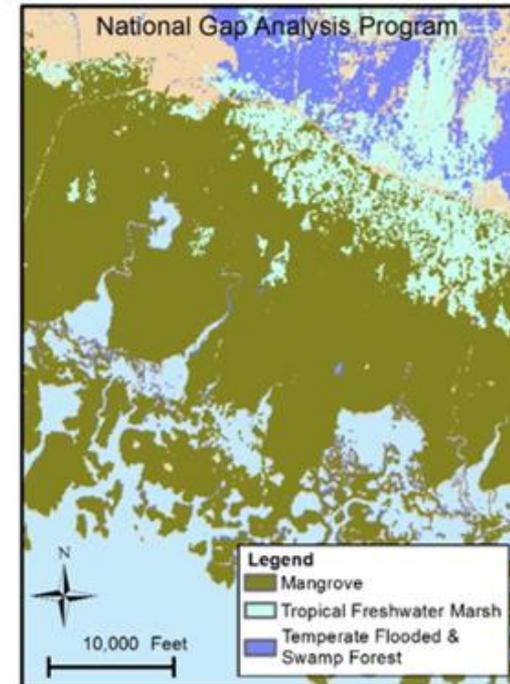
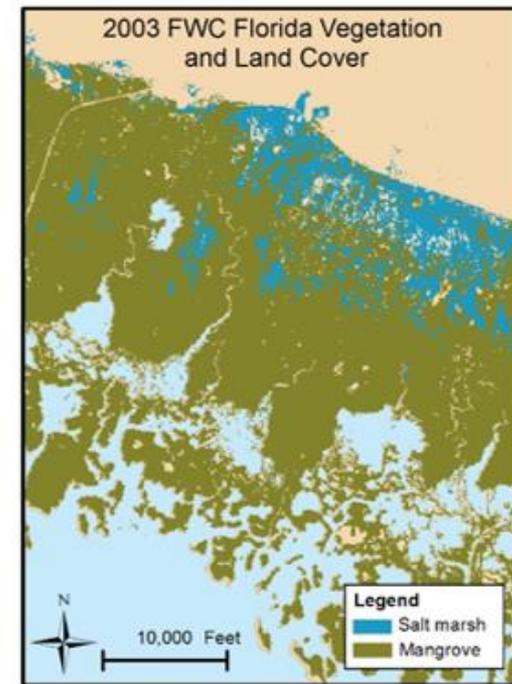
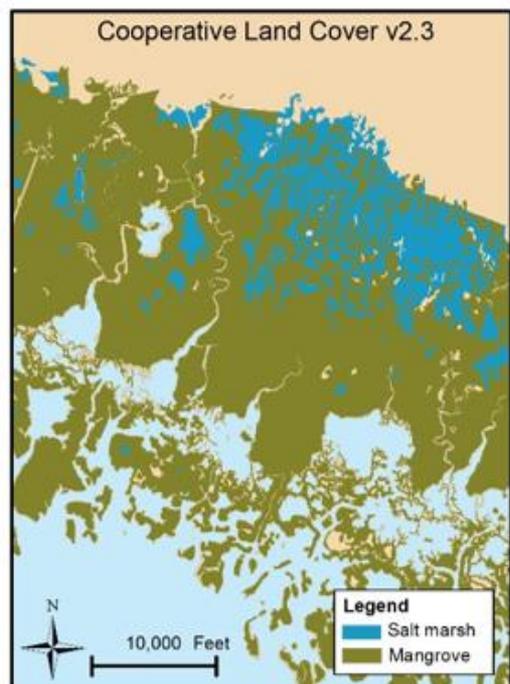
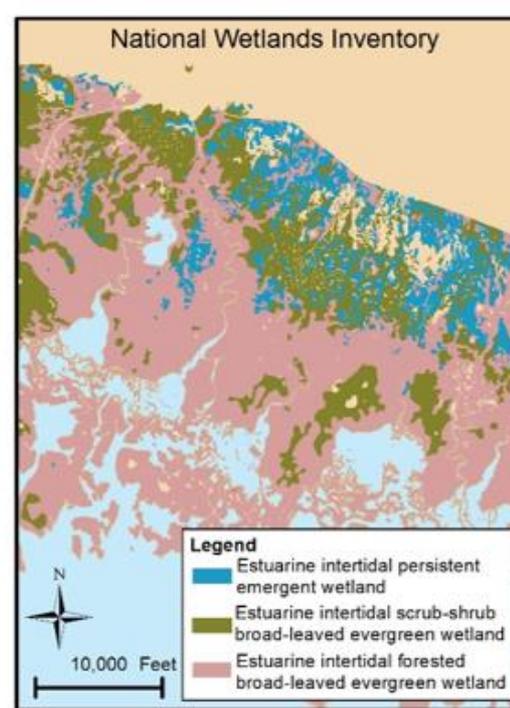
Total extent of salt marsh and mangroves in Florida:

Habitat	Florida Water Management Districts LULC maps	FWC 2003 Florida Vegetation and Land Cover	Cooperative Land Cover version 2.3
Salt marsh acreage	384,996 (155,802 ha)	447,396 (193,195 ha)	376,690 (153,655 ha)
Mangrove acreage	606,044 (245,257 ha)	588,320 (238,084 ha)	608,901 (246,413 ha)
Scrub mangrove acreage	-	6,519 (2,638 ha)	-
Keys tidal rock barren acreage	-	-	6,888 (2,787 ha)

# Tampa Bay Example



# Ten Thousand Islands Example



# Florida Water Management Districts



## Legend

--- Water Management Districts

### Mangrove and Salt Marsh Mapped using Florida Land Use, Cover and Forms Classification System for each district for the following years:

Northwest Florida: 1994-1995, 2004, 2006-2007, 2009-2010

Suwannee River: 1988, 1994-1995, 2004, 2006-2008, 2010-2011

Southwest Florida: 1990, 1994, 1999, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011

South Florida (extent of mapping varies by year): 1995, 1999, 2004-2005, 2008-2009

St. Johns River: 1990, 1995, 2000, 2004, 2009

The boundaries depicted on this map document are approximate. This map document is intended for use only at the published scale. These data are intended for informational use only and should not be considered authoritative for navigation, engineering, legal, or other site-specific purpose. FWC does not assume any legal liability or responsibility arising from the use of this product in a manner not intended by the author.

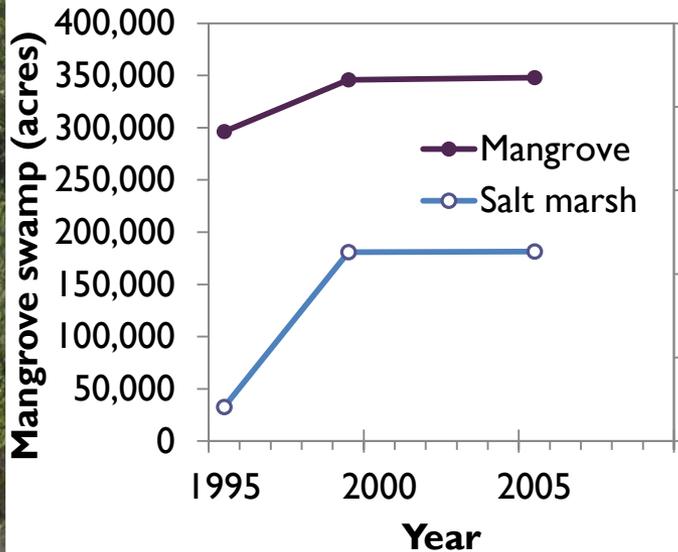
Miles



# Variability in mapping data

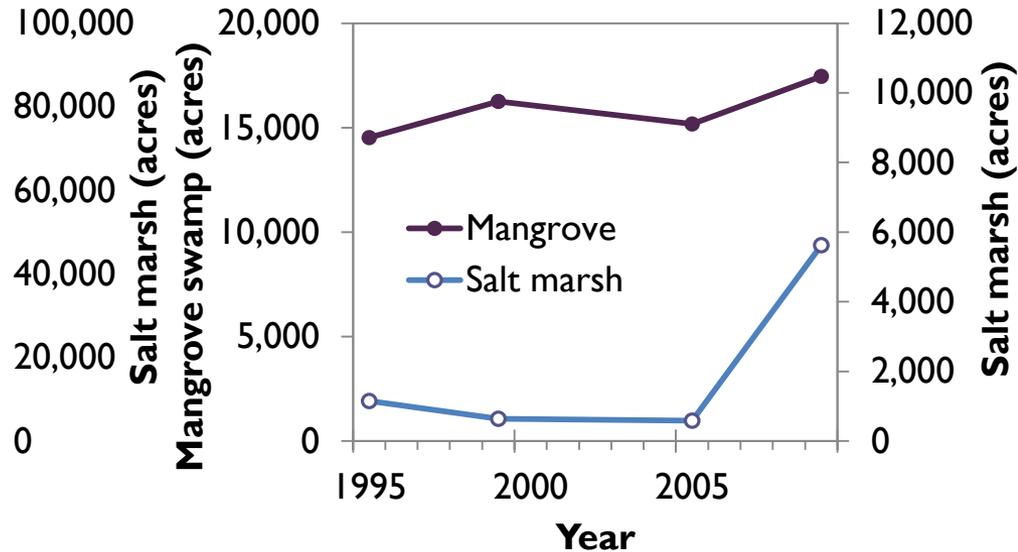
## Everglades SFWMD LULC data

Year	Mangrove	Salt marsh
1995	296372	8144
1999	345908	45188
2005	348018	45335



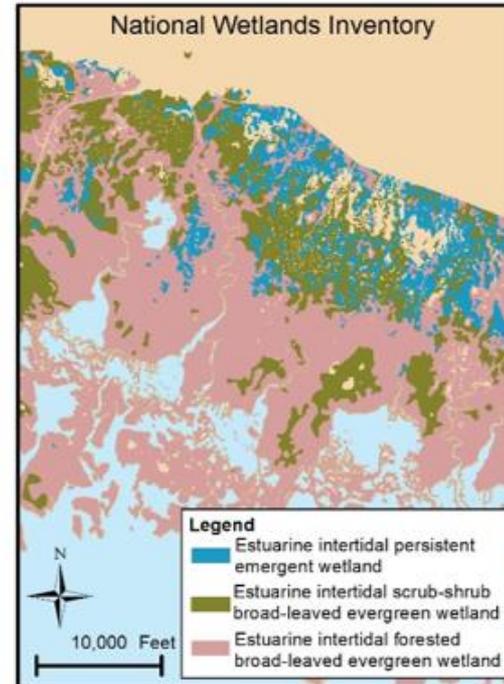
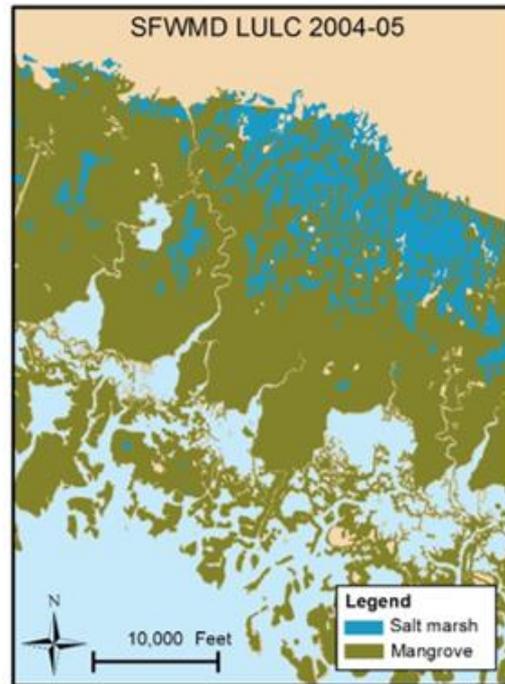
## Biscayne Bay SFWMD LULC data

Year	Mangrove	Salt marsh
1995	14526	1155
1999	16261	641
2005	15184	586
2009	17455	5623



# Mapping summary

- Large availability of mapping data when compared to other coastal habitats (ie seagrasses, oysters)
- Mapping data and categories can vary largely between sources, methodologies are often modified (and not directly comparable)



# Mapping summary

- Land classification schemes are not designed to incorporate a mixture of vegetation types
- Hinders study of mangrove expansion, intrusion of invasive species



# Monitoring summary

- Two general types of monitoring:
  - Short term monitoring at restoration or mitigation sites.
  - Short to long term monitoring on protected lands.
- Methodology varies
  - See Table 3 in handout for summary of common monitoring protocols



The slide features a decorative graphic on the left side. It consists of a vertical blue bar with two overlapping white circles. Below this bar is a photograph of a mangrove forest with dense green foliage and a body of water at the bottom.

# Monitoring summary

- Monitoring often short term due to funding.
- Monitoring needed for factors not met by mapping
  - Mangrove expansion northward or into adjacent habitats
  - Invasive species expansion
  - Species-specific vegetation shifts due to altered hydrology
  - Recognizing stressed mangroves before die-offs

# Most common threats

- Hydrologic alteration
  - Surface, ground, and coastal hydrology
  - Ditching and impoundments
- Sea level rise
  - Saline intrusion, lack of landward refuge
- Shoreline hardening



# Most common threats

- Continued human development
- Invasive vegetation
- Illegal trimming





# Common recommendations/needs

- Freshwater management is key to maintaining appropriate salinity levels
- Cooperation between agencies needed to coordinate land connectivity and establish landward buffer zones
- Methodologically consistent, long-term statewide monitoring

# Common recommendations/needs

- Constant vigilance/action against invasive vegetation
- Early identification of stressed mangroves may prevent mangrove die-offs



# Questions?



# FWC GIS Resources and Future Projects

Christi Santi

and

Kathleen OKeife



# FWC GIS Resources

- Habitat Data:
  - Statewide Compilations from multiple sources:  
Mangrove, Saltwater Marsh, Seagrass, Oysters etc.
- Cooperative Landcover: FWC and FNAI
- FWC GIS Downloads





2012-2013

2010-2011

2009

2011

2008-2009

2012

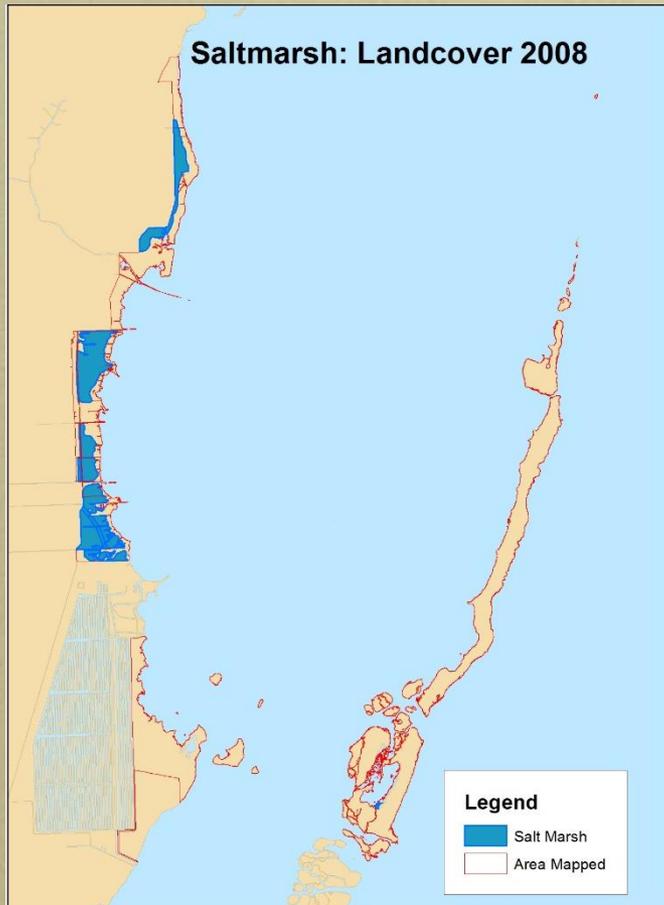
### Dates of Source Imagery used for FWC Mangrove and Salt Marsh Compilations

#### Source Imagery Date

- 2010-2013
- 2008-2009
- 2004-2006
- 1999



# Mapping: Regional or Local Data



# Cooperative Landcover:

- FWC and FNAI cooperative map
- Polygons or 10m raster
- Please Contribute [landcovermap@myfwc.com](mailto:landcovermap@myfwc.com)



# Open Data



Florida Fish and Wildlife Conservation Commission  
Florida Fish and Wildlife Research Institute  
GIS & Mapping Data Downloads

Search for open data



My Activity

## GIS Data Categories



Boating



Boundaries



Elevation



Emergency  
Response



Fish & Wildlife  
Habitat



Fish & Wildlife  
Management



Fish & Wildlife  
Species Locations



Freshwater  
Ecosystems



Harmful Algal  
Bloom



Imagery



Land Cover



Location



Manatees



Marine  
Ecosystems



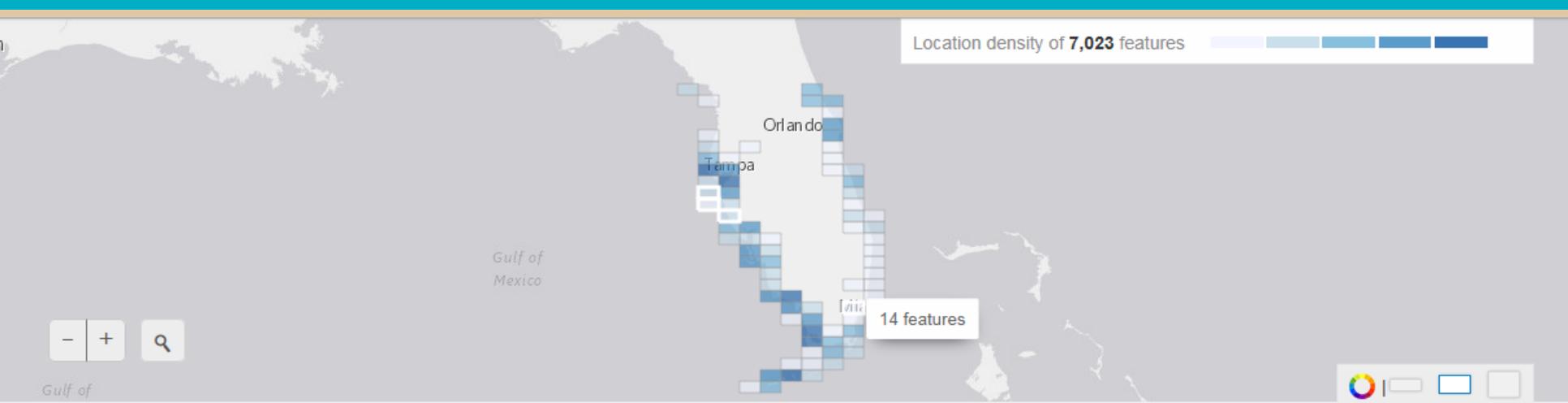
Shoreline



Transportation



FWC GIS Data Downloads:  
<http://geodata.myfwc.com/>



# Mangrove Habitat in Florida

Open In ArcGIS Share **Download Dataset**

Details Table

## DESCRIPTION

This GIS data set represents mangroves in Florida. The data are reselected from land use and land cover data from Florida's water management districts.

## DATASET ATTRIBUTES

SOURCE DATE Text	2008-2009 (2623), 2011 (2291), 2009 (1637), 2004-2005 (1312), 1999 (68), 2010-2011 (47), 2006 (45)
---------------------	--

+ 2 more attributes

## RELATED DATASETS

- Florida Fish and Wildlife Conservation Commission  
MyFWC.com

**Freshwater Ecosystems**  
Lakes Florida
- Florida Fish and Wildlife Conservation Commission  
MyFWC.com

**Shorelines**  
Gulf of Mexico Shoreline
- Florida Fish and Wildlife Conservation Commission  
MyFWC.com

**Boating**  
Inlets and Passes Florida
- Florida Fish and Wildlife Conservation Commission  
MyFWC.com

**Boating**  
Intracoastal Waterway  
East Coast Florida

DOWNLOAD ENTIRE DATASET

Spreadsheet KML Shapefile API

DOWNLOAD FILTERED DATASET

Spreadsheet KML Shapefile API

## ABOUT



Updated: 3 days ago

This group is for the FWC Open Data GIS & Mapping Data download site (geodata.myfwc.com). Datasets made public and shared with this group will be searchable on the OpenData Portal.

Contact Chris Boland at Chris.boland@myfwc.com for more information.

Source <http://atoll.floridamarine.org/arcgis/rest/servic>  
Metadata [Mangrove Habitat in Florida](#)  
License [Users are encouraged to read and fully comp](#)

## TAGS

FWC | FWRI | Florida | Statewide | Marine | Marine Ecosystems | Coastal Habitat | Land cover | Terrestrial | Upland | Southwest Florida | statewide |

# Future Projects...

- Mapping Mangrove Species using Hyperspectral Remote Sensing – A Pilot Project in the Florida Everglades (Bob Glazer, FWC).
- We would like to do similar work in Tampa Bay or Sarasota Bay Area





# Available AVIRIS

## 2006-Present AVIRIS Flight Locator Tool

Please note that the locator tool is only compatible with Mozilla Firefox, Google Chrome, and Safari web browsers.

### Use the Attribute Filter

- Select for Conditional Search  
 Select for Text Search

Year  AND Year

Month  AND Month

Day  AND Day

Run  AND Run

PixelSize  AND PixelSize

Rotation  AND Rotation

Solar\_Elev  AND Solar\_Elev

Solar\_Azimuth  AND Solar\_Azimuth

Pixel size unit is meters. Rotation, Solar Elevation, and Solar Azimuth are degrees.

### Or use the Spatial Filter

Enter WGS-84 Latitude and Longitude in Decimal Degrees Format, e.g. Latitude=34.86 and Longitude=-125.94 (West negative).

- NONE  
 RECTANGLE: ([Select on Google Earth](#))

(Upper Left) Latitude= Longitude=

(Lower Right) Latitude= Longitude=

**CLICK TO SEARCH** for AVIRIS flight lines.

Toggle All AVIRIS  
Toggle All Attrib. Filter

Map Satellite

Zoom to Polygon Save Polygon Coords to Filter Update Map

Results Count=2905  
Notes on Map Display:



# Resources

- Downloadable GIS data: <http://geodata.myfwc.com/>
  - Freshwater Shapefiles
  - Marine Shapefiles
  - Terrestrial Shapefiles
  - KML files for Google Earth
- To order Marine Resources GIS CD or specific GIS data, email: [GISLibrarian@MyFWC.com](mailto:GISLibrarian@MyFWC.com)
- For other questions call Kathleen OKeife or Christi Santi  
727-896-8626

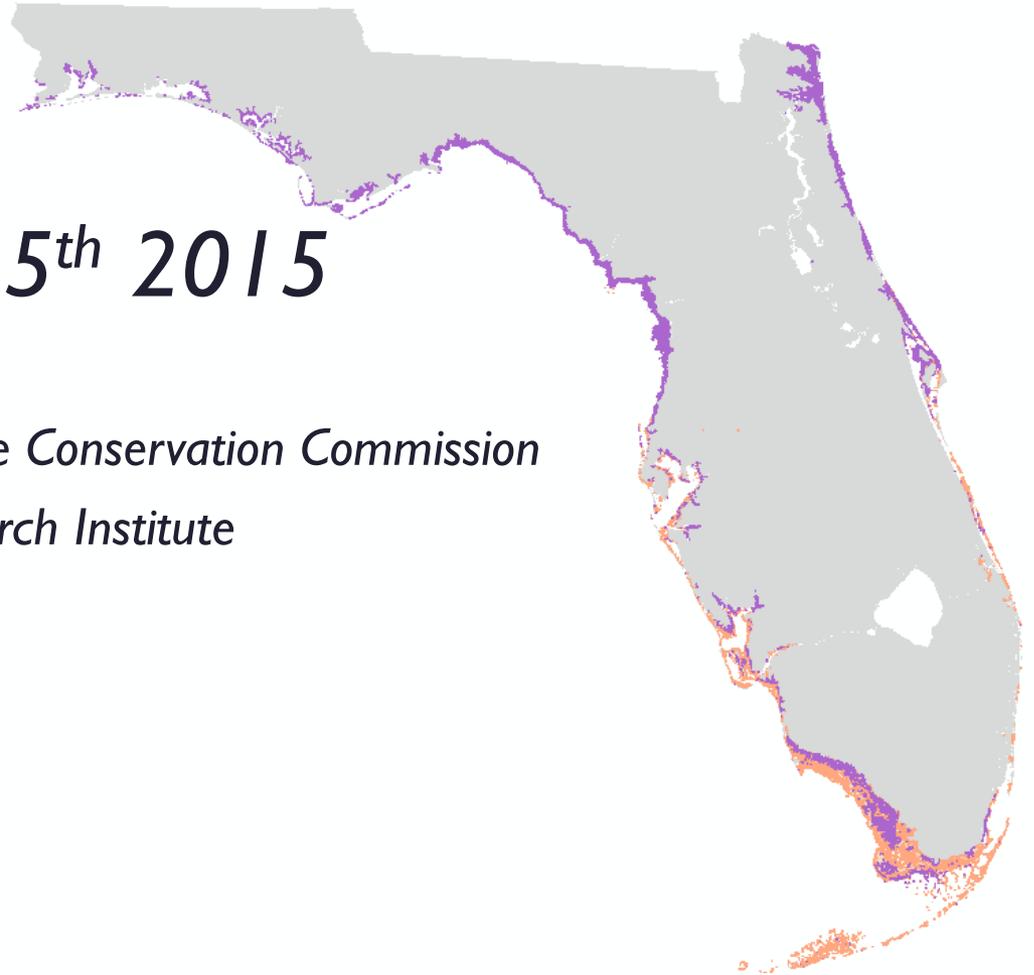


# Coastal Habitat Integrated Mapping and Monitoring Program (CHIMMP)

*Day 2*

*September 15<sup>th</sup> 2015*

*Florida Fish and Wildlife Conservation Commission  
Fish and Wildlife Research Institute  
St. Petersburg, Florida*



# Day 2 Itinerary

- **8:30-9:00 am** Travel reimbursement paperwork
- **9:00-9:15 am** Day 2 Introduction
- **9:15-10:00 am** Monitoring Presentations
- **10:00-10:30 am** Monitoring breakout
- **10:30-11:00 am** Reconvene and discuss
- Break
- **11:15-11:45 am** Regional breakout: gaps and needs
- **11:45-12:30 pm** Reconvene and discuss. Conclusion and future directions

# CHIMMP monitoring

- **Compare monitoring methodology**
  - Side-by-side comparison of common monitoring techniques
  - Determine needs and best practices for monitoring



Pilot monitoring in Clam Bayou, Gulfport.

# CHIMMP monitoring

- Clam Bayou
- 2011 SWFWMD Restoration Project



What are appropriate time scales for short-term and long-term monitoring?



December 2014



September 2015

# CHIMMP monitoring

- Comparison of methodologies
  - NERRS System Wide Monitoring Program (Moore 2013)
  - EPA National Wetland Condition Assessment (EPA 2011)
  - Point-Centered-Quarter (PCQ) sampling non-plot methodology (Cottam and Curtis 1956)
  - Various canopy cover metrics
  - MangroveWatch video monitoring

# Metrics for monitoring mangroves

- Tree density, biomass
  - Diameter at breast height (DBH)

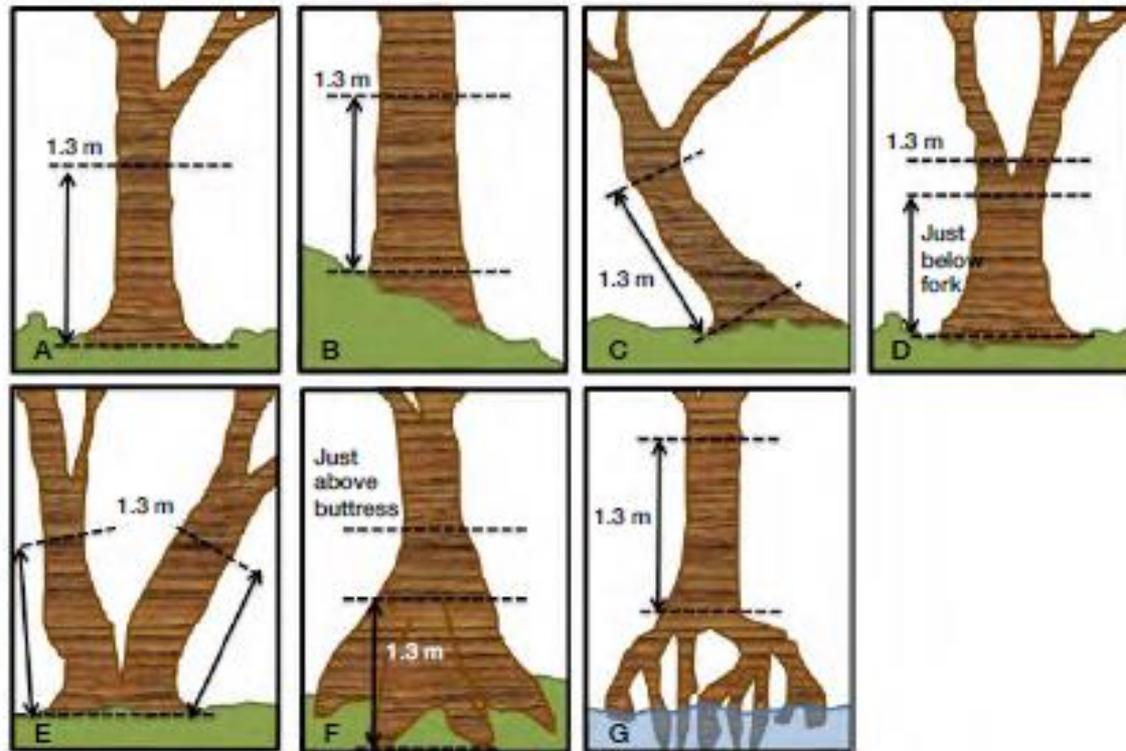


Figure 4.4 Estimating diameter at breast height for irregular mangrove trees (modified from Pearson, *et al.* 2005)

# Metrics for monitoring mangroves

- Biomass metrics in a mangrove forest
- Point-Centered-Quarter (PCQ) sampling non-plot methodology (Cottam and Curtis 1956)

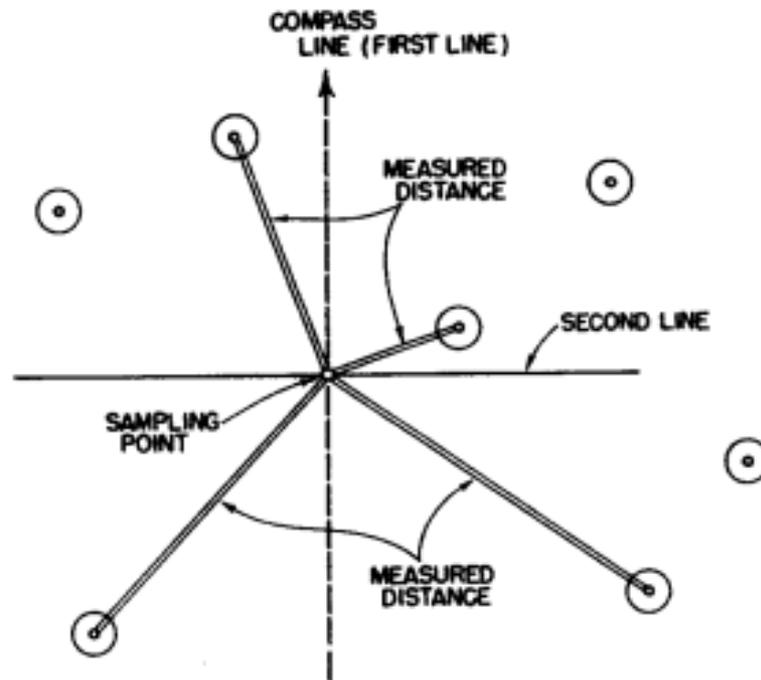


FIGURE 7.4. Point-centered quarter method.



Metrics that assume a vertical growth pattern can't always be applied in mangroves

EPA National Wetland Condition Assessment (EPA 2011)

- Standing dead tree (angle of incline  $>45$  degrees)
- Downed wood debris (angle of include  $<45$  degrees)

# Monitoring Breakout

Remote Sensing  
Group

Mangrove  
Monitoring  
Groups (4-6  
people in each)

Salt Marsh  
Monitoring  
Groups (4-6  
people in each)



# Most common gaps and needs identified at 2014 workshop

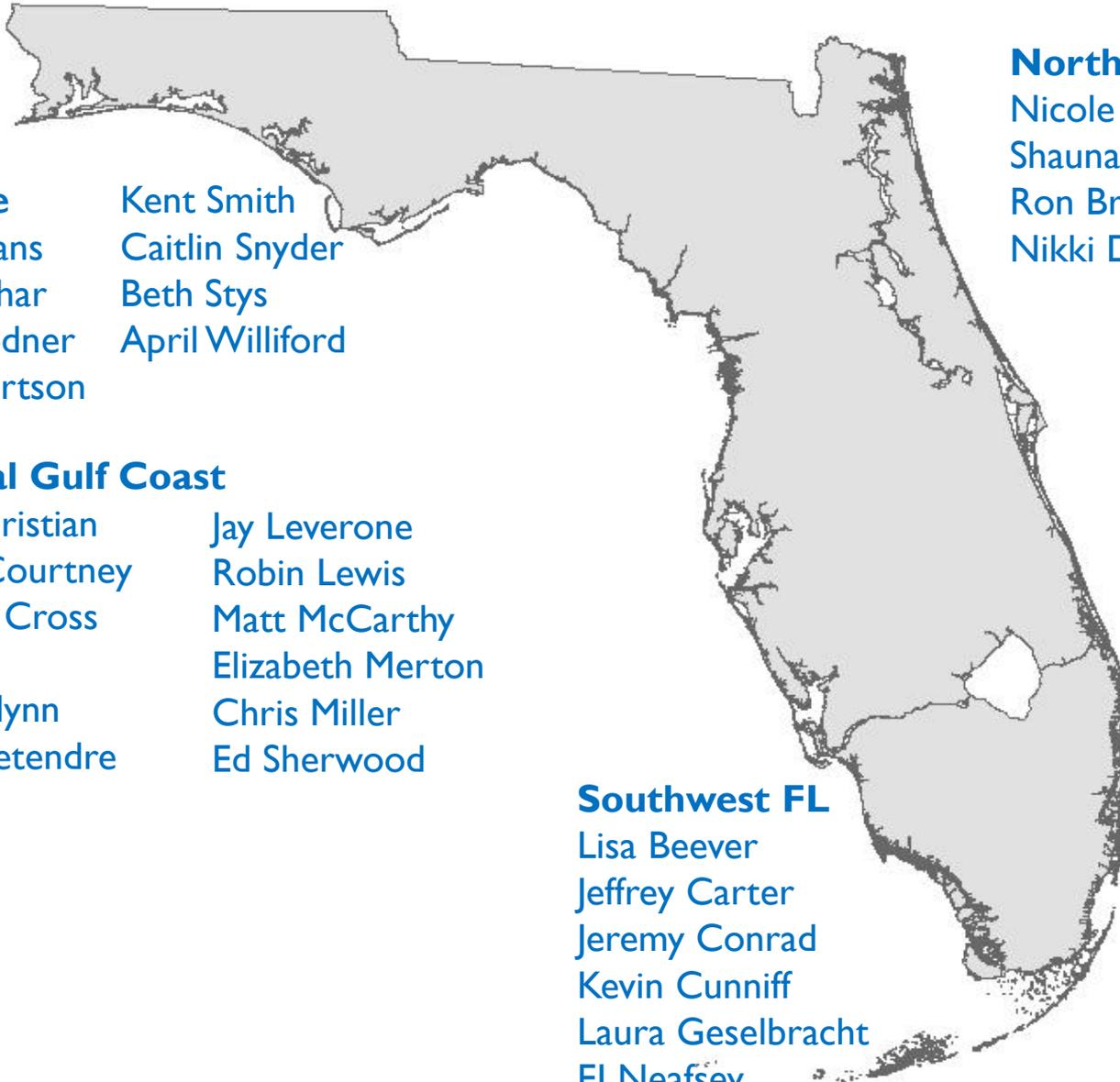
- Need coordination among agencies
- Coastal wetlands monitoring often follows variable methodology, is short term and has limited funding
- Mapping more extensive than monitoring, but classifications vary widely.
  - Historical/very recent data lacking
  - Budget cuts with recent recession
- Typical mapping categories often don't track mangrove expansion, stress, invasive species



# Gaps and Needs

- Have priorities, needs, and recommendations changed?
- Additional priorities and gaps recognized by new attendees?
- What is *specifically* on your wish list?

# Gaps and Needs breakout



## **Panhandle**

Kristine Evans  
Katie Konchar  
Jennylyn Redner  
Chris Robertson

Kent Smith  
Caitlin Snyder  
Beth Stys  
April Williford

## **Central Gulf Coast**

Julie Christian  
Frank Courtney  
Lindsay Cross  
Bill Ellis  
Laura Flynn  
Jamie Letendre

Jay Leverone  
Robin Lewis  
Matt McCarthy  
Elizabeth Merton  
Chris Miller  
Ed Sherwood

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Lisa Beever  
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Nicole Adimey  
Shauna Allen  
Ron Brockmeyer  
Nikki Dix

## **Central/Southeast FL**

Craig van der Heiden  
Jeff Beal  
Patrick Pitts



# Workshop Conclusion