

Implications of land use change on coastal wetlands and headwaters of Alabama

2015 Alabama Water Resource Conference & Symposium

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10 September 2015



Current and future urban growth- changing watersheds

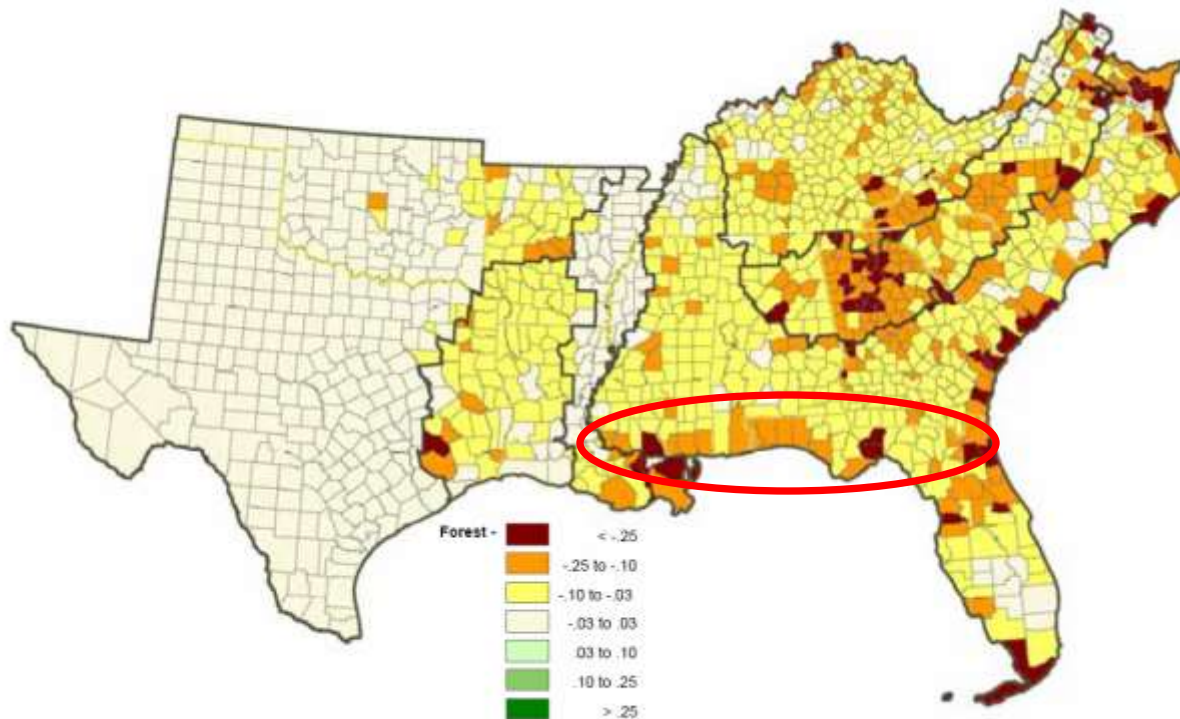


Figure 27—Forecasted change in the proportion of counties in forest land use for Cornerstone Future B (high population/income growth with decreasing timber prices).



(Projection for 2010 – 2060, Southern Forests Future Project, USDA-U.S. Forest Service, 2013).

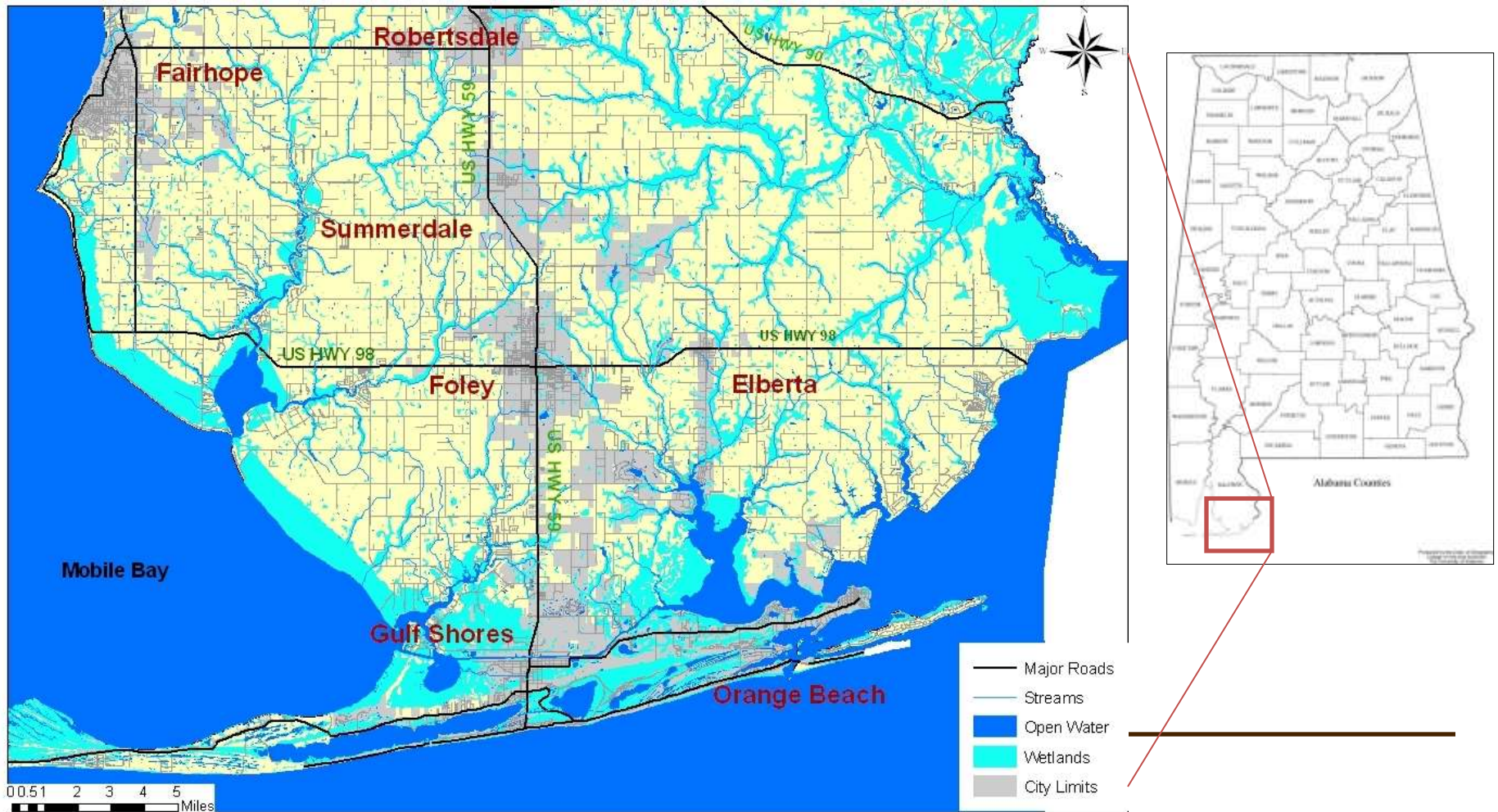
Land use change - coastal wetlands and headwaters



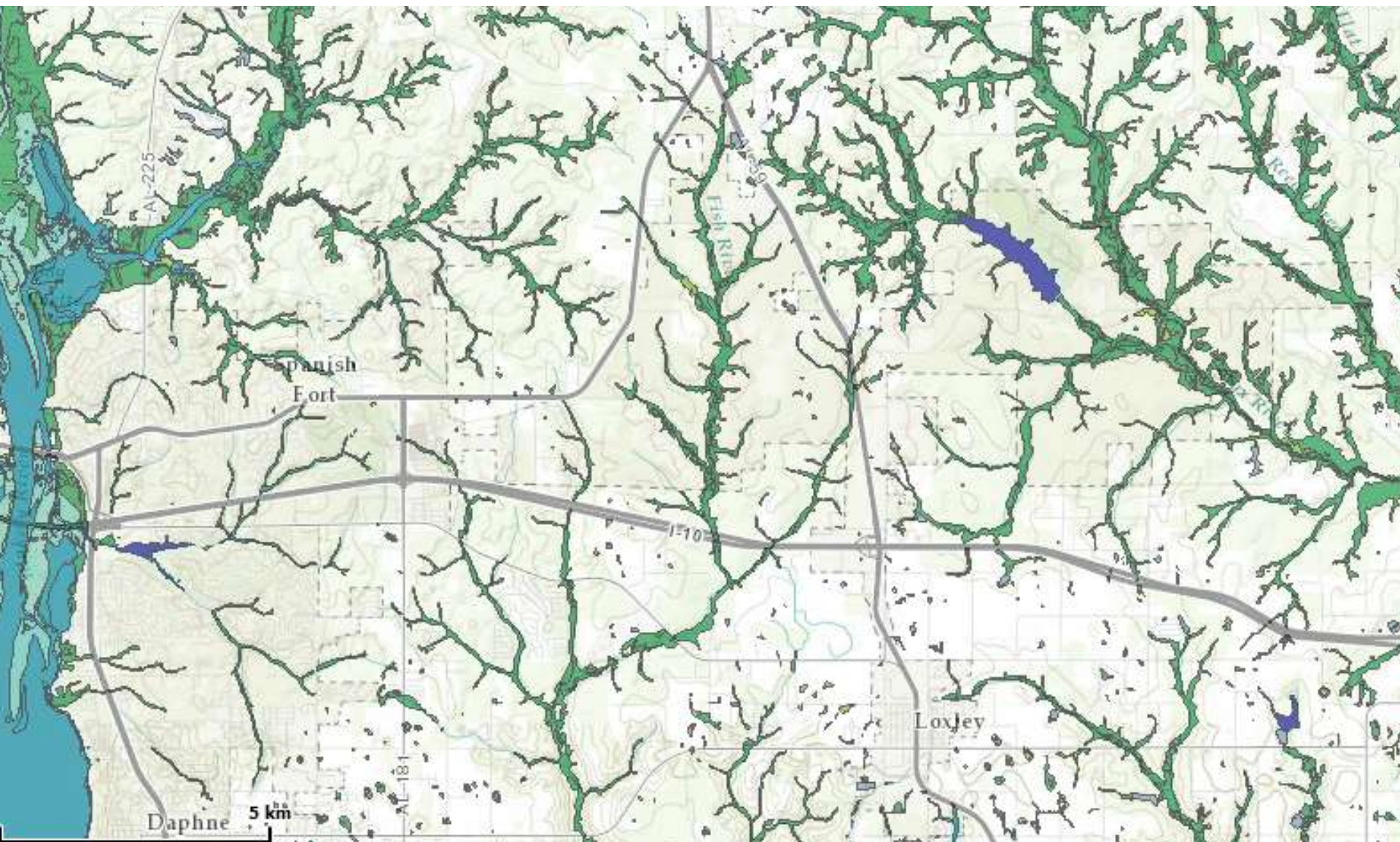
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Land use change - coastal wetlands and headwaters

- Lower Baldwin County, Alabama

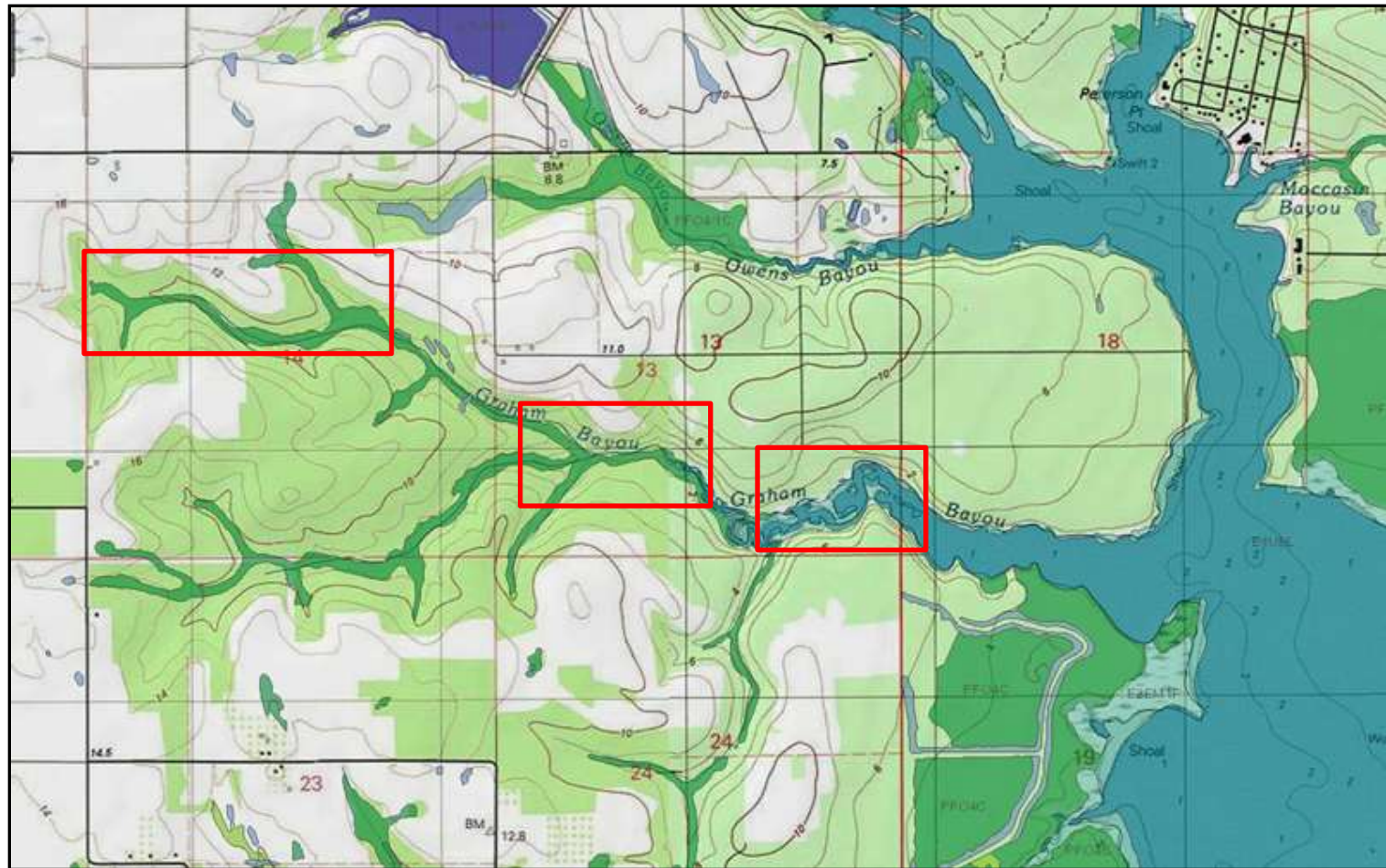


Land use change - coastal wetlands and headwaters



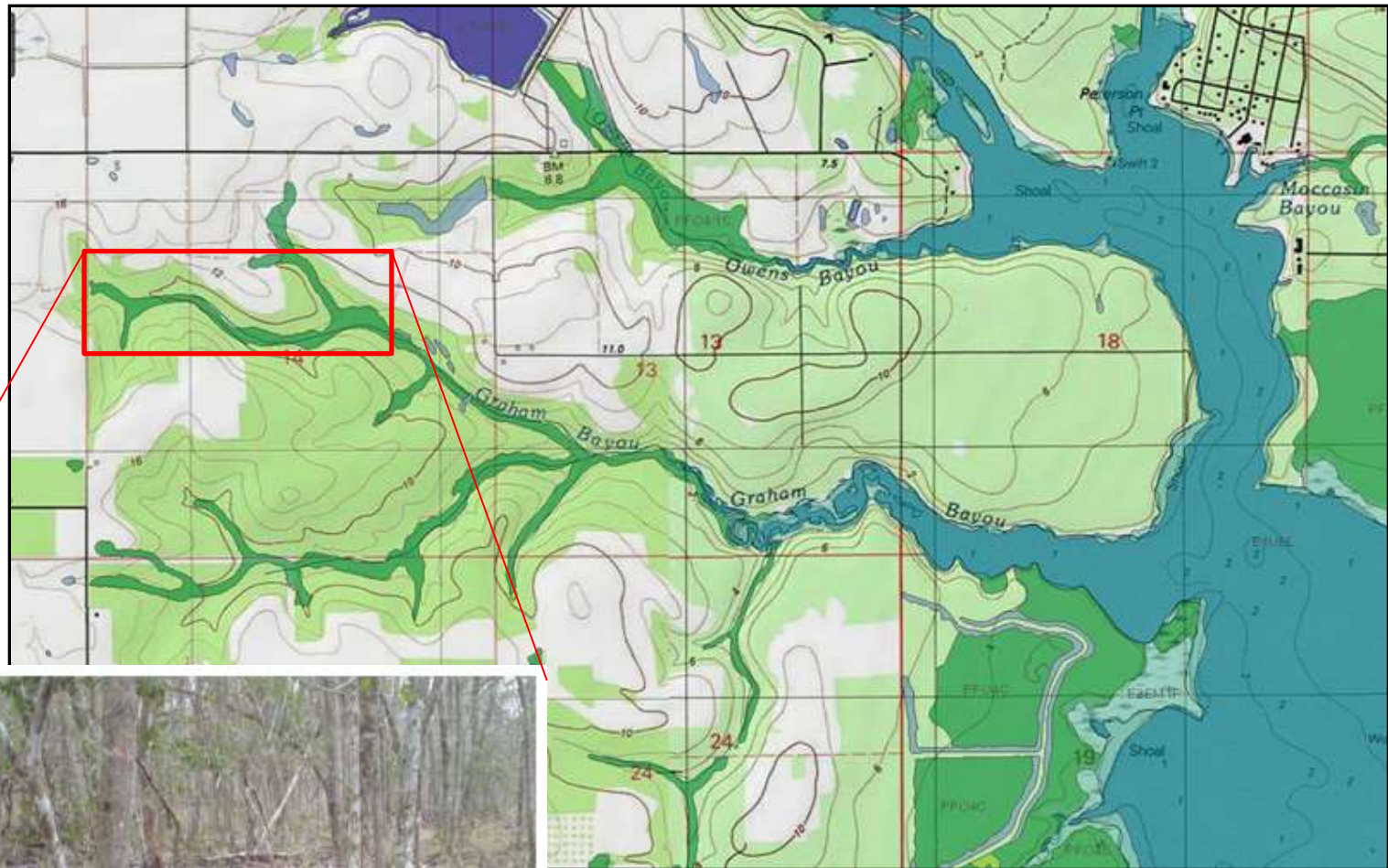
NWI and topography for the area of Spanish Fort, AL

Land use change - coastal wetlands and headwaters



Coastal creek draining to Wolf Creek in Foley, Alabama

Land use change - coastal wetlands and headwaters



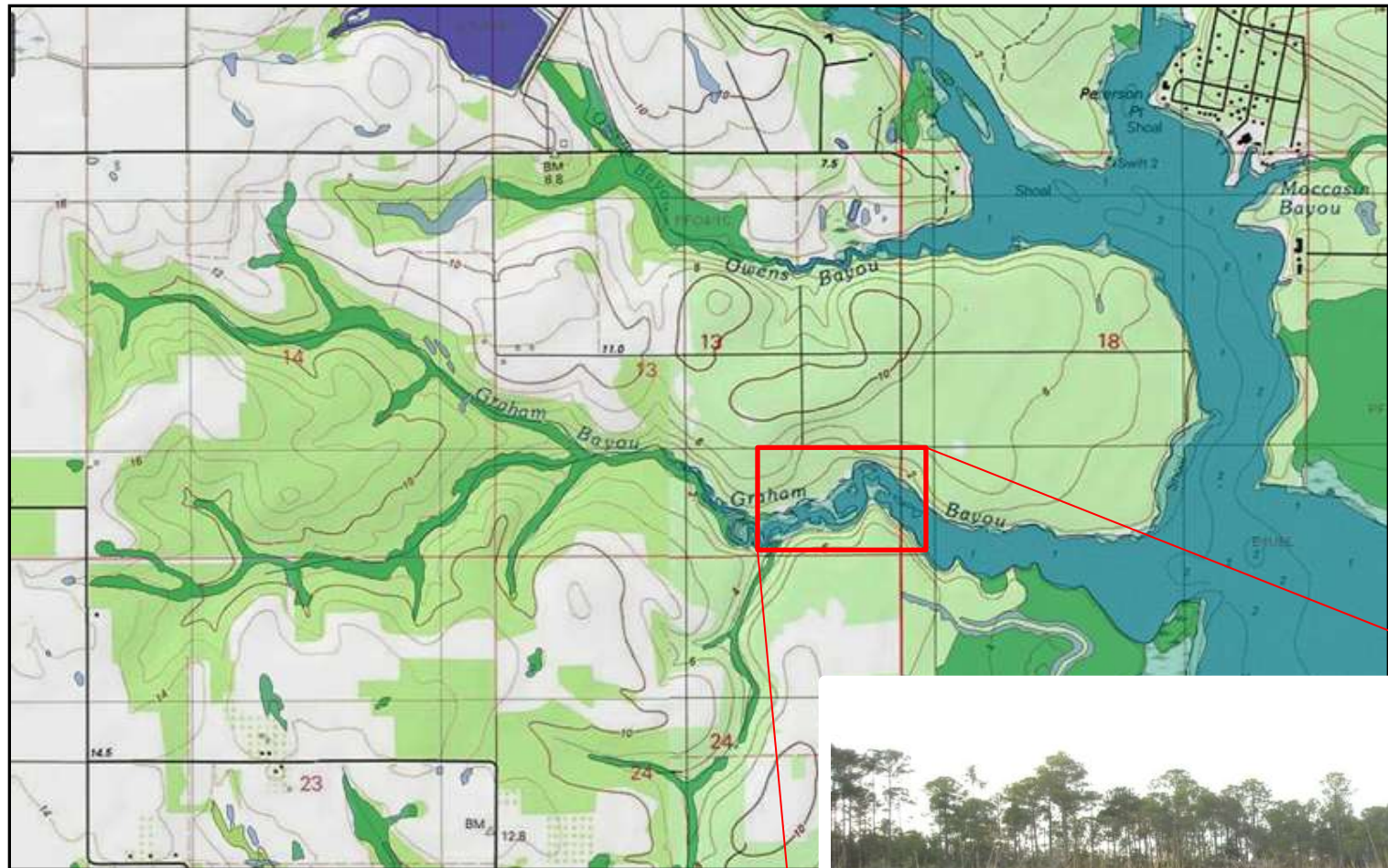
Headwater slope wetlands

Land use change - coastal wetlands and headwaters



Low-order creeks

Land use change - coastal wetlands and headwaters



Tidal creek salt marshes

Research goal:

Determine how land use change influences headwaters and wetland functions in coastal creeks of Alabama



Headwater wetlands

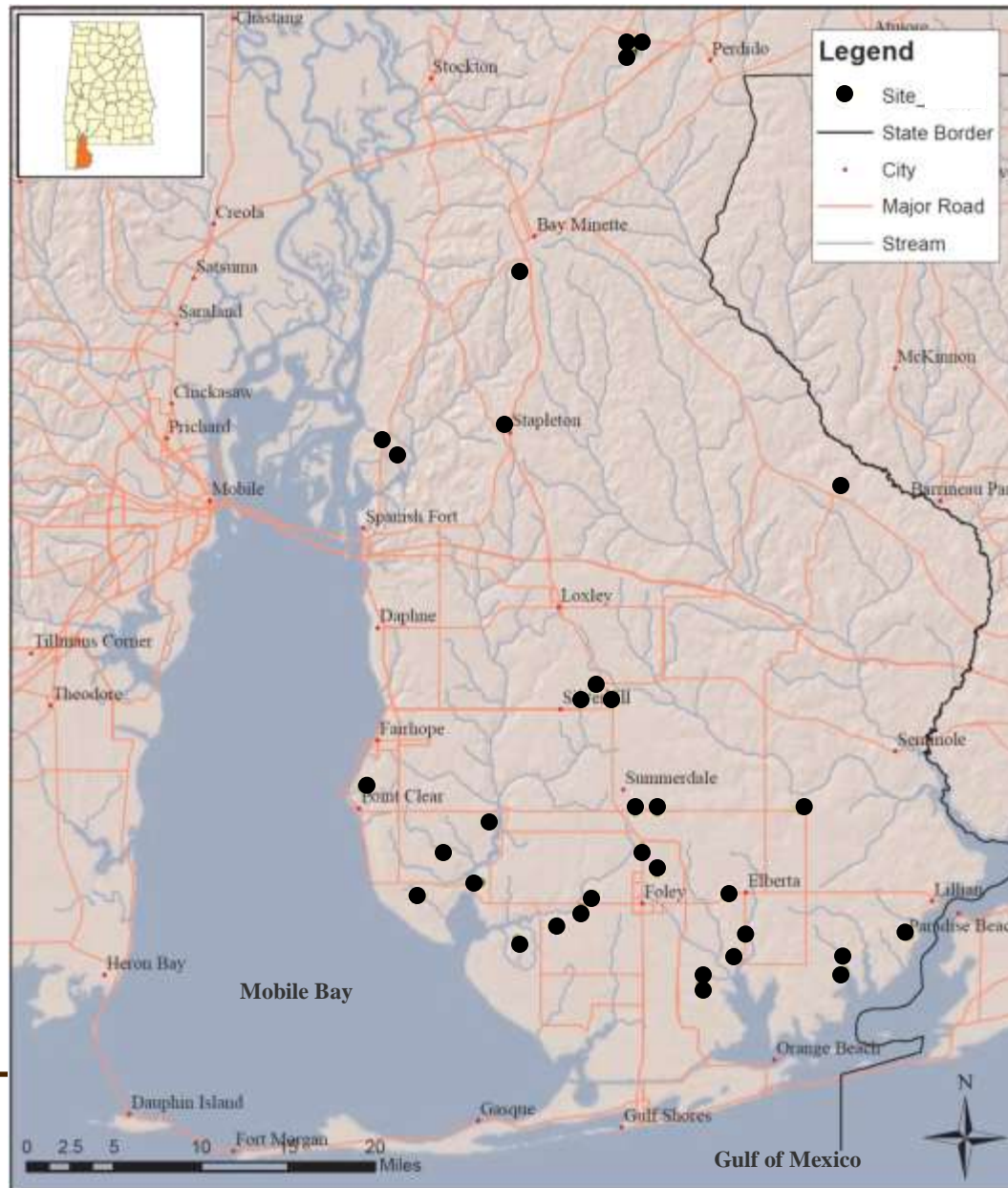


Field studies related to wetland functions:

- Forest community assemblage
- Water storage and hydrology
- Carbon cycling
- Amphibian species assemblages
- Water quality



Land use change - coastal wetlands and headwaters



Headwater wetland sites in Baldwin County, AL (n=33)

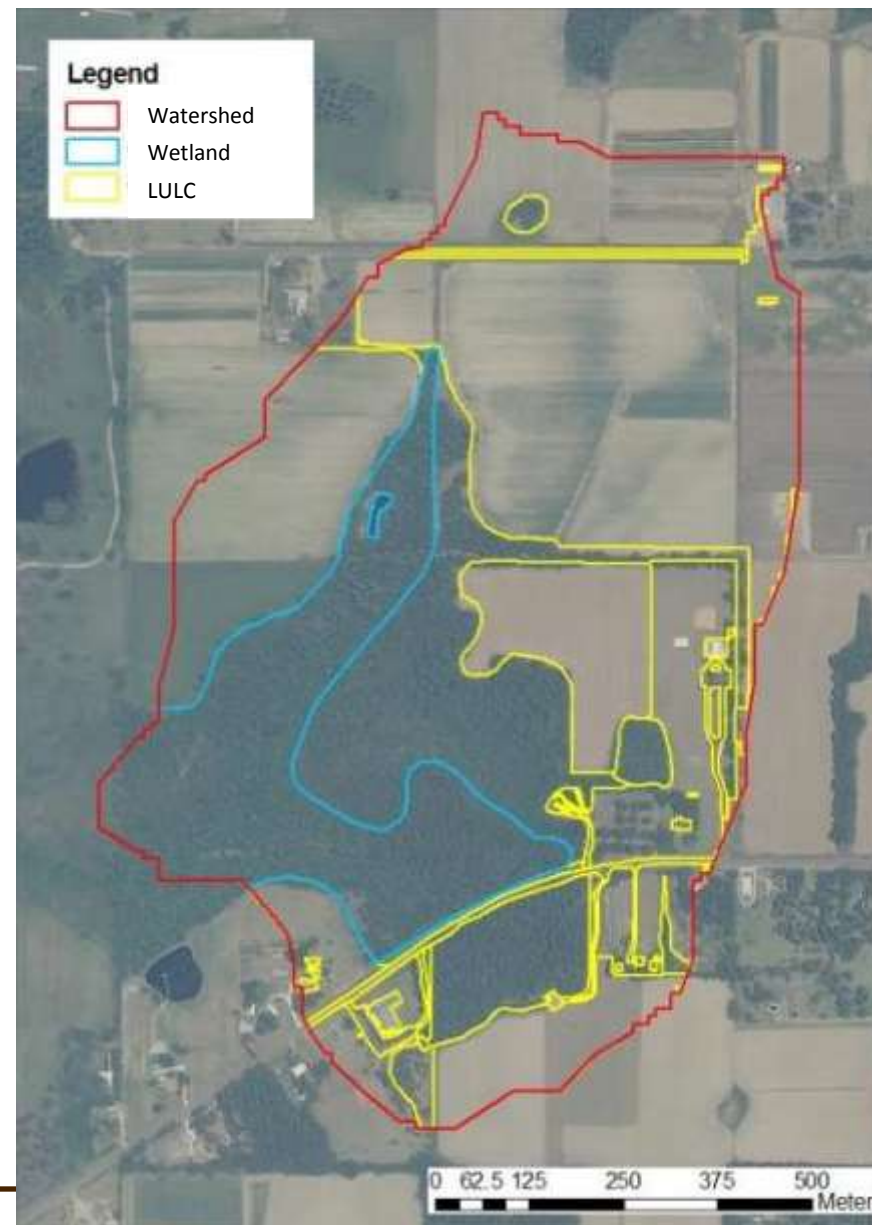
Functional assessments starting in 2009

Sites occur across a range of surrounding land use/land covers

Average watershed size: 77.9 ha

Headwater wetlands

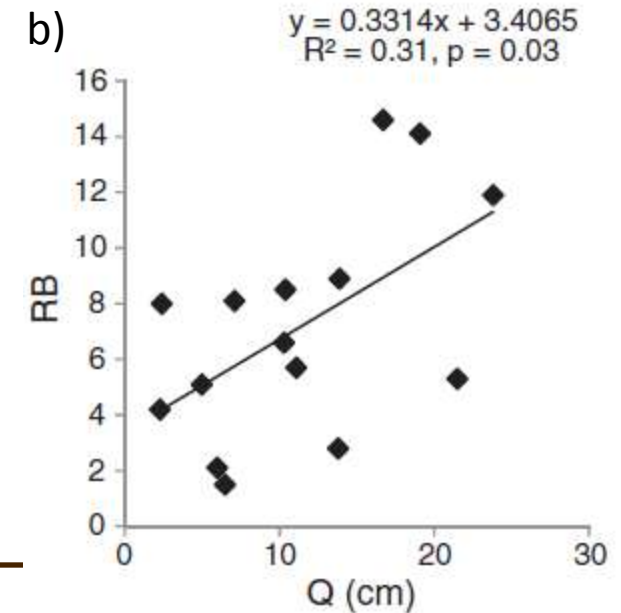
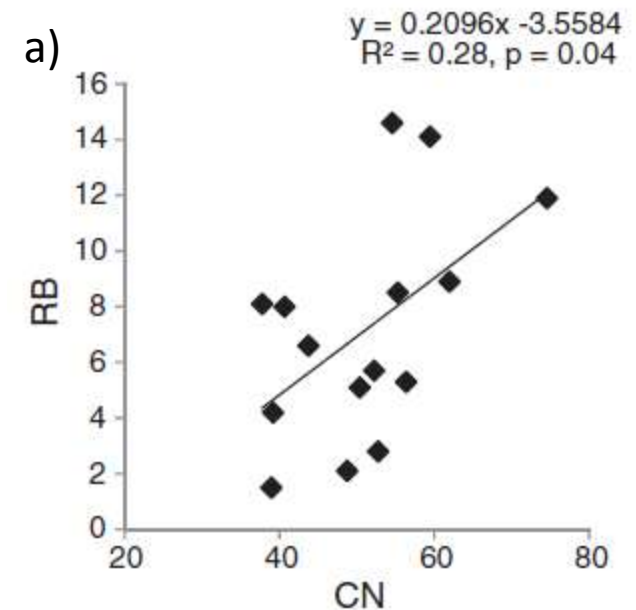
- 15 headwater wetlands
- SCS-method runoff curve nos. (CN) calculated using soil, LULC, and NEXRAD precipitation data
- Shallow groundwater monitoring with water level recorders
- Litterfall production and forest floor litter storage



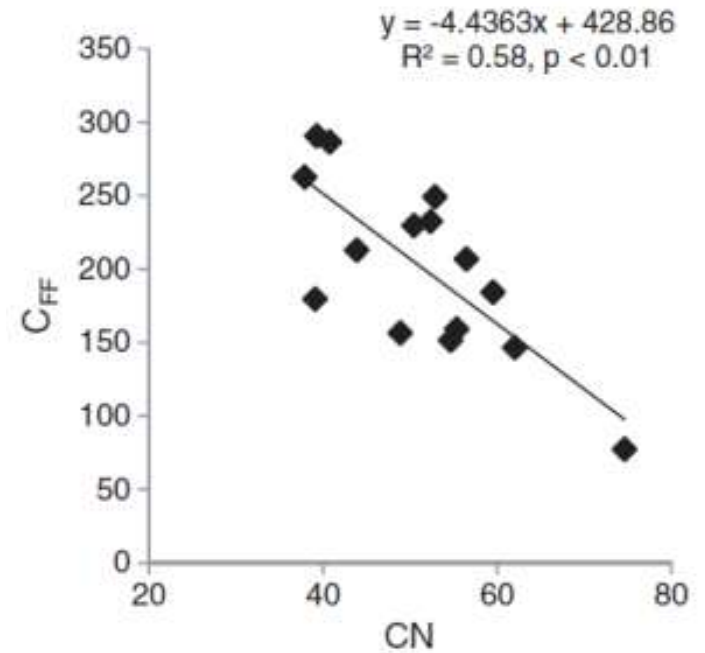
Headwater wetlands



Relationship between a) SCS-curve number (CN) and Richard baker Index (RB) and b) runoff depth (Q) and RB

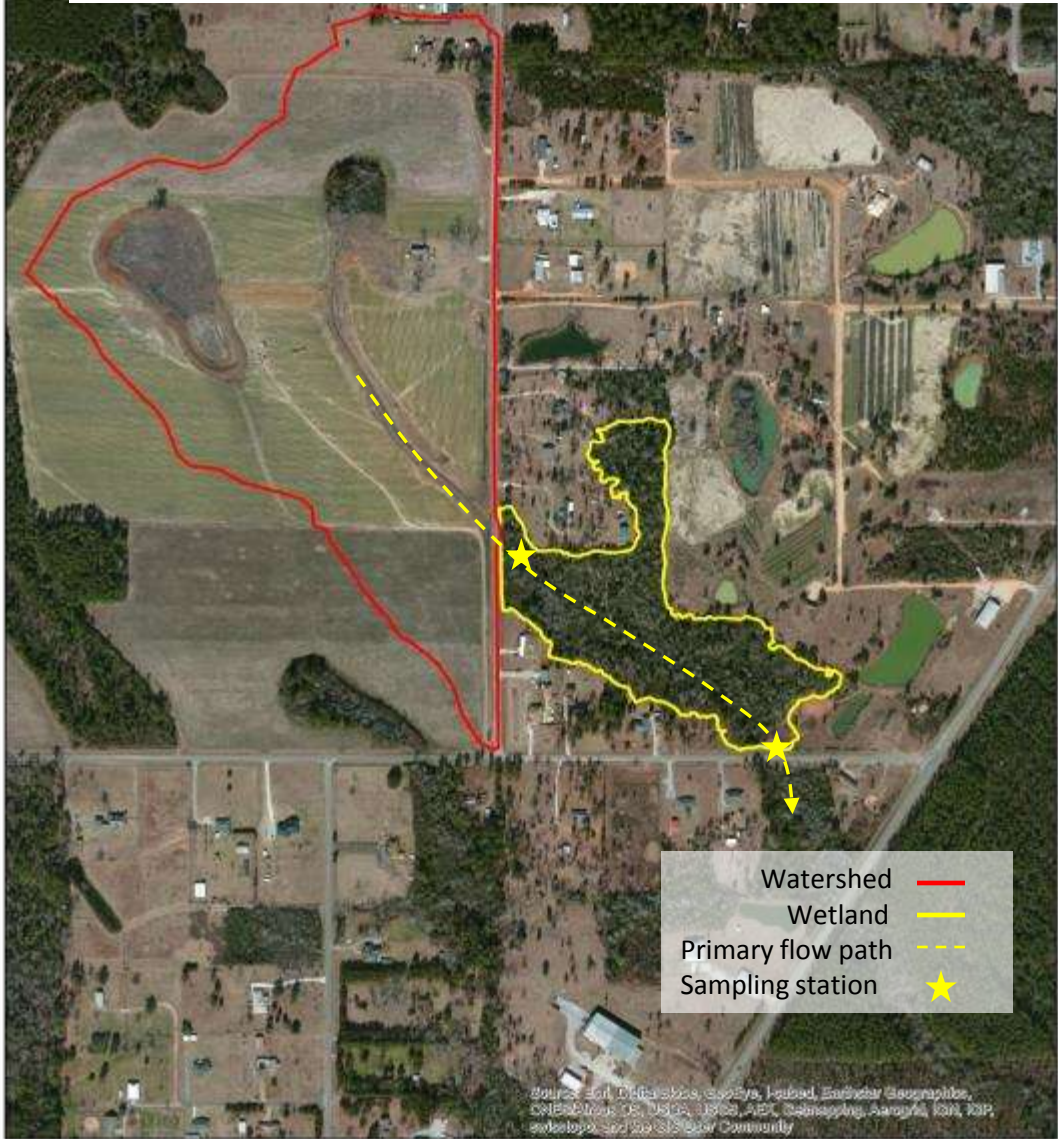


Headwater wetlands

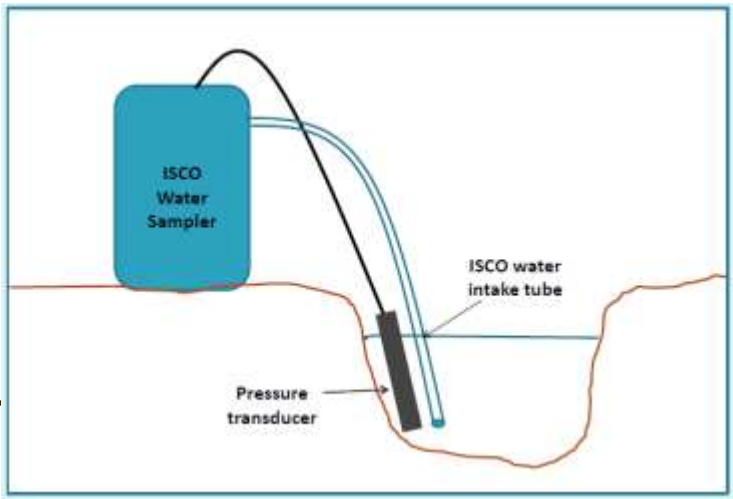


Relationship between SCS-curve number (CN) and a) forest floor carbon C_{FF} (g-C m⁻²)

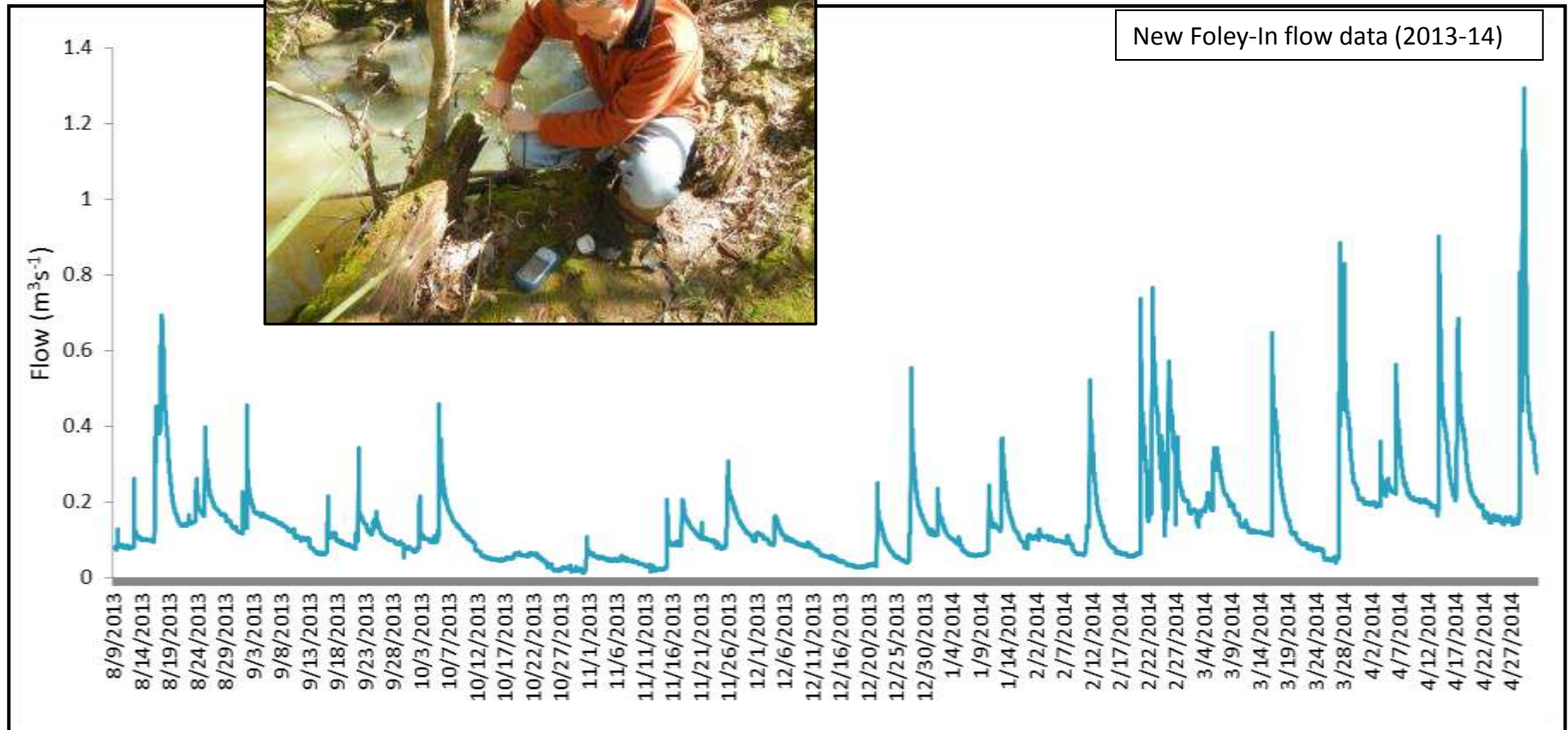
Headwater wetlands



- 4 headwater wetlands selected for water quality monitoring (DIN, SRP, TDP)
- Sampled wetland surface water inflows and outflows to estimate nutrient retention.



Headwater wetlands research

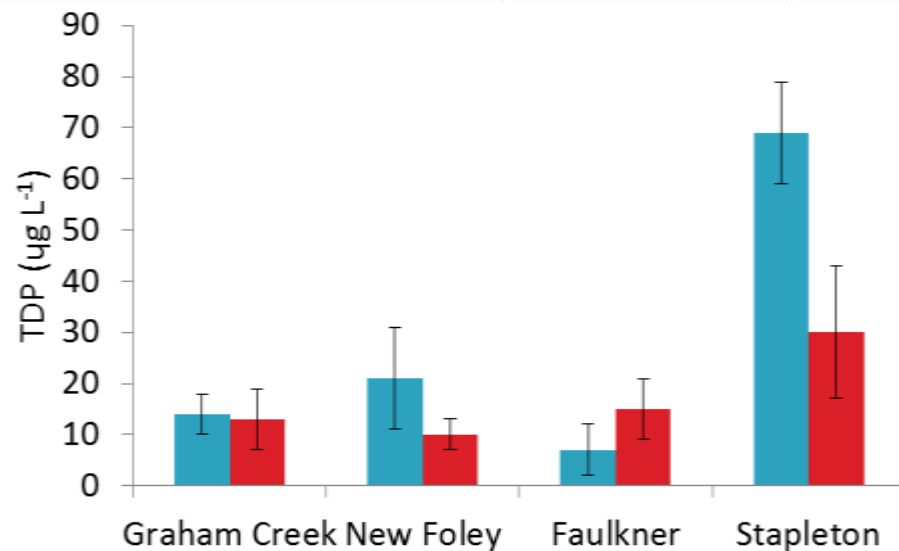
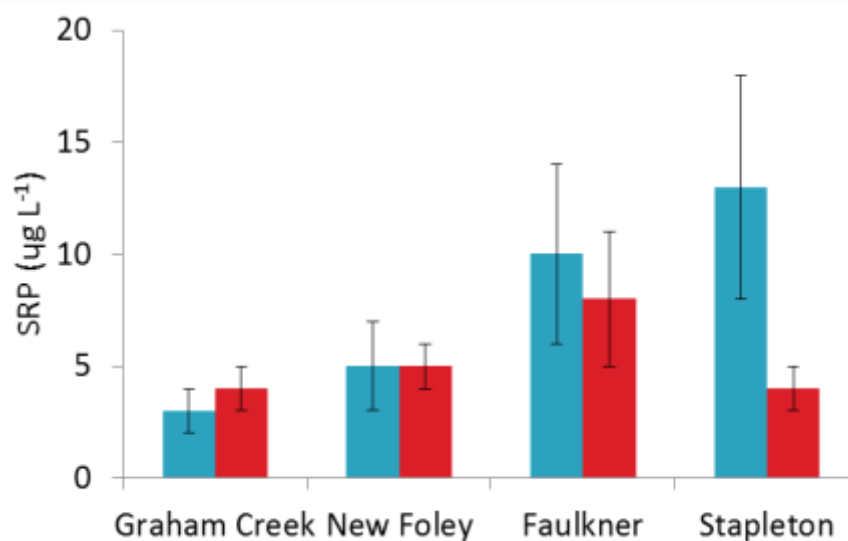
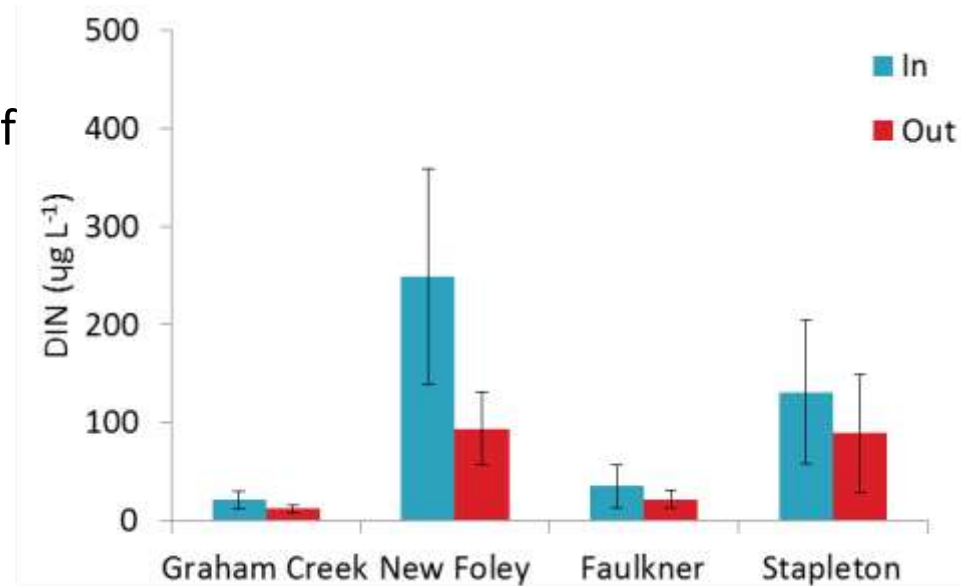


Rating curves were developed to estimate continuous flow at each wetland station

Headwater wetlands

Percent nutrient load reductions of functional urban wetlands:

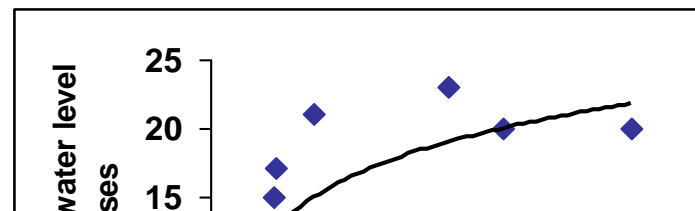
- DIN: 56 – 59%
- SRP: 33 – 56%
- TDP: 36 – 56%



Low-order creeks



Chemical and biological
responses of 13 low-order



Concurrent Session Five

Friday, 9:00 a.m. – 10:30 a.m.

$$\ln(x) + 9.8598$$
$$0.5153$$

Session Five (A): Coastal Issues

Session Chair: Todd Boatman, U.S. Army Corps of Engineers, Mobile District

Restoration Of The Northern Tip Of Mon Louis Island - Surmounting Challenges To Project Implementation Through Teamwork, Tom Herder, Mobile Bay National Estuary Program

Influence Of Low-intensity Watershed Development On Small Coastal Alabama Streams, Brad Schneid, Auburn University

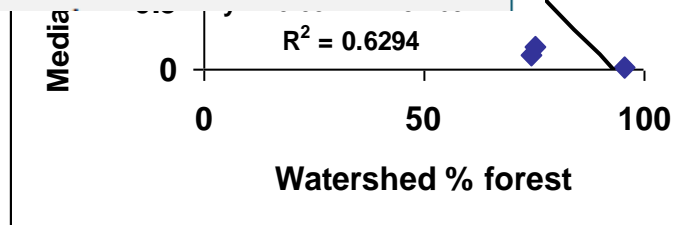
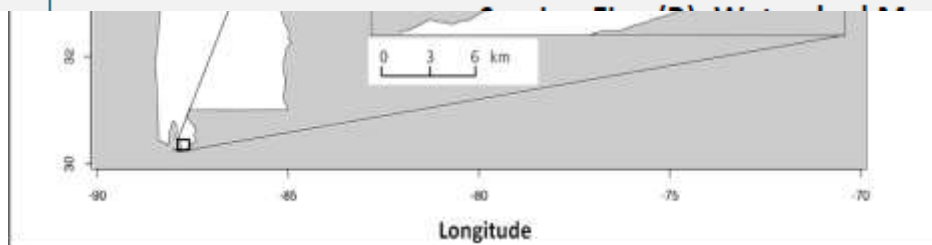
A Regional Holistic Approach To Watershed Management - To Protect And Enhance Ecosystem Services For Future Generations, Barbara Albrecht, Panhandle Watershed Alliance

Examining The Importance Of Submarine Groundwater Discharge (SGD) In A River Dominated Estuary: Example Of Mobile Bay, AL, Daniel Montiel, University of Alabama

Salon E

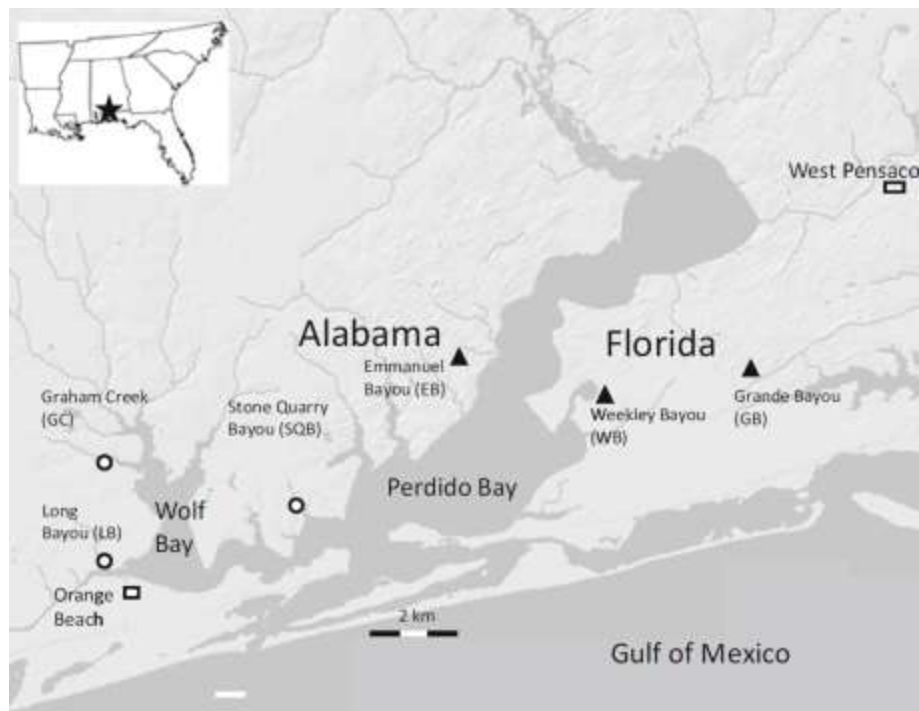
12

s surface



Tidal creek salt marshes

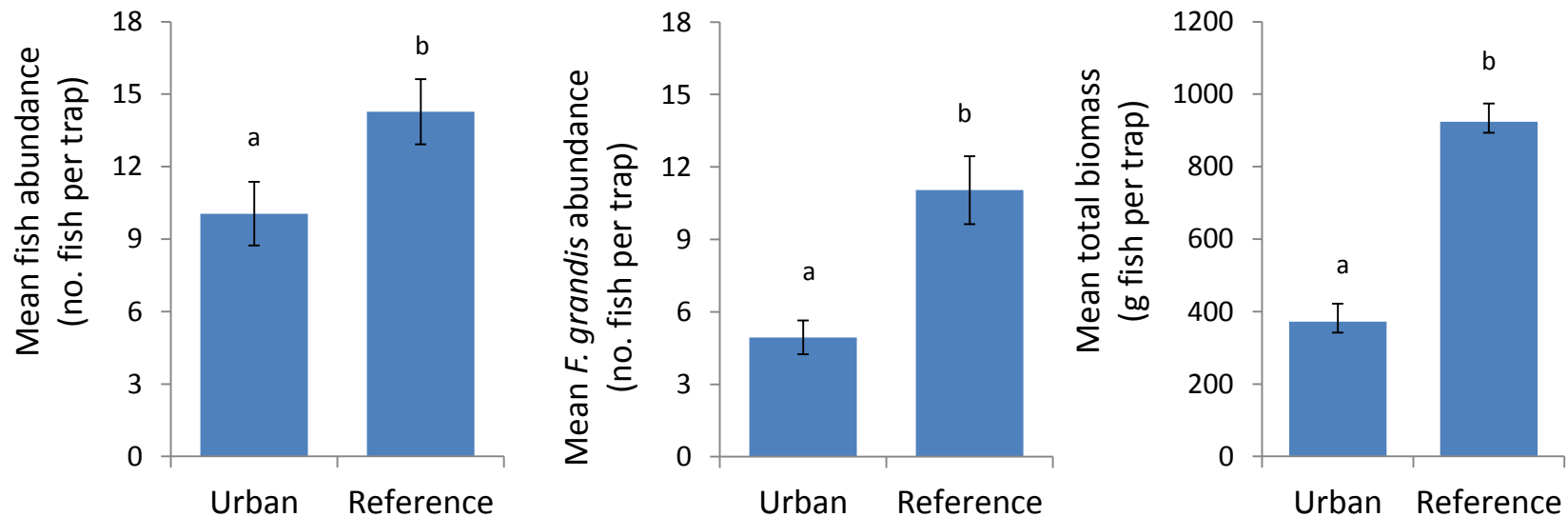
- Compare resident fish in salt marshes within urban (n=3) and reference (n=3) tidal creeks.
- Seasonal sampling using minnow traps
- Fish abundance, biomass, and condition



Tidal creek salt marshes

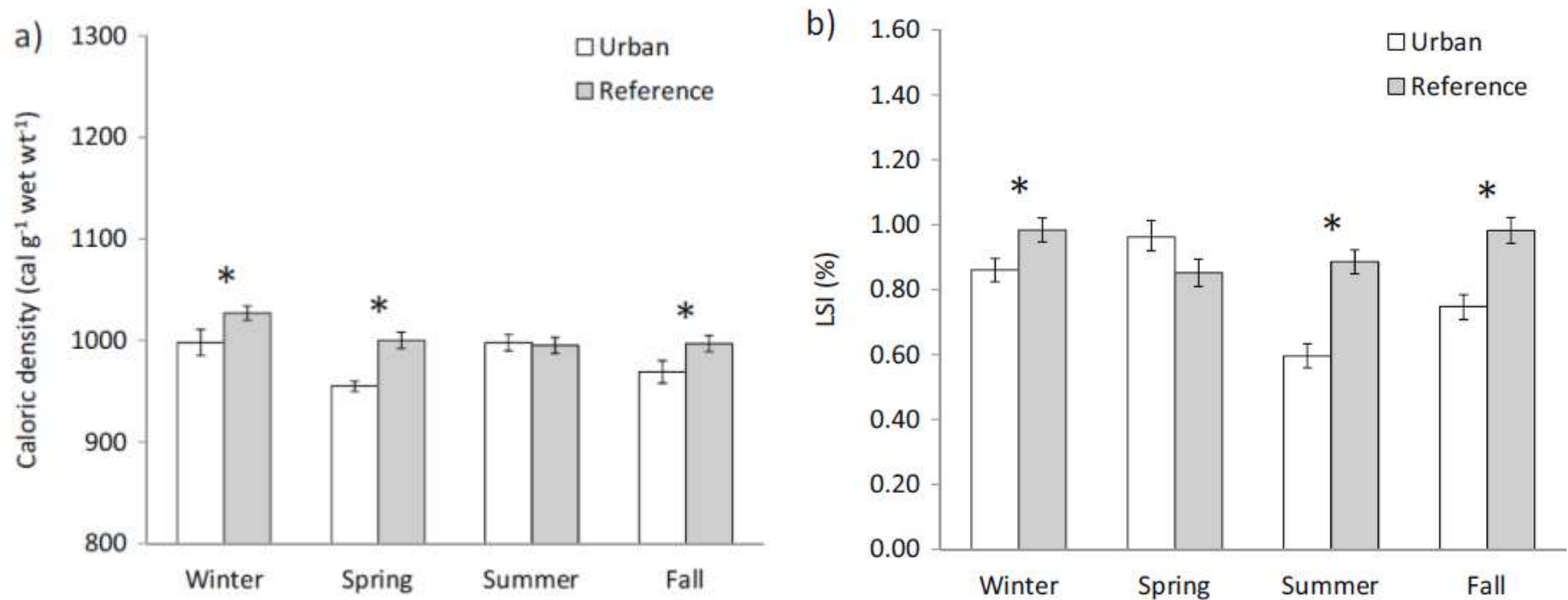


Gulf killifish (*Fundulus grandis*)



Salt marsh fish abundance and total biomass in urban and reference tidal creeks.

Tidal creek salt marshes



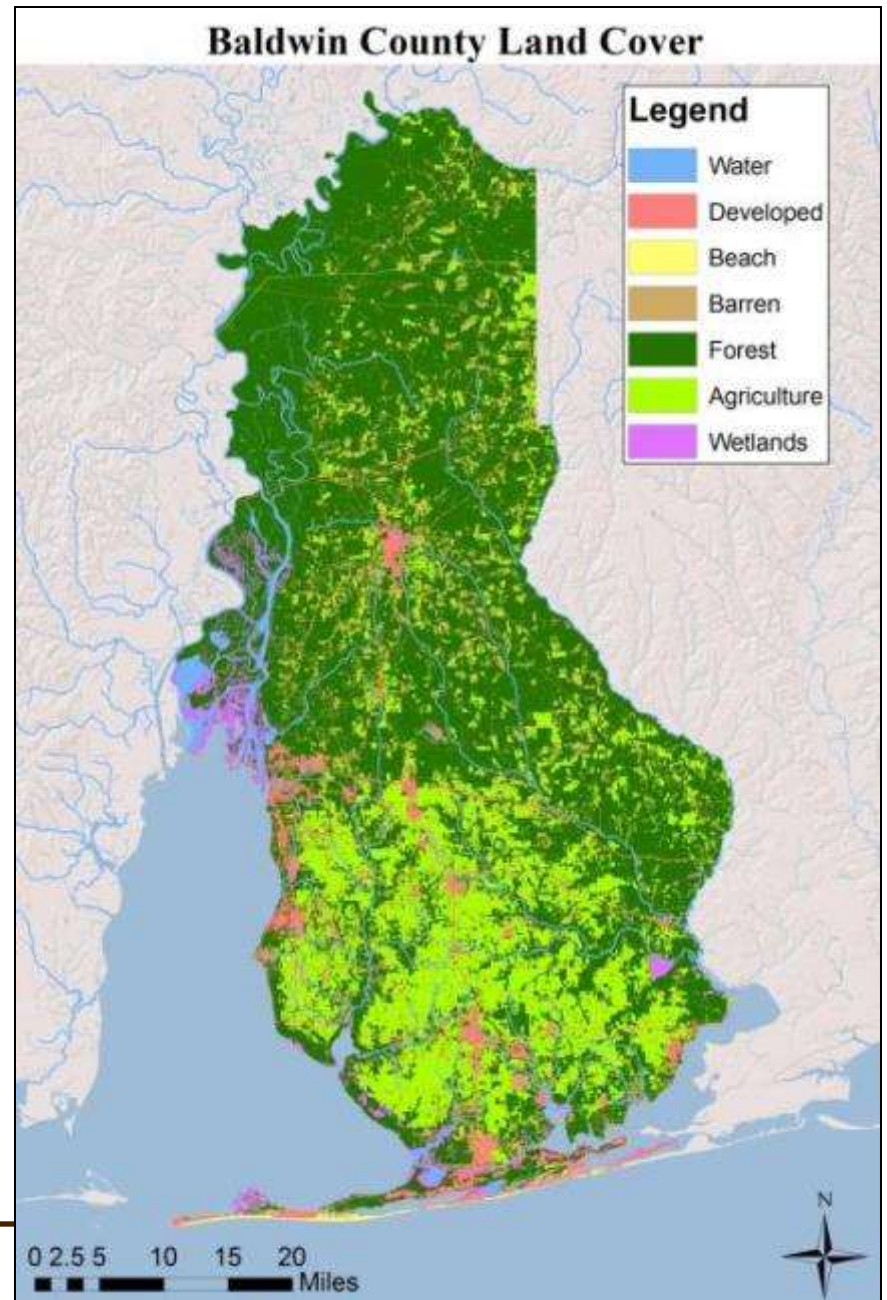
Seasonal mean (±SE) measures of a) caloric density and b) LSI for *F. grandis*.

- Summary
 - Land use change were shown to elicit greater flashiness and runoff that may enhance organic matter removal from headwater wetlands.
 - Headwater wetlands provided measurable reductions in surface water DIN, SRP and TDP.
 - Hydrological, chemical and biological effects related to forest cover loss/impervious surface were detected in low-order creeks.
 - Resident fish in urbanized fringe salt marshes showed changes in fish abundance and health

Land use change - coastal wetlands and headwaters

Applications-

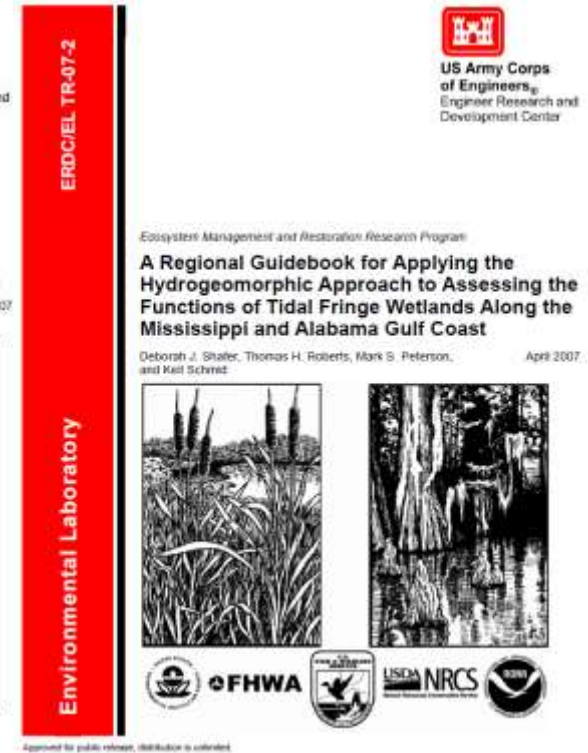
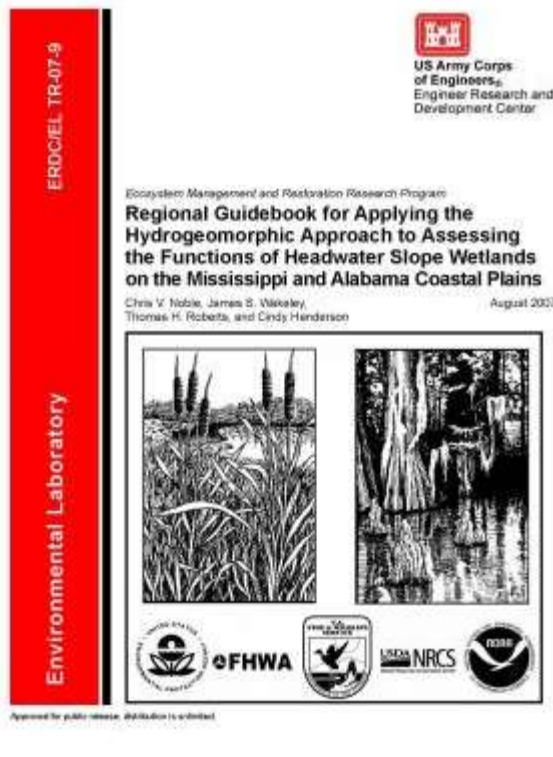
Guidance for future
development in coastal AL



Land use change - coastal wetlands and headwaters

Applications-

Validating Wetland Rapid Assessments Methods





Acknowledgements

Alabama Agricultural Experiment Station Hatch Grant
Mississippi Alabama Sea Grant Consortium
Auburn University Water Resource Center
Auburn University Center for Forest Sustainability
Weeks Bay National Estuarine Research Reserve
USGS Alabama Cooperative Fish and Wildlife Research Unit

Flynt Barksdale, Betsy Battistella, Cody Cox, Mignon Denton, Amber Dunn, Amanda Ecker, Barry Grand, Craig Guyer Lab, Latif Kalin, Charlene Lebleu, Graeme Lockaby, Brian McKnight, Tom Hess, Heather Hughes, Richard Peterson, Scott Phipps, Christina Romagosa, Brad Schneid, Amir Sharifi, Amy Silvano, Madeline Wedge

Land Access: Alabama State Parks, Graham Creek Preserve, The Nature Conservancy, Town of Robertsdale, Weeks Bay National Estuarine Research Reserve, many private landowners



Thank you

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Acknowledgments

