Planning for Sea Level Rise in the Matanzas Basin

A Closer Look at Community, Environment, and Legacy

UF UNIVERSITY of FLORIDA

June 4, 2013

GUANA · TOLOMATO · MATANZAS
NATIONAL ESTUARINE RESEARCH RESERVE

GTM partners with UF to study sea level rise in the Matanzas basin.

Study targets sea-level rise; Flagler reserve key to research

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BY DINAH VOYLES PULVER, STAFF WRITER

November 20, 2011 12:30 AM

Posted in: Flagler | Tagged: Matanzas estuary

A pair of researchers concerned about how future increases in sea level could spell trouble for fragile coastal areas of Flagler and St. Johns counties will use a new federal grant to start a regional planning process.

A tern rests on the rocks Saturday at the River to Sea Pre serve in Marineland. (NJ | David Massey)

The narrow coastline and marshes that fringe the Matanzas River south of Matanzas Inlet and make up the Guana Tolomato Matanzas National Estuarine Research Reserve are home to many varieties of animals and plants. Starting a planning process to ensure the estuary and surrounding areas are prepared and protected is the focus of the new research grant recently awarded to the research reserve.

The $618,377 grant from the National Oceanic and Atmospheric Administration will be awarded over three years to a collaborative effort between the reserve and scientists with the University of Florida. The grant was one of two received recently by the Florida Department of Environmental Protection out of only seven awarded to research reserves nationwide.

The grant will help the reserve further its research on how future changes in climate, particularly potential sea level increases, might impact the southern section of the reserve and people who live in the region.

http://www.news-journalonline.com/news/local/flagler/2011/11/20/study-targets-sea-level-rise-flagler-reserve-key-to-research.html

Project Leaders

Dr. Kathryn Frank, Principal Investigator
Assistant Professor, Urban & Regional Planning, UF

Dr. Michael Shirley, Co-Principal Investigator
Director of the GTM NERR

Emily Montgomery, Co-Principal Investigator
Coastal Training Program Coordinator, GTM NEER

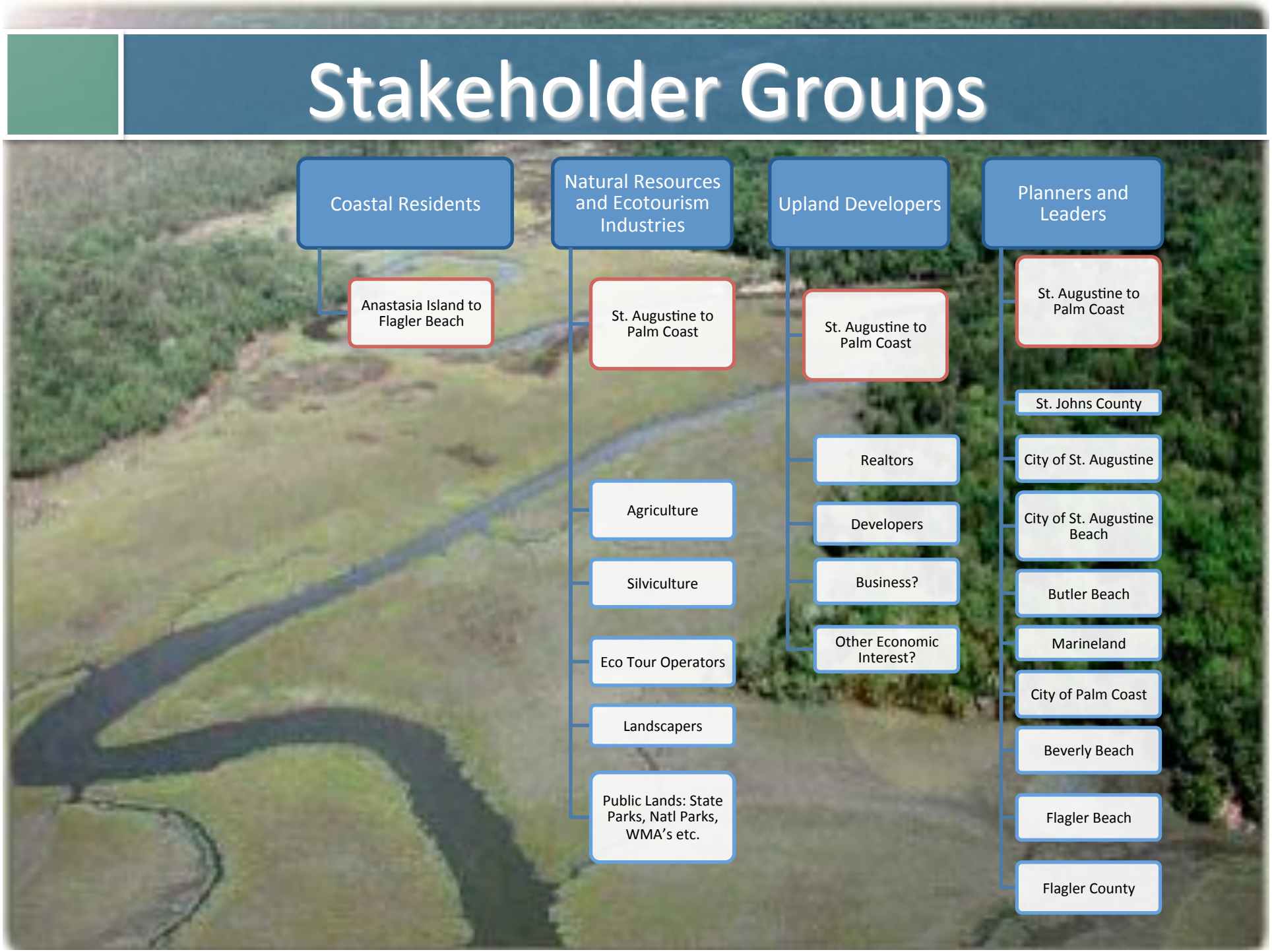
Supporting Investigators

- Dr. Dawn Jourdan, *Collaboration Lead*
- Prof. Bob Grist, *Visualization & Communications*
- Dr. Tom Hoctor, *Habitat Migration Corridors*
- Dr. Paul Zwick, *Geospatial Analysis*
- Dr. Greg Kiker, *Sea Level Rise Affecting Marshes Model*
- Dr. Anna Linhoss, *Sea Level Rise Affecting Marshes Model*
- Dr. Russell Watkins, *Model Coordination & Evaluation*
- Mr. Michael Volk, *Habitat Migration Corridors*
- Dr. Maia McGuire, *Collaboration & Outreach*
- Thomas Ruppert, Esq., *Adaptation Strategies*

Steering Committee

- Eric Anderson
- Denise Bevan
- Mike Brennan
- Jan Brewer
- Doug Davis
- Paul Haydt
- Patrick Hamilton
- Richard Hilsenbeck
- Chris Kelley
- Jackie Kramer
- Margo Moehring
- Ed Montgomery
- Sarah Owen Gledhill
- Eric Ziecheck

Stakeholder Groups



Three Year Work Plan

Phase 1: Stakeholder Workshop

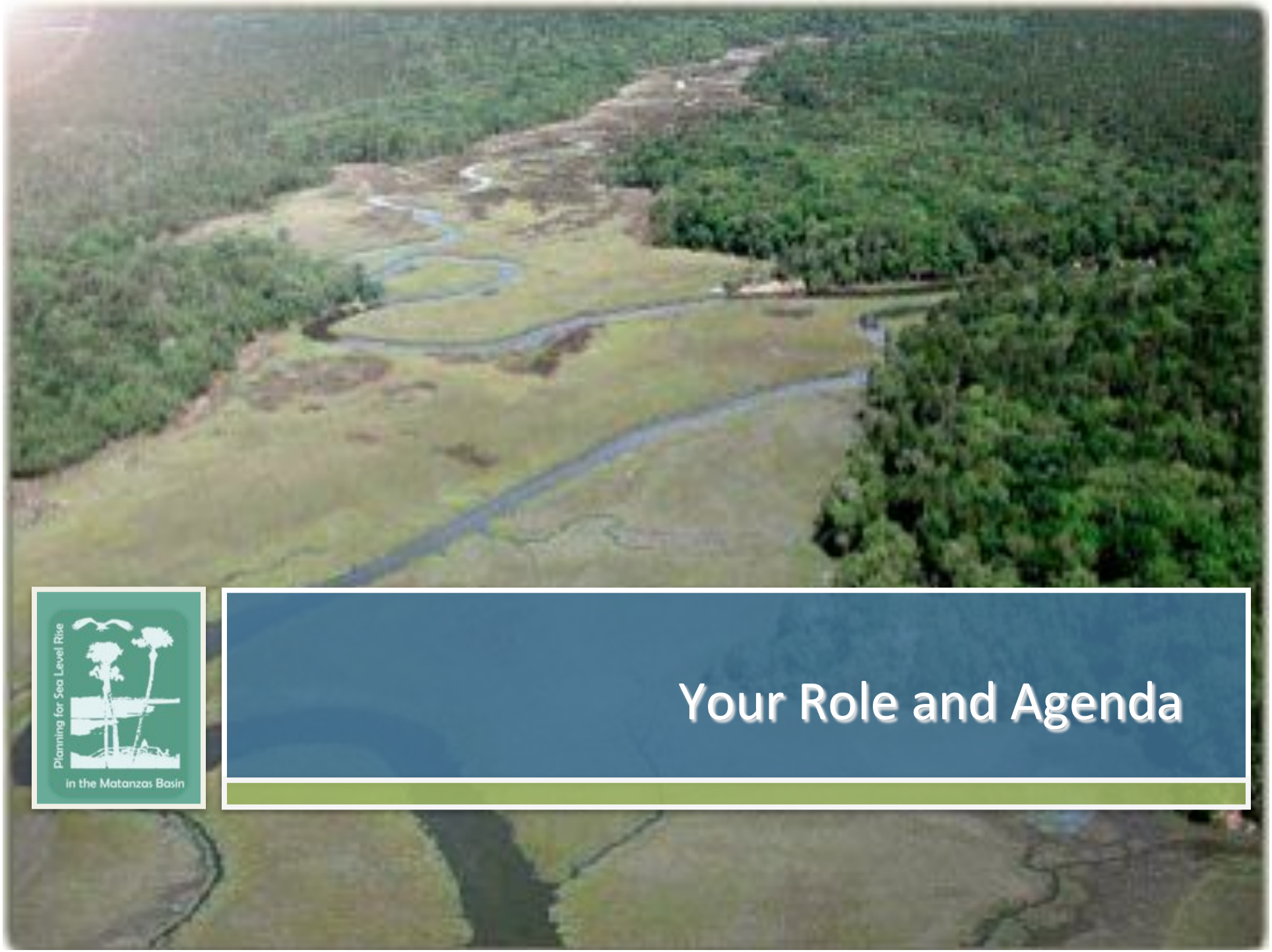
- Work with interested stakeholders to understand the potential implications of sea level rise in the Matanzas basin.

Phase 2: Large Public Workshops

- Analyze and compare possible future development and ecological conservation scenarios.

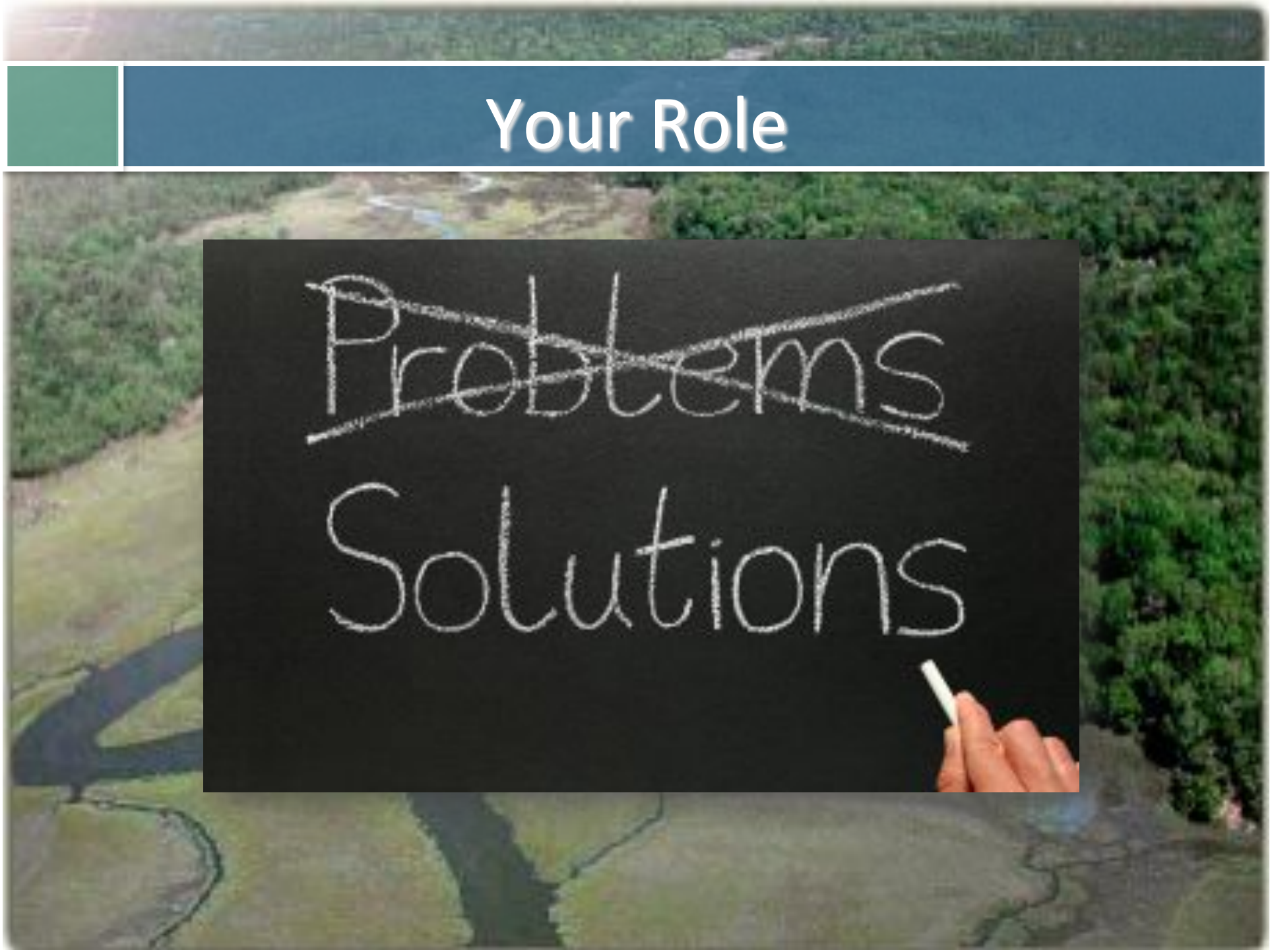
Phase 3: Final Open Meeting

- Identify and promote adaptation tools to bring future development and conservation strategies into fruition.



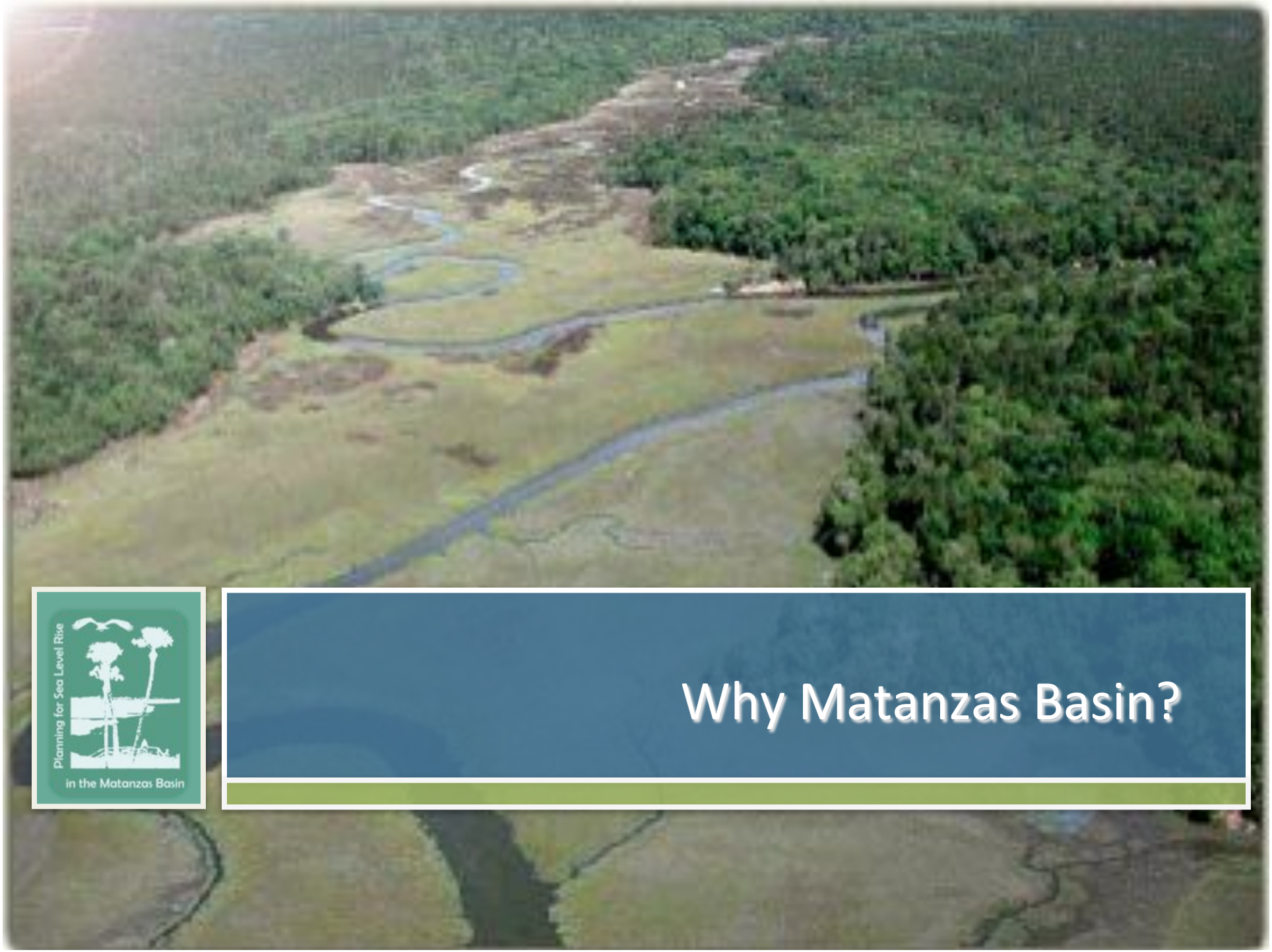
Your Role and Agenda

Your Role



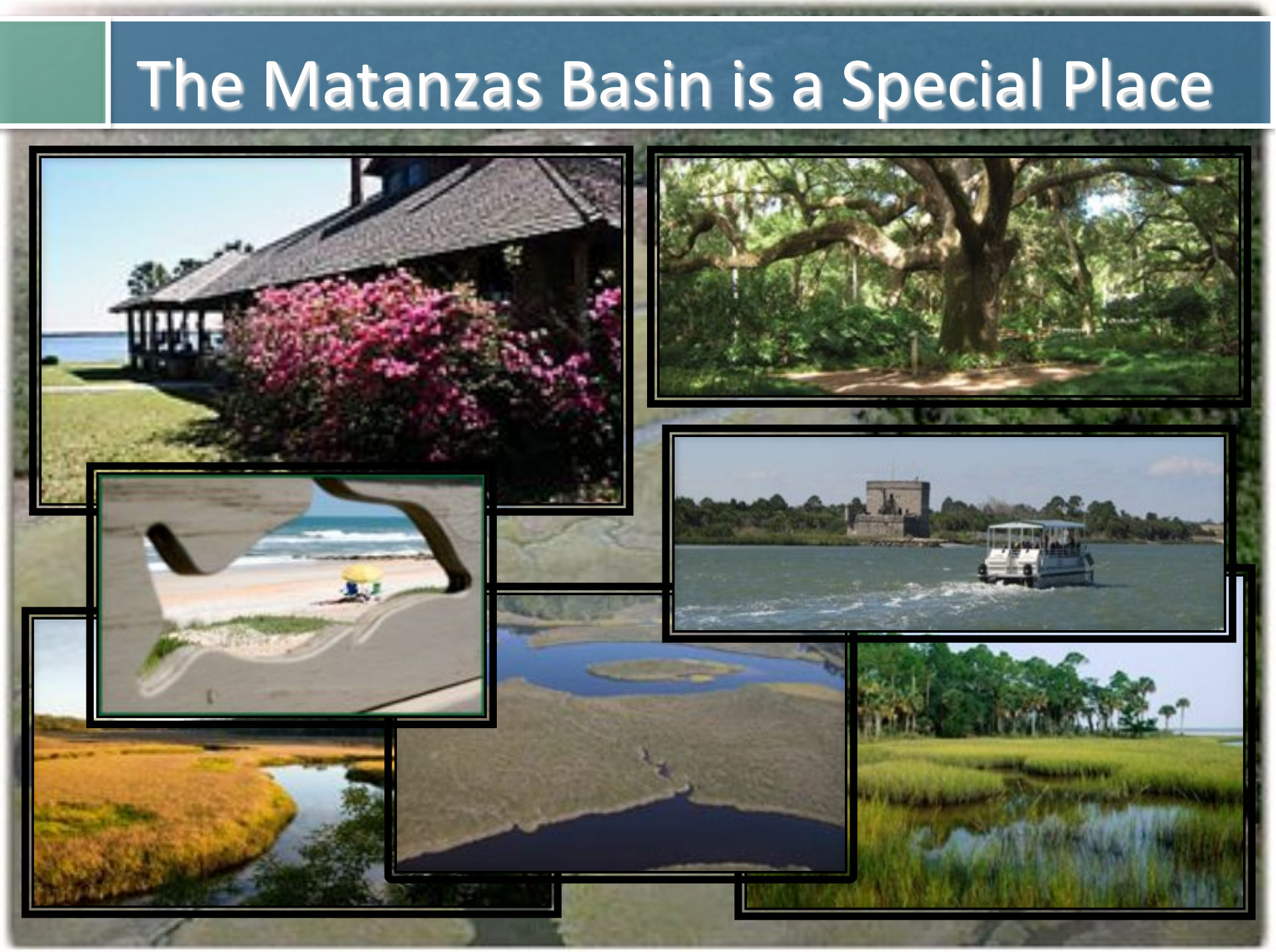
Agenda for the First Meeting

- Reflect on how coastal dynamics have historically changed the landscape in the Matanzas Basin.
- Discuss what the science tells us about the future of coastal dynamics in the region.
- Examine the ways such changes will affect the way we live in the Basin.
- Identify those things that are most important to us charting a course for planning efforts.



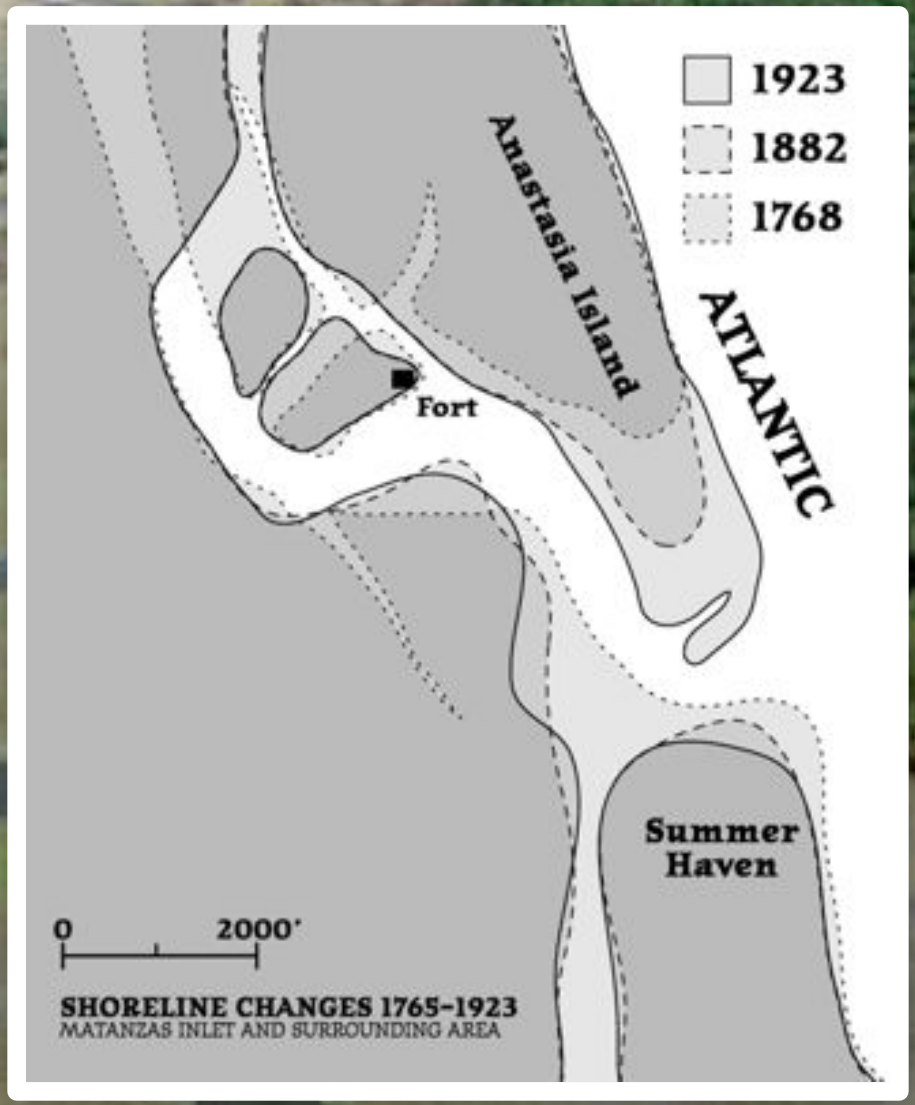
Why Matanzas Basin?

The Matanzas Basin is a Special Place

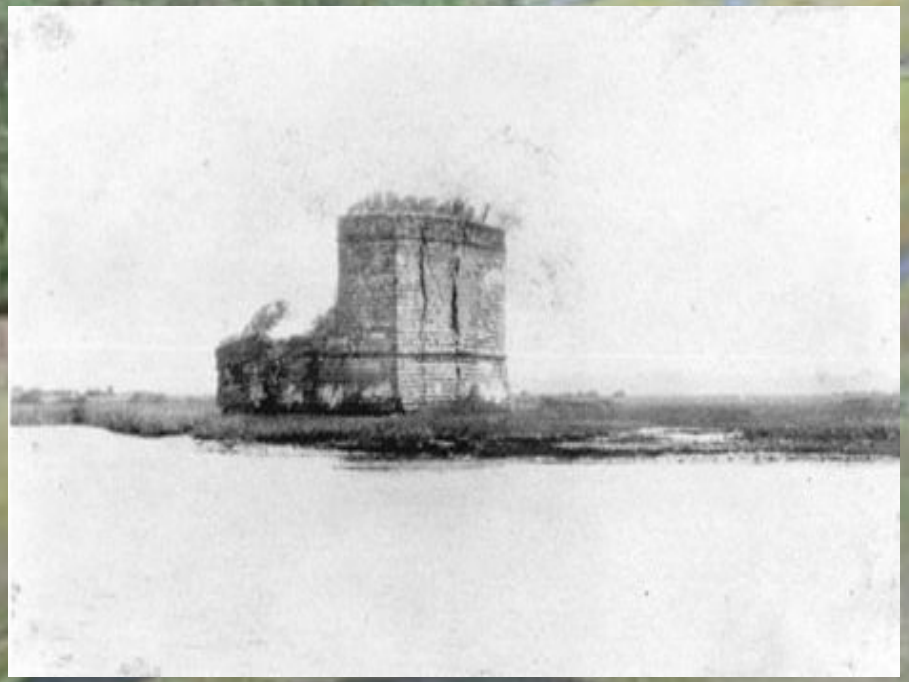


Matanzas Basin is Dynamic

Time Series of Shoreline Changes in the Matanzas Inlet

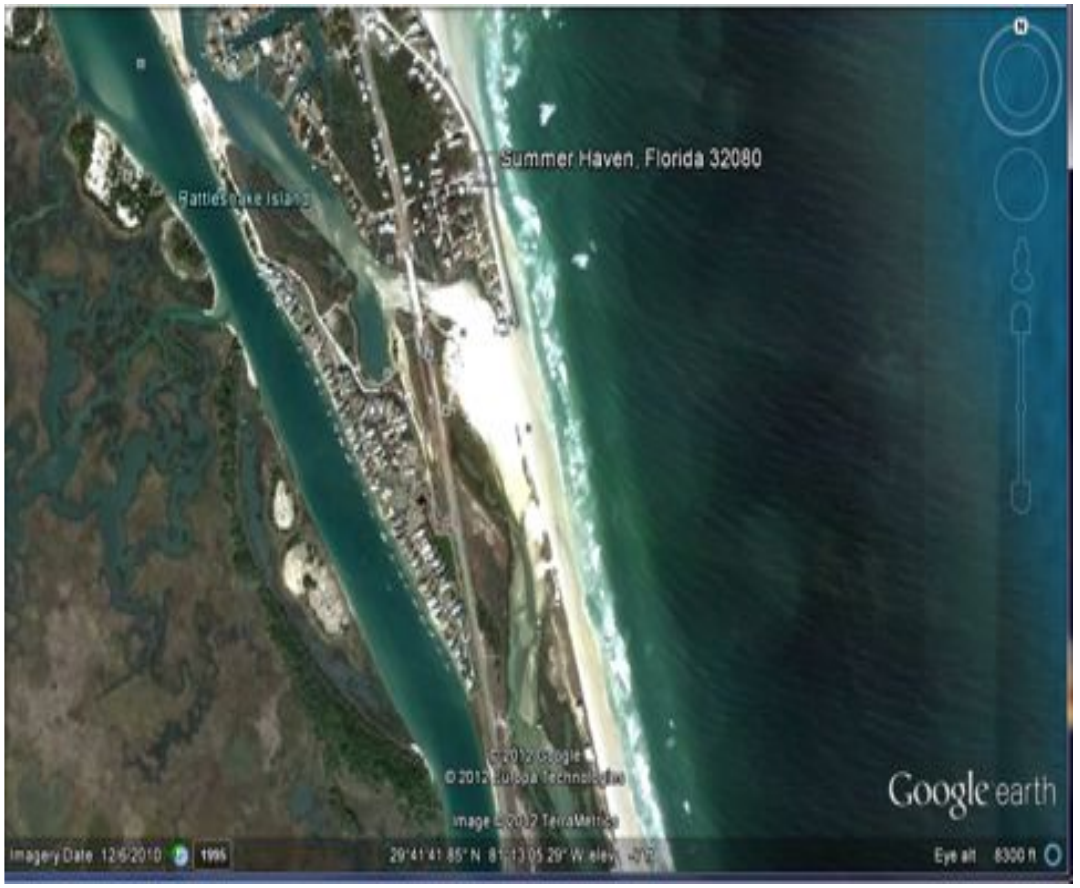


Responses:
Hard Armoring Fort Matanzas



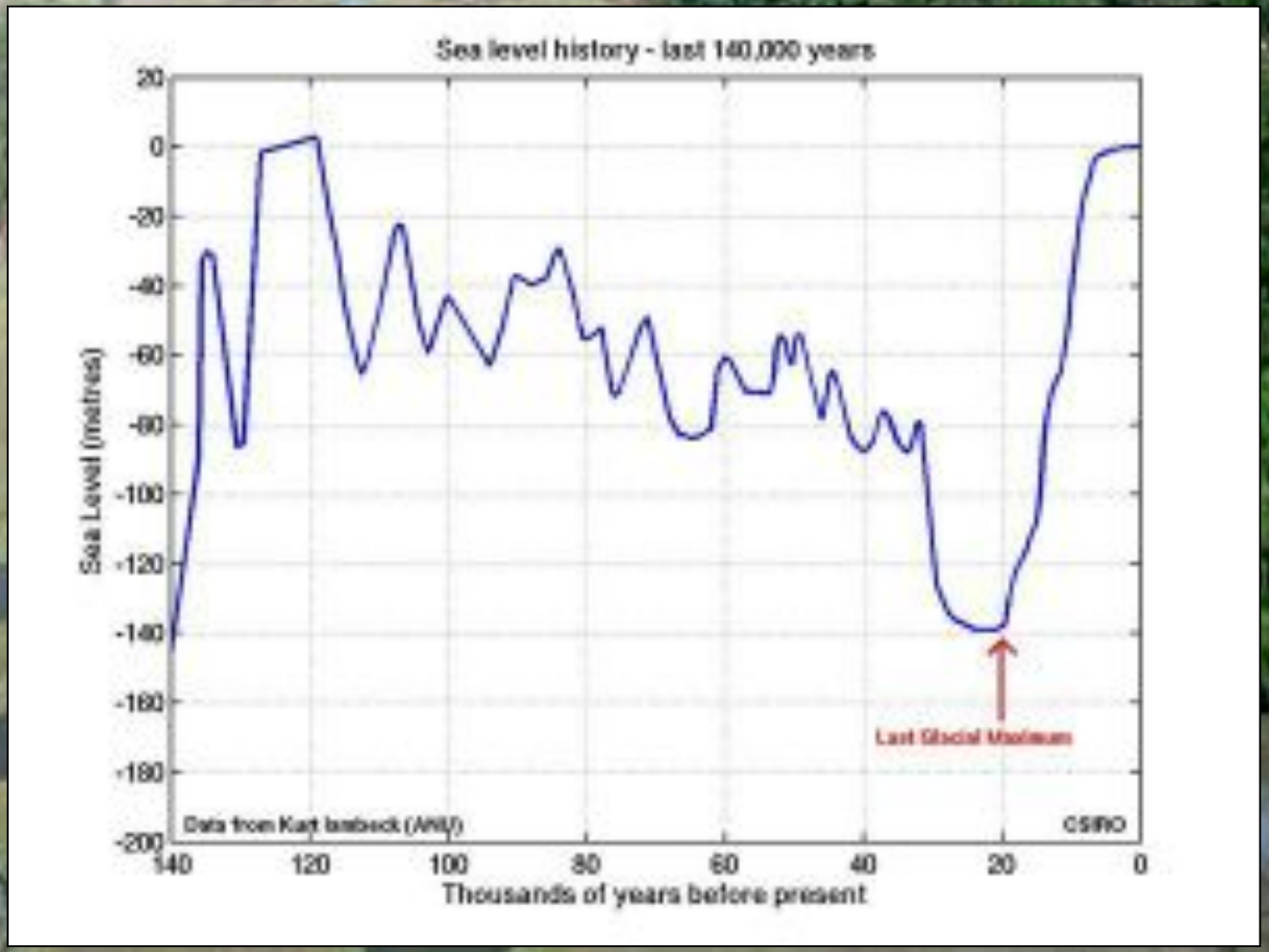
Responses:
Building Hazard Resistant Infrastructure

Responses:
Unknown at this Point

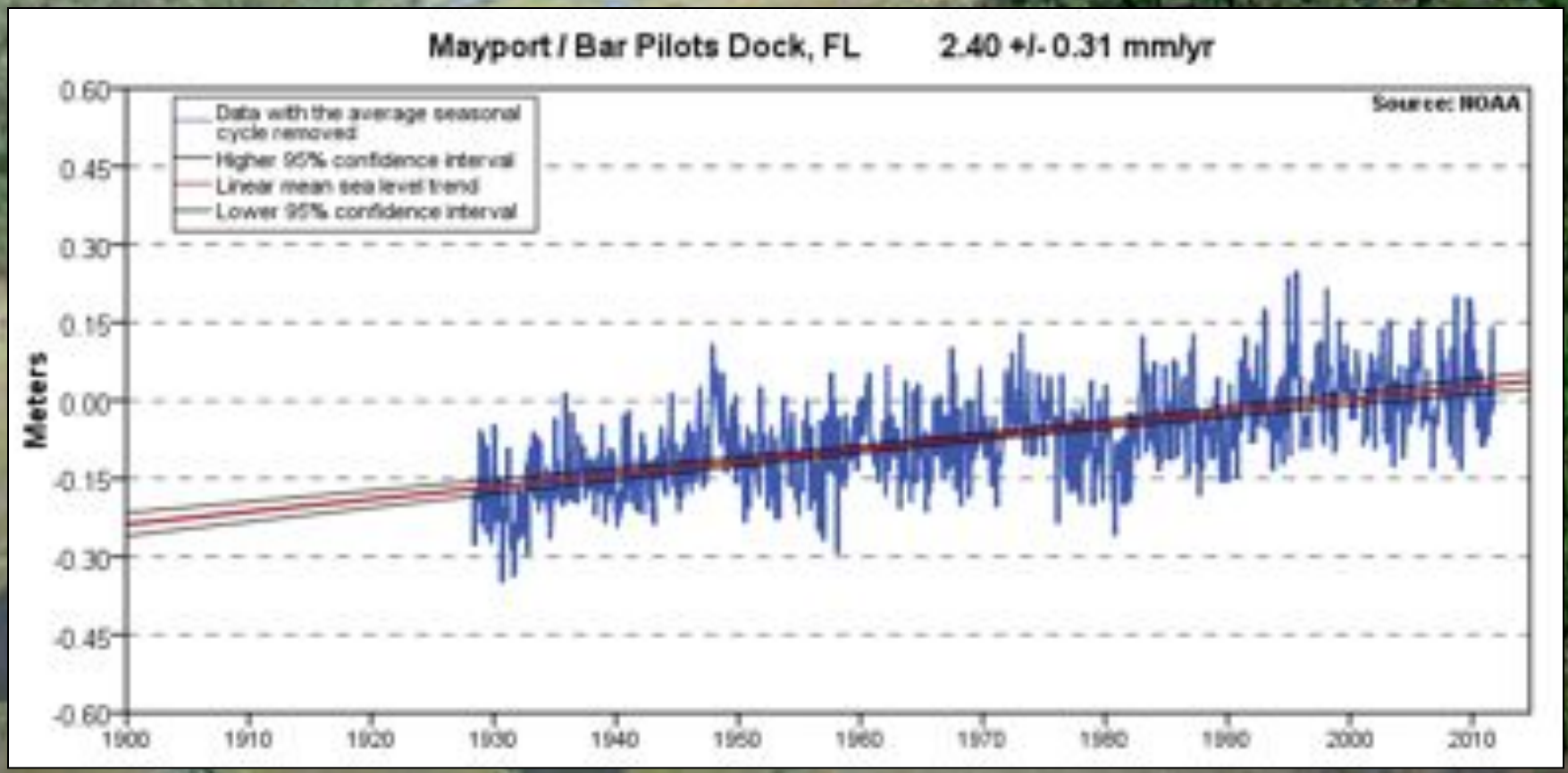


Trends and Projections

Relationship between Coastal Dynamic Forces and Sea Level Rise



A gradual upward trend…
Mayport, FL



Sea level rise will affect the Matanzas Basin

Sea Rise Changes Coastal Habitats

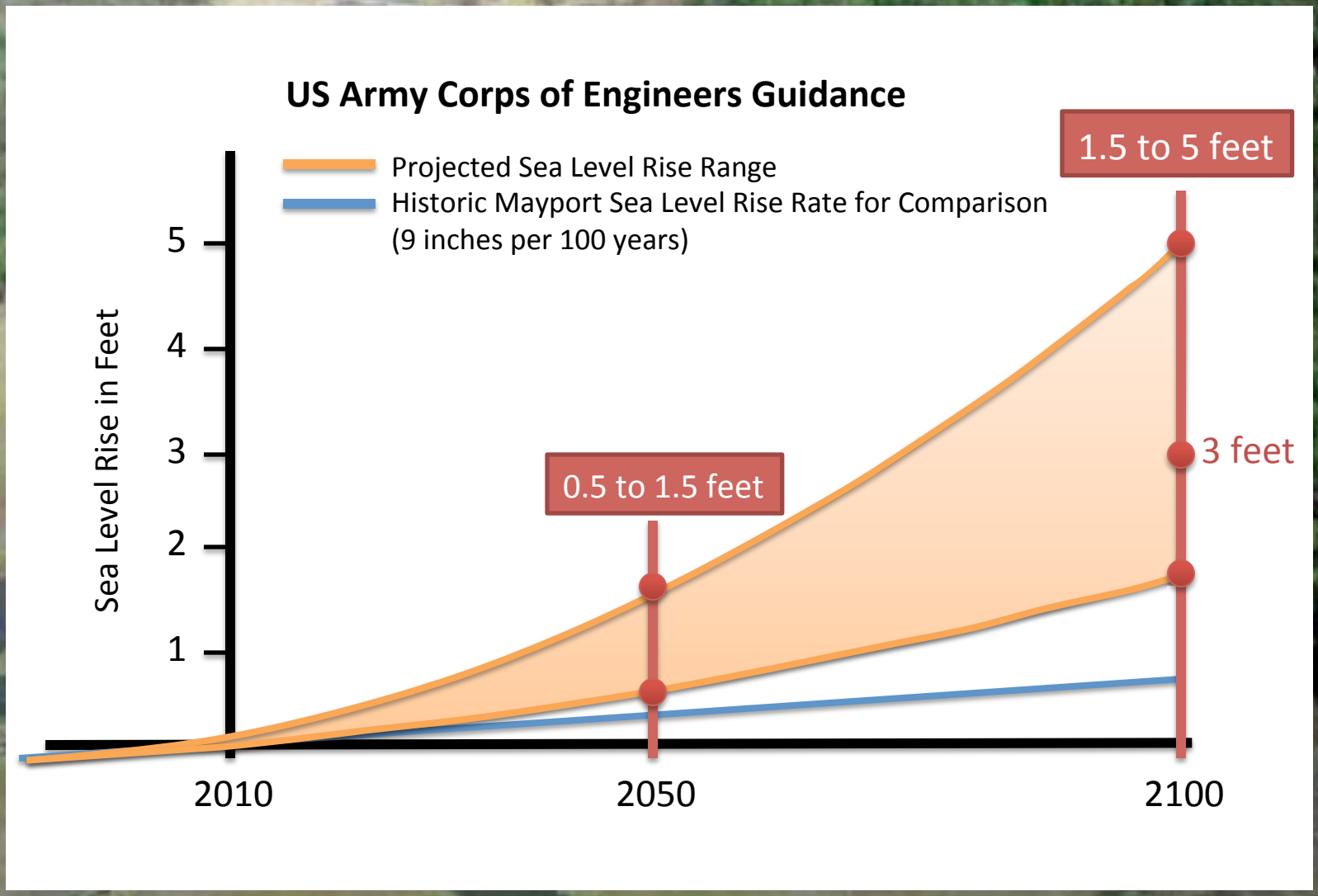
Chris Bergh, a scientist with the Nature Conservancy, examines a dead tree with son, Nate, near their home on Big Pine Key, Fla.

From the Christian Science Monitor, March 4, 2010.

Evidence of Ecological Change in the Matanzas Basin

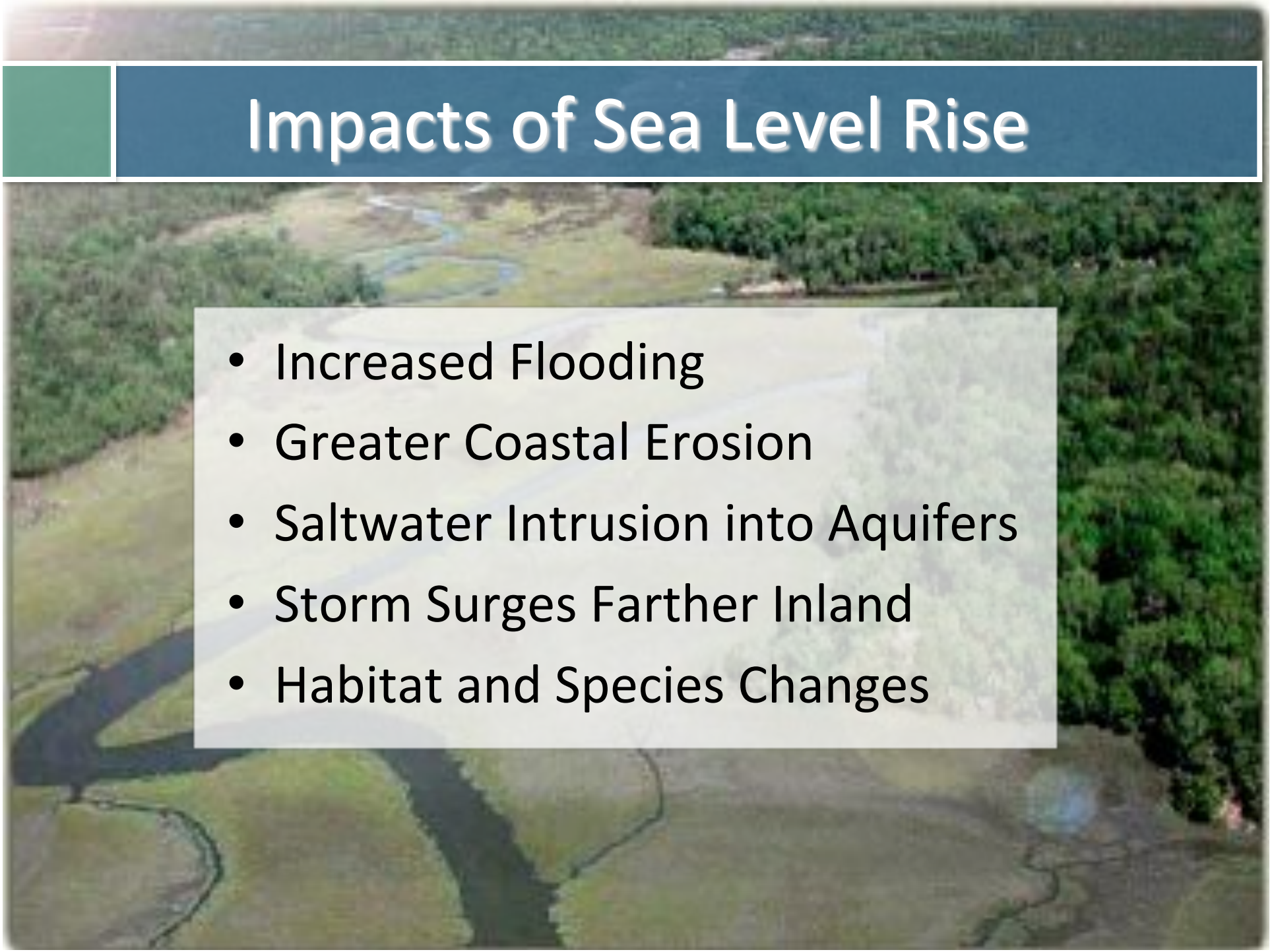
Why is sea level rising?

Future Sea Level Rise



Impacts and Changes

Impacts of Sea Level Rise

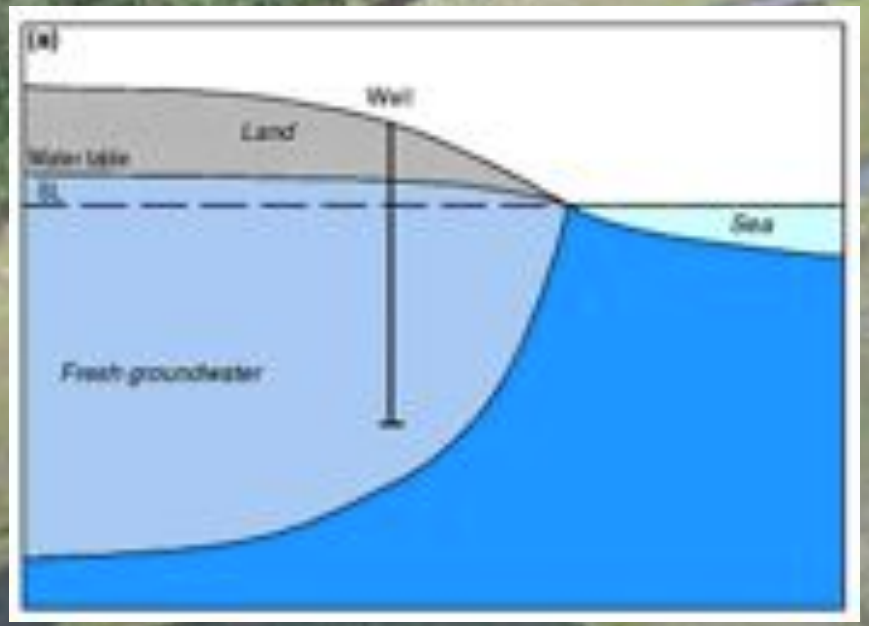


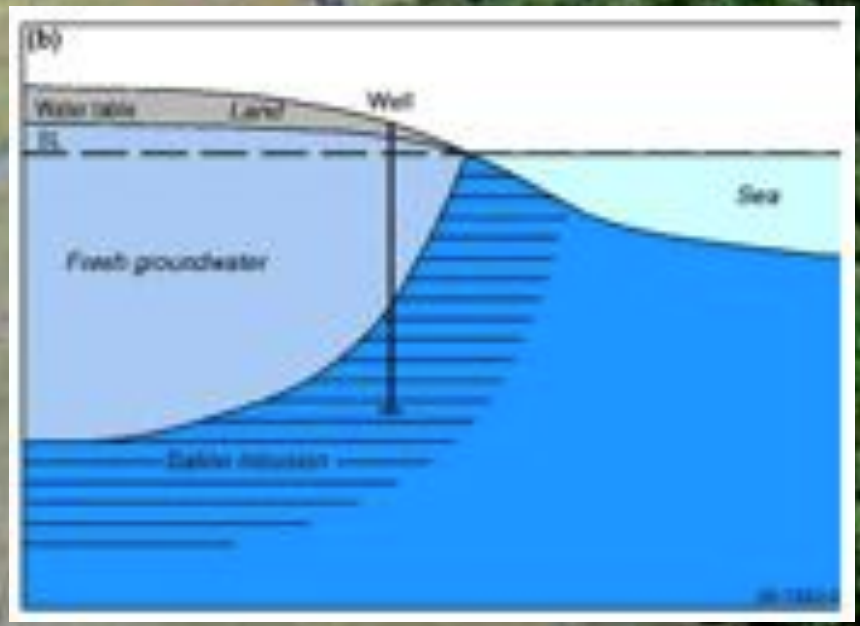
- Increased Flooding
- Greater Coastal Erosion
- Saltwater Intrusion into Aquifers
- Storm Surges Farther Inland
- Habitat and Species Changes

Increased Flooding

Greater Coastal Erosion

Saltwater Intrusion into Aquifers





Storm Surges Farther Inland

Habitat and Species Change

Small changes in sea levels can have a BIG effect…

We have plenty of time to plan. Don't we?

Near term implications

- We are already beginning to experience the effects associated with gradual sea level rise in terms of:
  - Coastal Properties and Roads
  - Stormwater Management
  - Water Quality and Supply
  - Emergency Preparedness
  - Natural Resources

Proactive planning may lessen the short and long-term effects of sea level rise

- Preserve natural lands and systems
- Plan for infrastructure investments
- Move special places
- Encourage new development on higher ground

This is not going to happen in my lifetime. Why should I care?

We must contemplate our legacy.

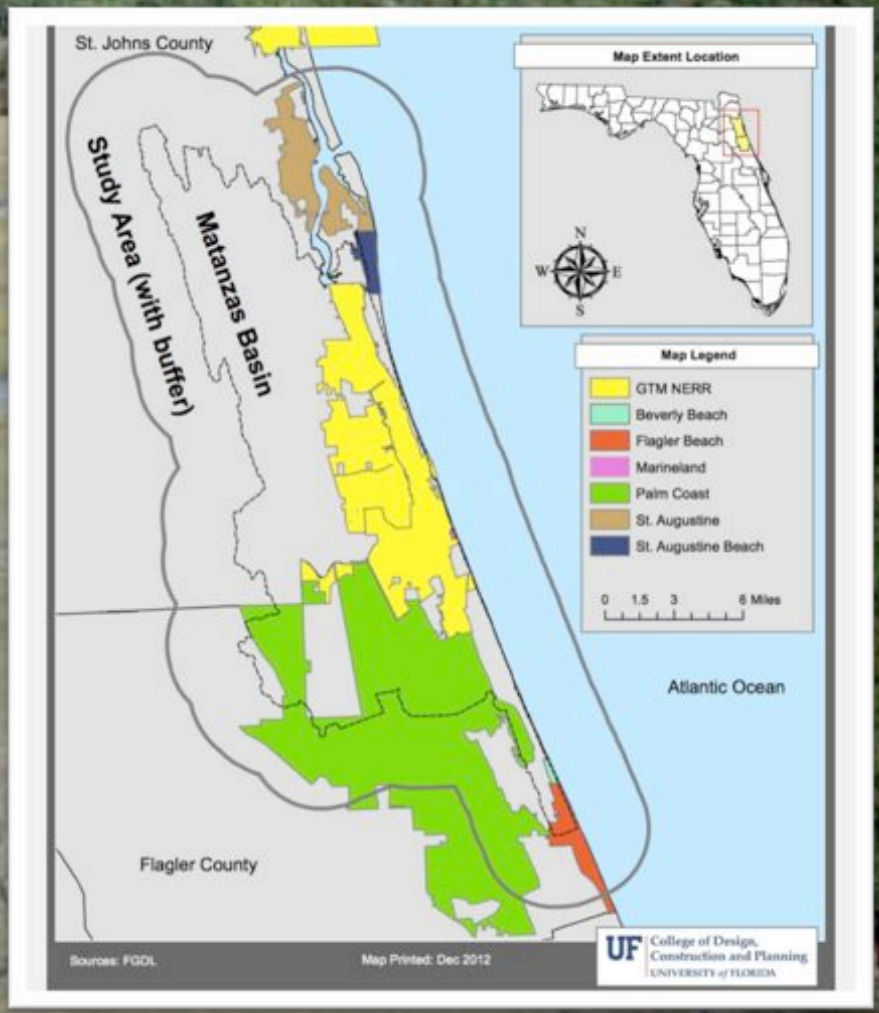
Community Planning and You.

- We ask you to help us begin this difficult conversation.

Study Area Findings

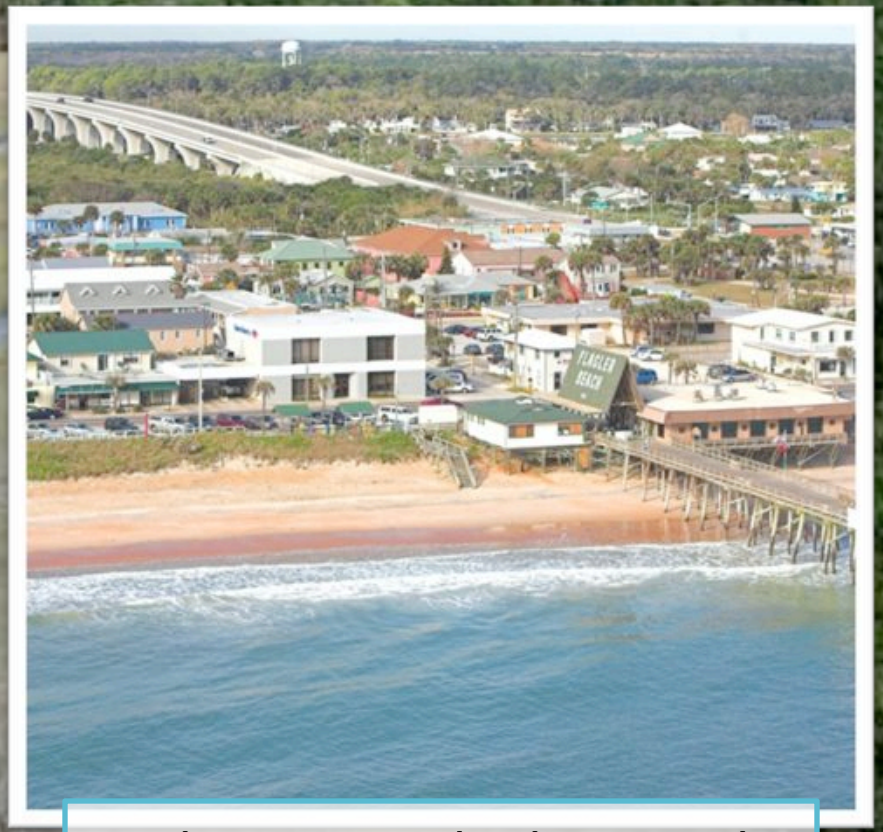
Study Area

Matanzas Basin



Study Area

St. Augustine

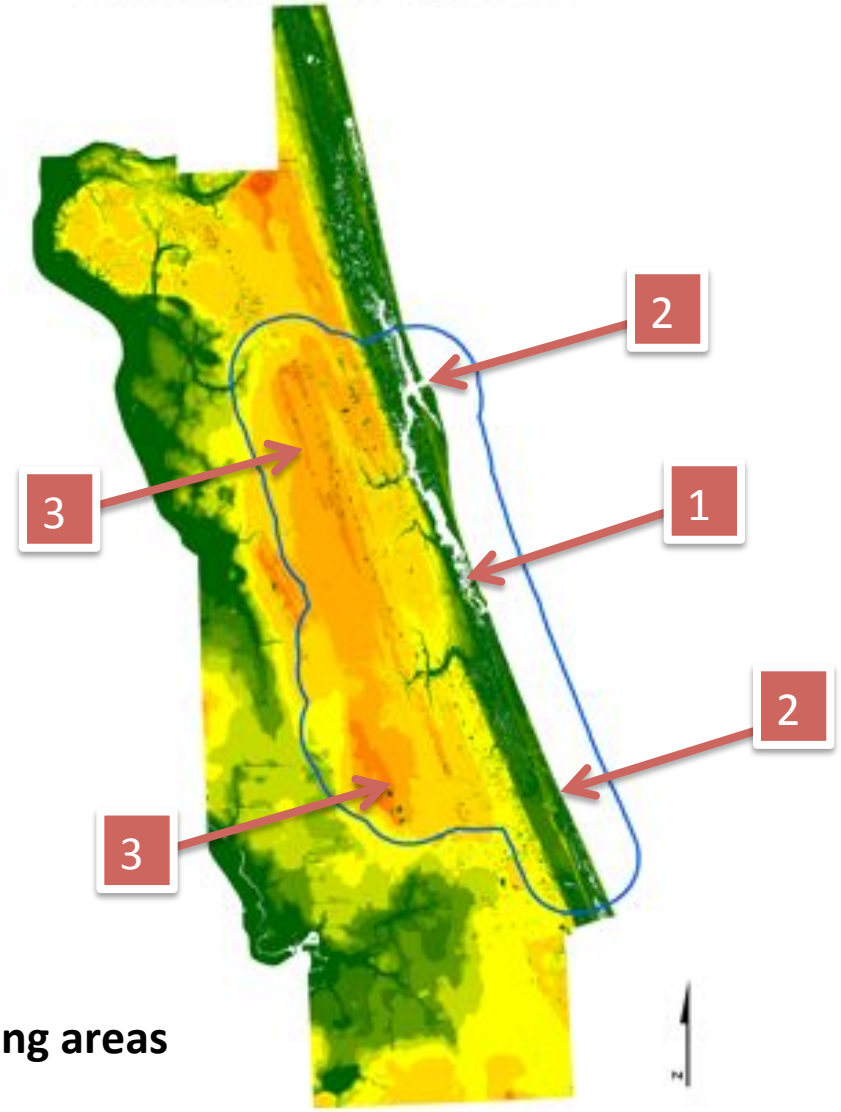


Palm Coast-Flagler Beach

Elevation and Development

Three Types of Areas for Adaptive Design

1. Coastal natural areas
2. Coastal development
3. Upland future development or conservation



Low-lying areas

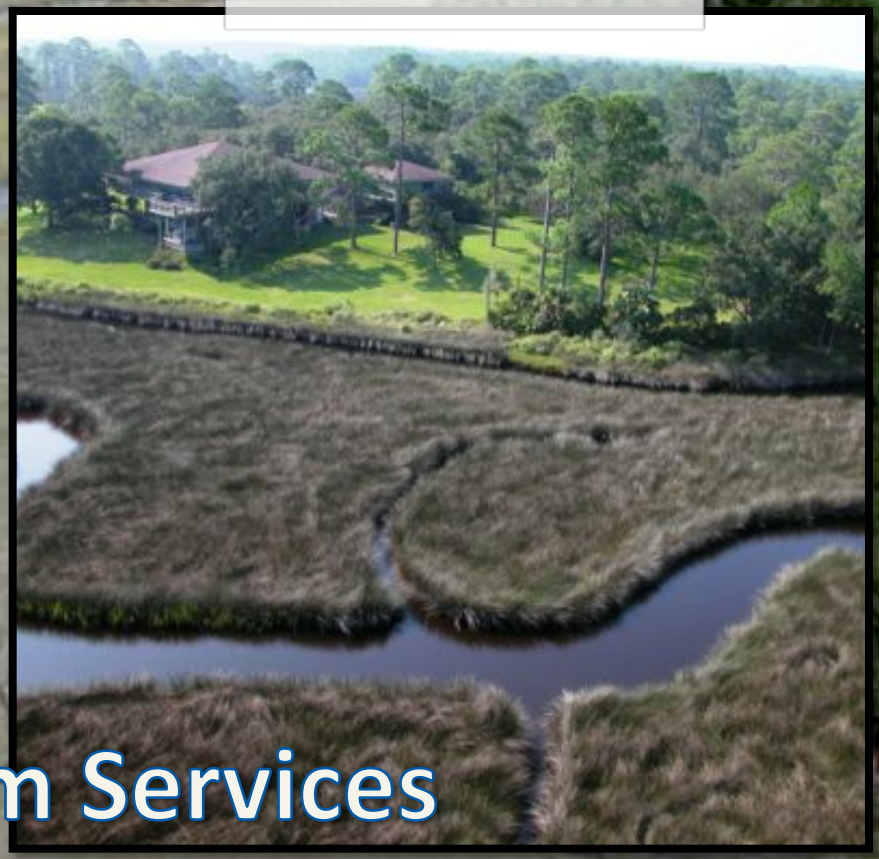
Matanzas Topography

Stair Steps

Matanzas Estuary Habitats

Open Water and Tidal Flats

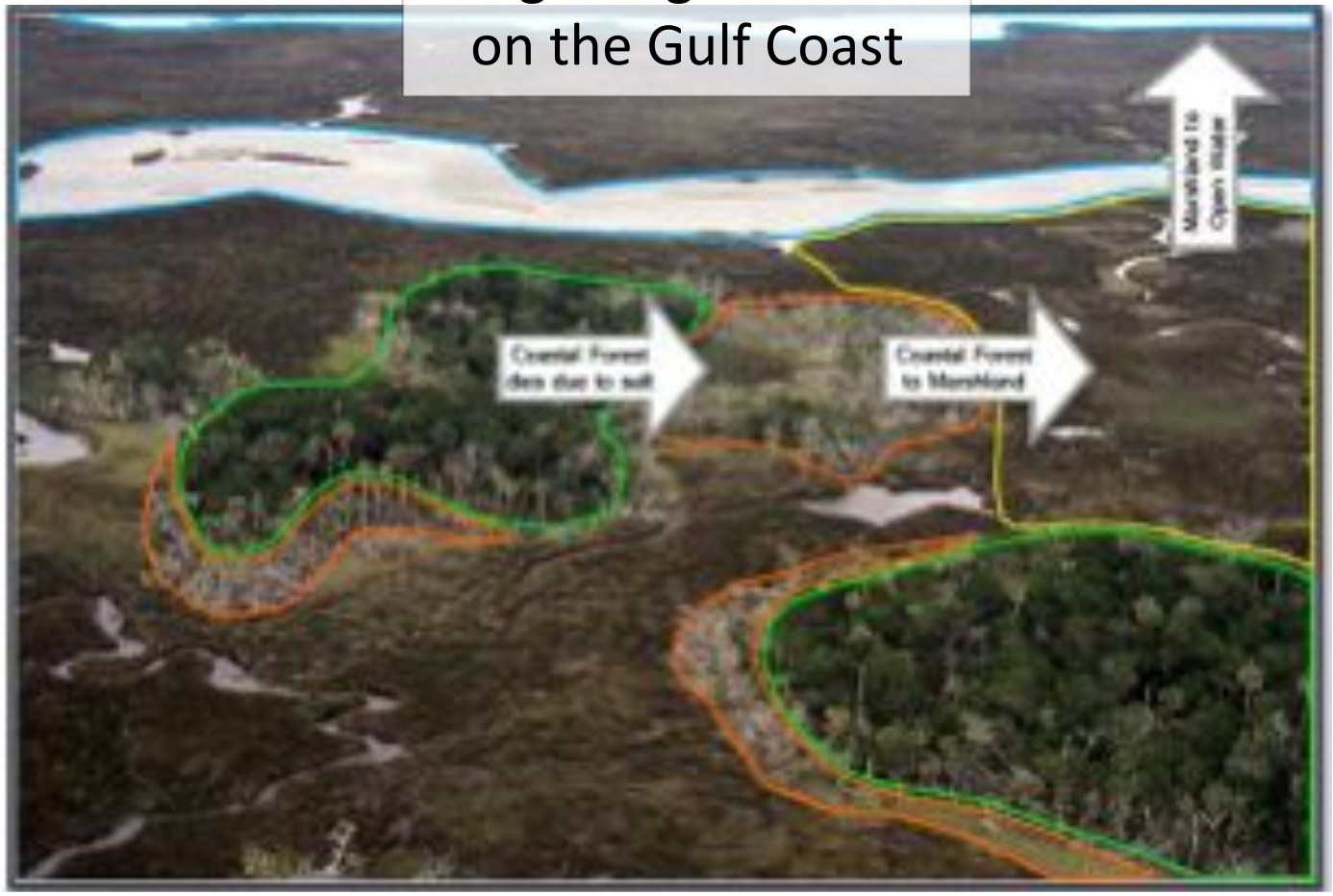
Saltwater Marsh and Uplands



Ecosystem Services

Habitat Changes

Migrating Marshes on the Gulf Coast



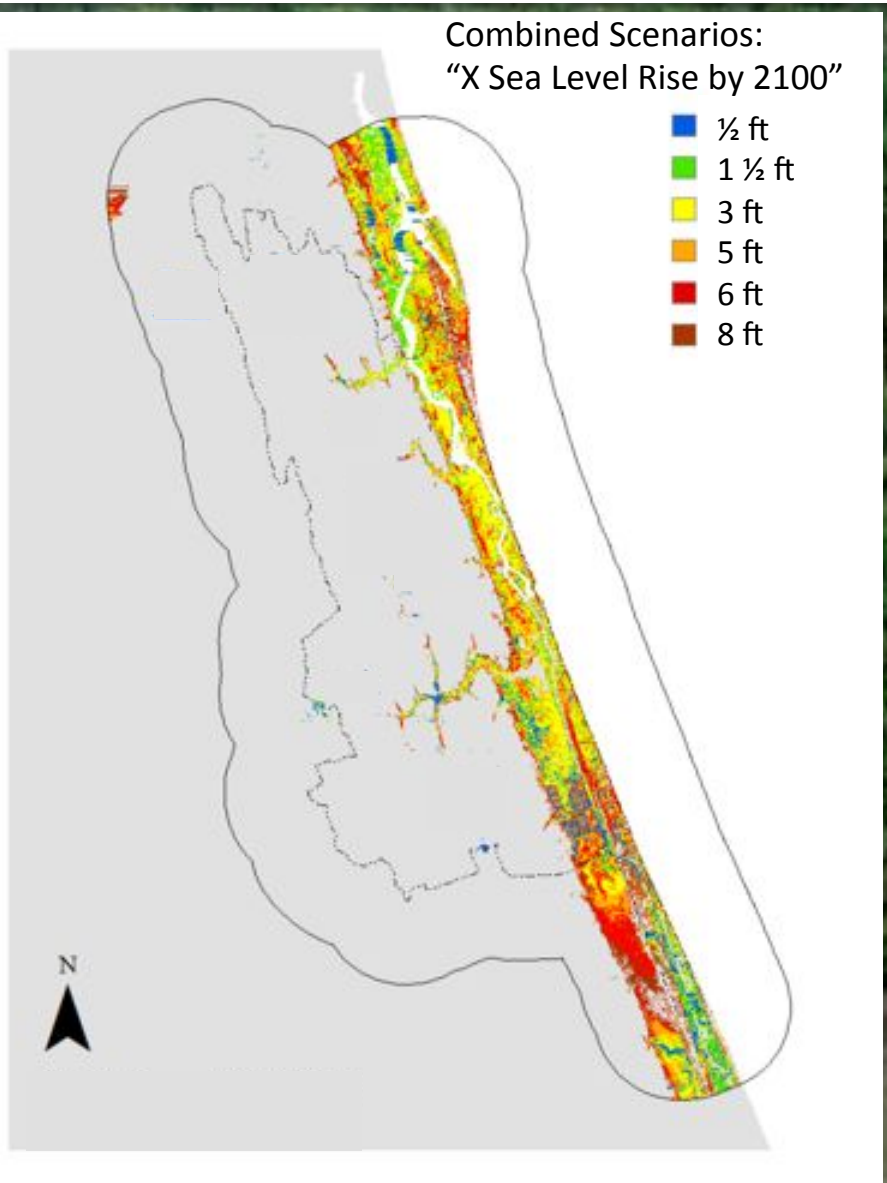
Analysis of Sea Level Rise Impacts

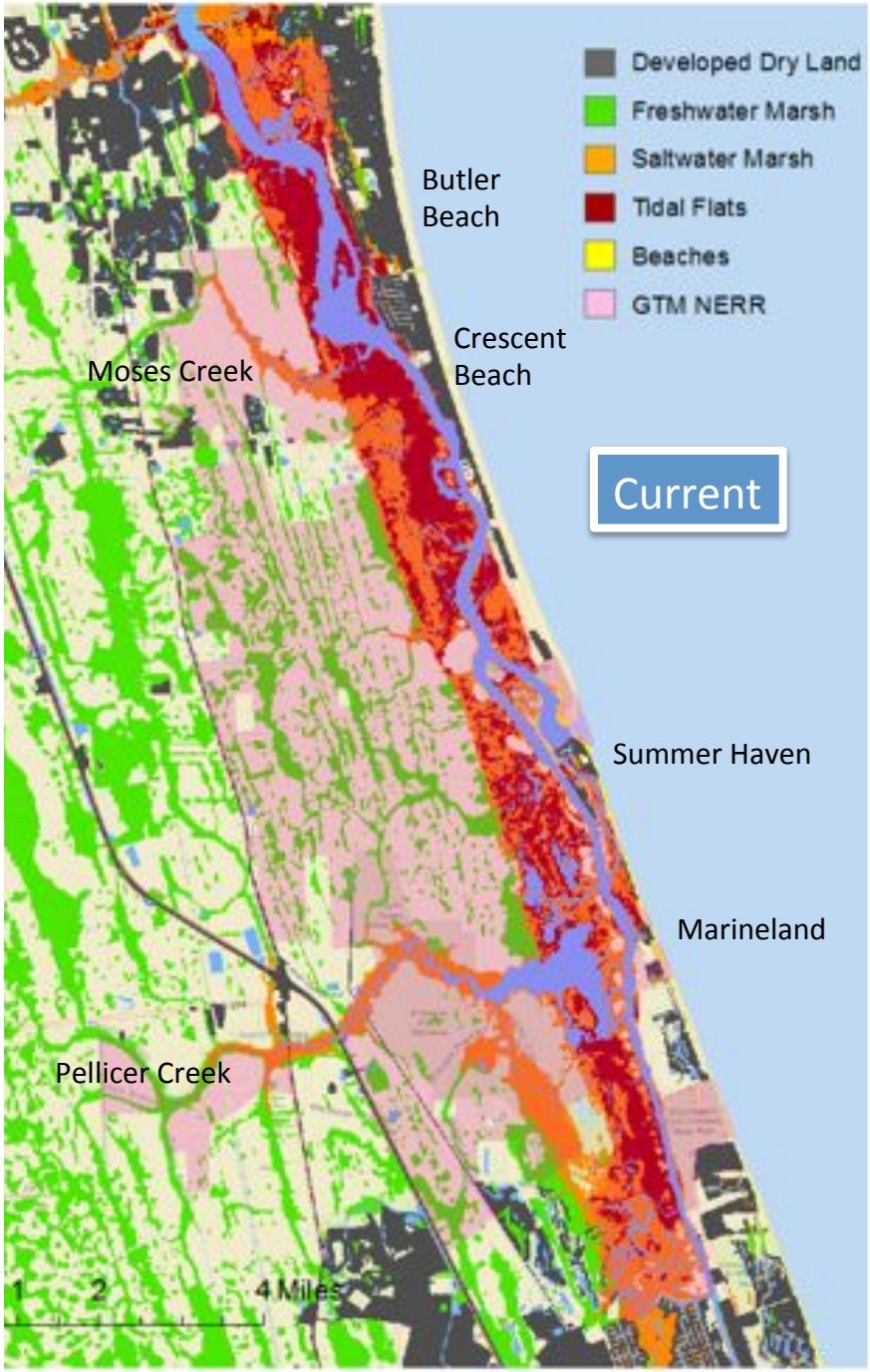
Vulnerable Areas Due To:	Elevation Model	Habitat Changes Model: SLAMM	Storm Surge Model: Hazus	Local Knowledge and Tailored Studies
Increased flooding frequency	✔	✔	✔	✔
Greater coastal erosion				✔
Saltwater intrusion into aquifers				✔
Higher storm surges			✔	✔
Habitat and species changes		✔		✔

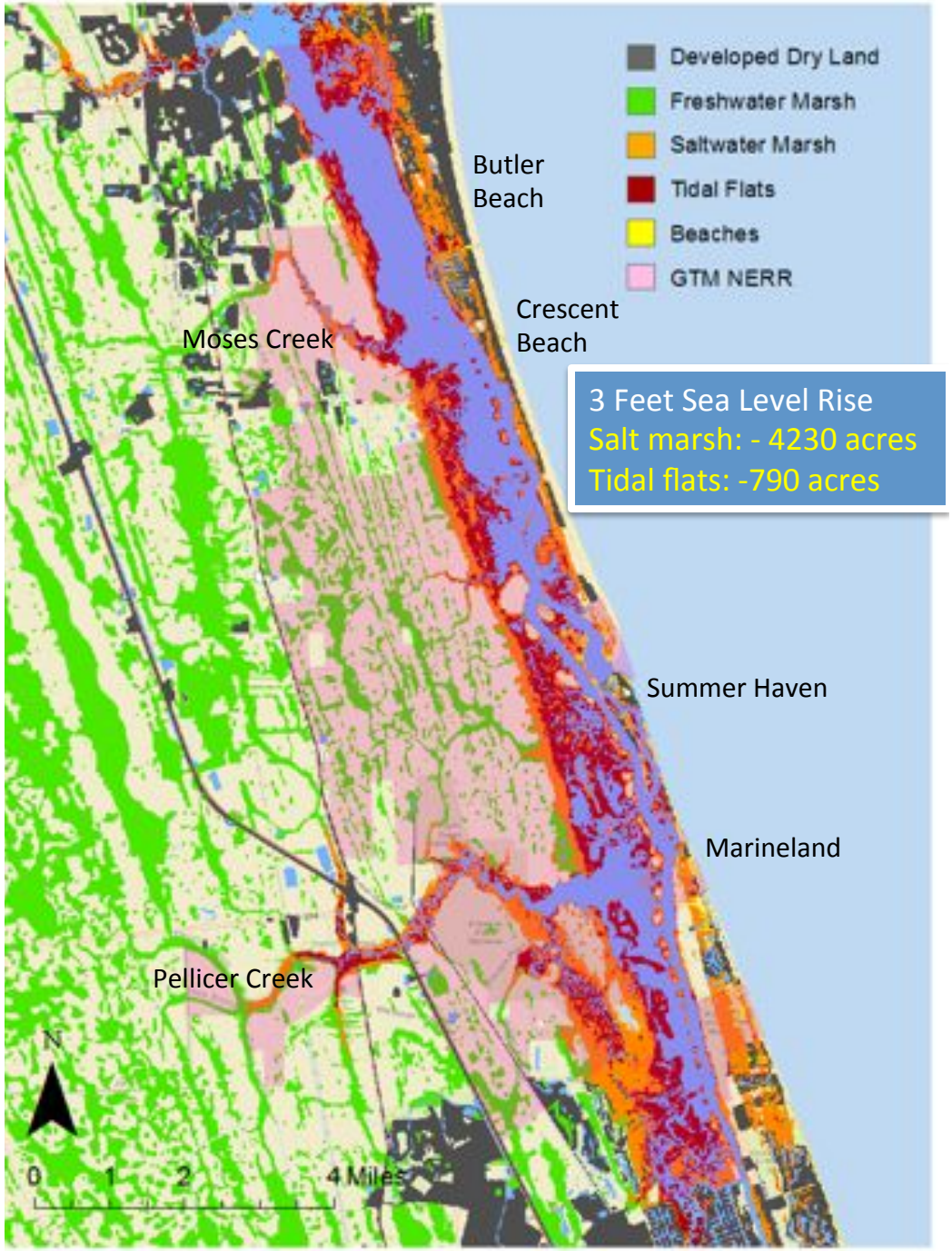
Areas Impacted by Sea Level Rise

Dynamic Model

- Sea Level Affecting Marshes Model (SLAMM)
- Habitat changes
- Shows impacts to developed areas *if they are allowed to change*

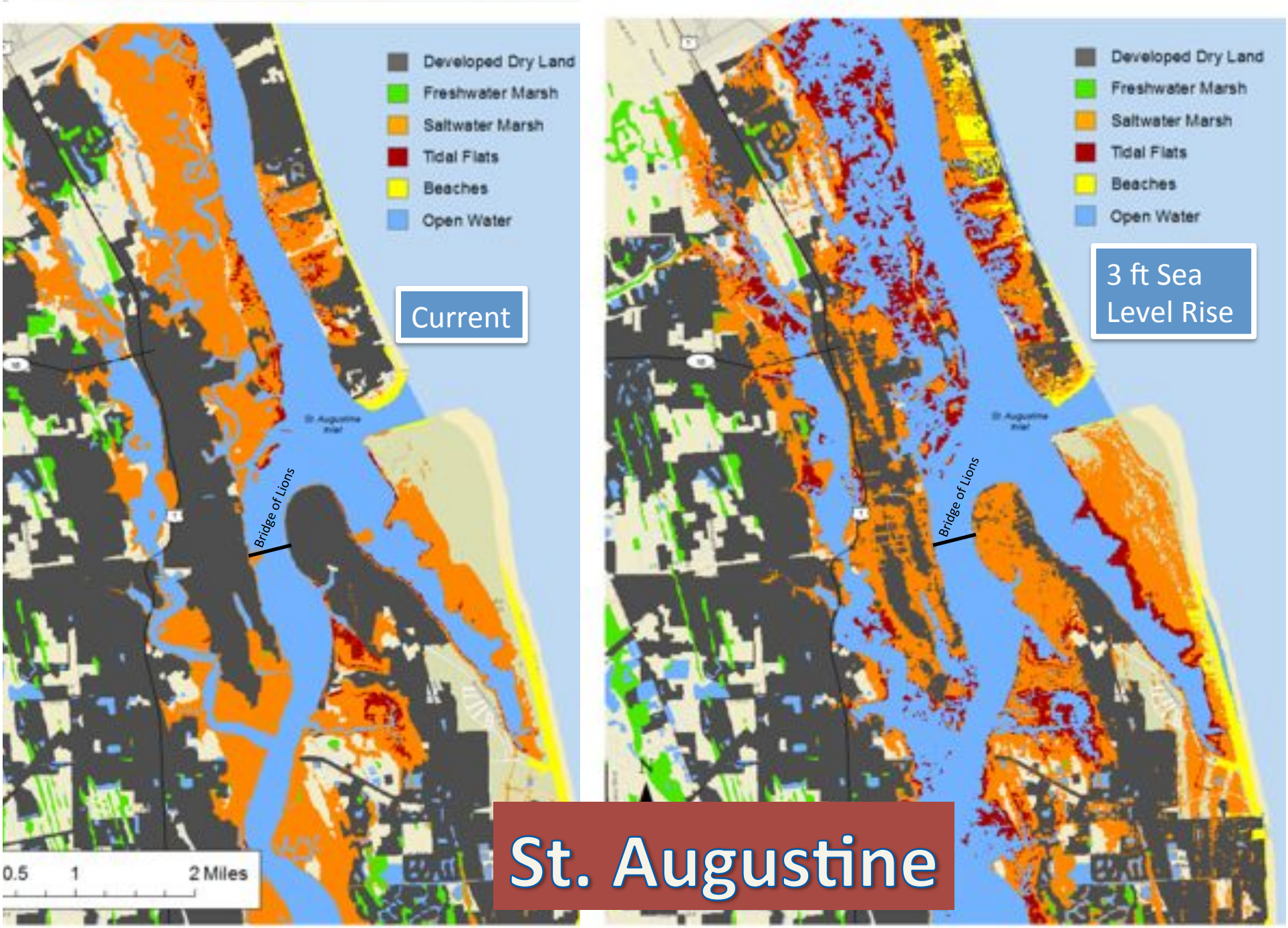



Developed Dry Land
Freshwater Marsh
Saltwater Marsh
Tidal Flats
Beaches
GTM NERR
Butler Beach
Crescent Beach
Moses Creek
Current
Summer Haven
Marineland
Pellicer Creek
0 1 2 4 Miles


Developed Dry Land
Freshwater Marsh
Saltwater Marsh
Tidal Flats
Beaches
GTM NERR
Butler Beach
Crescent Beach
Moses Creek
3 Feet Sea Level Rise
Salt marsh: - 4230 acres
Tidal flats: -790 acres
Summer Haven
Marineland
Pellicer Creek
N
0 1 2 4 Miles

Sea Level Rise Simulation

http://planningmatanzas.org/2012/12/21/sea-level-rise-simulation-videos/


Developed Dry Land
Freshwater Marsh
Saltwater Marsh
Tidal Flats
Beaches
Open Water
Current
Bridge of Lions
0.5
1
2 Miles
Developed Dry Land
Freshwater Marsh
Saltwater Marsh
Tidal Flats
Beaches
Open Water
3 ft Sea Level Rise
Bridge of Lions
St. Augustine

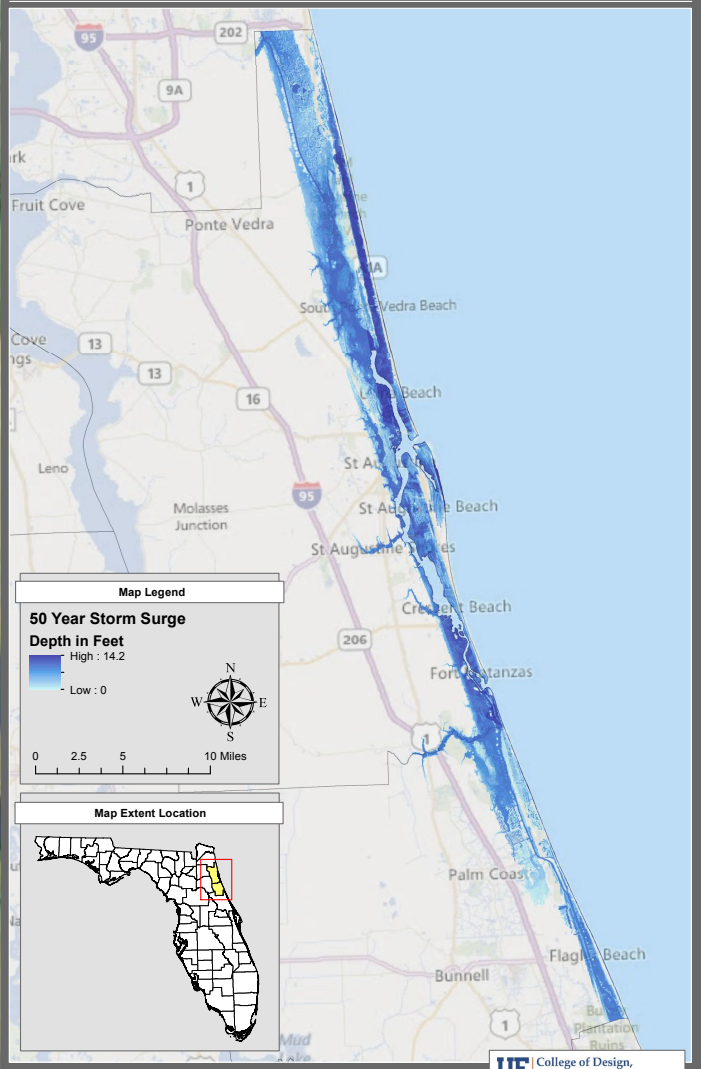
Loss of Dry Land

Acres change from 3 feet sea level rise		St. Augustine	Anastasia Island	Flagler Beaches	Palm Coast
Developed land to:					
	Salt marsh	2450	1400	2470	360
	Tidal flats	4	12	4	32
	Water	4	7	9	19
Undeveloped dry land to:					
	Salt marsh	1250	1700	2310	190
	Tidal flats	2	9	4	2
	Water	2	4	2	14

Affecting residential, commercial, and institutional land uses

Storm Surge

STUDY AREA 50 YEAR STORM SURGE



Sources: FGDL

Map Printed: Oct 2012

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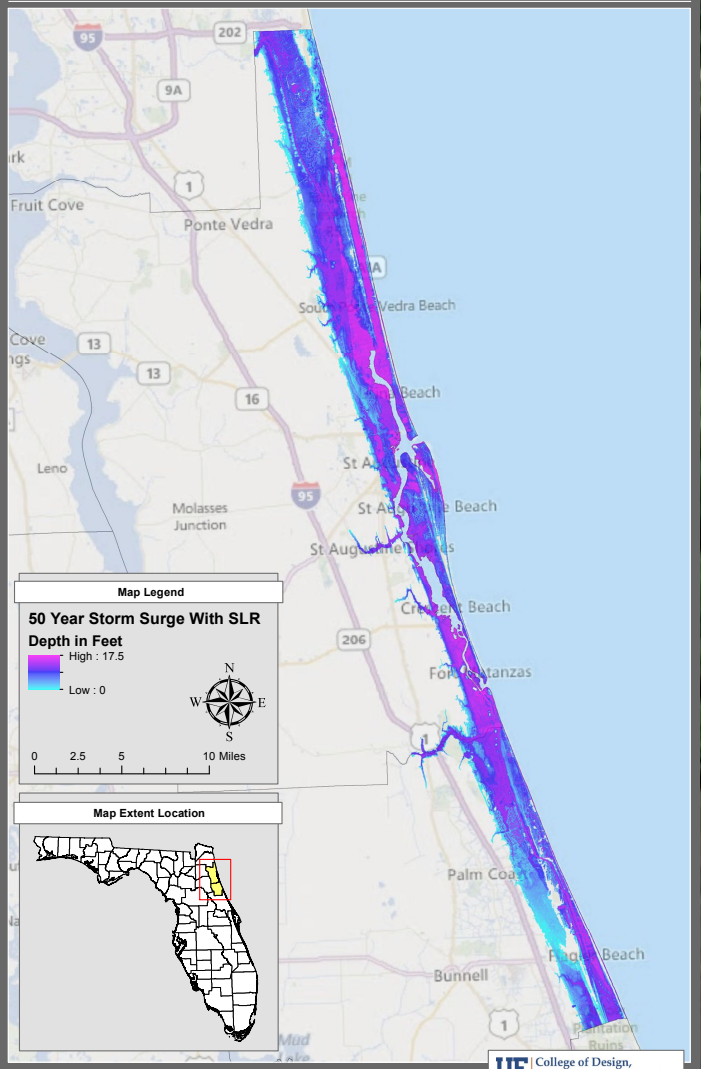
STUDY AREA 50 YEAR STORM SURGE WITH 3 FEET OF SLR



Sources: FGDL

Map Printed: Oct 2012

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Why plan for sea level rise now?

- Sea level rise is occurring now and will accelerate
- Planning is slow
- Responsibility for public safety, health and welfare
- Gain public confidence and reduce liability and market uncertainties
- Opportunities to reduce risk and costs, improve communities, and provide adaptation services

Leave a Positive Legacy

Adaptation Strategies

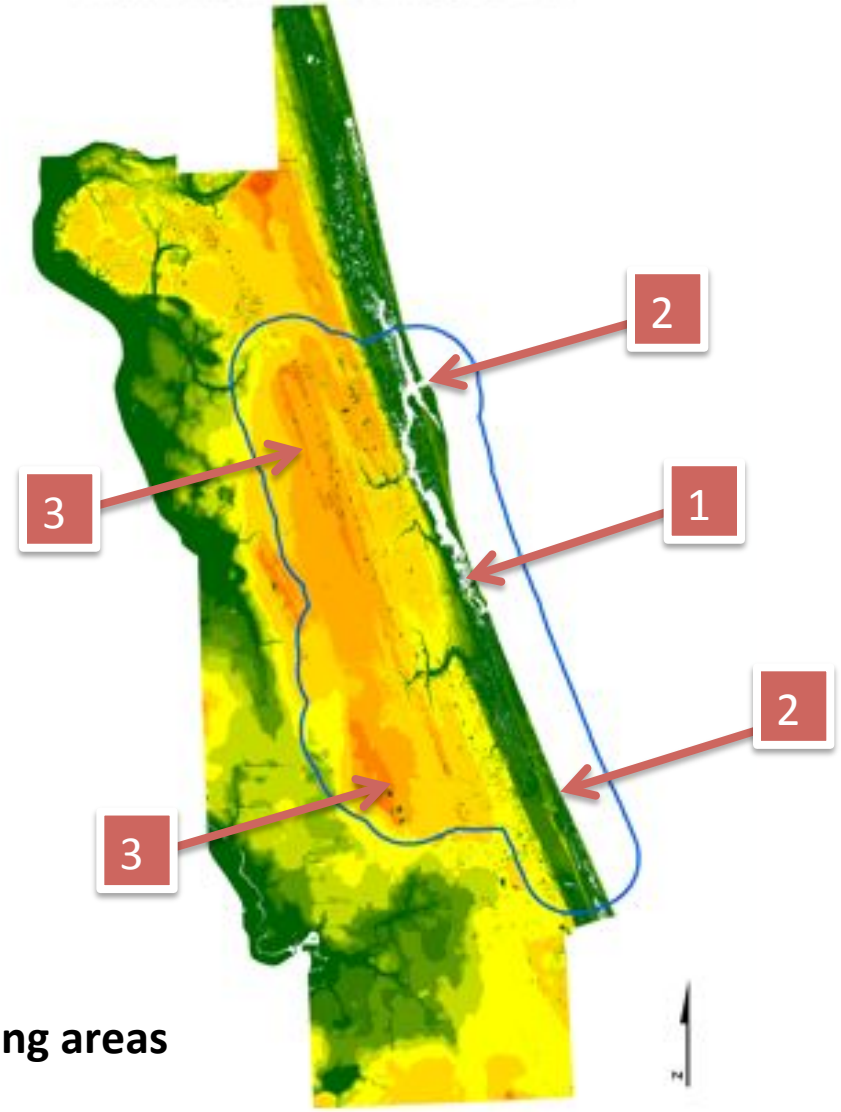
Adaptation Strategies

- Options, not recommendations
- Urban and regional planning
  - "Protection, accommodation, retreat"
- Environmental, natural resource, and rural planning
- References
  - Grannis, Jessica. 2011. Adaptation tool kit: sea-level rise and coastal land use. How governments can use land-use practices to adapt to sea-level rise. Georgetown Climate Center. http://www.georgetownclimate.org/sites/default/files/Adaptation_Tool_Kit_SLR.pdf
  - Florida Department of Economic Opportunity: Adaptation Planning http://www.floridajobs.org/community-planning-and-development/programs/technical-assistance/community-resiliency/adaptation-planning

Integrated Planning and Design

Three Types of Areas for Adaptive Design

1. Coastal natural areas
2. Coastal development
3. Upland future development or conservation



Area 1. Coastal Natural Areas

Ecosystem Conservation

Coastal Land Acquisition and Conservation Easements

Area 2. Coastal Development

Riprap and Seawalls

"Protection"

Area 2. Coastal Development

Living Shoreline
Restore Wetlands

Area 2. Coastal Development

Beach Nourishment

Area 2. Coastal Development

Elevating Structures

"Accommodation"

Area 2. Coastal Development

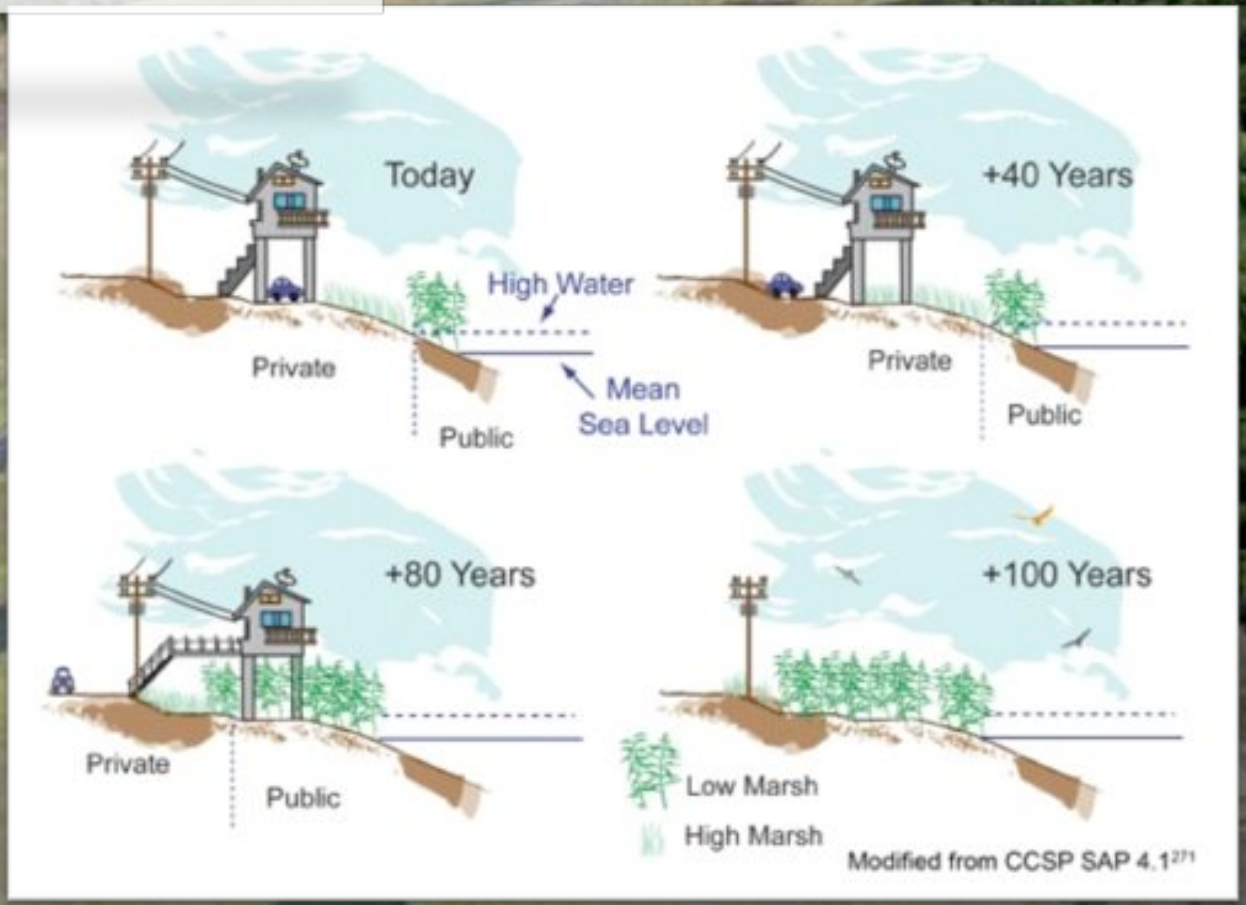
Activities Compatible with Flooding

Outdoor Recreation

Area 2. Coastal Development

Planned Relocation
Rolling Easements

"Retreat"



Area 3. Upland Undeveloped Land

Planned Relocation

Local Plans

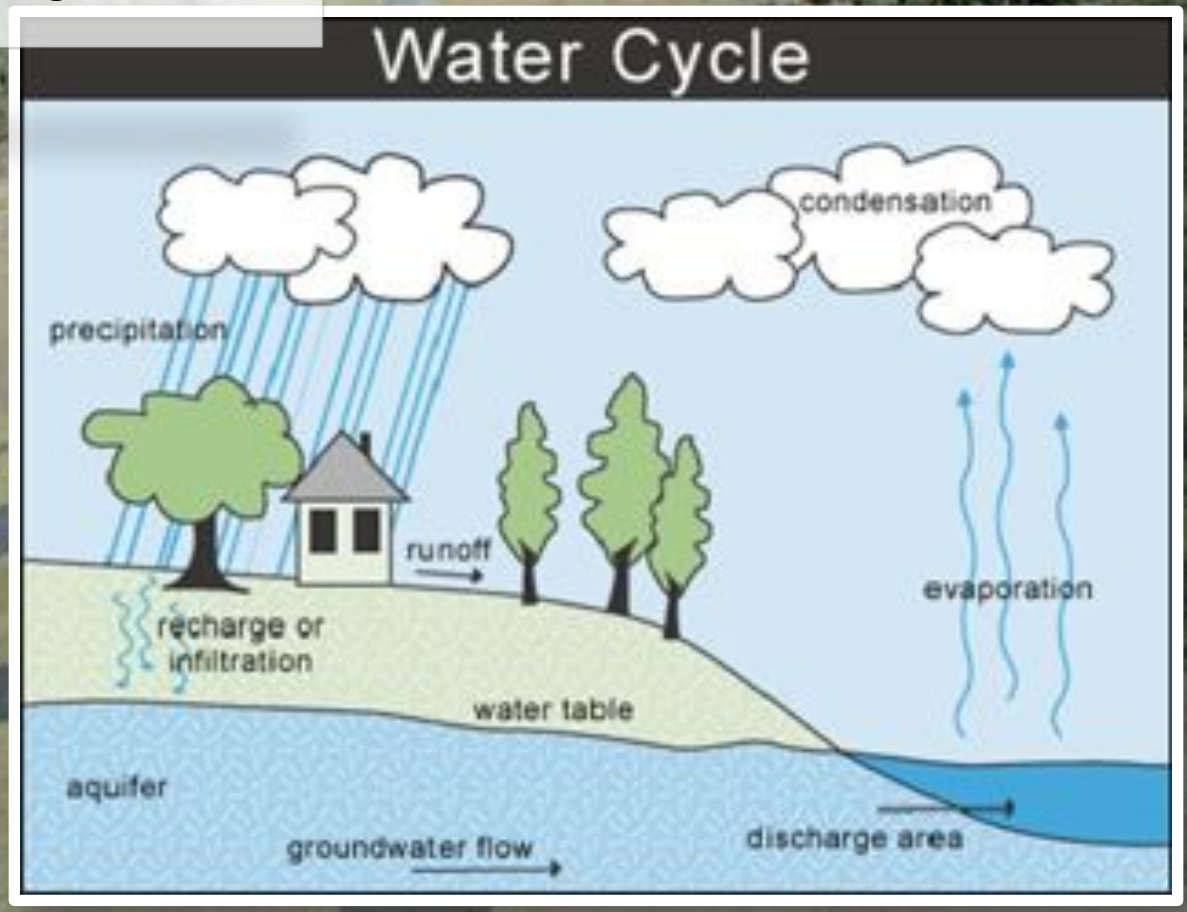
Area 3. Upland Undeveloped Land

Habitat Migration Corridors

Upland Land Acquisition and Conservation Easements

Area 3. Upland Undeveloped Land

Ecosystem Services
Water Storage Easement




Thank You!
PlanningMatanzas.org
Planning for Sea Level Rise
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