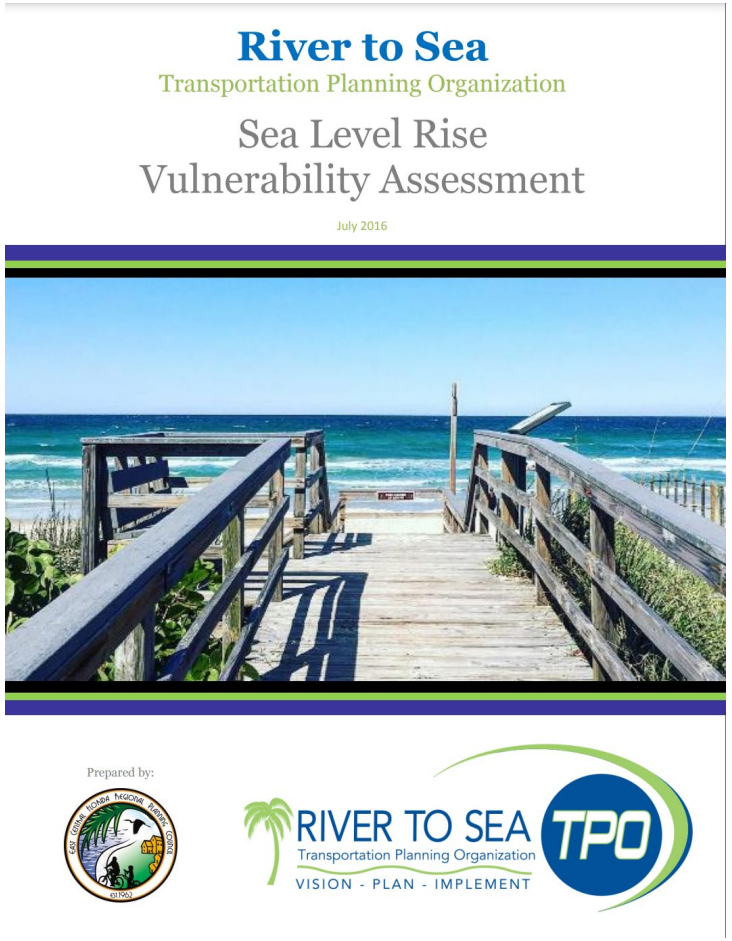
Collaborating for Resilience: A Volusia County Coastal Resilience Workshop

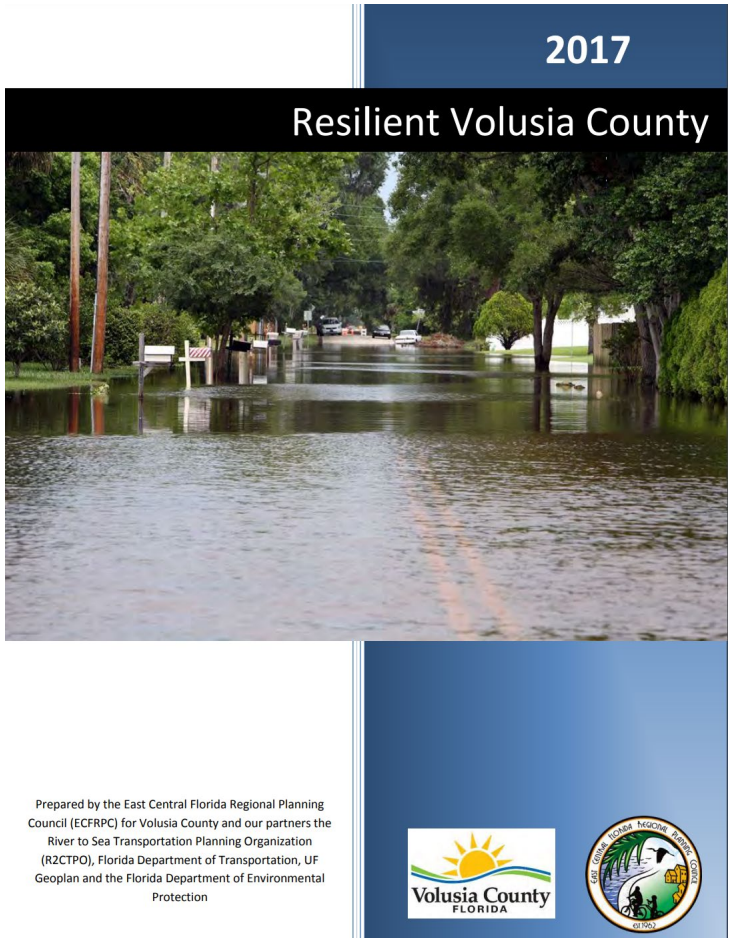
October 28, 2020

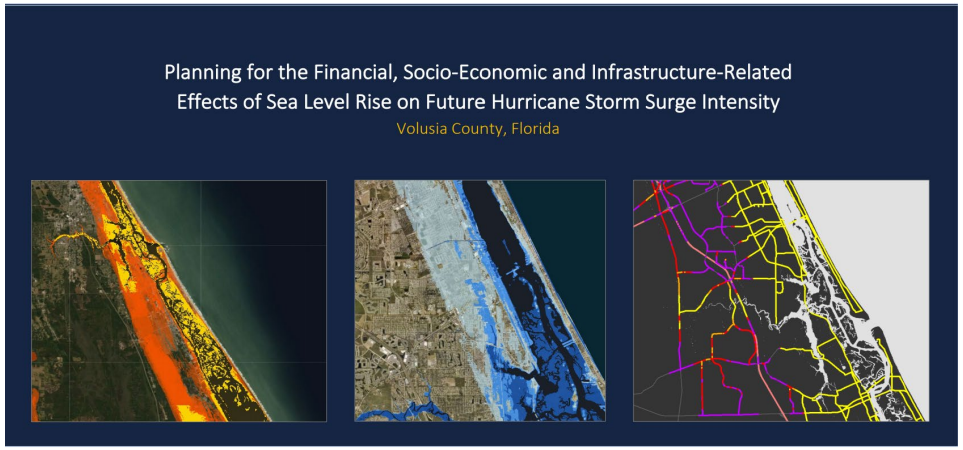
Welcome & Introductions

- Katrina Locke – Volusia County
- Dr. Jason Evans – Stetson University
- Dr. Chris De Bodisco – Stetson University
- Dr. Janardan Mainali – Stetson University
- Carson Bockoven – Stetson University
- Thomas Ruppert – Florida Sea Grant
- Charles Abbatantuono – ECFRPC
- Tara McCue, AICP - ECFRPC

Where We've Been?



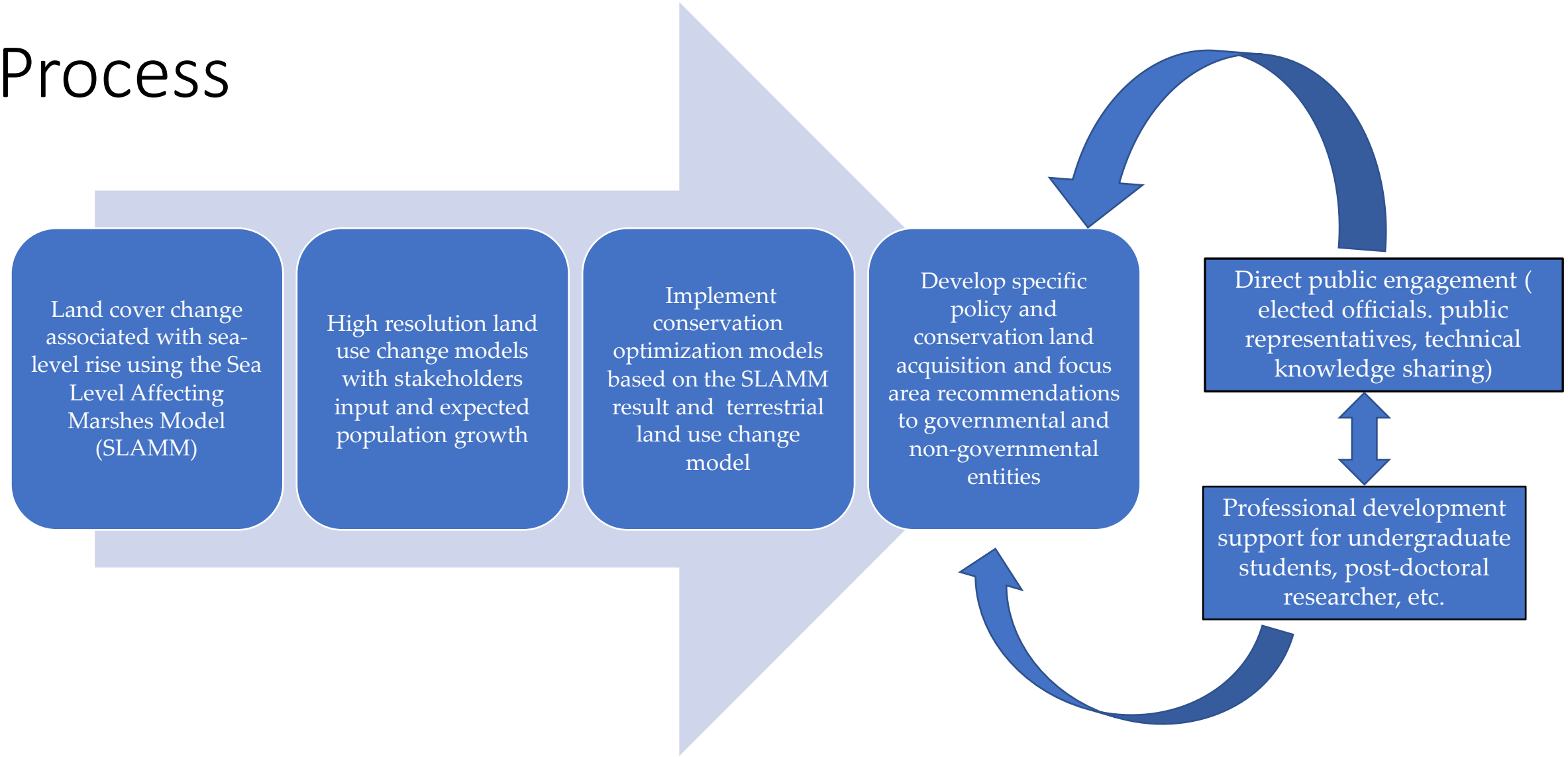




Project Overview and Goals

- Funded by Florida Sea Grant & FDEP Coastal Resilient Program
- Model future conditions and other vulnerabilities to open space
- Identify barriers to habitat corridors and migration
- Examine Open Space through a Resilience Lens
- Engage stakeholders and experts to advance solutions and vet data and impacts
- Develop specific policy and conservation land acquisition recommendations and processes to establish focus areas
- Identify focus areas for adaptation solutions

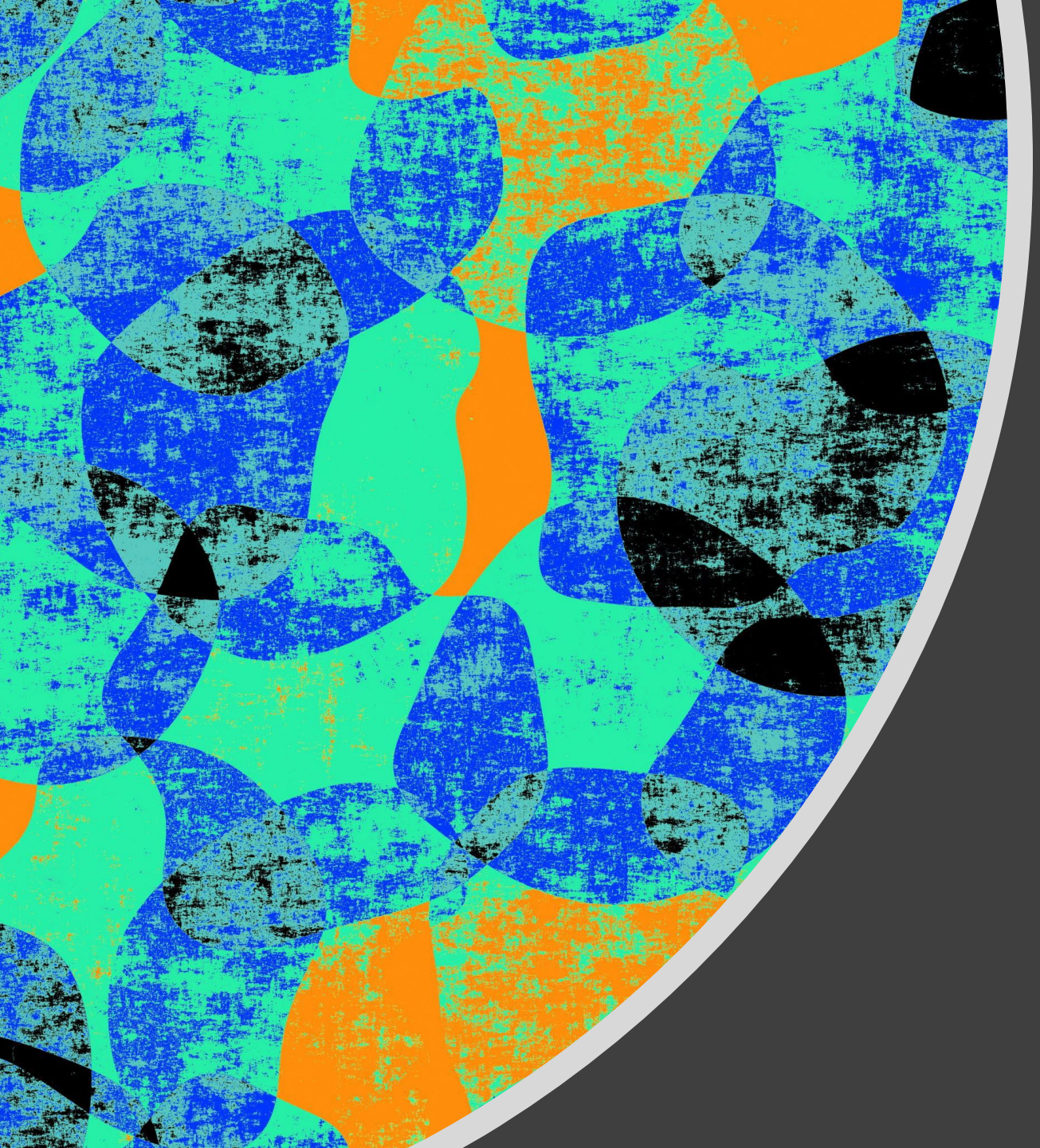
Process


Land cover change associated with sea-level rise using the Sea Level Affecting Marshes Model (SLAMM)
High resolution land use change models with stakeholders input and expected population growth
Implement conservation optimization models based on the SLAMM result and terrestrial land use change model
Develop specific policy and conservation land acquisition and focus area recommendations to governmental and non-governmental entities
Direct public engagement (elected officials. public representatives, technical knowledge sharing)
Professional development support for undergraduate students, post-doctoral researcher, etc.

Goals of Today's Workshop

Verify	Verify areas of intense population growth under existing land ownership patterns (assuming no further conservation purchase) for local and regional staff to better prepare, plan and implement resiliency.
Discuss	Discuss potential shifts in land cover associated with sea-level-rise
Identify	Identify ways to prioritize green infrastructure for coastal defense and promote habitat interconnectivity for habitat migration
Assess	Assess processes for prioritization of focus areas in the County.

Green Infrastructure includes natural or living features (including engineered struc tures built to mimic natural
features in look and functionality) that perform critical natural processes.

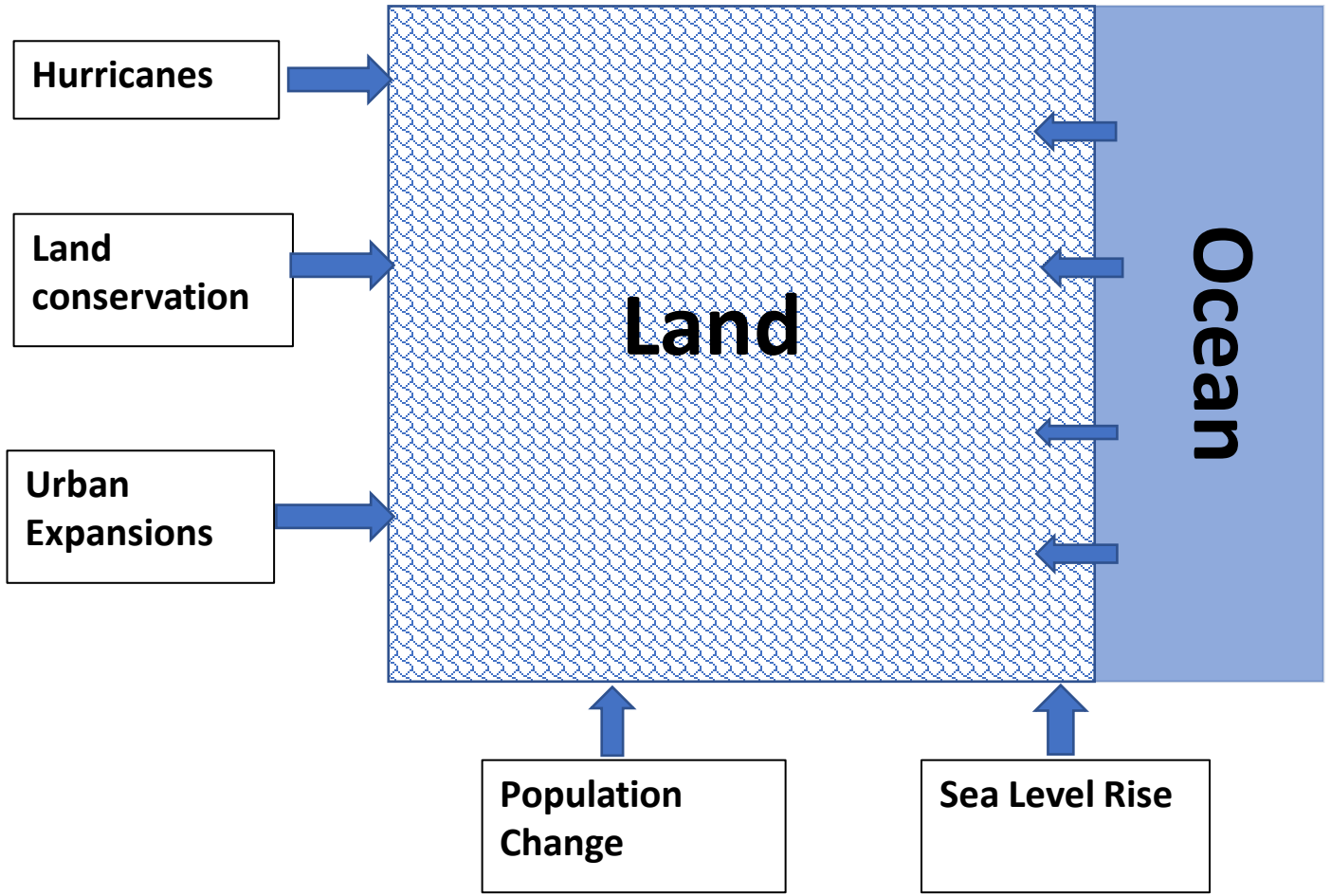


Landuse and Habitat Change Modelling

Dr. Jason Evans

Dr. Janardan Mainali

Spatial Conceptualization

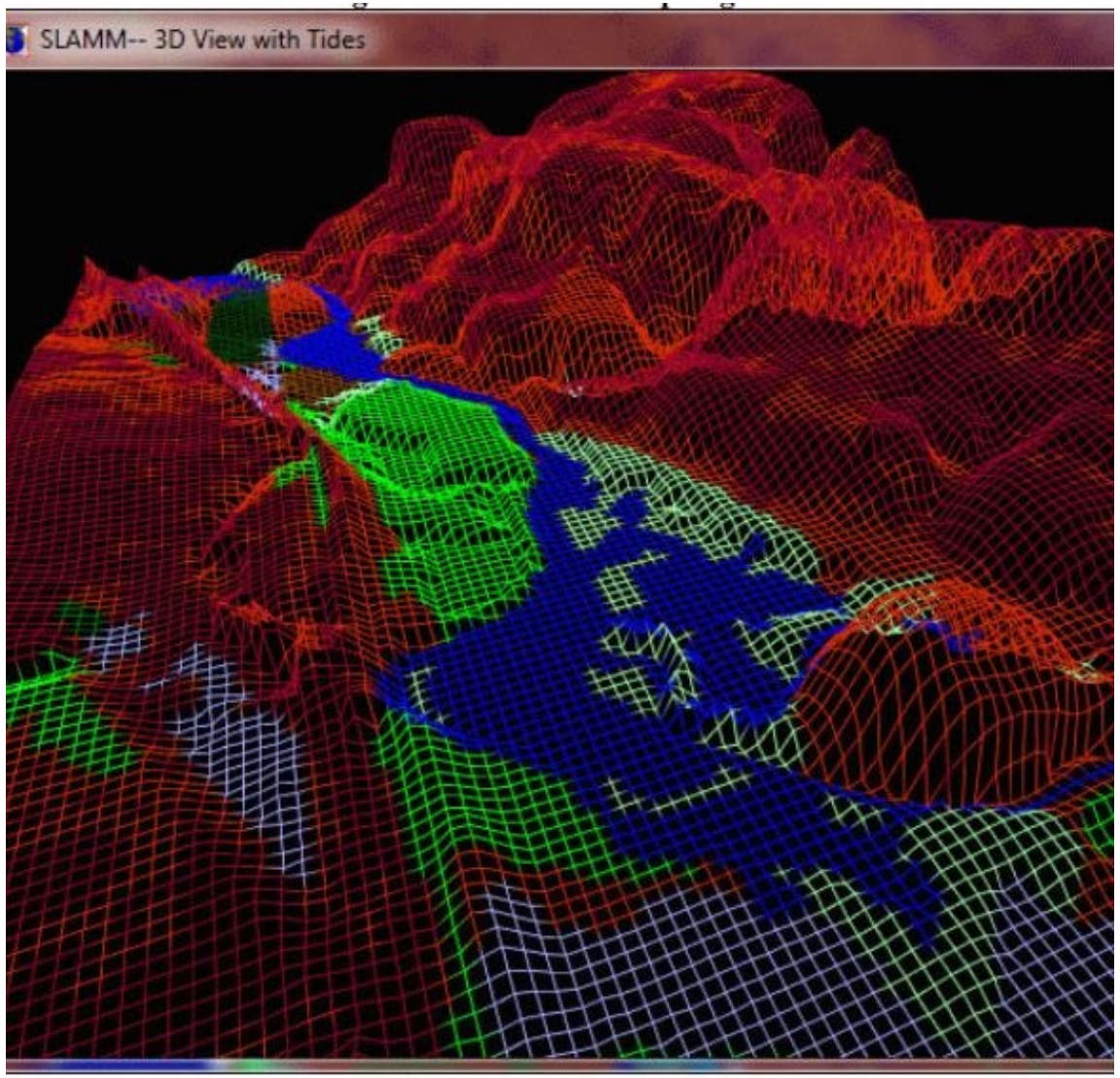


Landuse and Habitat Change Modelling

- Timeseries landcover data (1973, 1983, 1990, 1994, 2004, 2009, 2014)
- Landcover trend analysis using standard statistics method (eg. Default Markov Chain Model)
- Impact of Sea Level Rise using SLAMM (Sea Level Affecting Marshes Model) modelling approach
- Land cover change analysis using AHP (Analytical Hierarchy Process) by incorporating results from the SLAMM Model
- Validation of landcover change models
- Identification of potential regions for habitat conservation and flood control

Sea Level Affecting Marshes Model for Coastal and Riparian regions

- Wetland habitat change model – incorporates physical and biological process to predict future shift in habitat types
- Can incorporate various sea level rise scenarios
- Produces both spatially explicit and quantitative output
- Can aid in land conservation and management
- Used extensively by U.S. Fish and Wildlife Service and FWC for coastal ecosystem management and resilience planning



https://coast.noaa.gov/digitalcoast/tools/slamm.html

Application of the Sea-Level Affecting Marshes Model (SLAMM 6) to Merritt Island NWR

U. S. Fish and Wildlife Service
National Wildlife Refuge System
Division of Natural Resources and Conservation Planning
Conservation Biology Program
4401 N. Fairfax Drive - MS 670
Arlington, VA 22203

December 27, 2011

warren pinnacle consulting, inc.
PO Box 315, Waitsfield VT, 05673
(802)-496-3476

USFWS Cooperative Agreement F16AC01213

Florida Keys Case Study on Incorporating Climate Change Considerations into Conservation Planning and Actions for Threatened and Endangered Species

Project Coordinator:

Logan Benedict, Florida Fish and Wildlife Conservation Commission

Project Team:

Bob Glazer, Florida Fish and Wildlife Conservation Commission

Chris Bergh, The Nature Conservancy

Steve Traxler, US Fish and Wildlife Service

Beth Stys, Florida Fish and Wildlife Conservation Commission

Jason Evans, Stetson University

Project Report

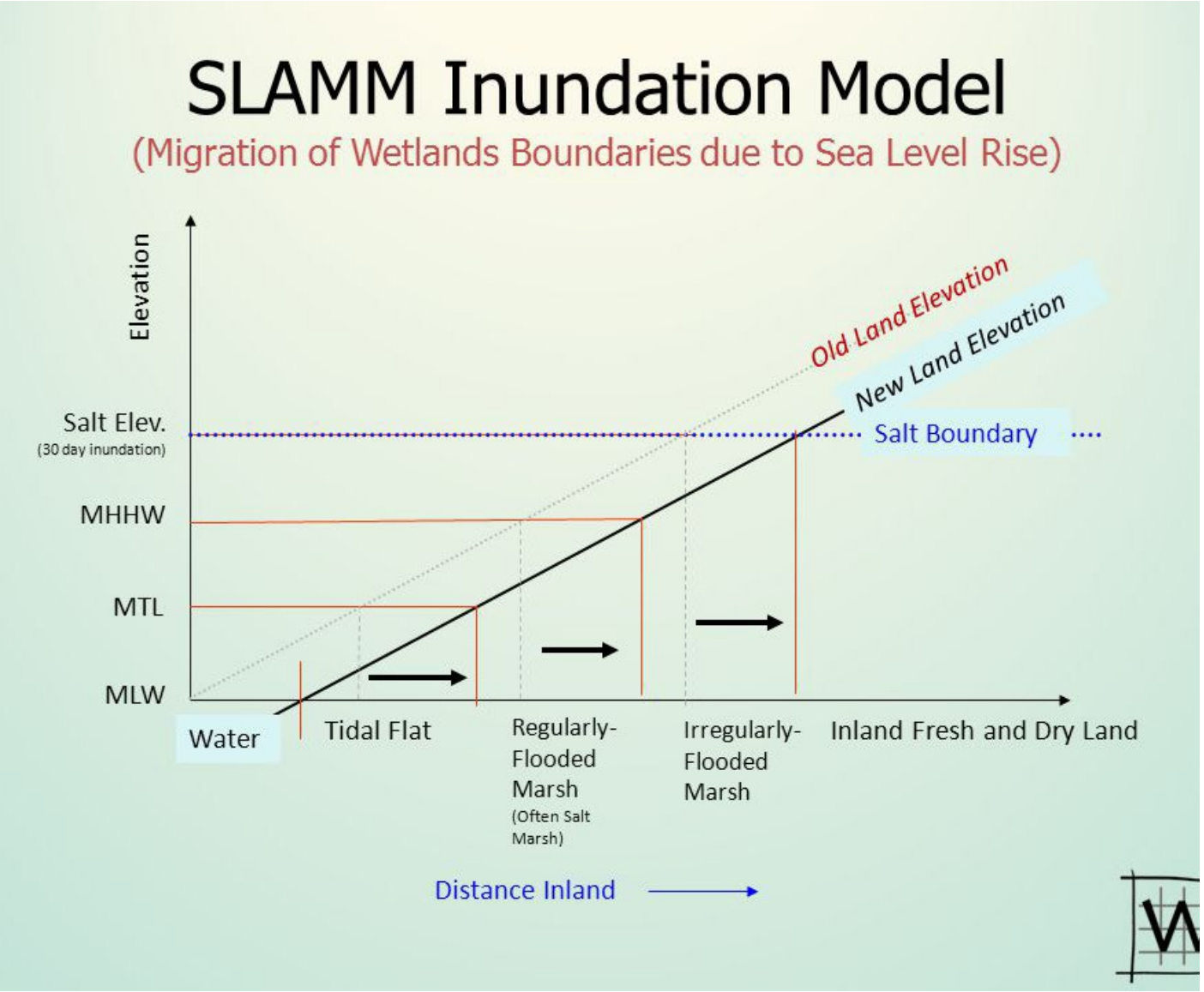
Photo by Logan Benedict

Cover Photo by Ricardo Zambrano

SLAMM

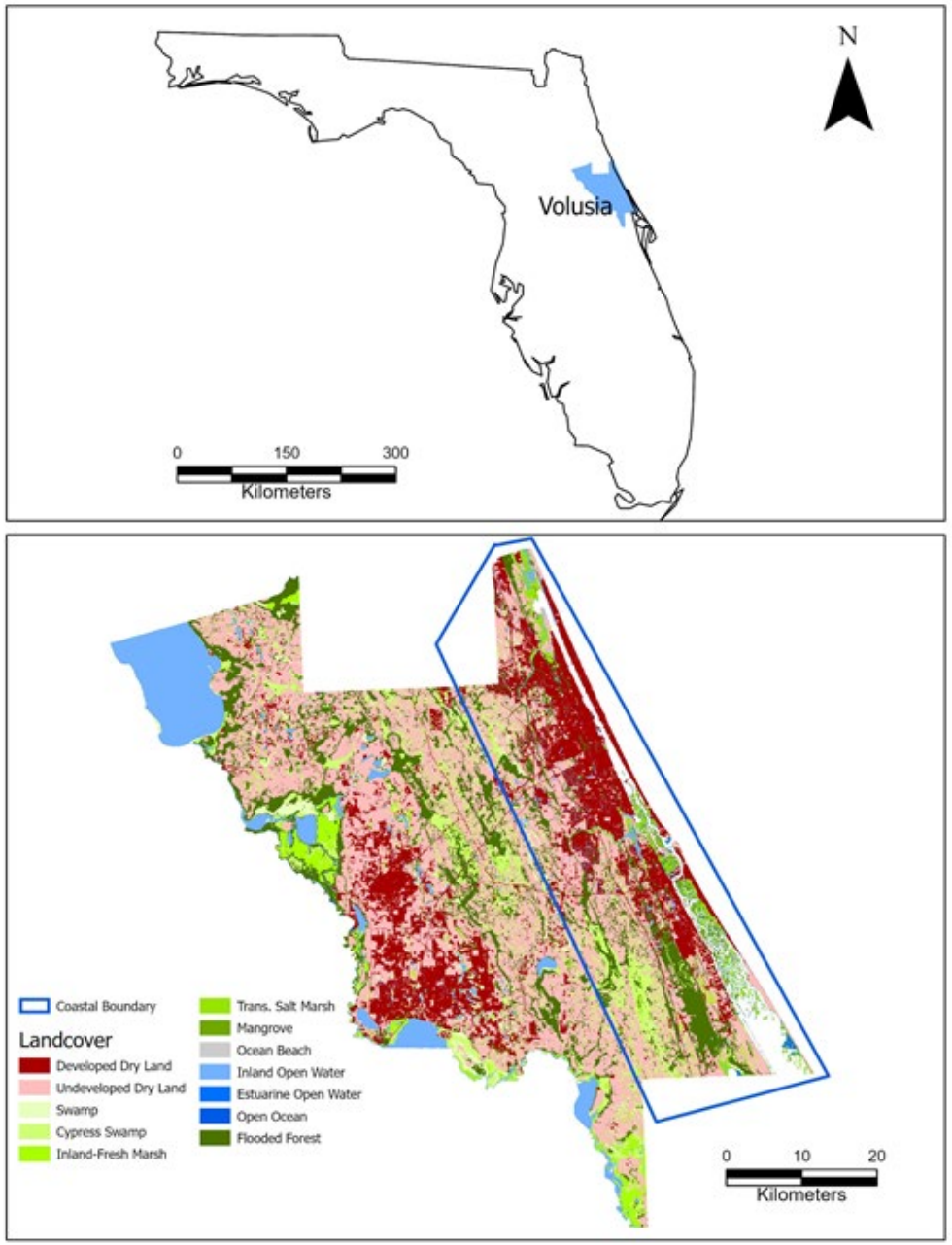
Table 2. Summary of SLAMM input parameters for Merritt Island NWR.

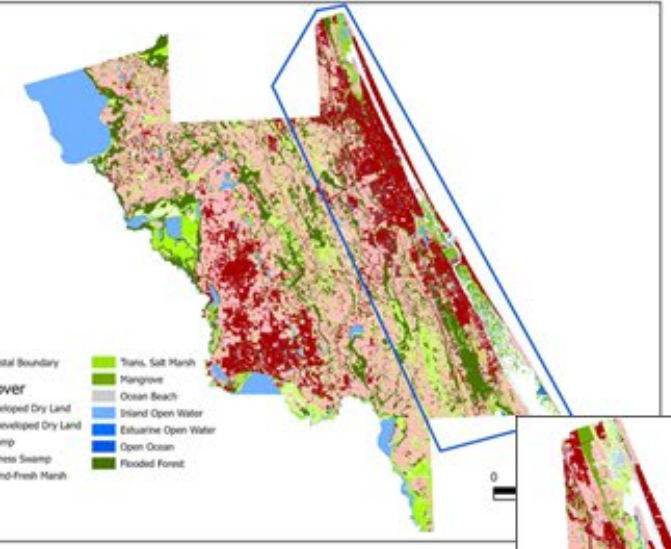
Parameter	S1	S2	S3	S4	S5
NWI Photo Date (YYYY)	2009	2009	2009	2009	1984
DEM Date (YYYY)	2007	2006	2007	2007	2007
Direction Offshore [n,s,e,w]	East	East	East	East	East
Historic Trend (mm/yr)	2.37	2.37	2.37	2.37	2.37
MTL-NAVD88 (m)	-0.29	-0.13	-0.17	-0.21	-0.21
GT Great Diurnal Tide Range (m)	1.2	0.28	0.28	0.28	0.28
Salt Elev. (m above MTL)	0.9	0.21	0.21	0.21	0.21
Marsh Erosion (horz. m /yr)	1.8	1.8	1.8	1.8	1.8
Swamp Erosion (horz. m /yr)	1	1	1	1	1
T.Flat Erosion (horz. m /yr)	0.5	0.5	0.5	0.5	0.5
Reg.-Flood Marsh Accr (mm/yr)	3.9	3.9	3.9	3.9	3.9
Irreg.-Flood Marsh Accr (mm/yr)	4.7	4.7	4.7	4.7	4.7
Tidal-Fresh Marsh Accr (mm/yr)	5.9	5.9	5.9	5.9	5.9
Inland-Fresh Marsh Accr (mm/yr)	5.9	5.9	5.9	5.9	5.9
Mangrove Accr (mm/yr)	7	7	7	7	7
Tidal Swamp Accr (mm/yr)	1.1	1.1	1.1	1.1	1.1
Swamp Accretion (mm/yr)	0.3	0.3	0.3	0.3	0.3
Beach Sed. Rate (mm/yr)	0.5	0.5	0.5	0.5	0.5
Freq. Overwash (years)	25	25	25	25	25
Use Elev Pre-processor [True,False]	FALSE	FALSE	FALSE	FALSE	FALSE

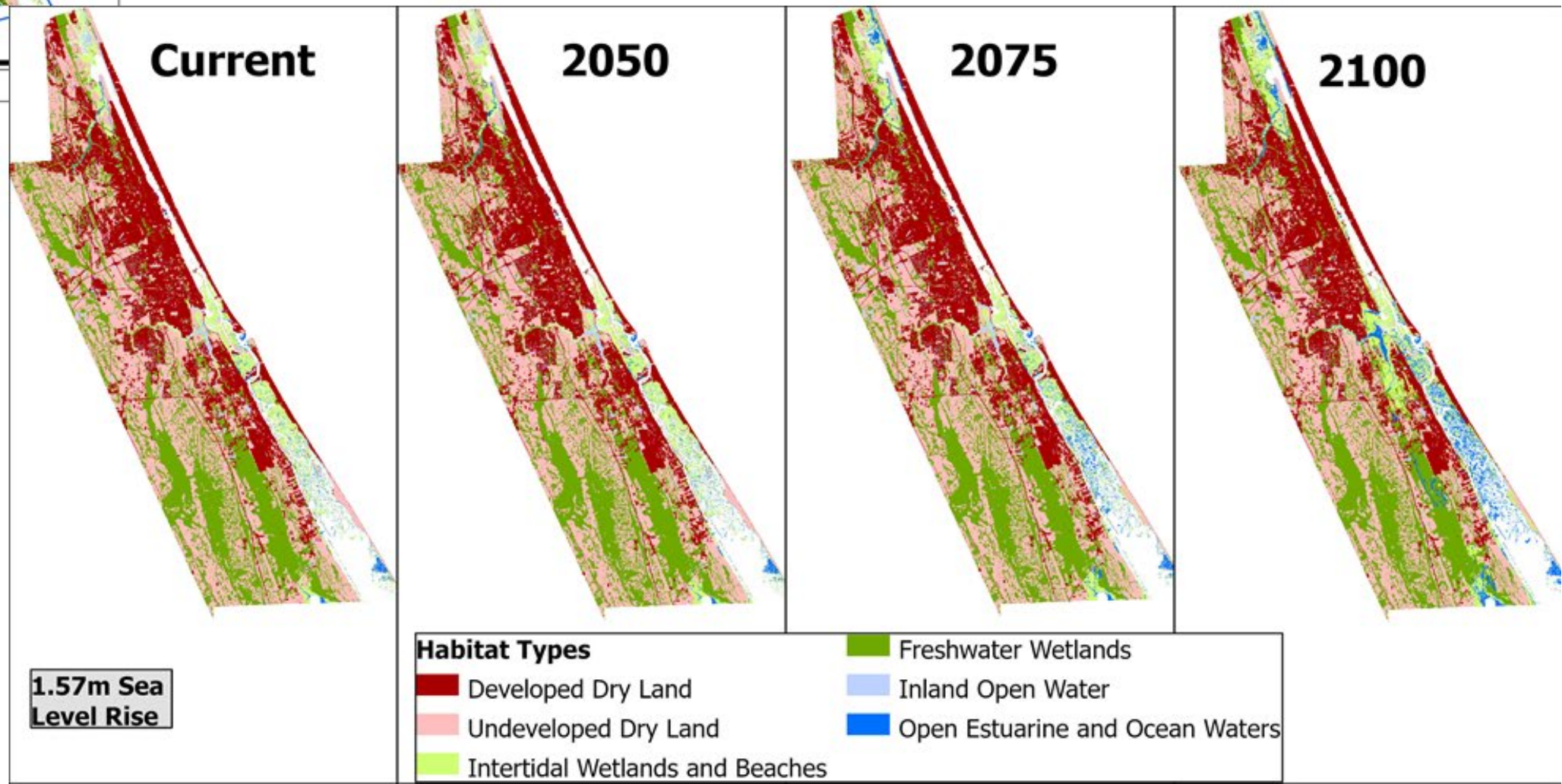


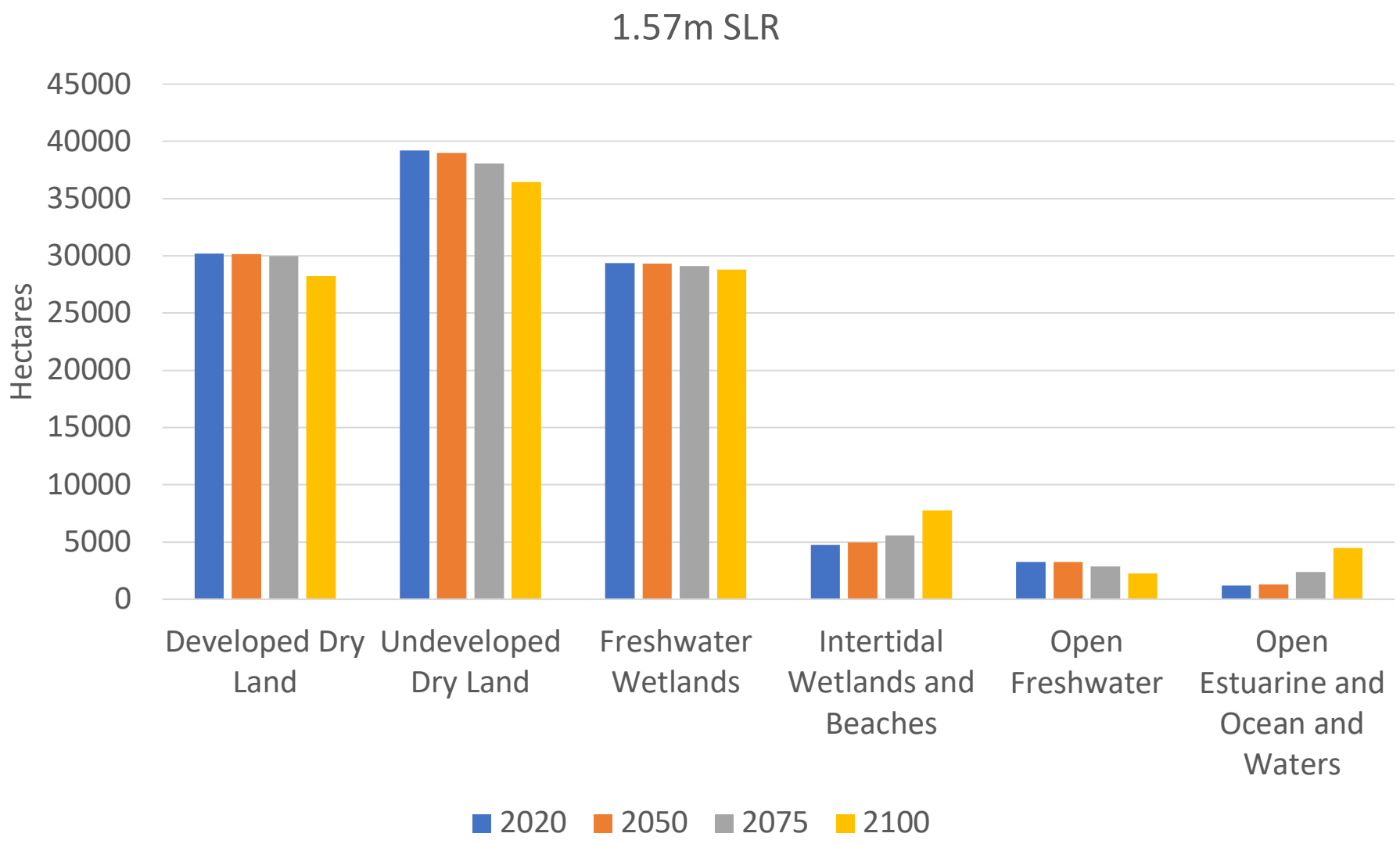
https://www.slideshare.net/riseagrant/sea-level-affecting-marshes-model-slamm

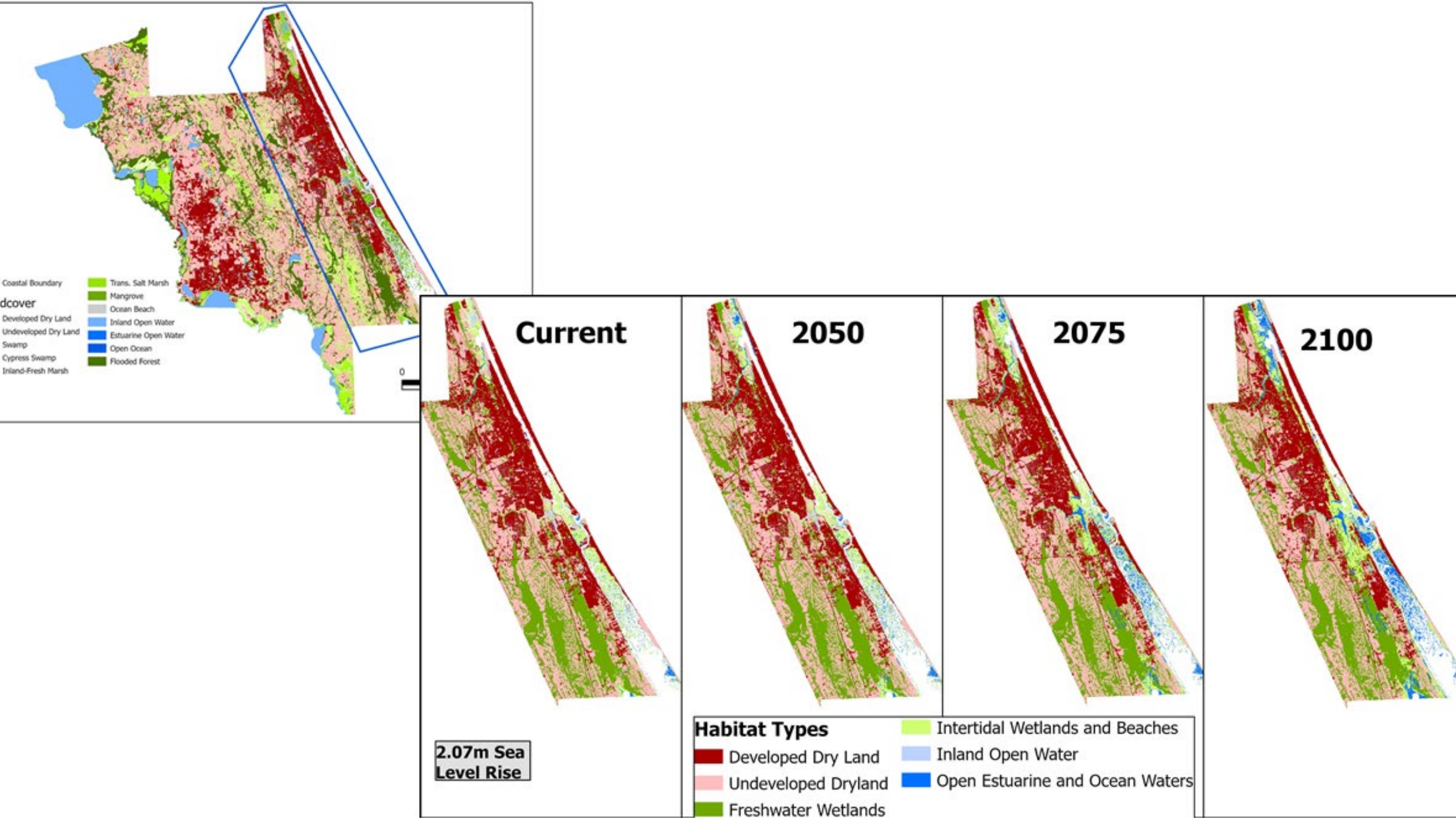
Initial SLAMM Modeling Results

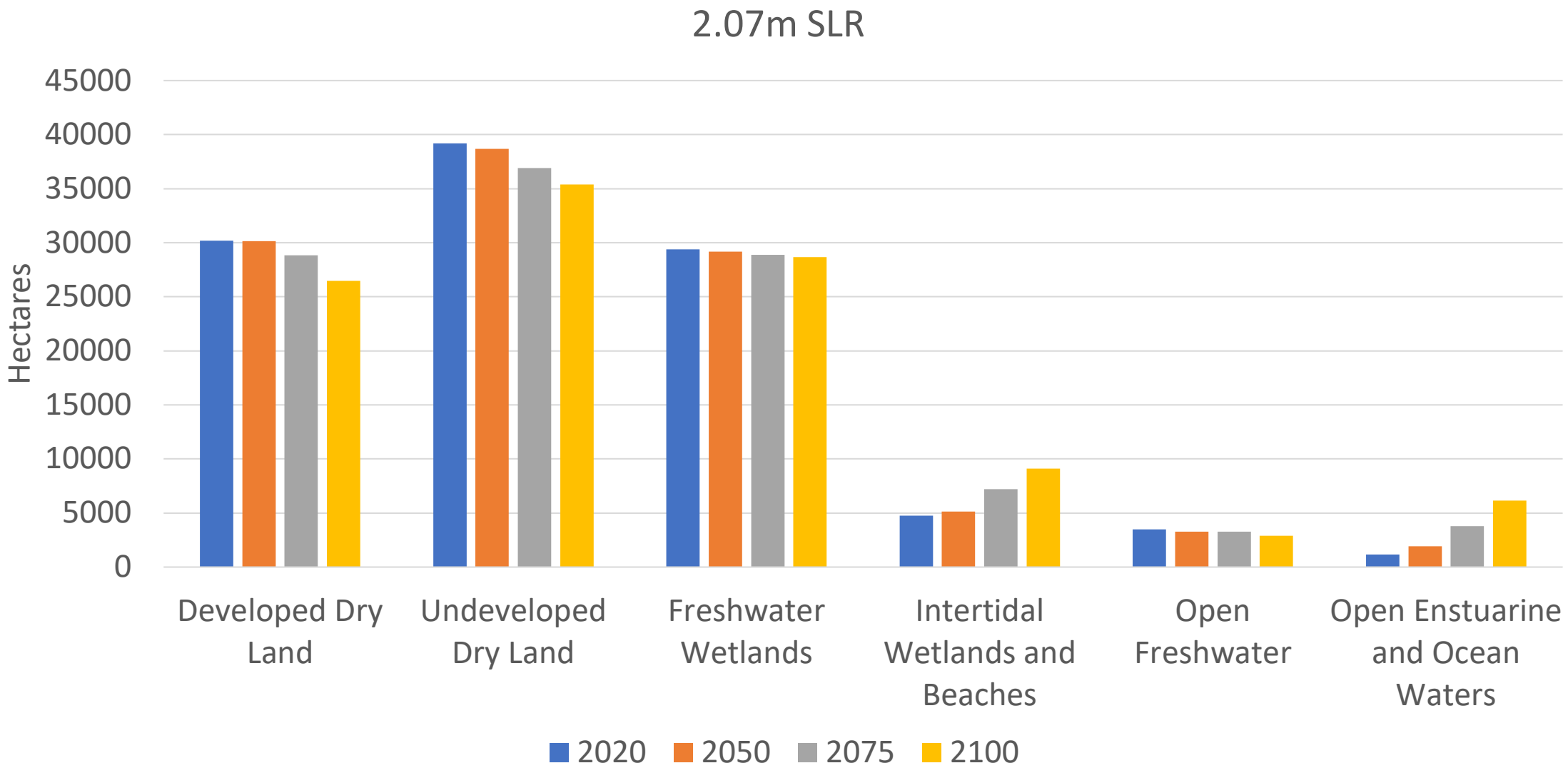

N
Volusia
0
150
300
Kilometers
Coastal Boundary
Landcover
Developed Dry Land
Undeveloped Dry Land
Swamp
Cypress Swamp
Inland-Fresh Marsh
Trans. Salt Marsh
Mangrove
Ocean Beach
Inland Open Water
Estuarine Open Water
Open Ocean
Flooded Forest
0
10
20
Kilometers


Trans. Salt Marsh
Mangrove
Ocean Beach
Inland Open Water
Estuarine Open Water
Open Ocean
Flooded Forest


Current
2050
2075
2100
1.57m Sea Level Rise
Habitat Types
Developed Dry Land
Undeveloped Dry Land
Intertidal Wetlands and Beaches
Freshwater Wetlands
Inland Open Water
Open Estuarine and Ocean Waters


1.57m SLR
Hectares
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Developed Dry Land
Undeveloped Dry Land
Freshwater Wetlands
Intertidal Wetlands and Beaches
Open Freshwater
Open Estuarine and Ocean and Waters
2020
2050
2075
2100


Coastal Boundary
dcover
Developed Dry Land
Undeveloped Dry Land
Swamp
Cypress Swamp
Inland-Fresh Marsh
Trans. Salt Marsh
Mangrove
Ocean Beach
Inland Open Water
Estuarine Open Water
Open Ocean
Flooded Forest
0
Current
2050
2075
2100
2.07m Sea Level Rise
Habitat Types
Developed Dry Land
Undeveloped Dryland
Freshwater Wetlands
Intertidal Wetlands and Beaches
Inland Open Water
Open Estuarine and Ocean Waters


2.07m SLR
Hectares
45000
40000
35000
30000
25000
20000
15000
10000
5000
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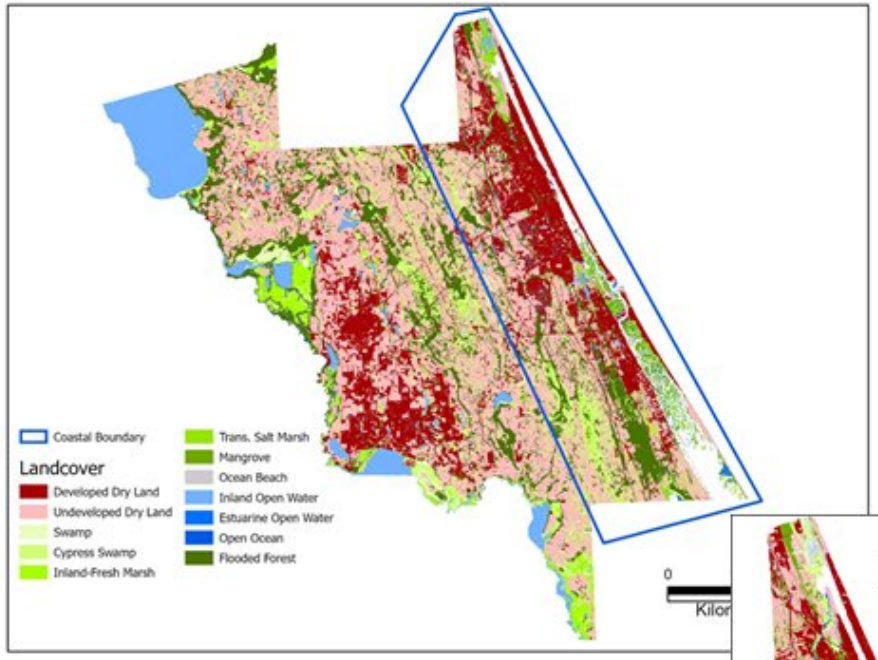
Developed Dry Land
Undeveloped Dry Land
Freshwater Wetlands
Intertidal Wetlands and Beaches
Open Freshwater
Open Enstuarine and Ocean Waters
2020
2050
2075
2100


Coastal Boundary
Landcover
Developed Dry Land
Undeveloped Dry Land
Swamp
Cypress Swamp
Inland-Fresh Marsh
Trans. Salt Marsh
Mangrove
Ocean Beach
Inland Open Water
Estuarine Open Water
Open Ocean
Flooded Forest
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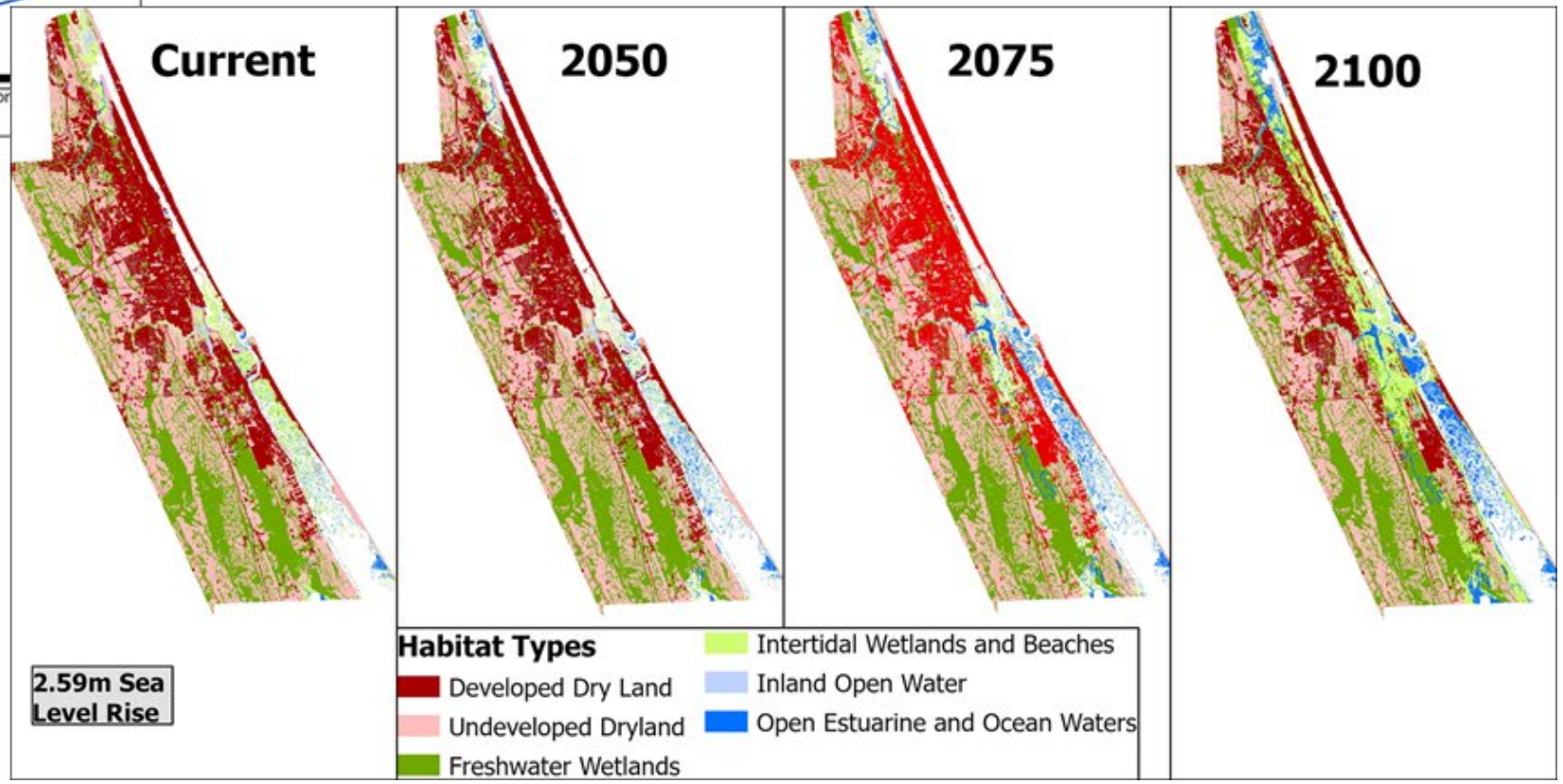
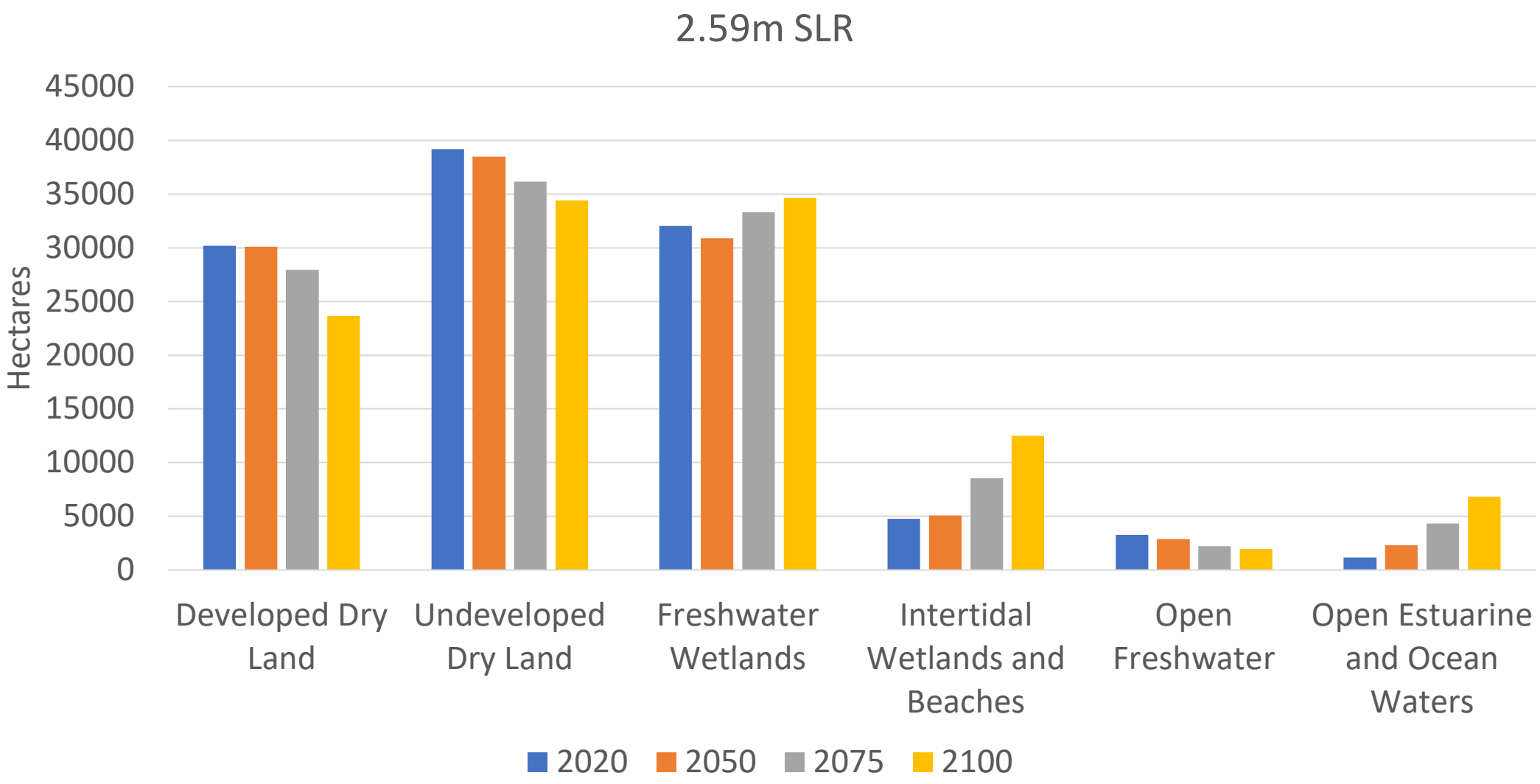

Current
2050
2075
2100
2.59m Sea Level Rise
Habitat Types
Developed Dry Land
Undeveloped Dryland
Freshwater Wetlands
Intertidal Wetlands and Beaches
Inland Open Water
Open Estuarine and Ocean Waters

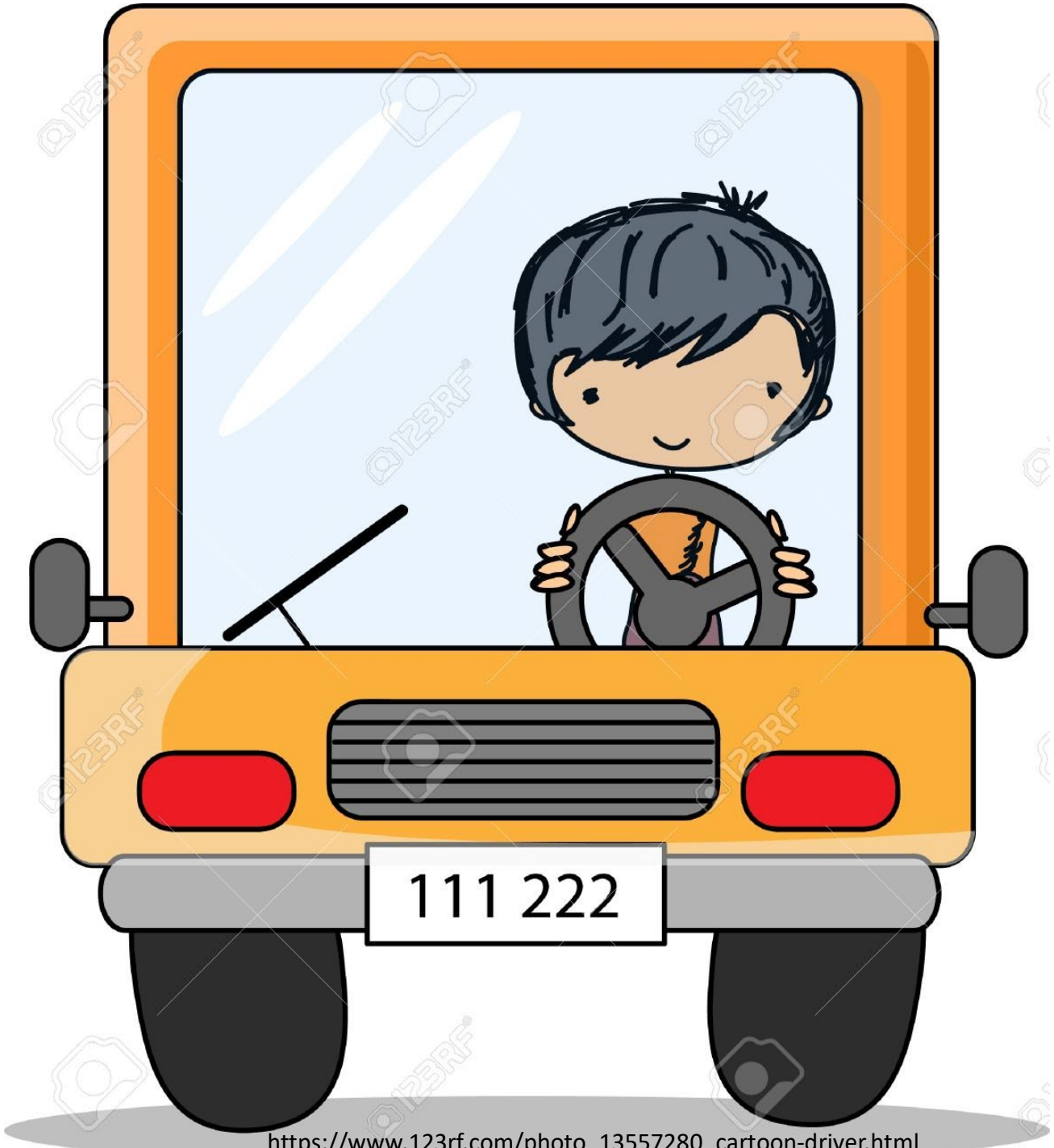

2.59m SLR
Hectares
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Developed Dry Land
Undeveloped Dry Land
Freshwater Wetlands
Intertidal Wetlands and Beaches
Open Freshwater
Open Estuarine and Ocean Waters
2020
2050
2075
2100

Further Modeling Adventure

- Revised SLAMM runs of different regions
- Terrestrial landcover change modeling using TerrSet software and Markov chain statistics
- Modification of landcover trend model with Analytical Hierarchy Process (AHP). Next workshop for inputs for AHP.
- Merging terrestrial and coastal landcover change modeling to inform landcover shift, habitat connectivity, and flood control measures
- Evaluating ecosystem service benefits

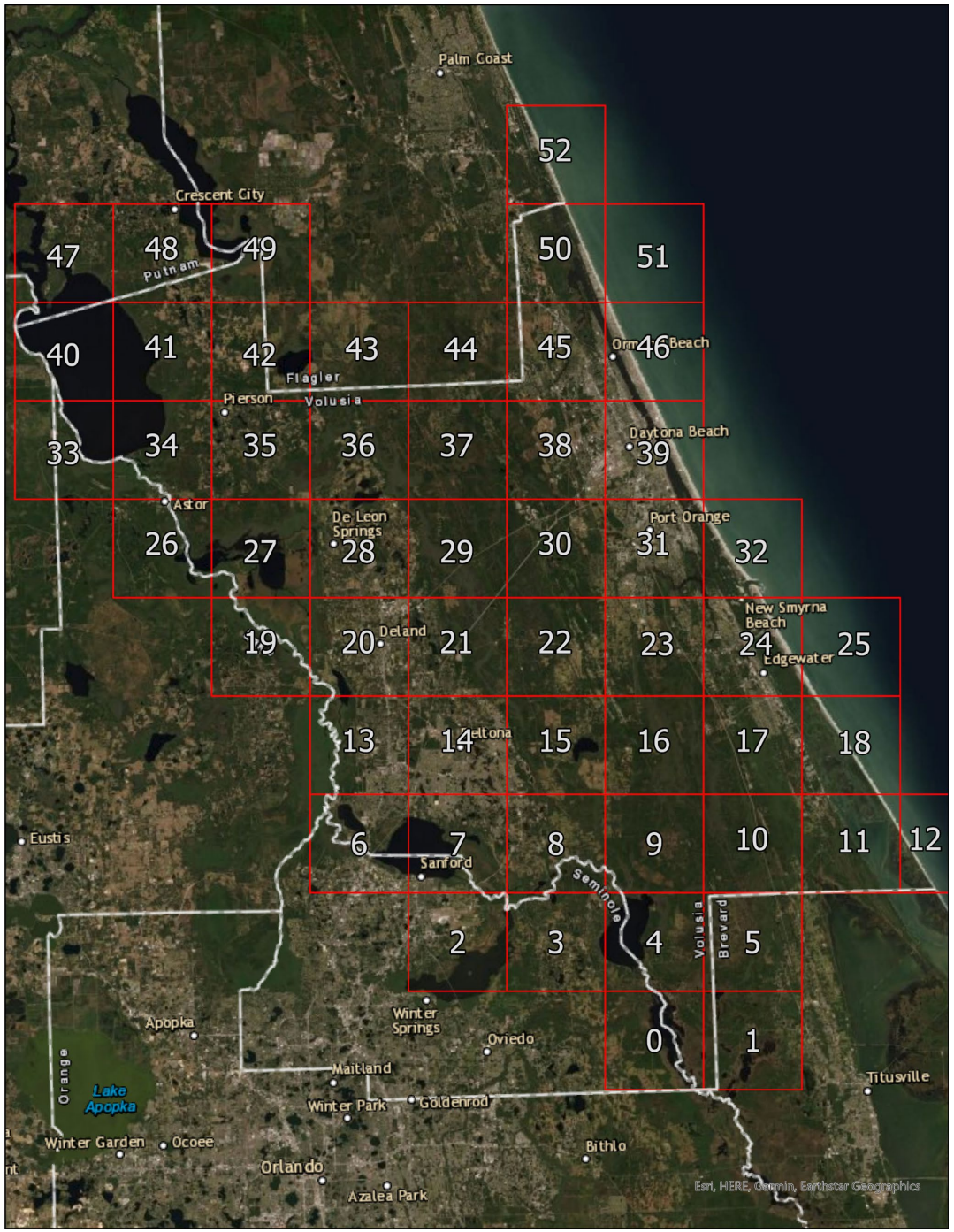
Breakout Session 1 (40 Mins)

In one word, what do you see as the **most important driver of land use change** impacting conservation in Volusia County?



https://www.123rf.com/photo_13557280_cartoon-driver.html

Where are the most critical locations in Volusia County in terms of human driven land cover change pressures over the next twenty years?



What are the important plant and animal species we need to pay attention to in this region?

Data question

- Have we missed anything?
- Do you have any other data that would be helpful for us?
- Are they any other stakeholders that should be here?

Report Outs

Lunch and Jam Session
15 minutes

Thomas Ruppert, Esq.
Dr. Chris de Bodisco

Volusia Land Use Planning

Collaborating for Resilience

Project Goal: Develop conservation actions that use scarce resources most effectively to minimize ecological and economic losses over time. Develop an implementable, locally acceptable, long term resilience plan to increase the economic and social value of natural resources in the face of changing environment.

Step One: Data Driven

1. Categorize land uses and habitat types
2. Identify Ecosystem Services associated with land uses and habitats
3. Calculate the economic and social value for each type of services
4. Map threats and range of conservation options
5. Prioritize actions based on highest net value post conservation

Collaborating for Resilience

Project Goal: Develop conservation actions that use scarce resources most effectively to minimize ecological and economic losses over time. Develop implementable, locally acceptable, long term resilience plan to increase economic and social value of natural resources in face of changing environment.

Step Two: Stakeholder Driven

1. Engage stakeholders with this information through engagement and seek direct input from them based on their values, attitudes, and perceptions about things like need, value, and political feasibility.
2. Utilize information from this stakeholder engagement to re-evaluate the costs and benefits of response options through modifying costs and benefits based on feedback. For example, by including an additional political feasibility cost factor.

Prioritization Process

1. Identify land uses and locate habitat types
2. Overlay environmental, demographic and economic characteristics
3. Develop map of economic and ecological features
4. Identify data-based areas of special interest
5. Incorporate local priorities

Habitat Type
Pine Flatwood
Mangrove Swamp
Saltwater Marsh
Upland Forest
Woodland Pasture

1. Identify Ecosystem Services provided by land use and habitats

PROVISIONING SERVICES		REGULATING SERVICES
Food		Influence on air quality
(Fresh) water supply		Climate regulation
Genetic resources		**Moderation of extreme events**
Medicinal resources		Regulation of water flows
Raw materials		Waste treatment / water purification
		Erosion prevention
HABITAT SERVICES		Nutrient cycling / soil fertility
Lifecycle maintenance (nurseries)		Pollination
Gene pool protection (conservation)		Biological control
CULTURAL SERVICES		
Opportunities for recreation / tourism		
Aesthetic information / Education		

2. Calculate the economic and social value for each type of services

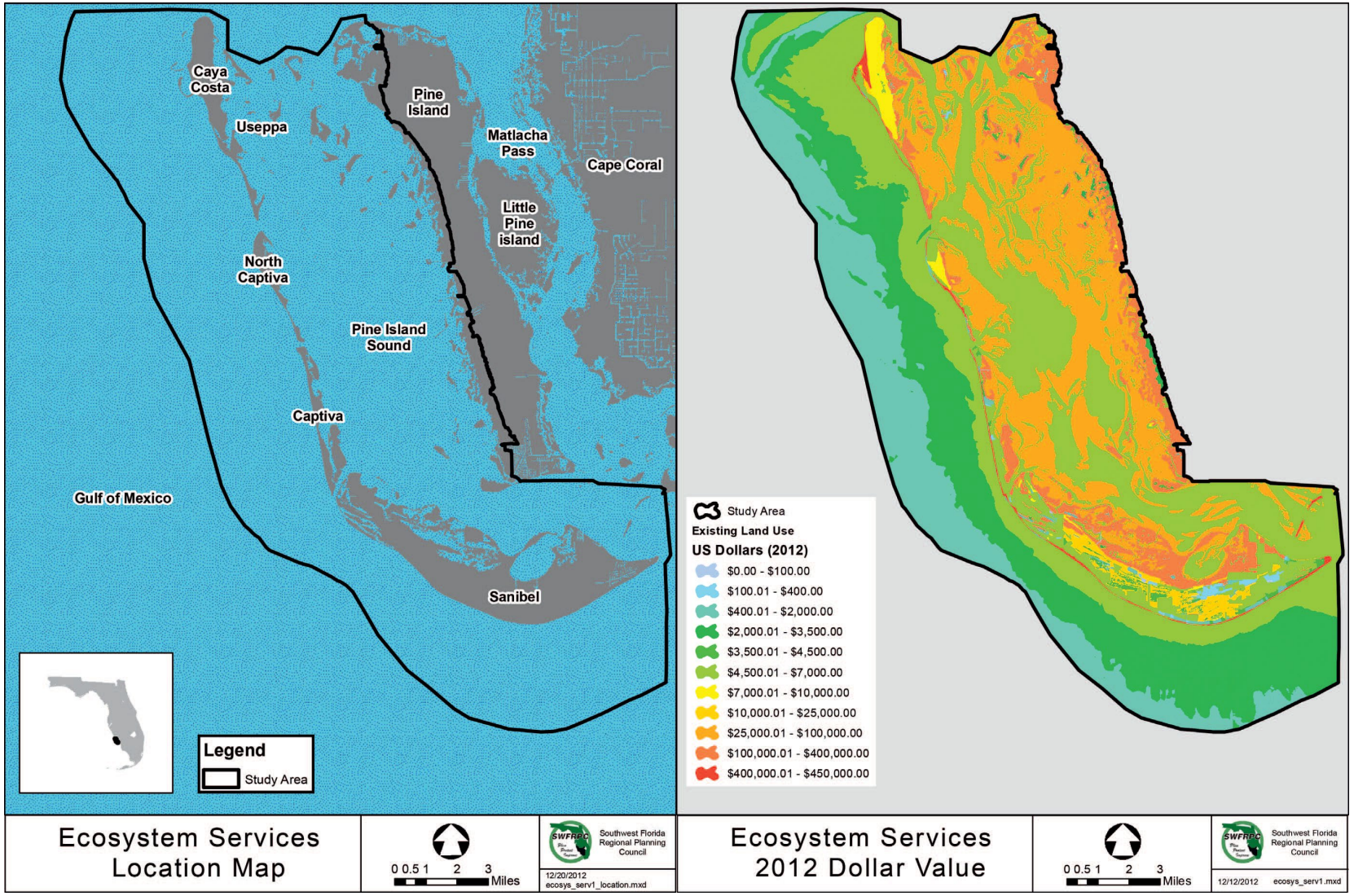
	Mangroves & tidal marshes	No. of used estimates	Minimum value (Int.$/ha/y)	Maximum value (Int.$/ha/y)
	TOTAL:	**112**	**1995**	**215,349**
	PROVISIONING SERVICES	**35**	**44**	**8289**
1	Food	12	0	2600
2	(Fresh) water supply	3	41	4240
3	Raw materials	18	1	1414
4	Genetic resources	?		
5	Medicinal resources	2	2	35
6	Ornamental resources	?		
	REGULATING SERVICES	**26**	**1914**	**135,361**
7	Influence on air quality			
8	Climate regulation	6	2	4677
9	Moderation of extreme events	13	4	9729
10	Regulation of water flows	?		
11	Waste treatment / water purification	4	1811	120,200
12	Erosion prevention	3	97	755

Habitat Type	Dollar/Acre	Acres
[illegible]		
Mangrove Swamp	215,349	5.5
Saltwater Marsh		
Upland mixed Forest		
Woodland Pasture		

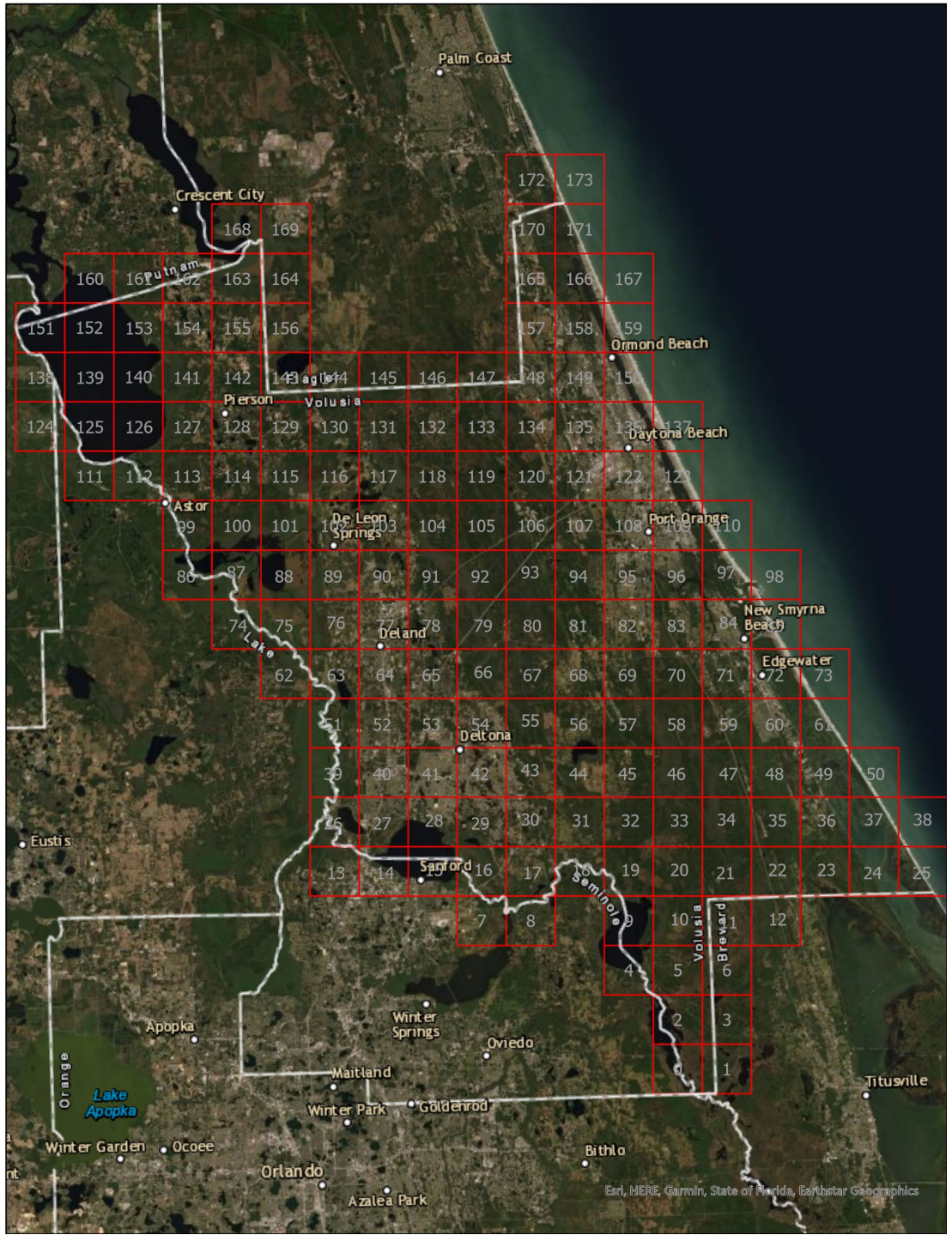
3. Develop a map that links values with risks.

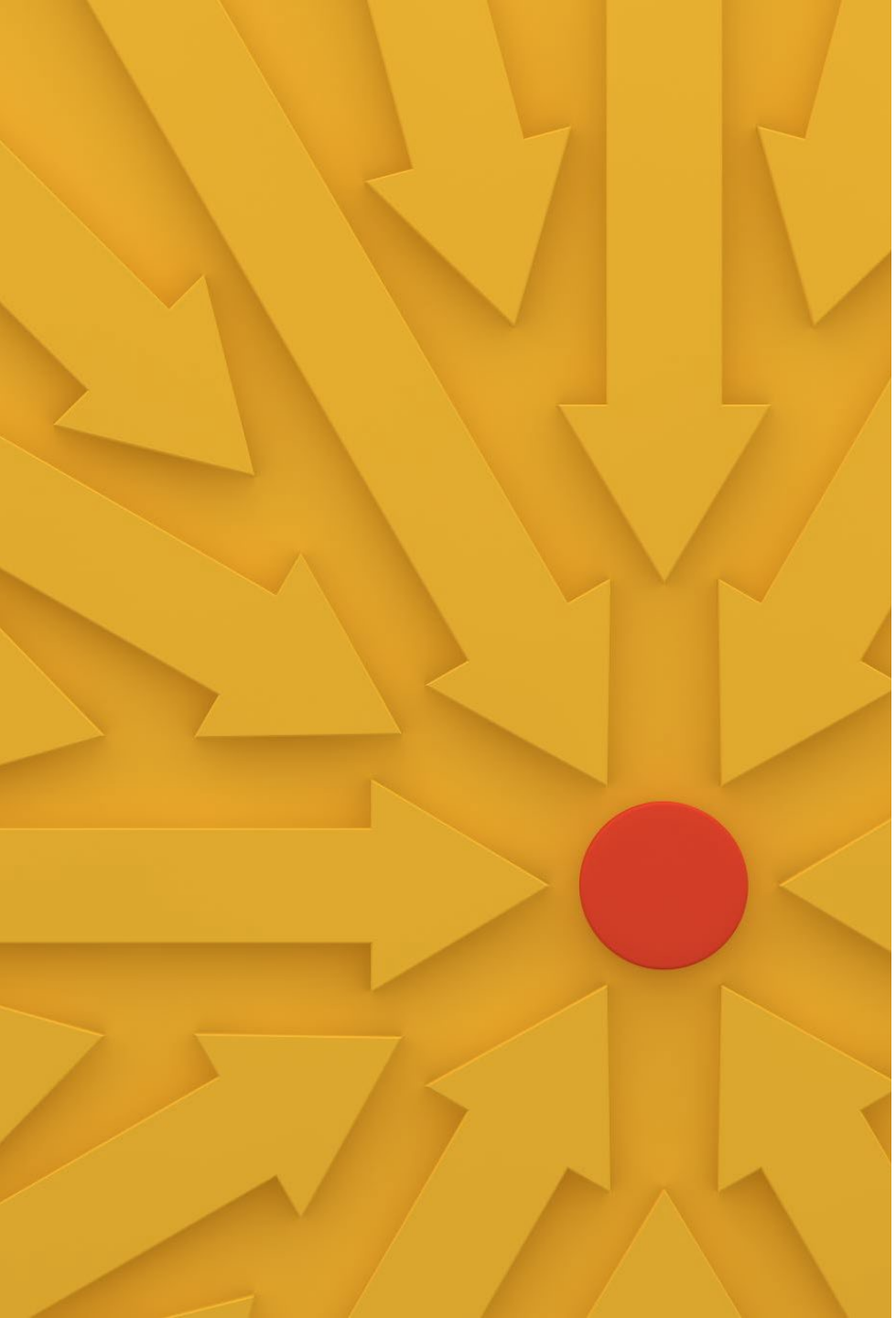
- Identify lands with the most valuable ecosystem services.
- Overlay that map with threats from developing land use changes, including sea level rise.
- Develop conservation cost estimates
- Prioritize conservation land targets that maximize net social benefits.

- Example from James Beever, Pine Island Sound SWFRPC, 2016



4. Identify data-based areas of special interest



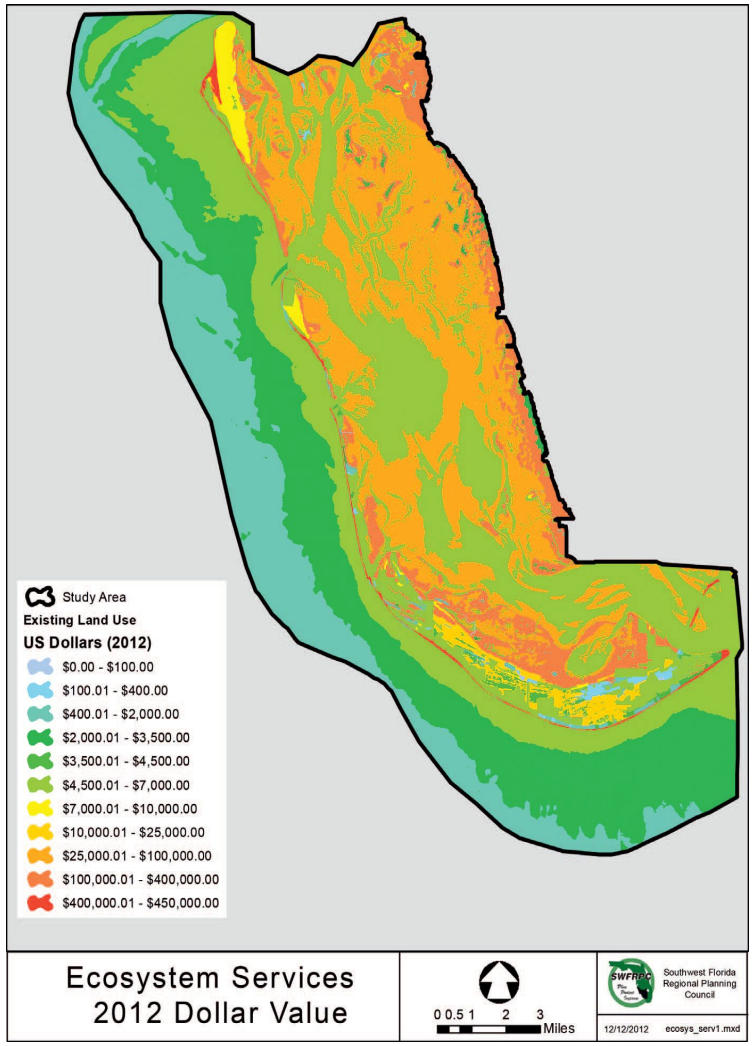


5. Identify local priorities and concerns to weight results

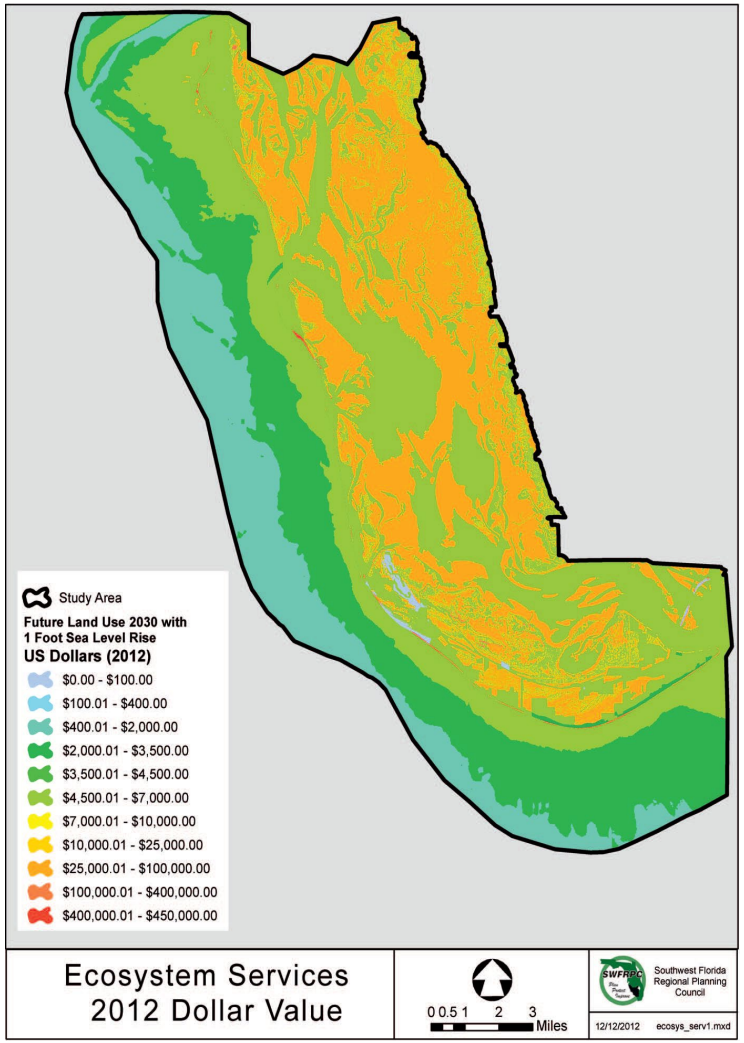
- Role of community: Clarify local values and priorities by identifying goals and perceived impediments.
    - What goal should drive land conservation?
        - Write one word that exemplifies the most important goal of conservation planning. You may list more than one goal, but use one word to describe each goal.
    - What do you see as key impediments to land conservation?
        - Write one word that exemplifies the most important goal of conservation planning. You may list more than one goal, but use one word to describe each goal.

- Prioritize actions based on highest post-conservation values with and without local priorities as weights

6. Develop two maps of conservation options



A. Develop one map that prioritizes conservation based on cost benefit analysis.
B. Develop a second map that weights priorities based on stakeholder goals and perceived impediments.
C. Compare these to learn how local values affect conservation priorities.



Breakout Session 2 (40 Mins)

Questions for Breakout Groups 2 and 3

List three of the most important economic and social considerations that should guide land conservation decisions in Volusia County?

http://www.christopherharold.com/guide-makes-huge-difference/

What do you see as key impediments to land conservation?

Questions for Breakout Groups 2 and 4

List three of the most important considerations that should guide climate and flood resilience planning in Volusia County?

http://www.christopherharold.com/guide-makes-huge-difference/

What do you see as key impediments to implementing resilience measures?

Report Outs

Next Steps

- Complete modeling
- Identify potential areas for additional conversations
- Prioritize considerations for focus area processes
- Create policies and procedures to identify focus areas and relevant strategies
- Additional engagement

Questions and Open Discussion