SEA LEVEL RISE IN TAMPA BAY: BUILDING TOWARD AN ADAPTIVE FUTURE

BRIAN COOK | DIRECTOR OF URBAN AND ENVIRONMENTAL DESIGN | APPLIED SCIENCES
FOR THE AMERICAN INSTITUTE OF ARCHITECTS (AIA) | 04.11.2023

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Landscape Architect
Urban Designer
Climate and Resilience Specialist

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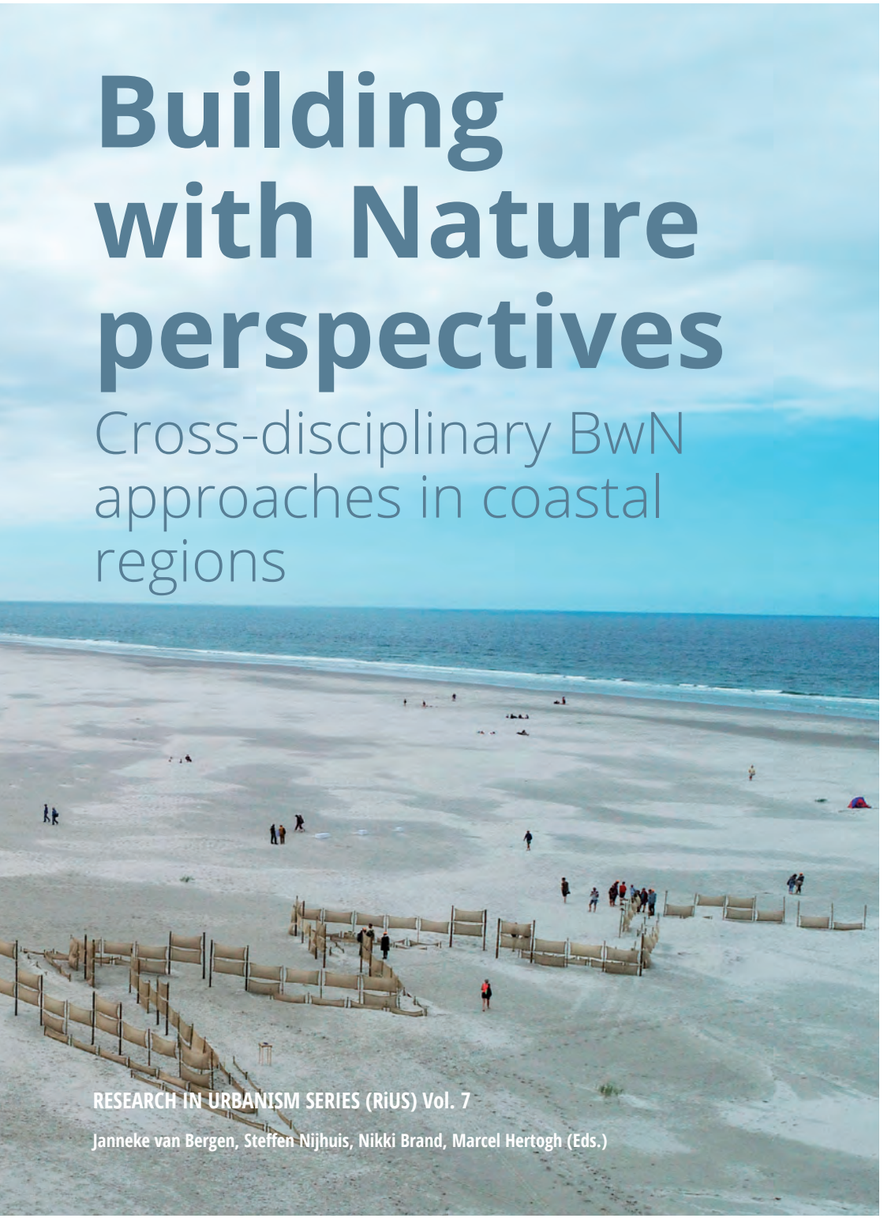

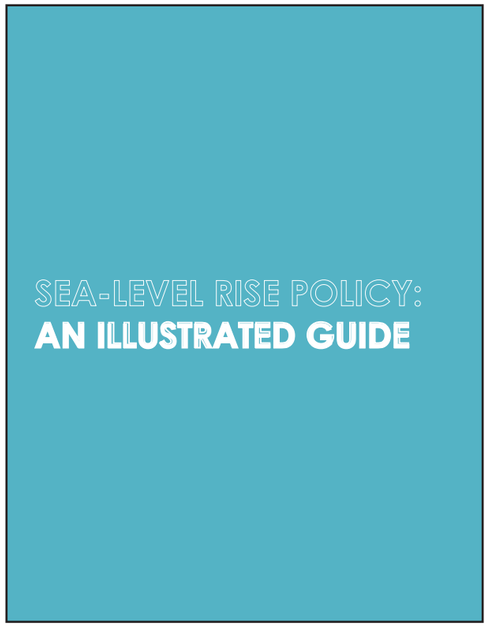

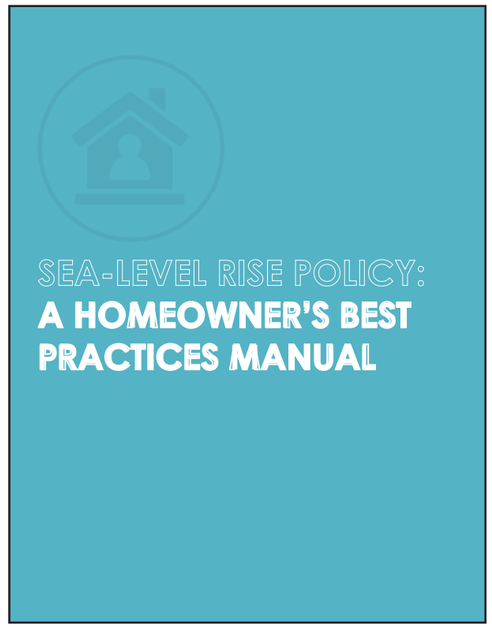

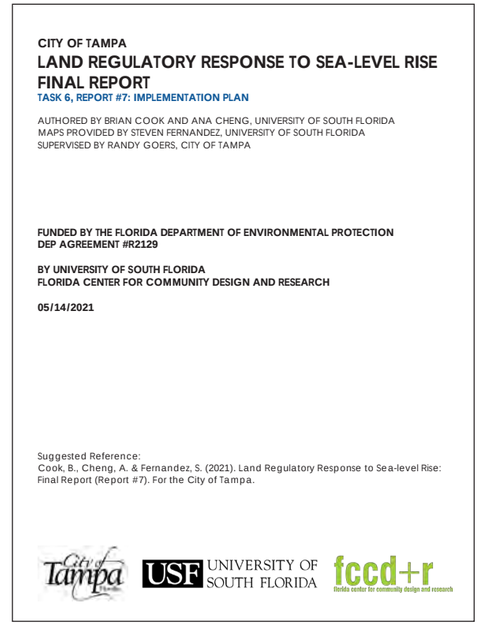

The Hillsborough County Community Vulnerability Study
City of Tampa Regulatory Approach to Sea Level Rise
City of Tampa Climate Action and Equity Plan
Tampa Bay Regional Planning Council, Resilient Ready Tampa Bay
Palmetto Beach Living Coastline and Community Engagement
Eckerd College Sea Level Rise Resilience Master Plan
The Howard F. Curren Wastewater Treatment Plant Vulnerability Assessment
The Port Tampa Bay Vulnerability Assessment
The City of Palmetto Vulnerability Assessment
City of Tampa Coastal Area Action Plan

Author: Building with Nature Perspectives (TU Delft)

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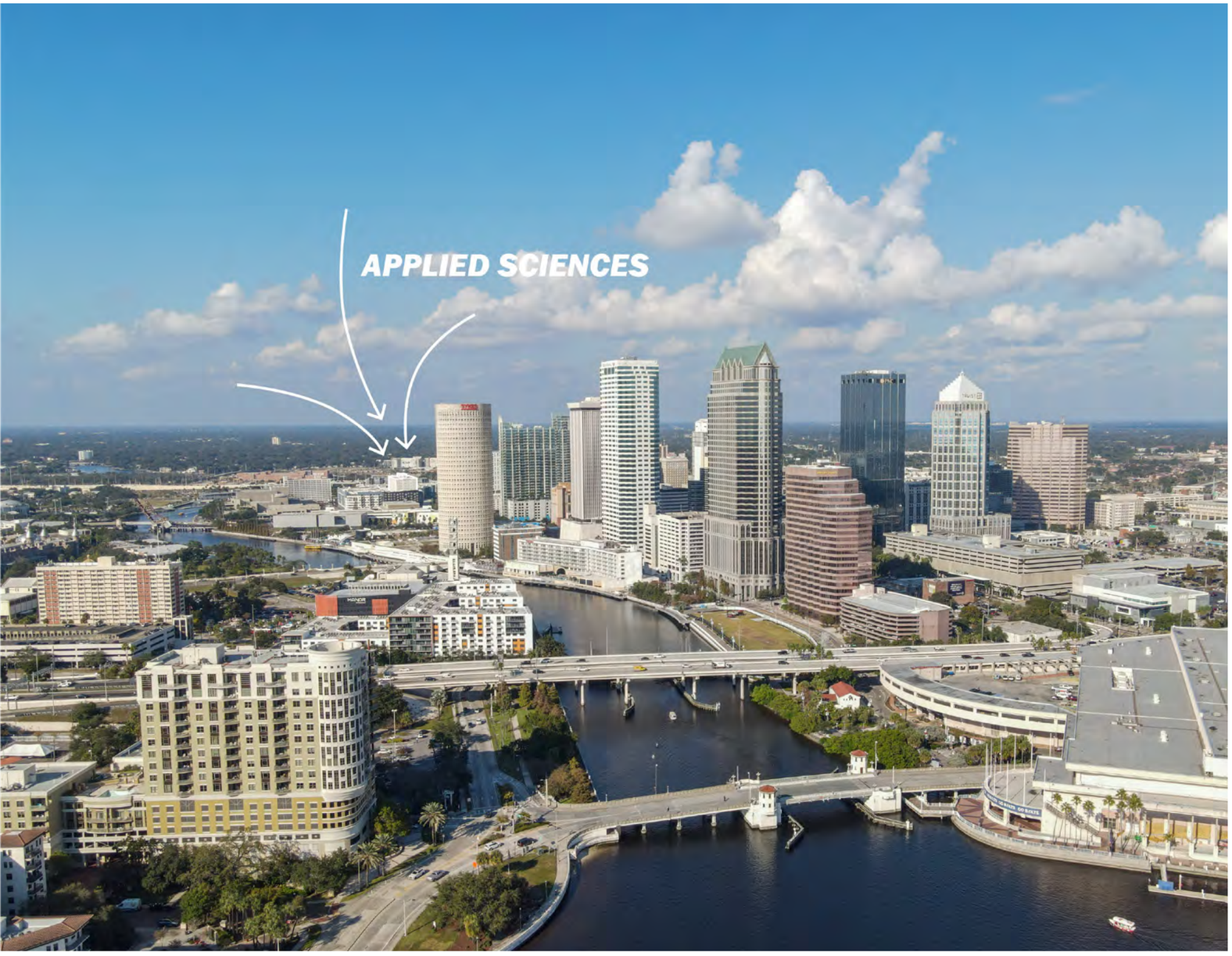

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Service Lines

- Watershed Planning
- Urban Planning and Resilience
- Civil and Site Design
- Landscape Architecture

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A HISTORICAL VIEW OF SEA LEVEL RISE AND LIFE IN THE FLOODPLAIN

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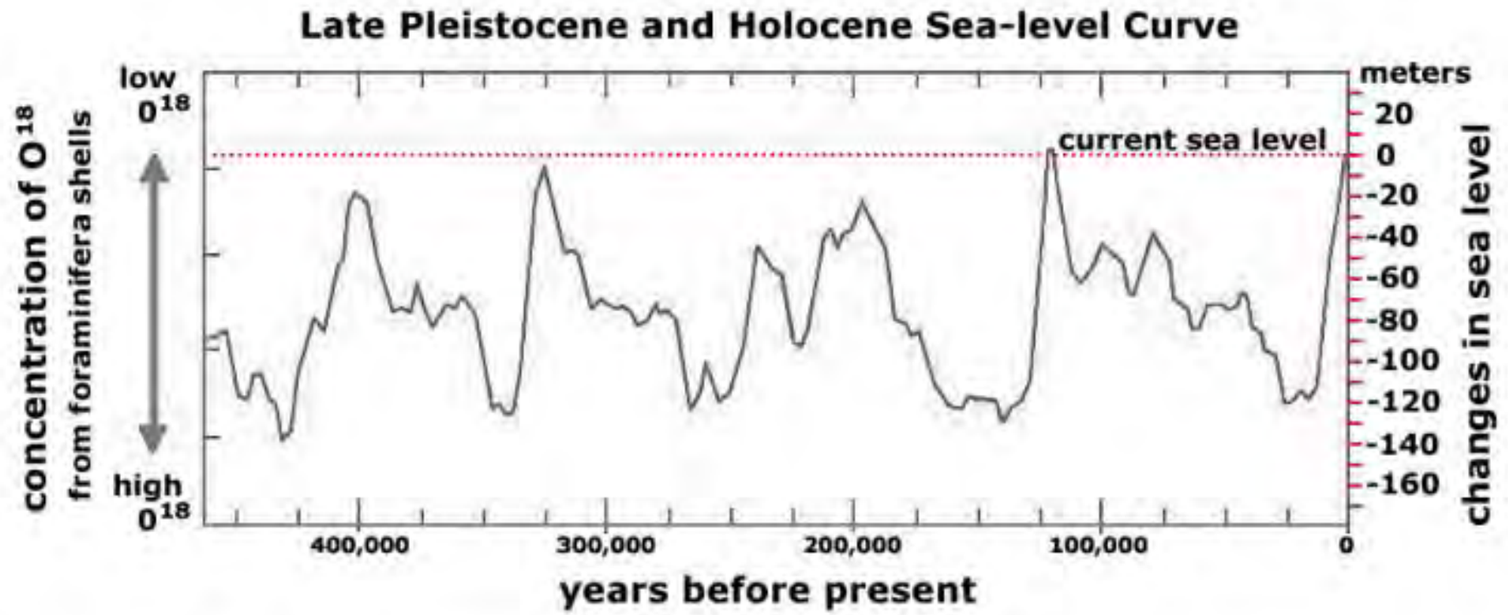
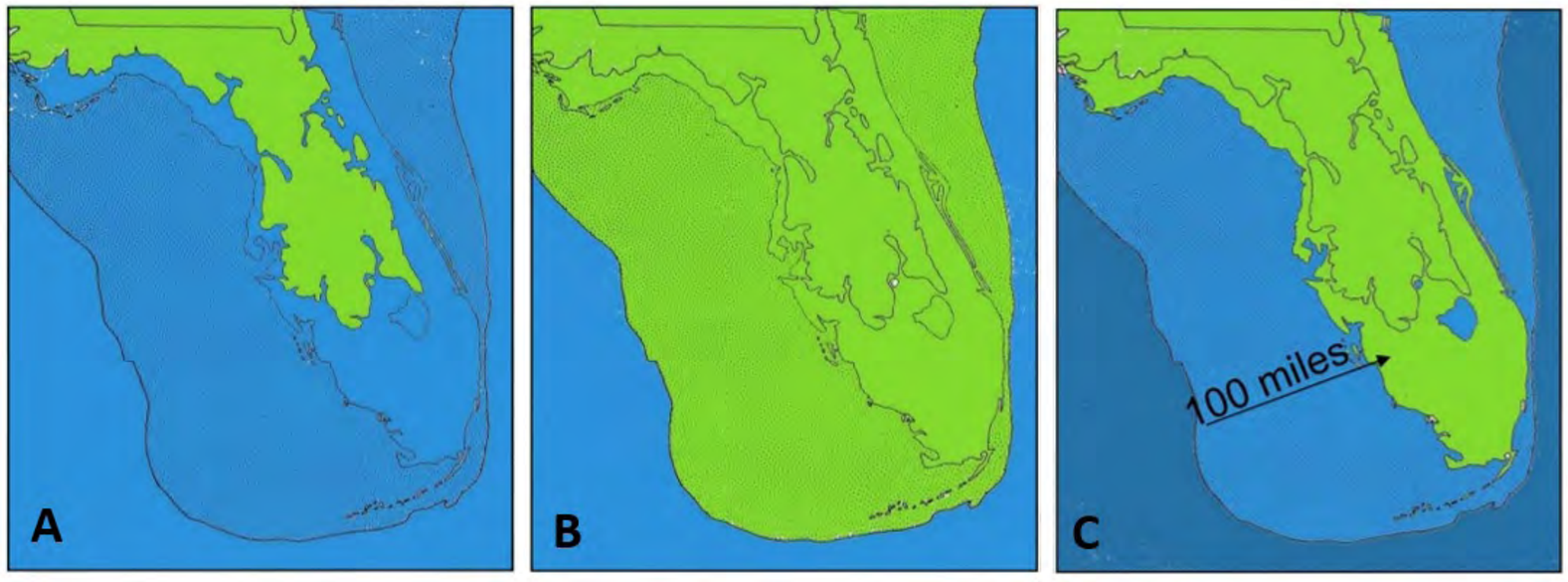


Source of data modified from CLIMAP isotopic data summarized in chart is from *Ice Ages* by John Imbrie and Katherine Imbrie, 1979



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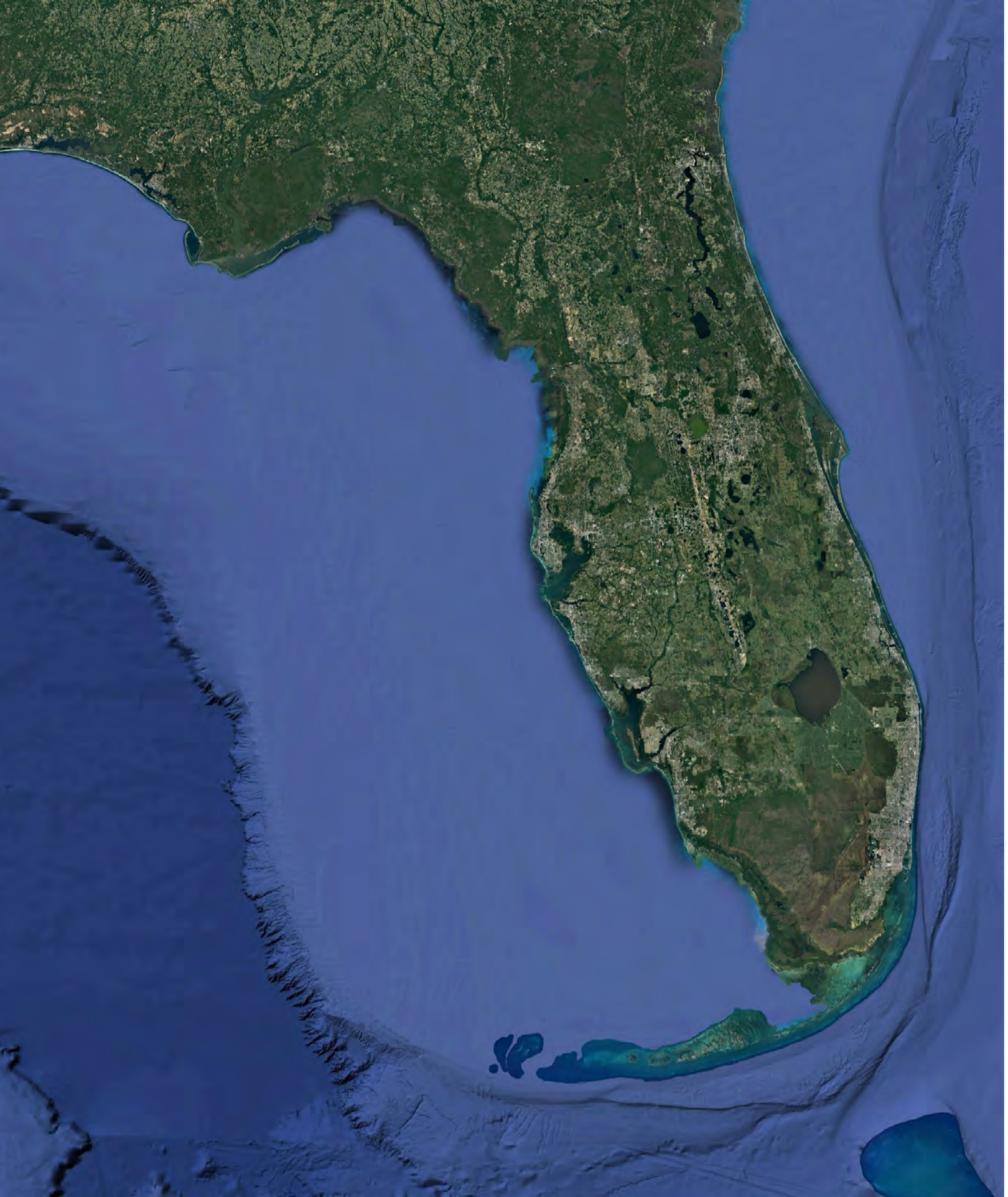

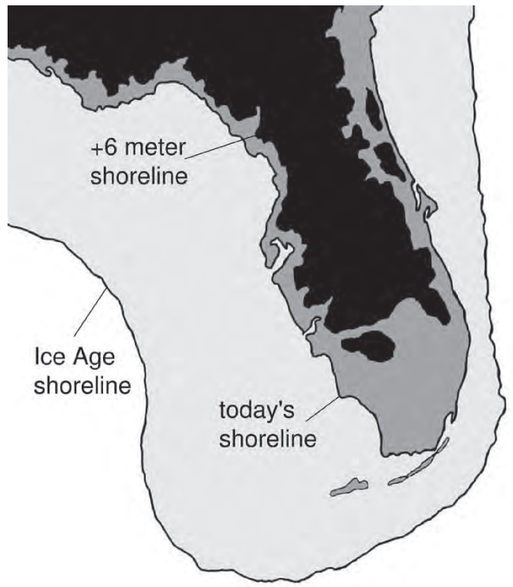

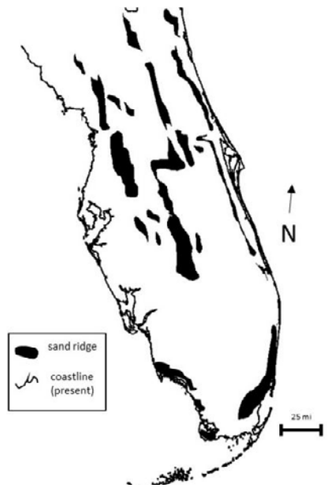

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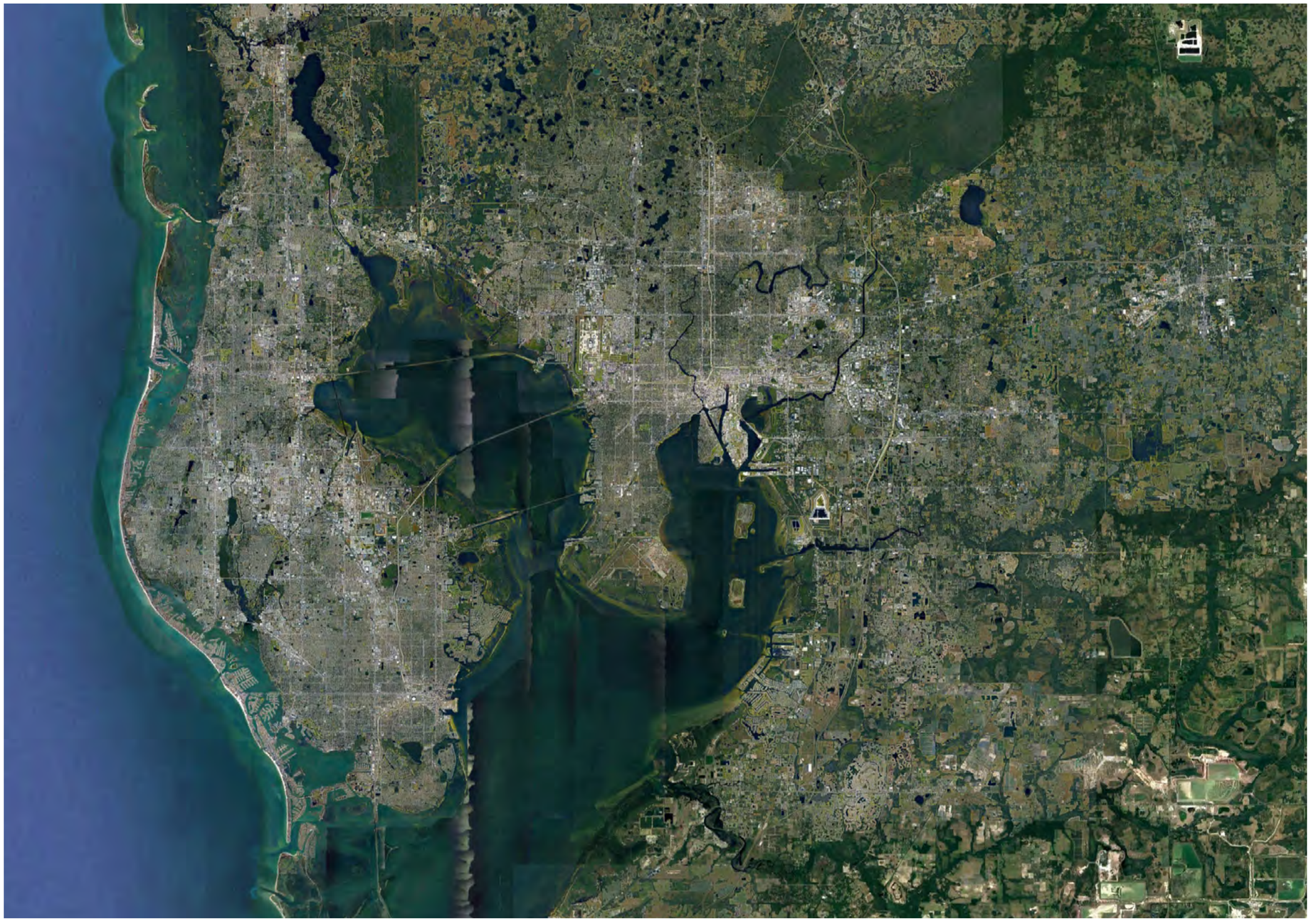
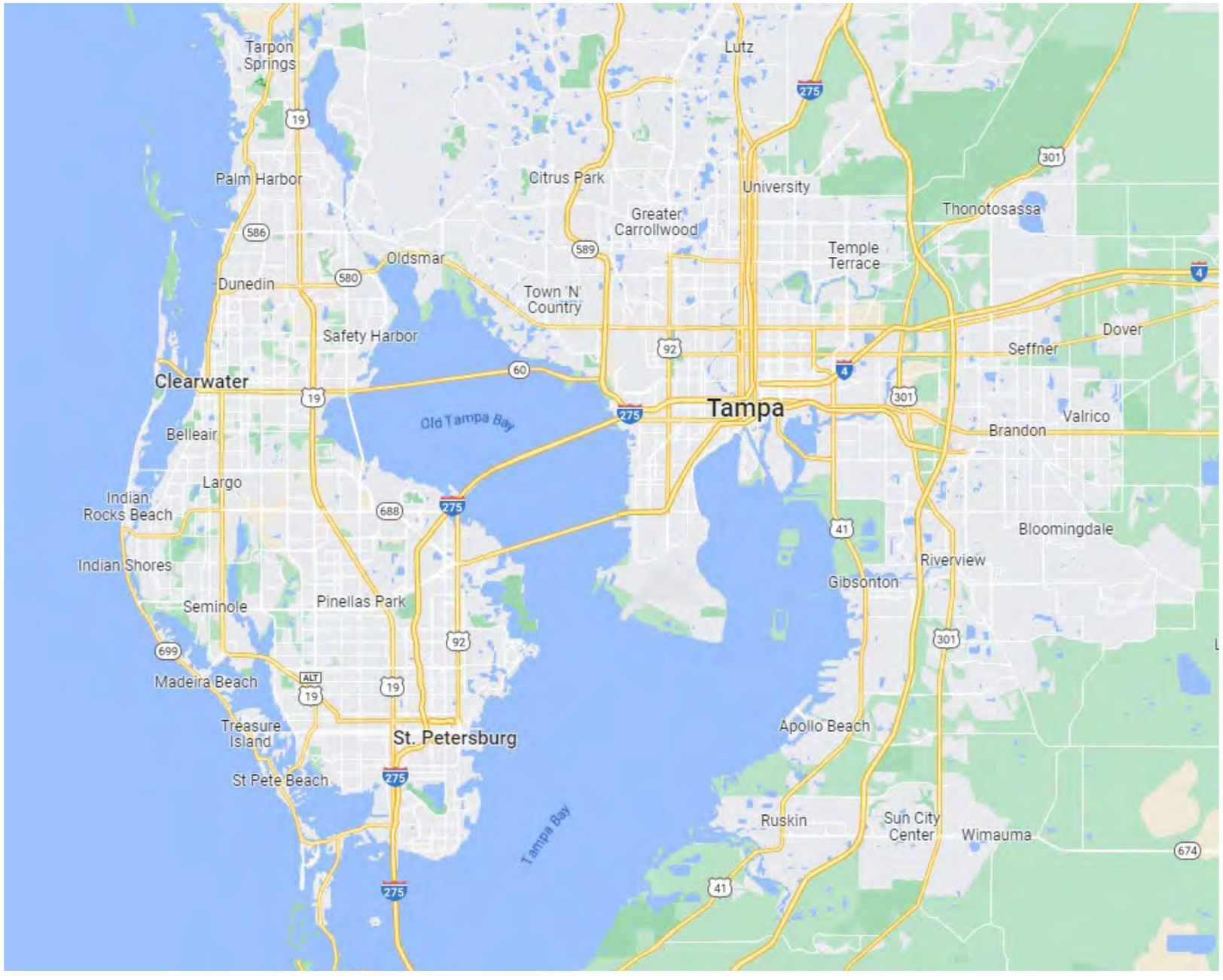
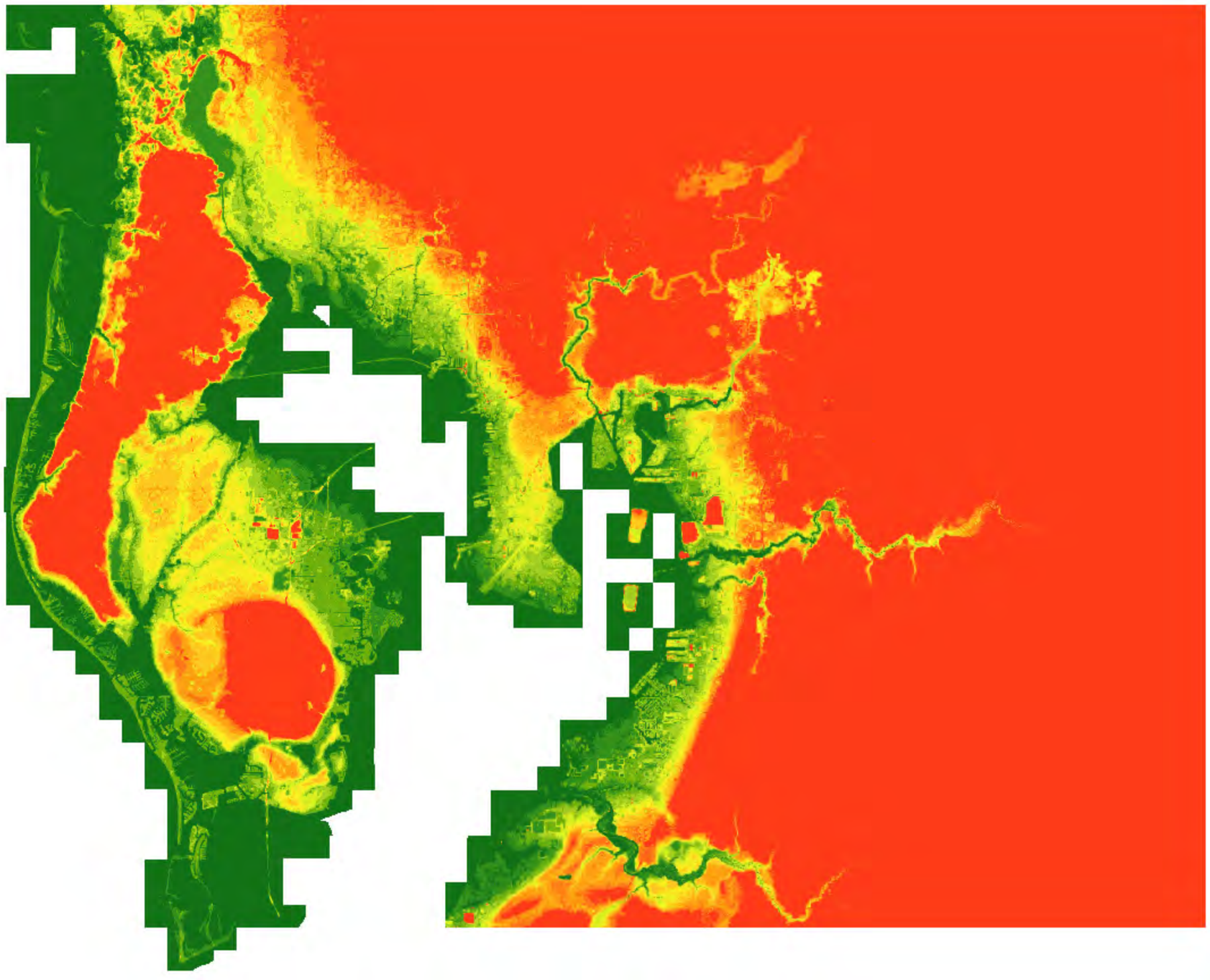


A problem of depiction





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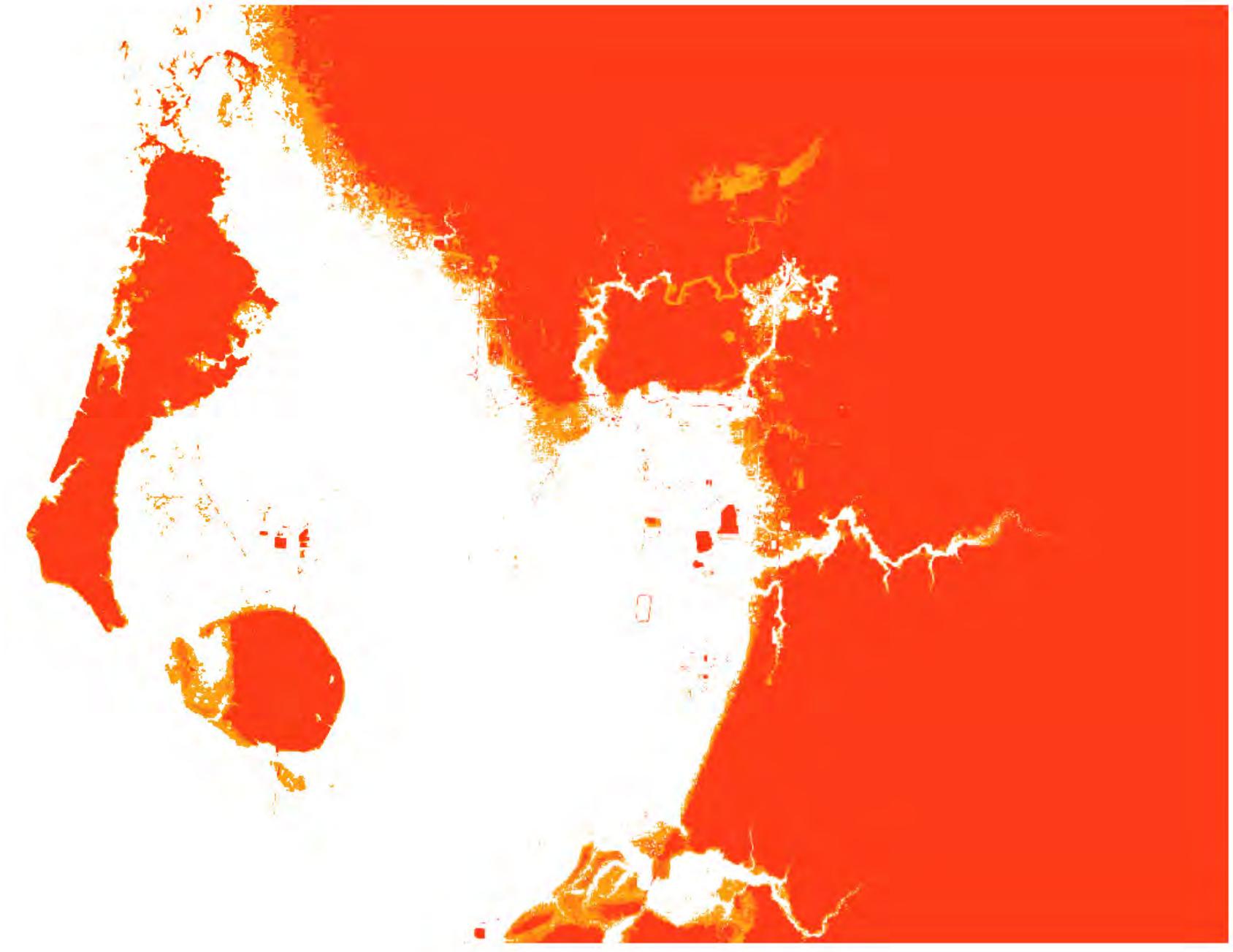

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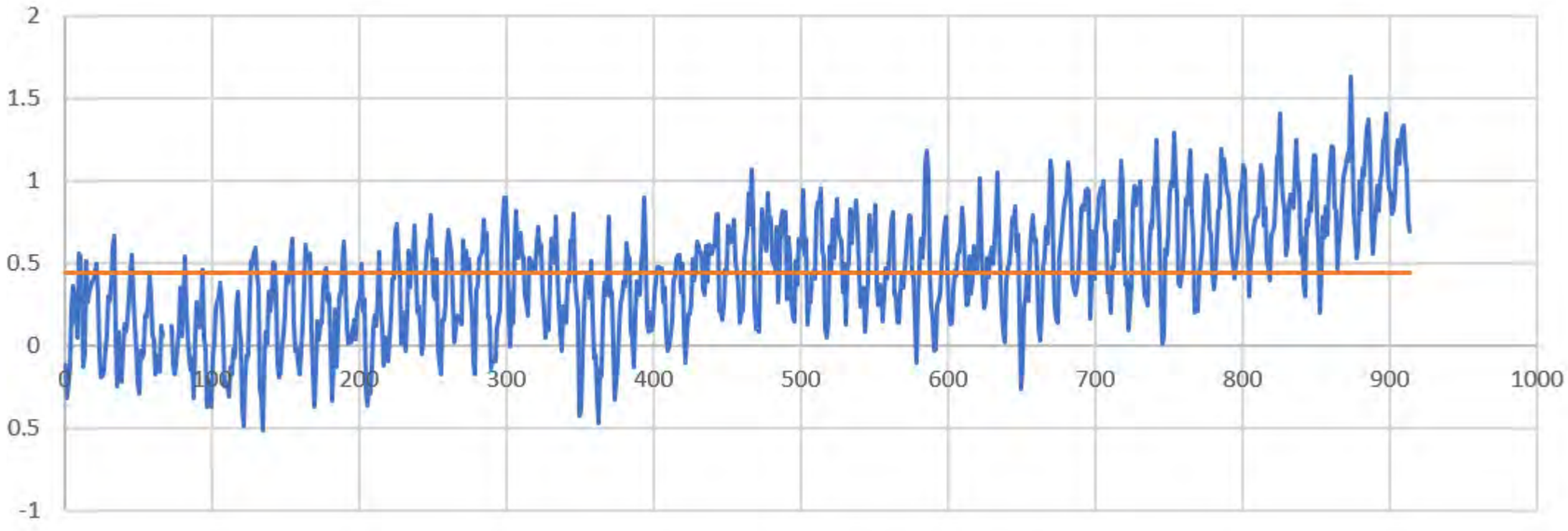
St. Petersburg, Tampa Bay
(RSL from year 2020)

Year	NOAA 2022				
	Low	Int-Low	Intermediate	Int-High	High
2020	0.00	0.00	0.00	0.00	0.00
2030	0.20	0.23	0.23	0.26	0.30
2040	0.39	0.46	0.52	0.59	0.69
2050	0.59	0.69	0.82	1.02	1.25
2060	0.75	0.92	1.15	1.57	2.00
2070	0.89	1.15	1.54	2.26	2.95
2080	1.02	1.38	2.07	3.08	4.13
2090	1.12	1.61	2.69	4.00	5.38
2100	1.25	1.84	3.41	4.99	6.66



1947 **2015**

Tide data source: https://tidesandcurrents.noaa.gov/stationhome.html?id=8726520

APPLIED SCIENCES

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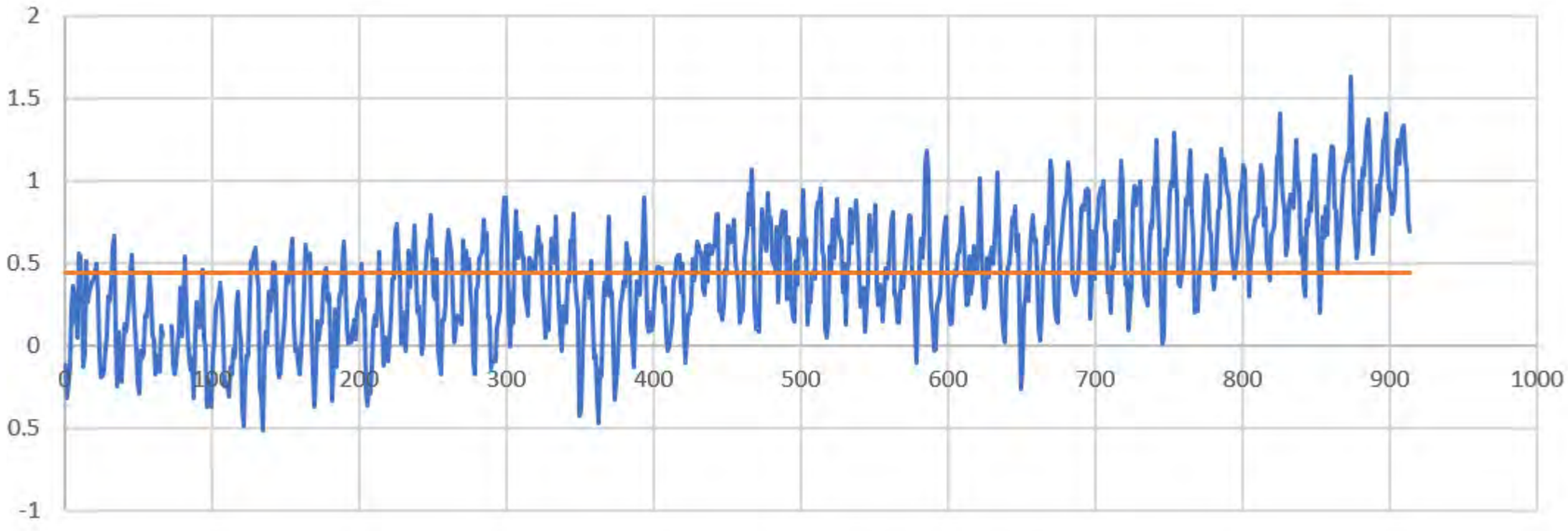

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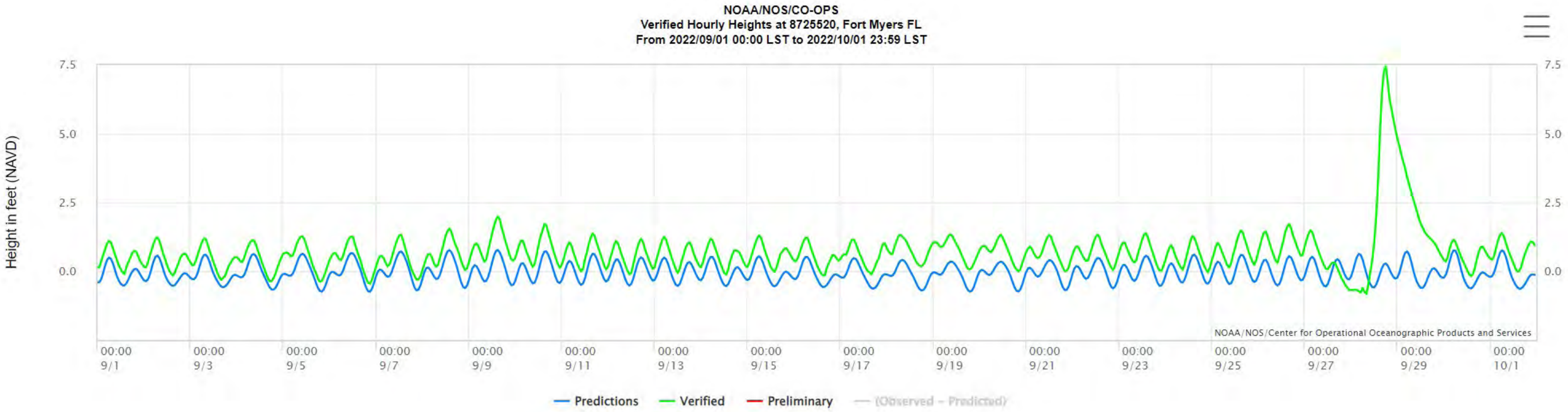

Tide data source: https://tidesandcurrents.noaa.gov/stationhome.html?id=8725520

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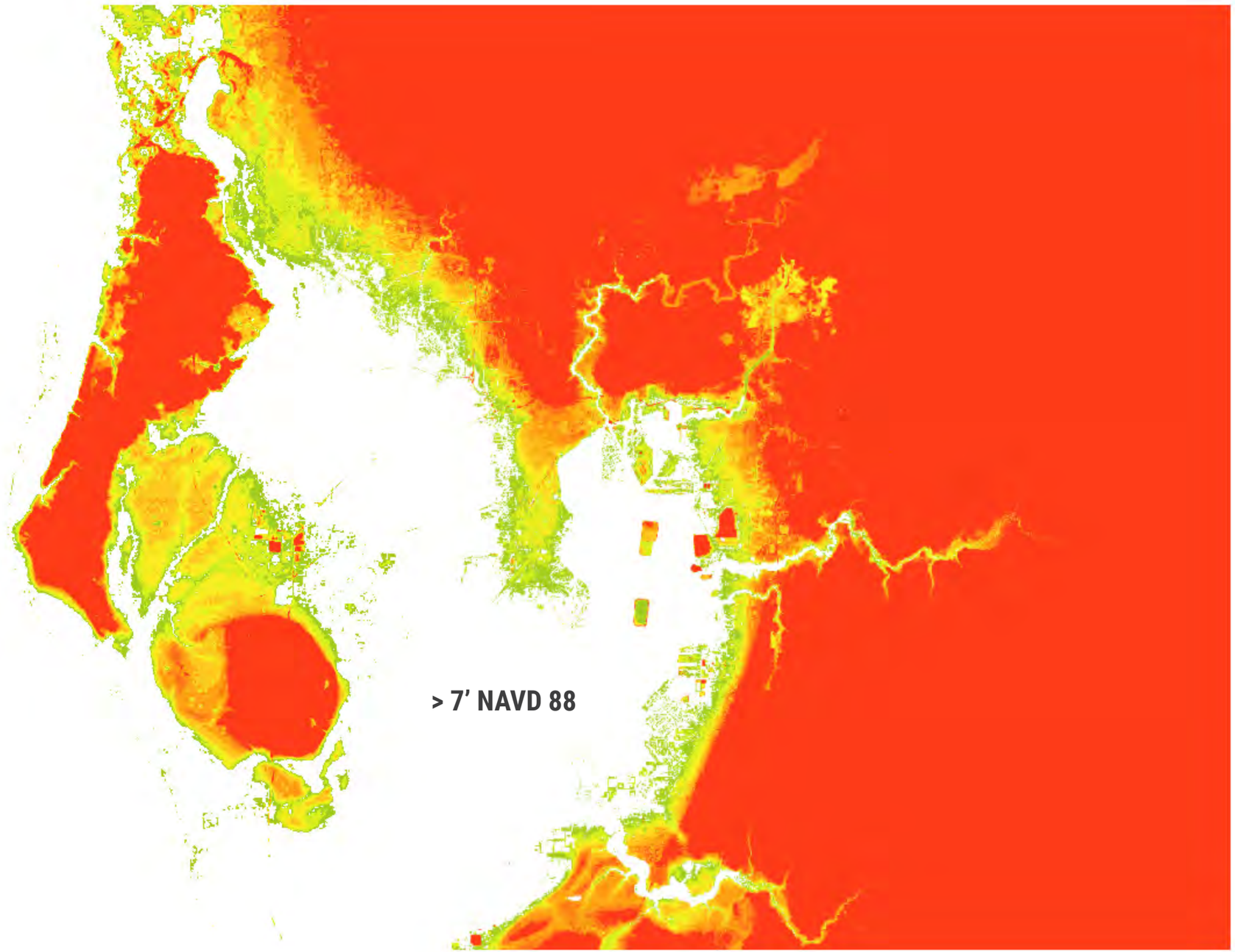

Hurricane Ian, Fort Myers Downtown

St. Petersburg, Tampa Bay
(RSL from year 2020)

Year	NOAA 2022			
	Low	Int-Low	Intermediate	Int-High
2020	0.00	0.00	0.00	0.00
2030	0.20	0.23	0.23	0.26
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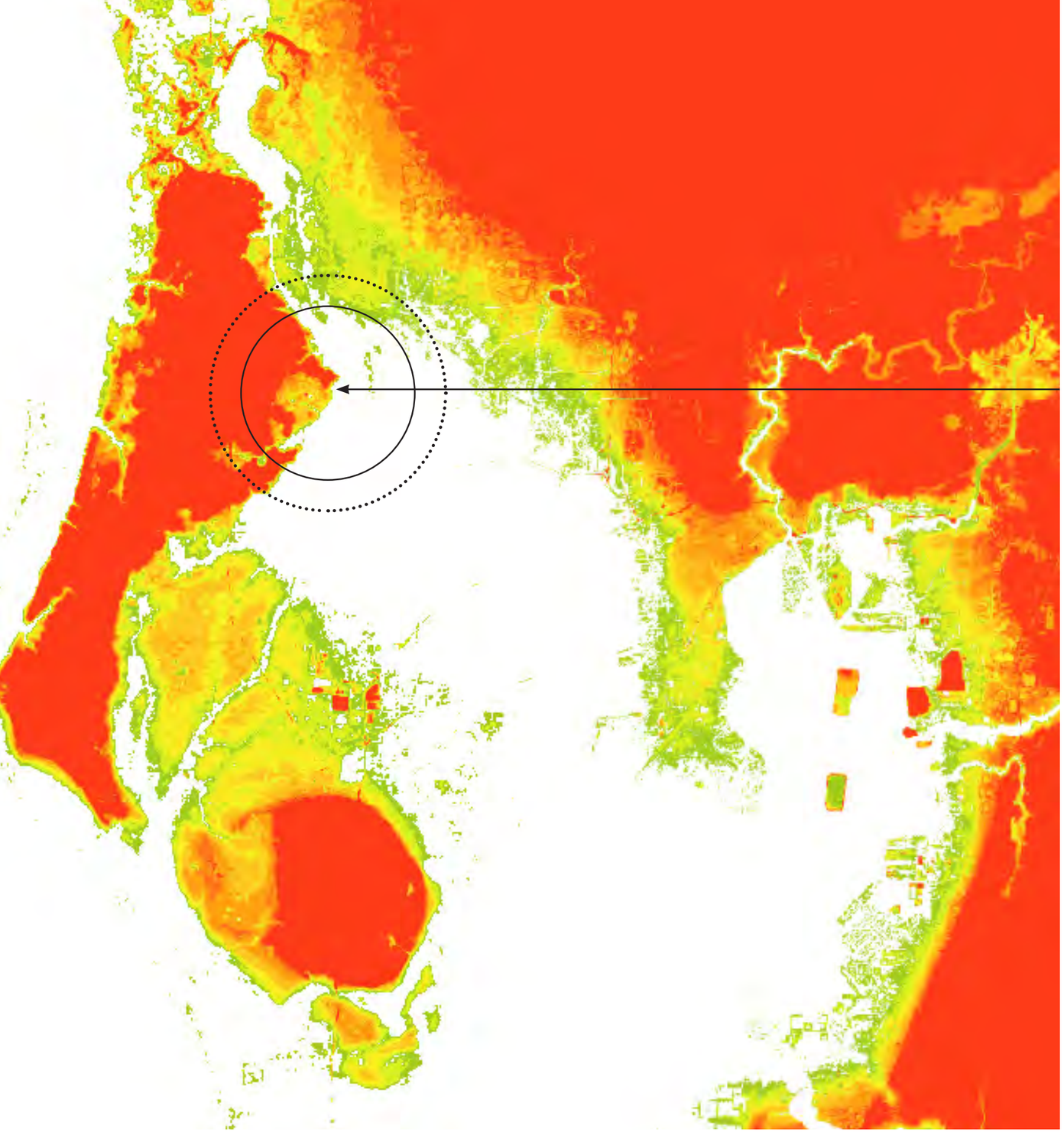
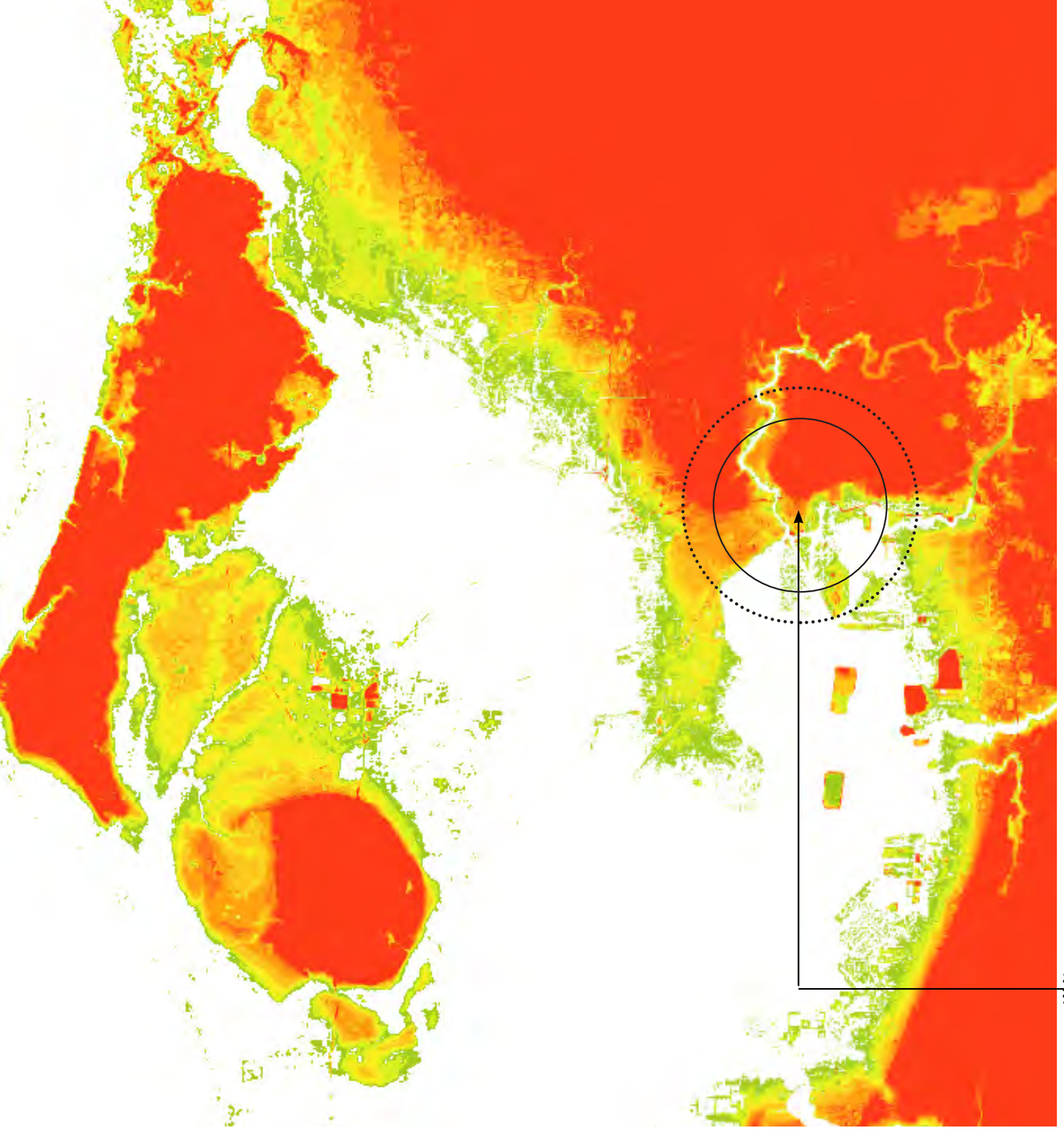
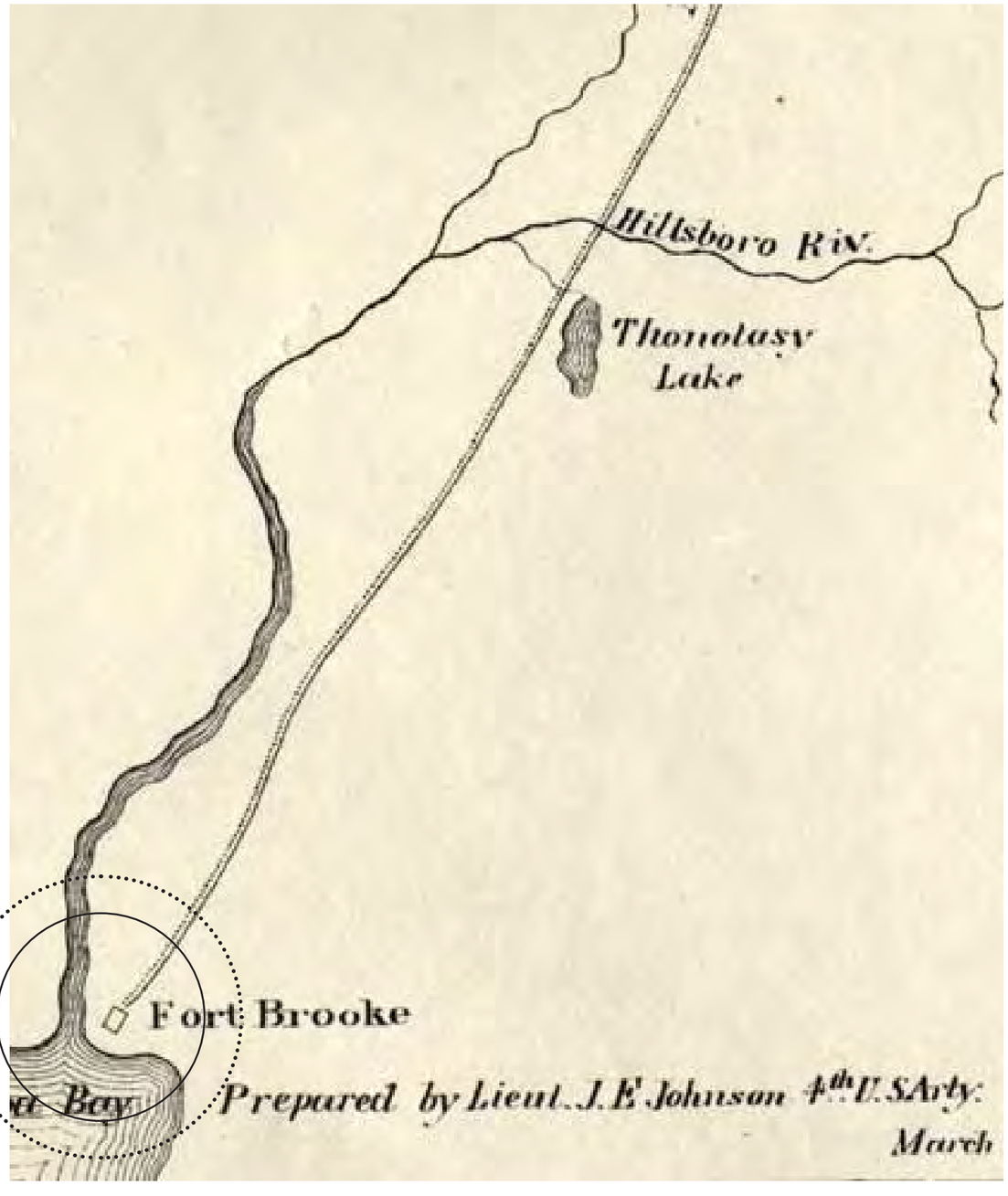


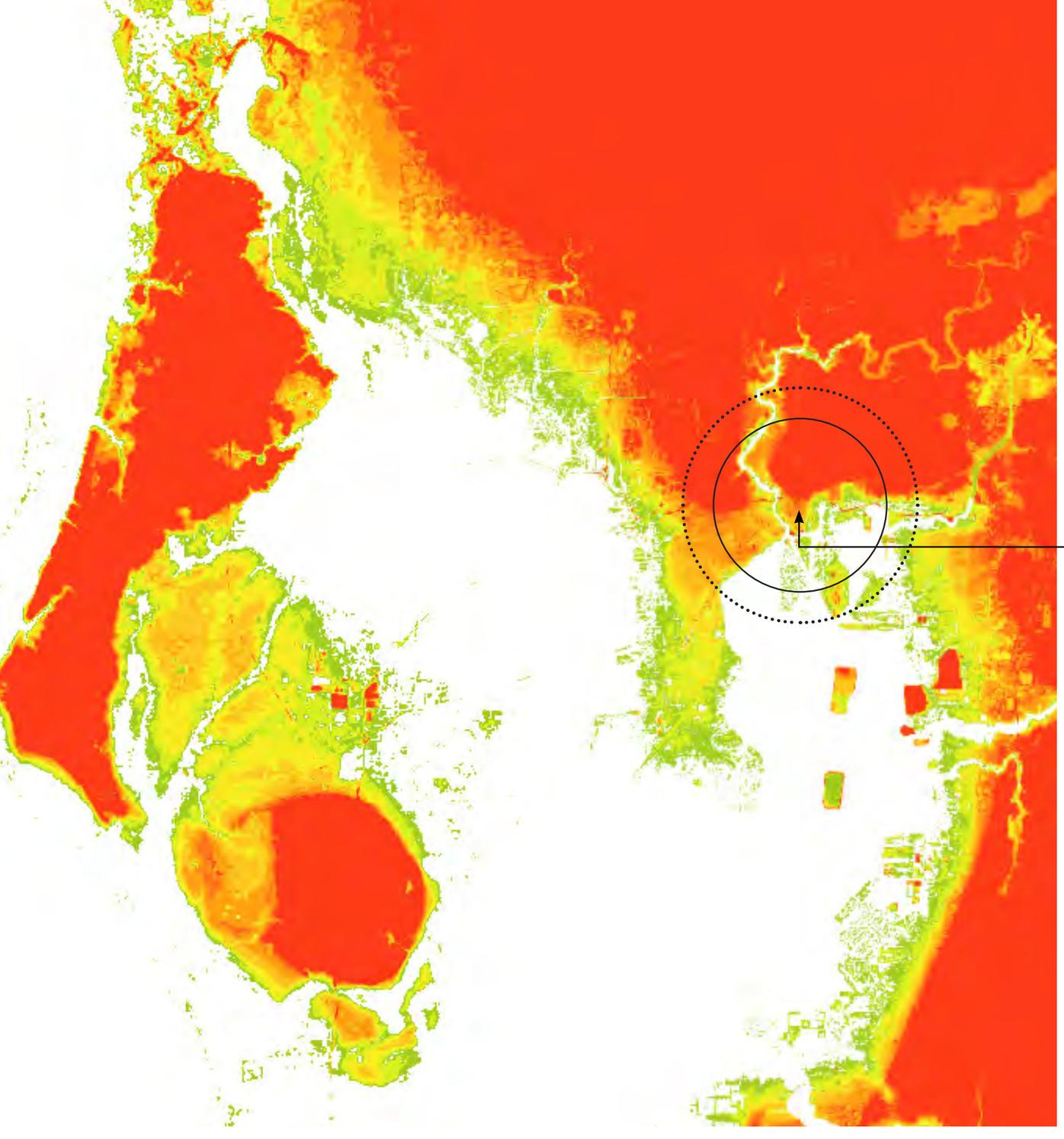
900 TO 1500(S):
TOCOBAGA INDIAN SETTLEMENT IN SAFETY HARBOR
Source: Florida Center for Instructional Technology. (2002). Tocobaga Indians of Tampa Bay

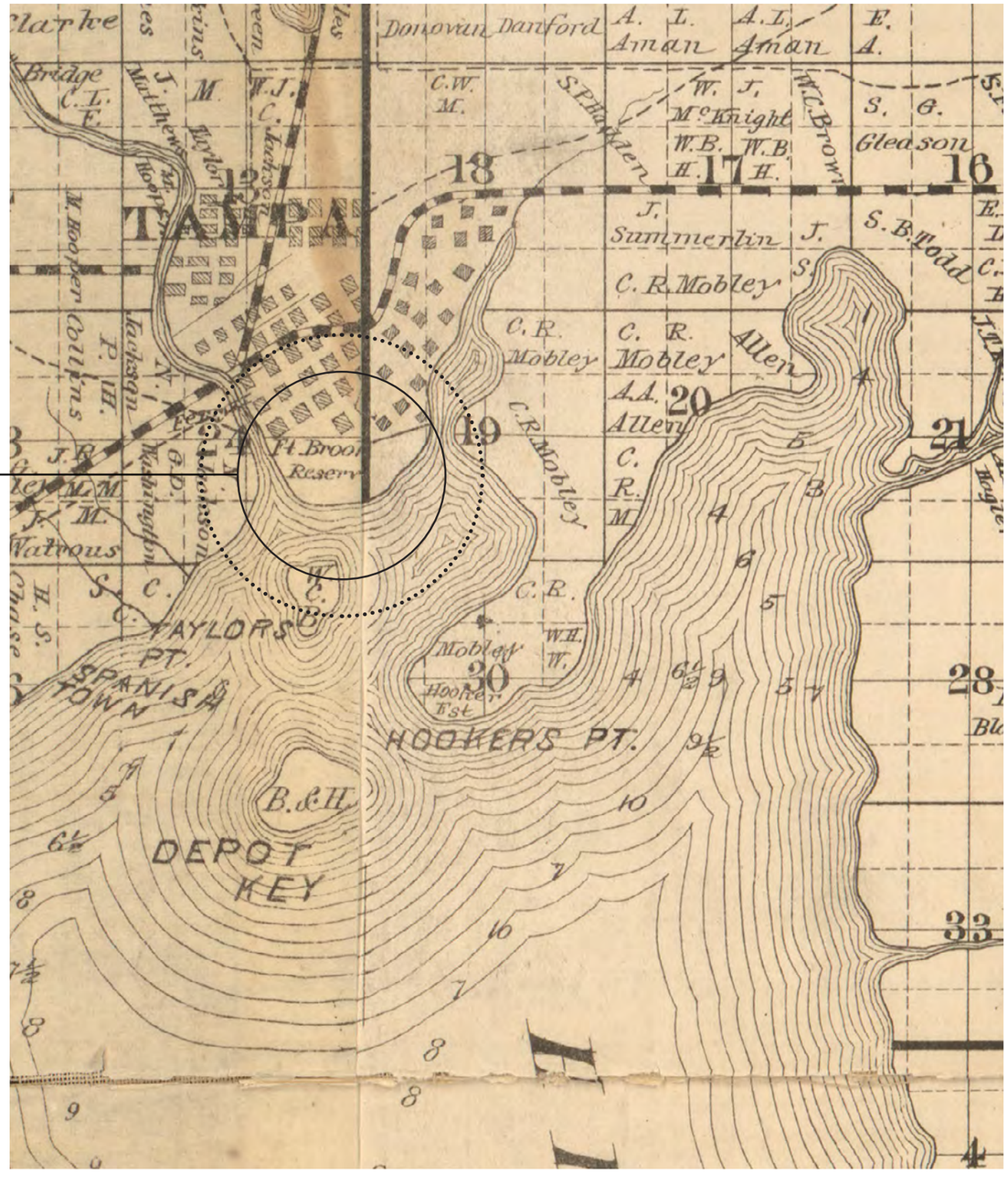




1835: FORT BROOKE

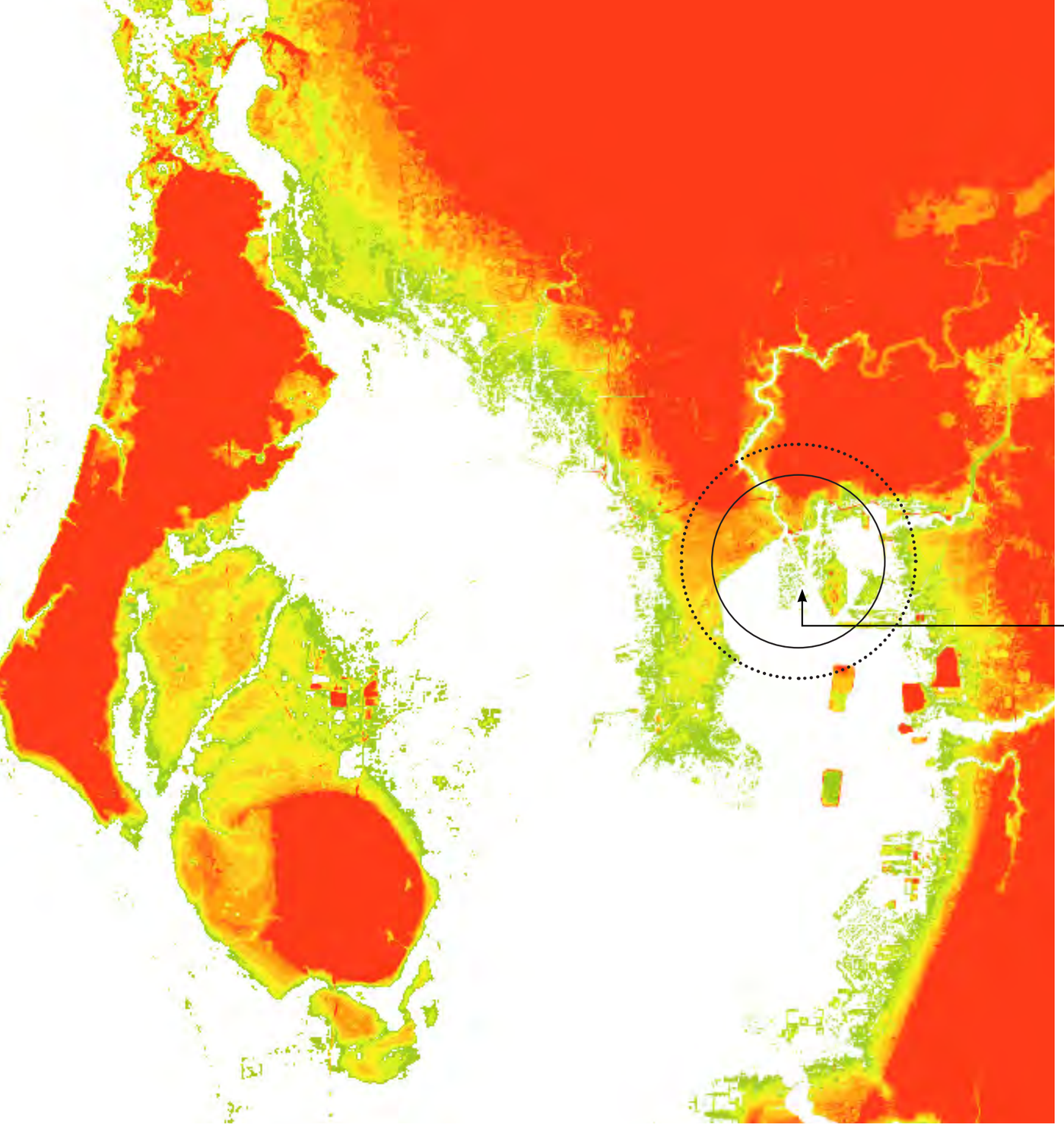
Source: Florida Center for Instructional Technology. (2007). Detail Map of Major Dade Battle Ground: Fort Brooke.



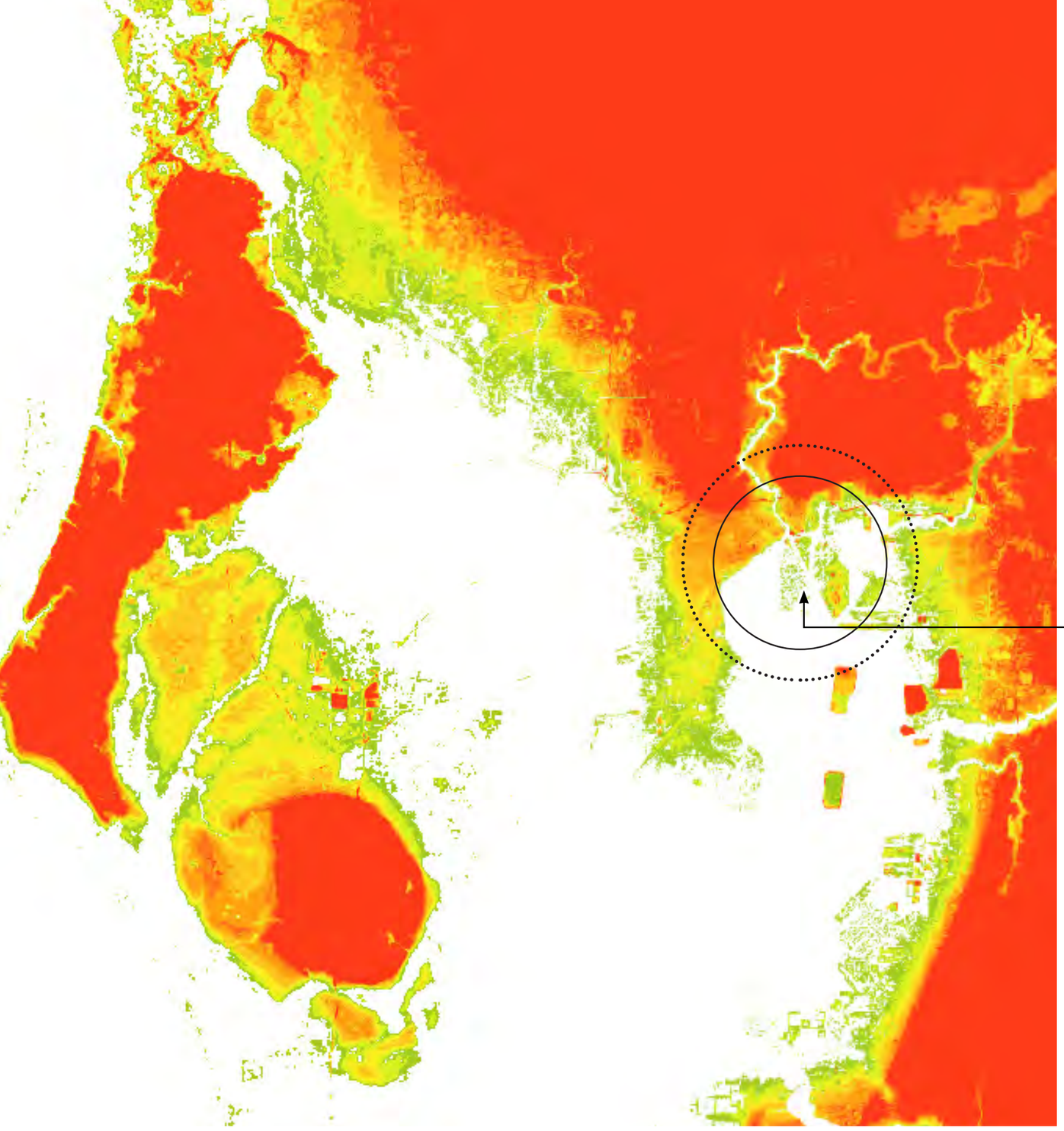


1882: HILLSBOROUGH BAY

Source: Florida Land And Improvement Co, Bourquin, F. & Treveres, J. J. (1882) Map of Hillsborough County, Florida.



1920'S: DAVIS ISLANDS

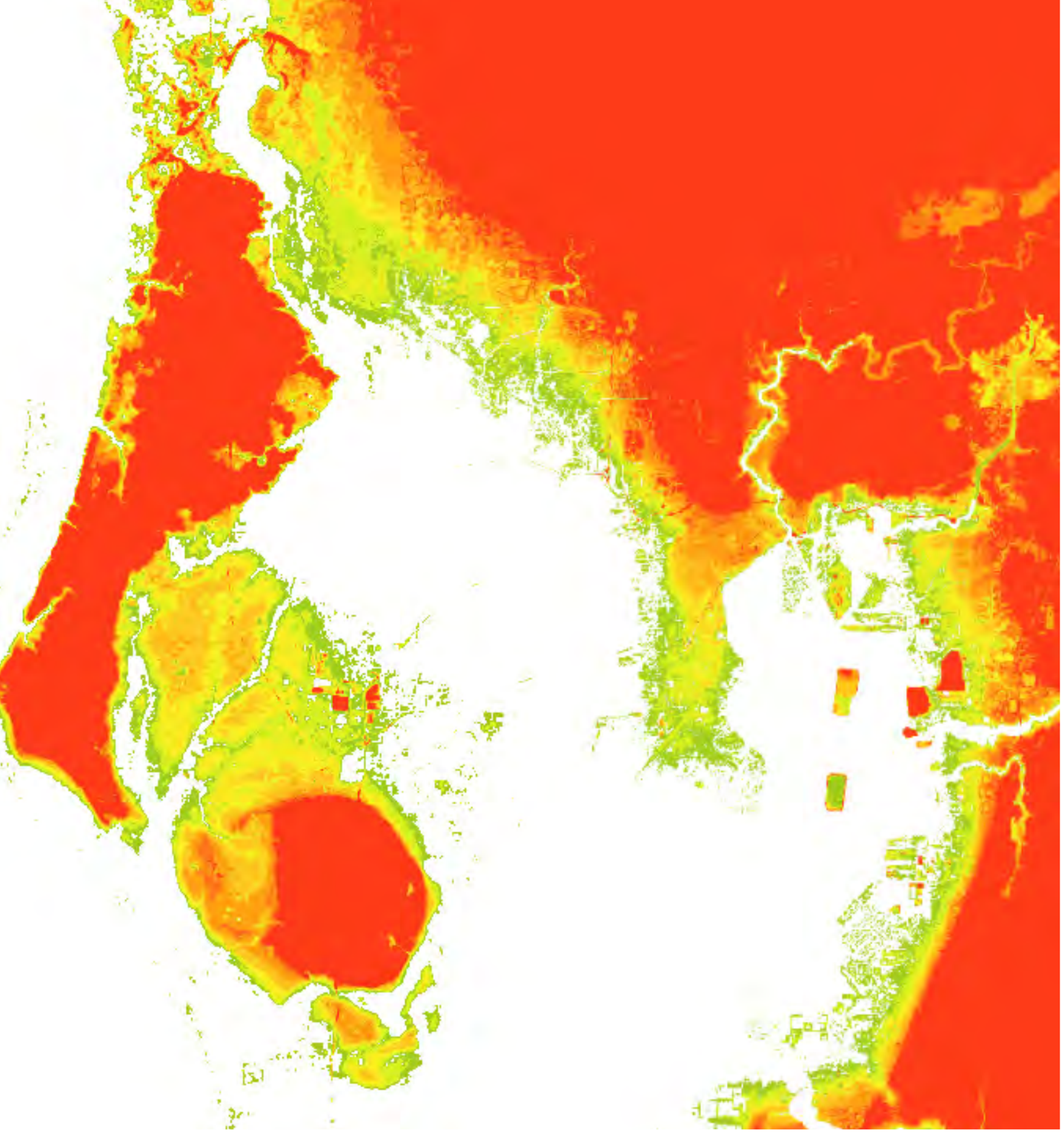


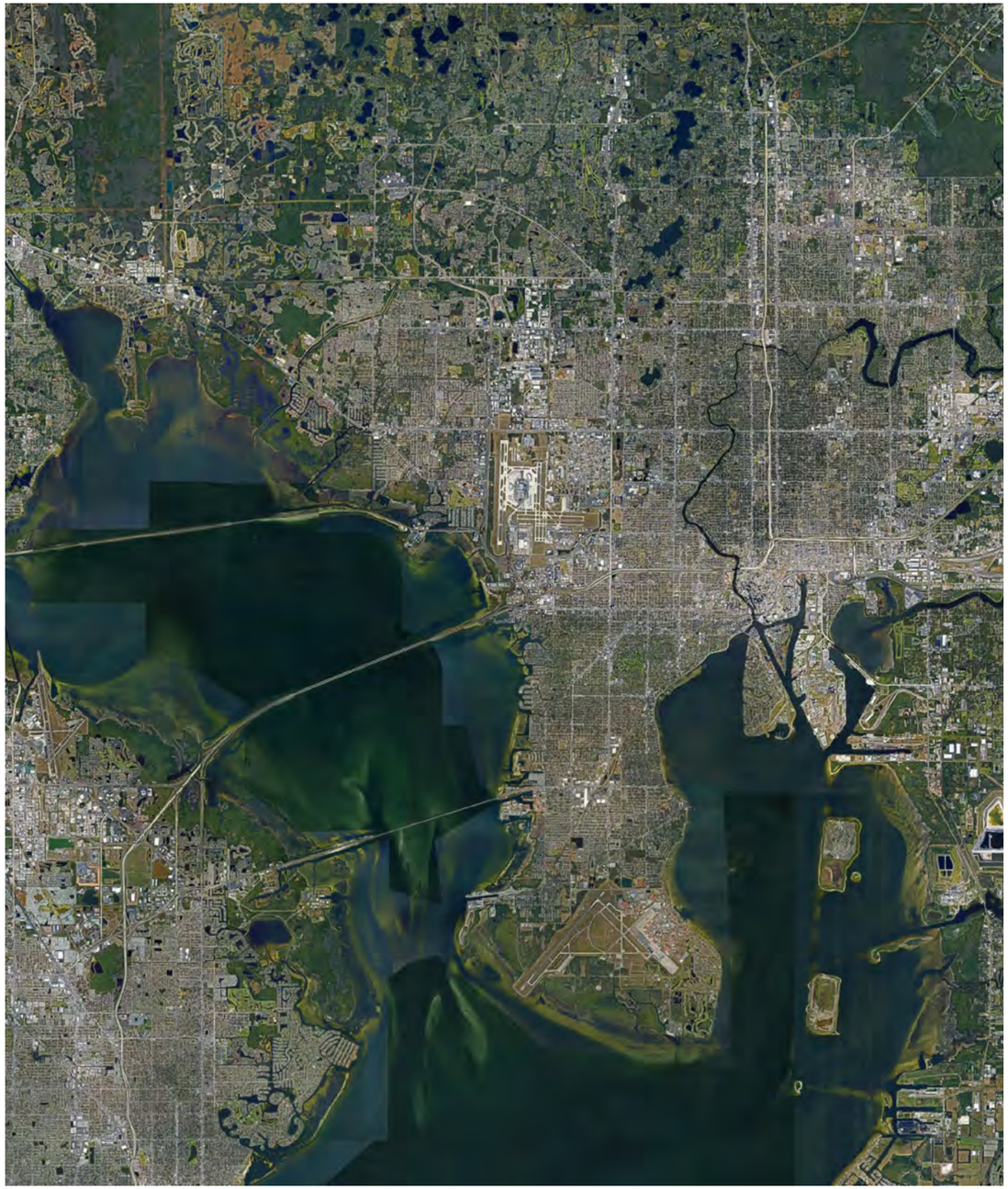
DAVIS ISLANDS TODAY


Maverick, it's not your flying, it's your attitude. The enemy's dangerous, but right now you're worse. Dangerous and foolish.
- Ice Man

BUTLER ACT OF 1921

ALLOWED LAND OWNERS TO "OBTAIN TITLE TO SUBMERGED LANDS ADJACENT TO THEIR UPLANDS BY BULKHEADING, FILLING OR PERMANENTLY IMPROVING SUBMERGED LANDS." (STEINMEYER, 1999)





PRESENT DAY
Source: Google Earth

Every Coastal Home Is Now a Stick of Dynamite

Wealthy homeowners will escape flooding. The middle class can't.

By Jake Bittle

Getty; The Atlantic

FEBRUARY 20, 2023

The New York Times

Perils of Climate Change Could Swamp Coastal Real Estate

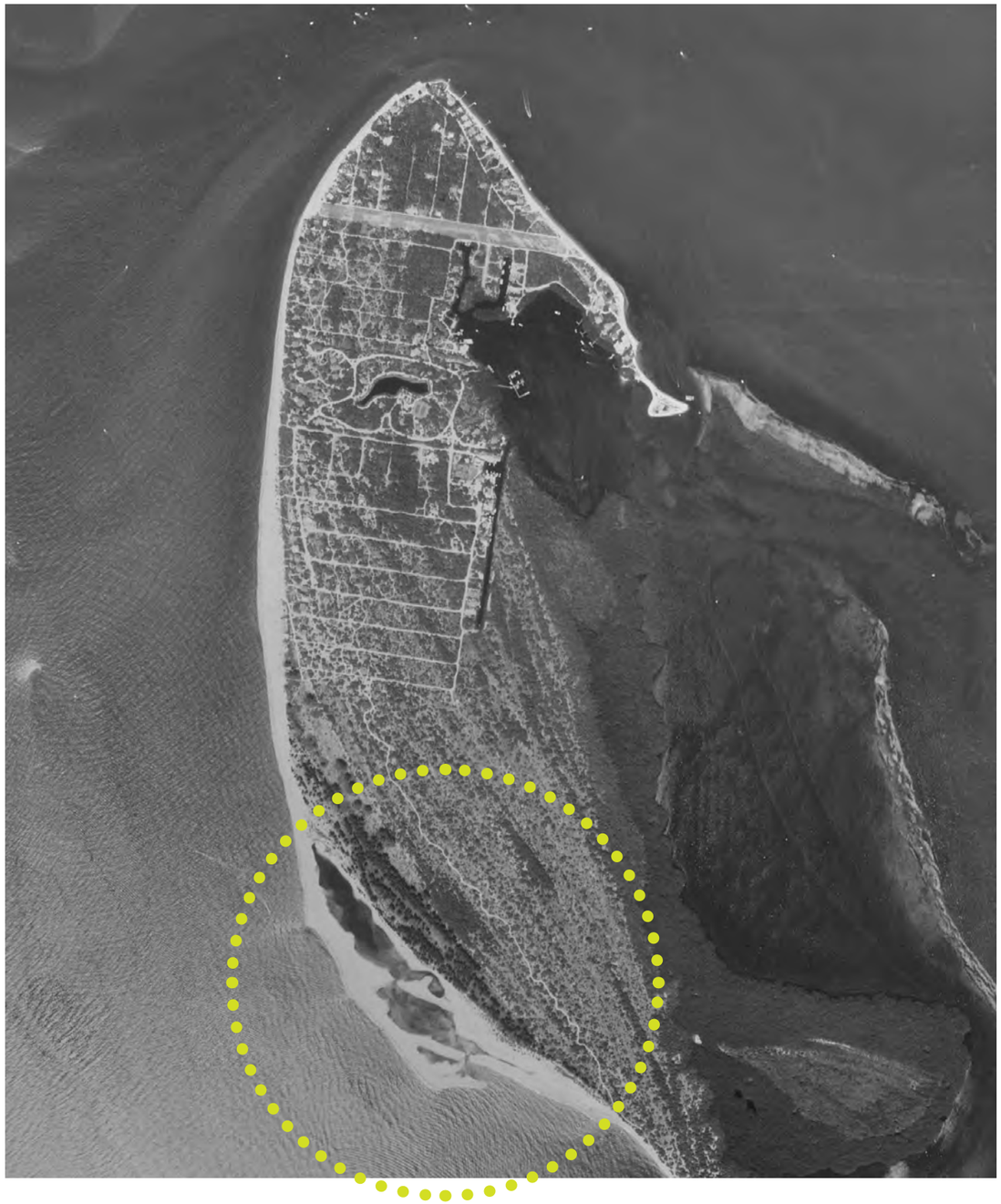
Homeowners are slowly growing wary of buying property in the areas most at risk, setting up a potential economic time bomb in an industry that is struggling to adapt.

2017: $306.2 BILLION

HURRICANE HARVEY, HOUSTON, 2017

HURRICANE MICHAEL, MEXICO BEACH, 2017


Son, your ego is writing checks your body can’t cash!
- Stinger



NORTH CAPTIVA ISLAND // 1999

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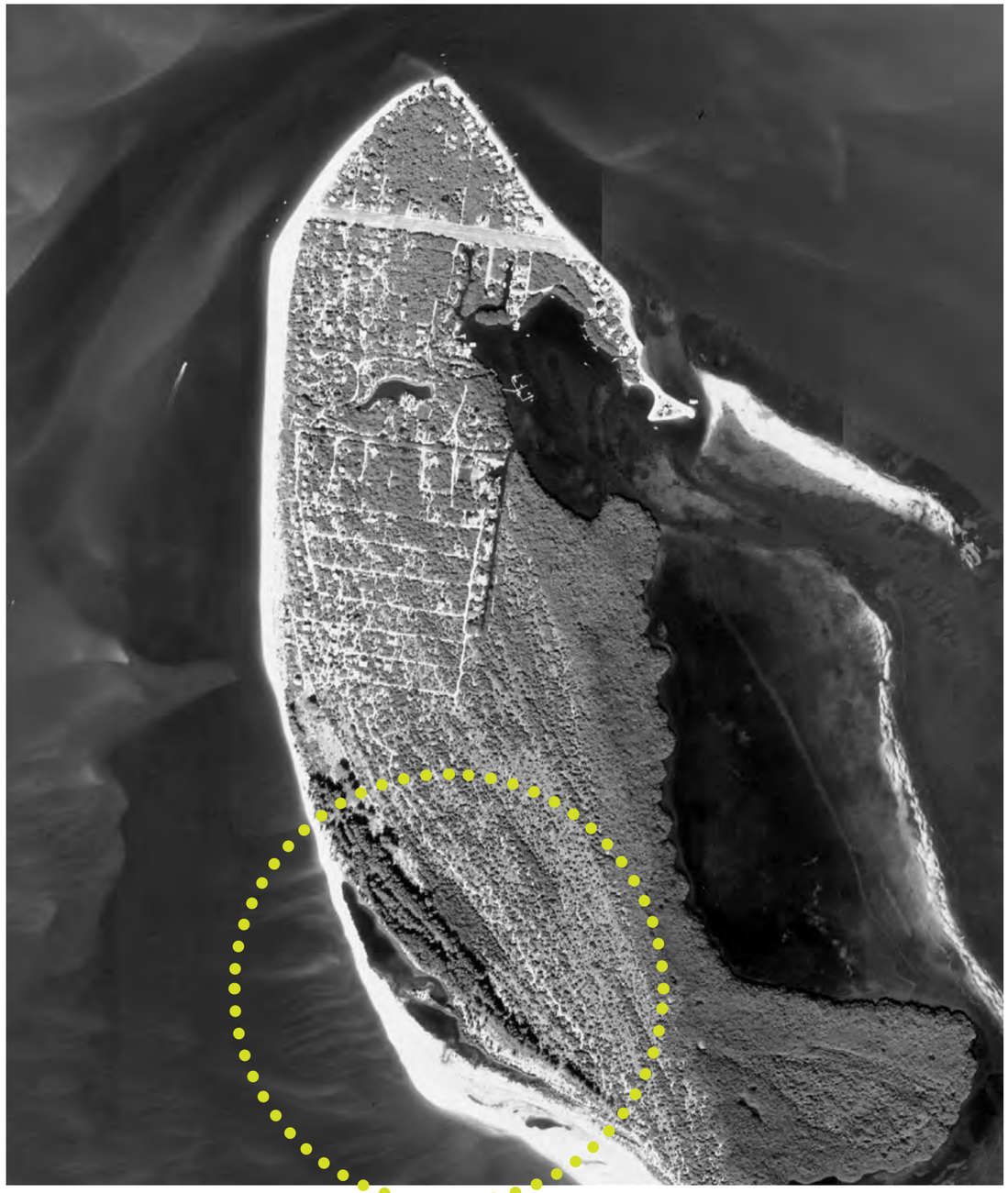

NORTH CAPTIVA ISLAND // 2003

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NORTH CAPTIVA ISLAND // 2008

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NORTH CAPTIVA ISLAND // 2014

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NORTH CAPTIVA ISLAND // 2019

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NORTH CAPTIVA ISLAND // 2020

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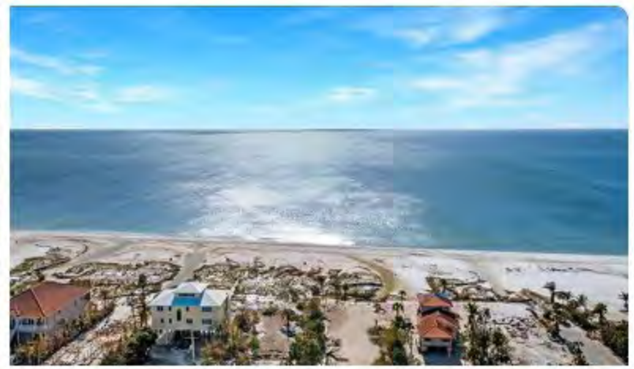

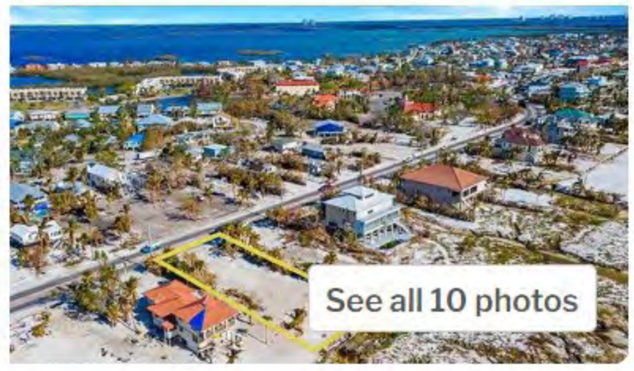

5830 Estero Blvd, Fort Myers Beach, FL 33931

$4,190,000
Est. $24,984/mo Get pre-approved

— Beds

— Baths

0.35 Acre (Lot)

Go tour this home

SATURDAY	SUNDAY	MONDAY
21 JAN	22 JAN	23 JAN

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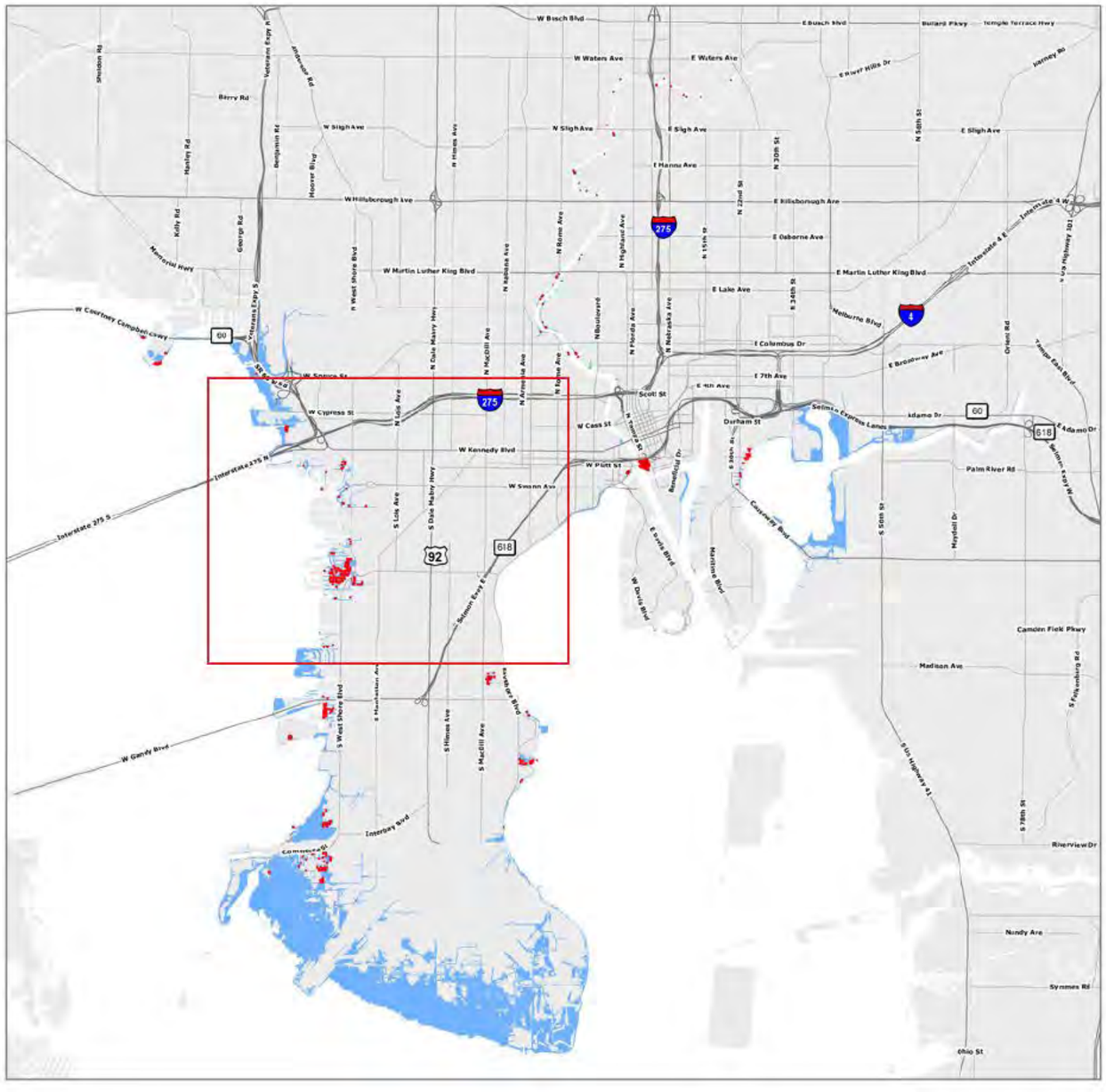

2060 HIGH / 2100 INTERMEDIATE SCENARIOS

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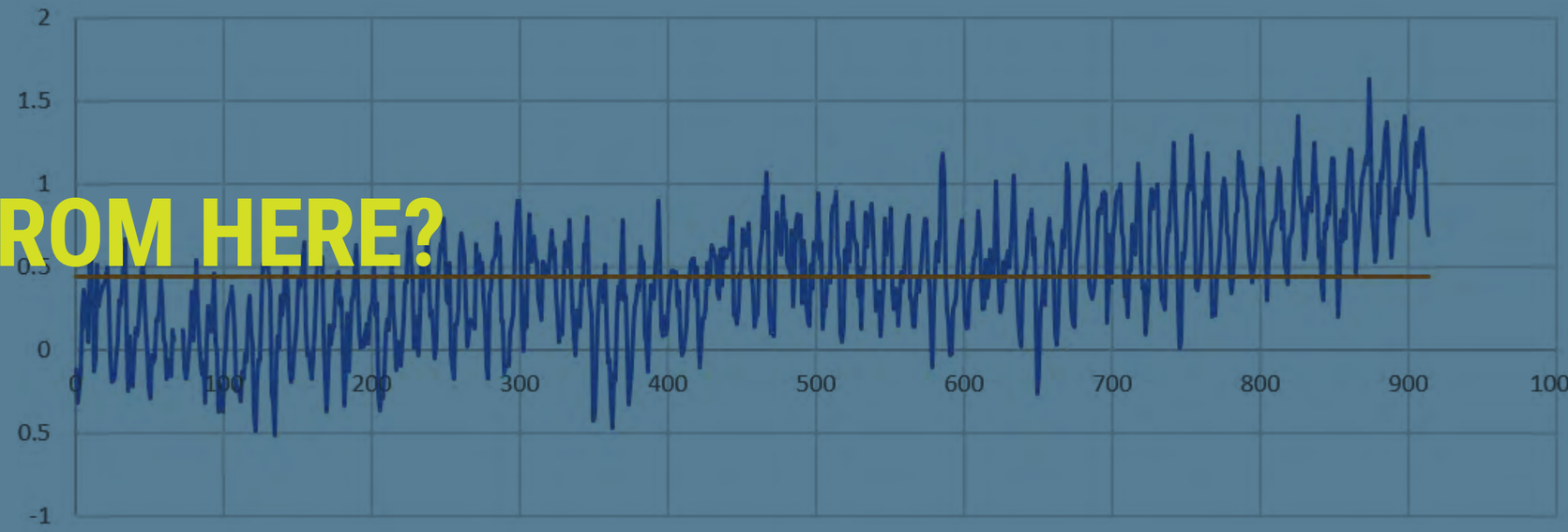
STOP
9012

WHERE DO WE GO FROM HERE?



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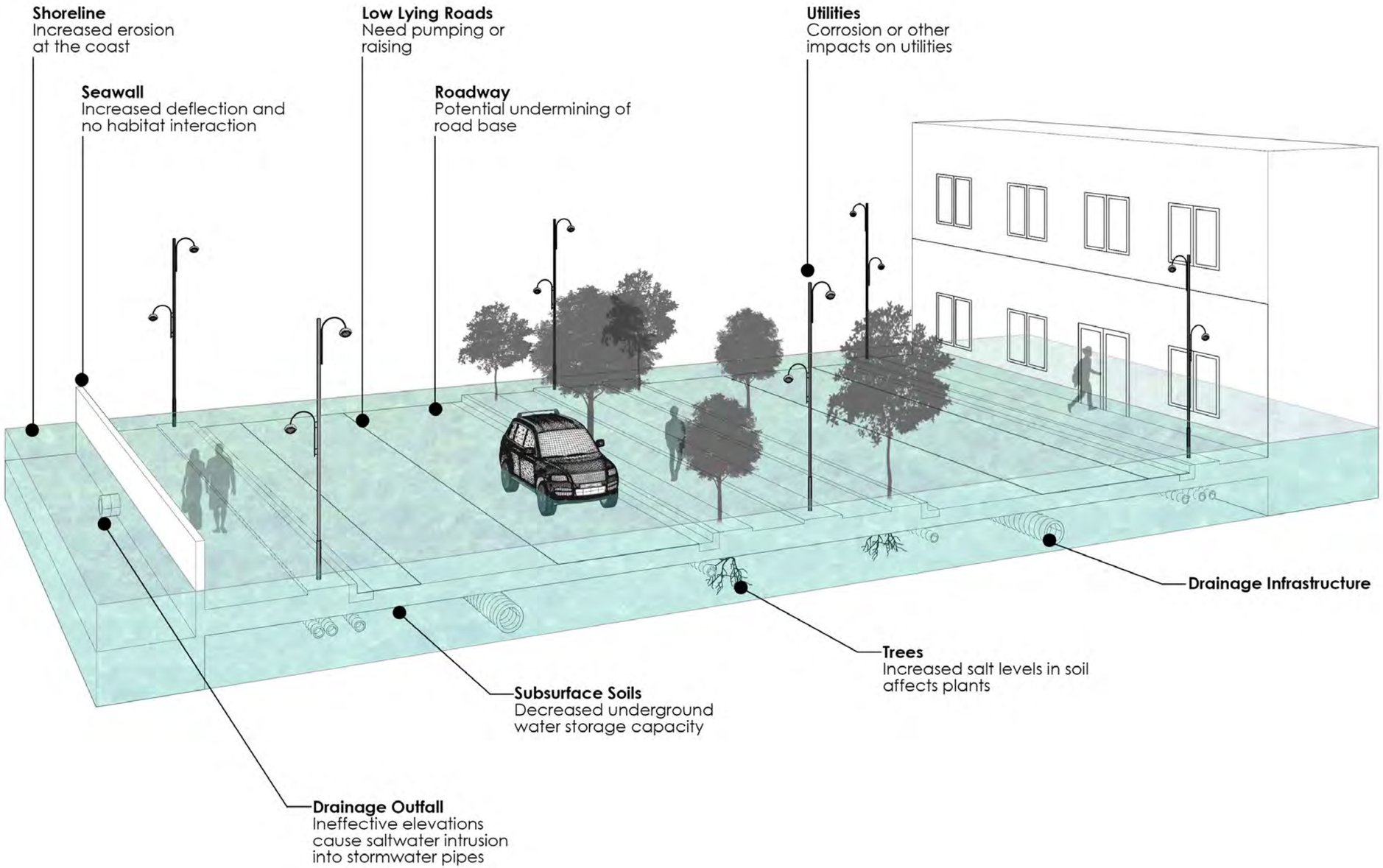
What are the impacts from sea level rise?



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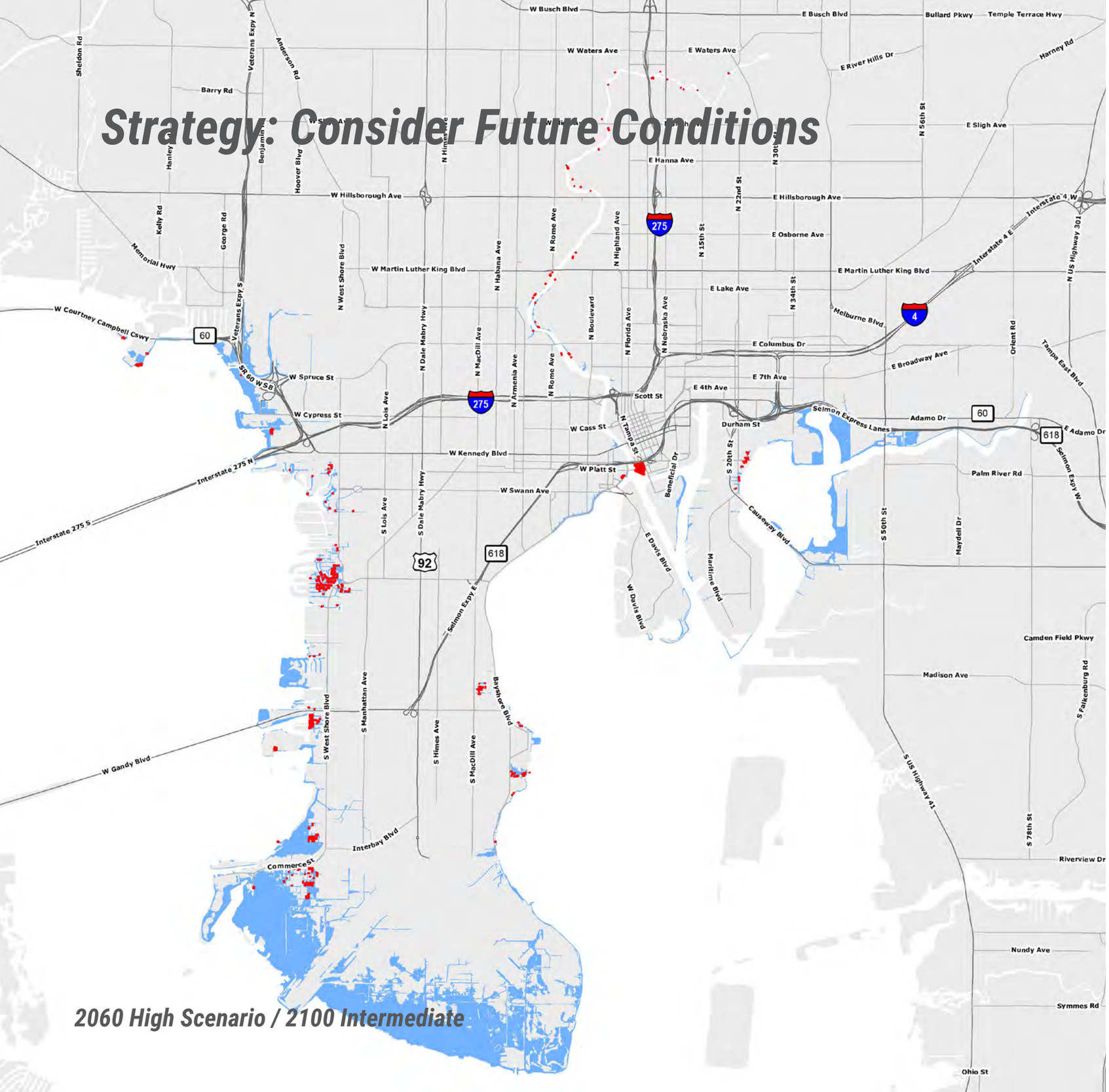
Strategy: Consider Future Conditions



2060 High Scenario / 2100 Intermediate

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Strategy: Consider Future Conditions

Future Conditions Average Wet Season Groundwater Elevation Map

June 12, 2020

Future Ave Wet GW Elev Final

-3.500000
-3.499999 - -3.000000
-2.999999 - -2.500000
-2.499999 - -2.000000
-1.999999 - -1.500000
-1.499999 - -1.000000
-0.999999 - -0.500000
-0.499999 - 0.000000
0.000001 - 0.500000
0.500001 - 1.000000
1.000001 - 1.500000
1.500001 - 2.000000
2.000001 - 2.500000
2.500001 - 3.000000

1:144,448

0 1 2 4 mi

0 1.75 3.5 7 km

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS,

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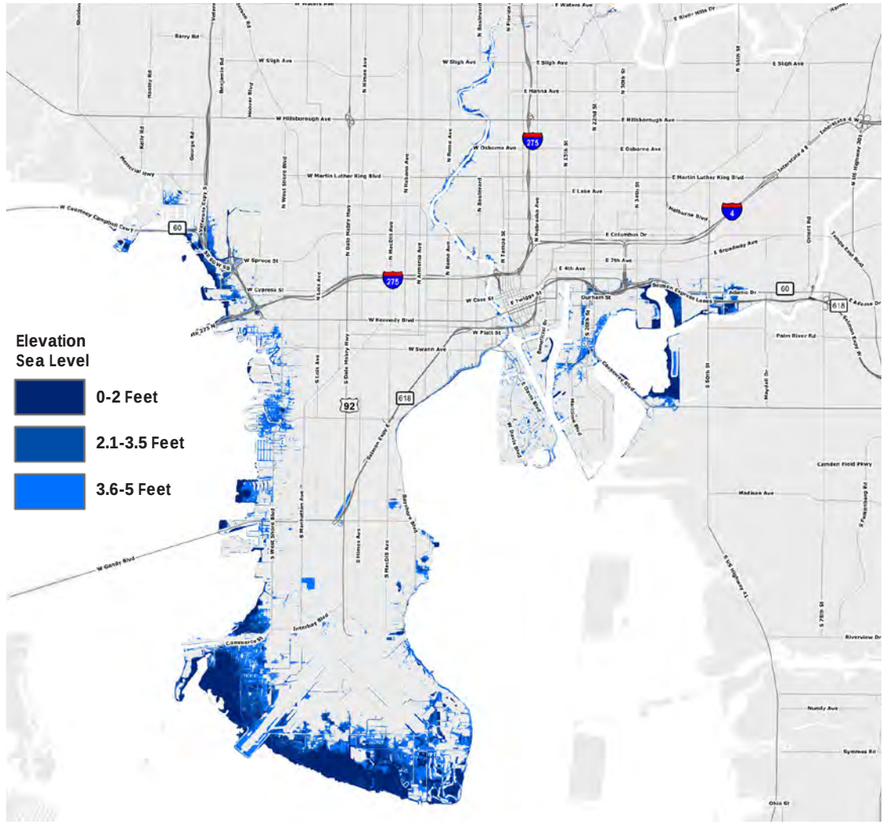
Strategy: Consider Future Conditions



This requires planning to resolve!

(Main) Areas that may possibly be experiencing high tide flooding (in darkest blue), or where this type of flooding can be expected in the near future.

(Right bottom) The projected flood scenarios from the Climate Science Advisory Panel (CSAP, 2019), highlighting elevations that may be associated with seasonal floods.

	Year	NOAA Int-Low (feet)	NOAA Intermediate (feet)	NOAA High (feet)
2020	2000[3]	0	0	0
30 Years	2030	0.56	0.79	1.25
	2040	0.72	1.08	1.77
	2050	0.95	1.44	2.56
60 Years	2060	1.15	1.87	3.48
	2070	1.35	2.33	4.56
	2080	1.54	2.82	5.71
	2090	1.71	3.38	7.05
	2100	1.90	3.90	8.50

LEADING EDGE IMPACTS FROM SEA LEVEL RISE

SHORE ACRES 'SUNNY DAY FLOODING'

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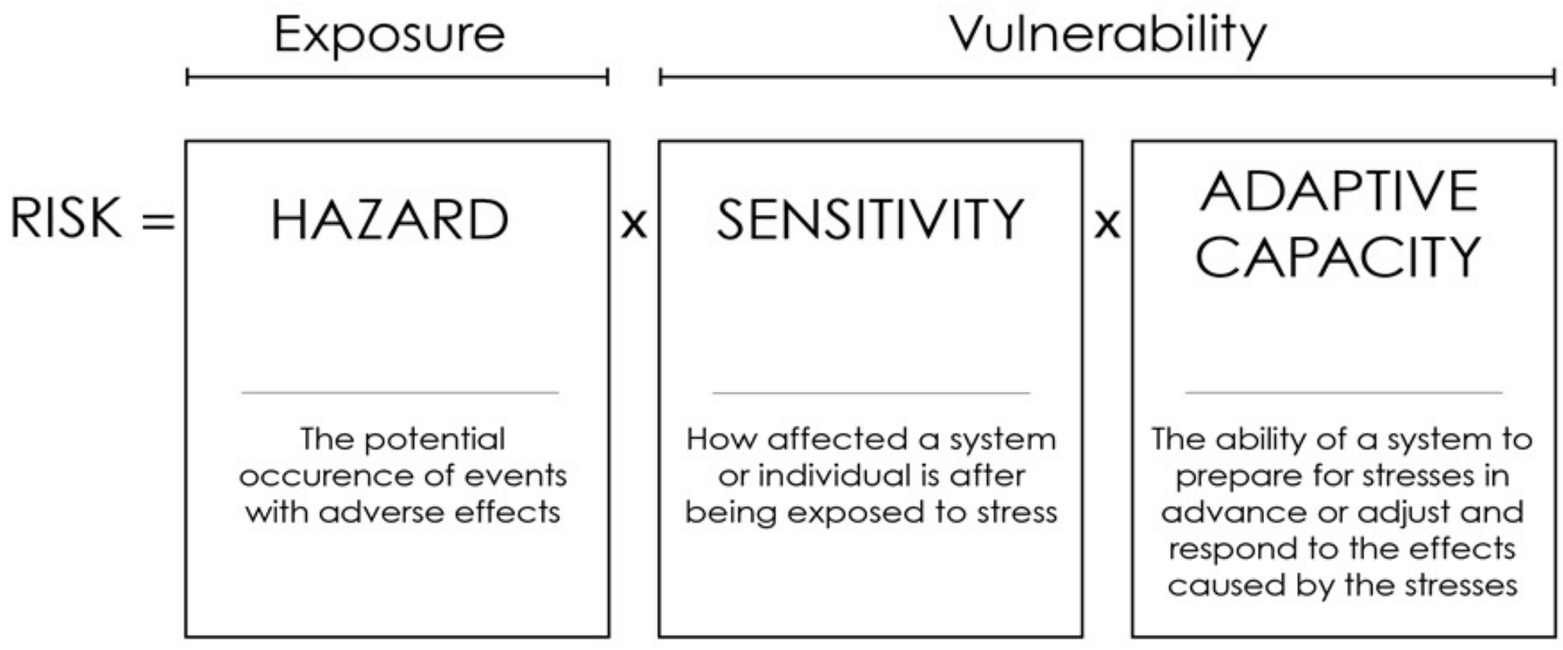
Strategy: Differentiatiation



Strategy: Differentiation + Localized Planning Districts (and Funding)

Planning strategies will differ depending on community characteristics

Dispersed Properties

'Dispersed' properties along the Hillsborough River, using the 2100 High scenario

'Dispersed' properties near the Port, using the 2100 High scenario,

Clustered Properties

'Dispersed' properties on Rocky Point, using the 2060 High / 2100 Intermediate scenario.

'Clustered' properties on Rocky Point, using the 2100 High scenario.

Linear Properties

'Linear' sea-level rise inundation along the Hillsborough River, with the 2100 High scenario.

'Linear' sea-level rise inundation near MacKay Bay and East Ybor City, with the 2100 High scenario.

Saturated Properties

'Saturated' sea-level rise inundation at Davis Islands, with the 2100 High scenario.

'Saturated' sea-level rise inundation near Port Tampa City, with the 2100 High scenario.

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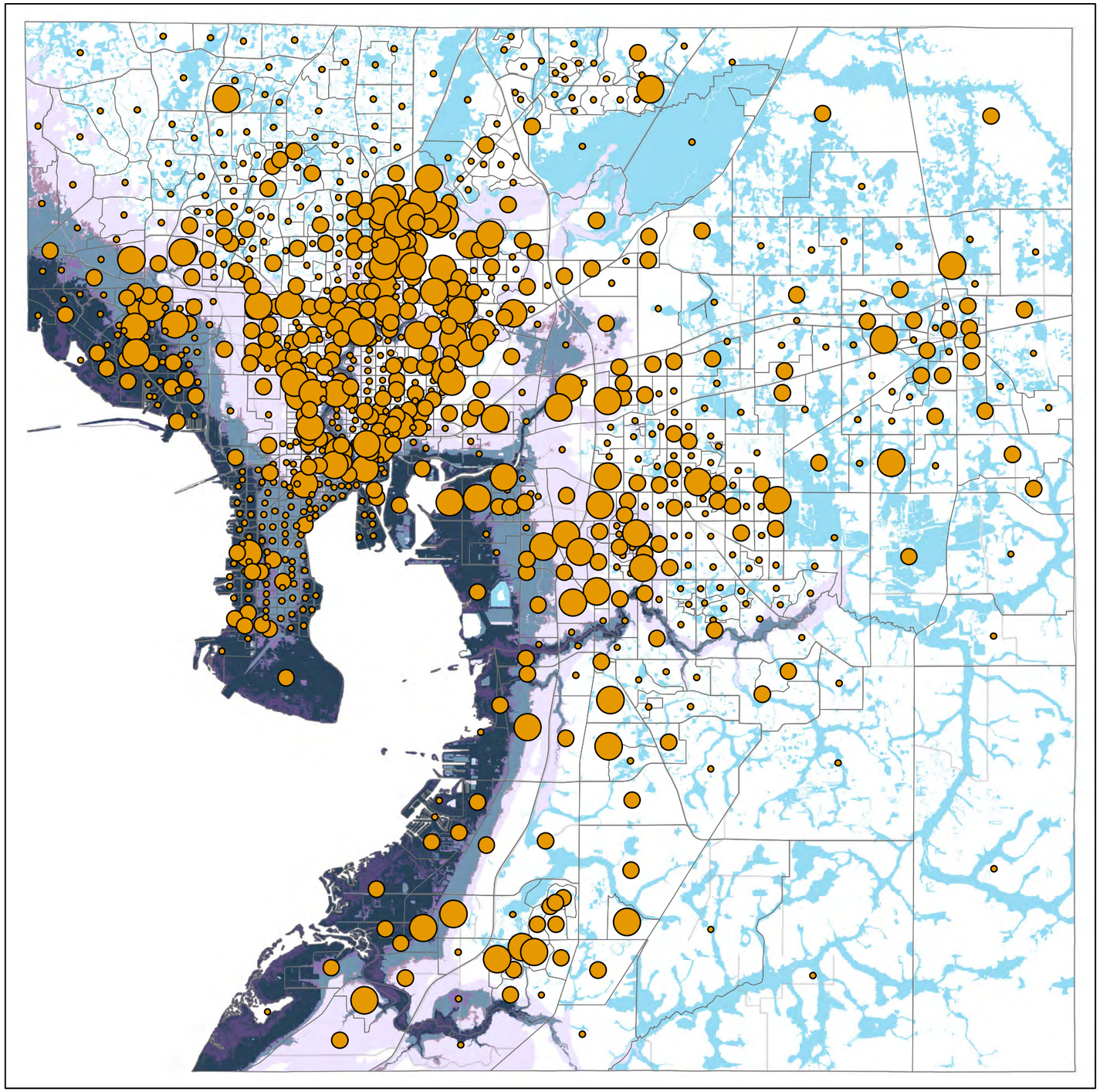
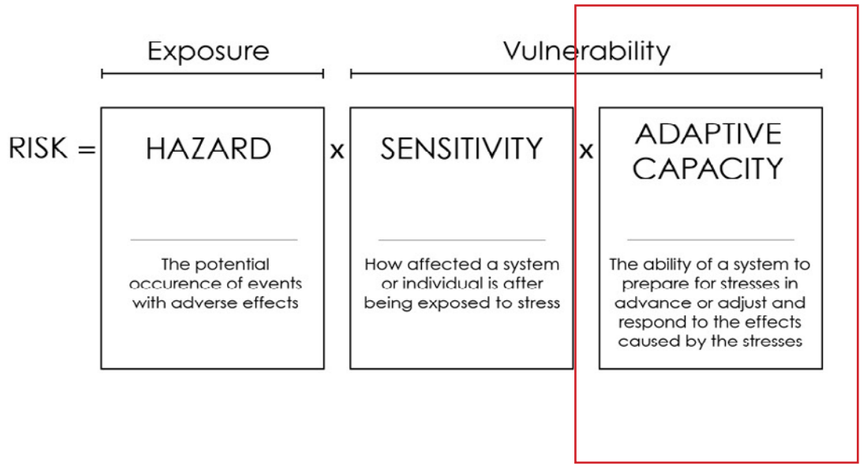
LOW INCOME POPULATIONS





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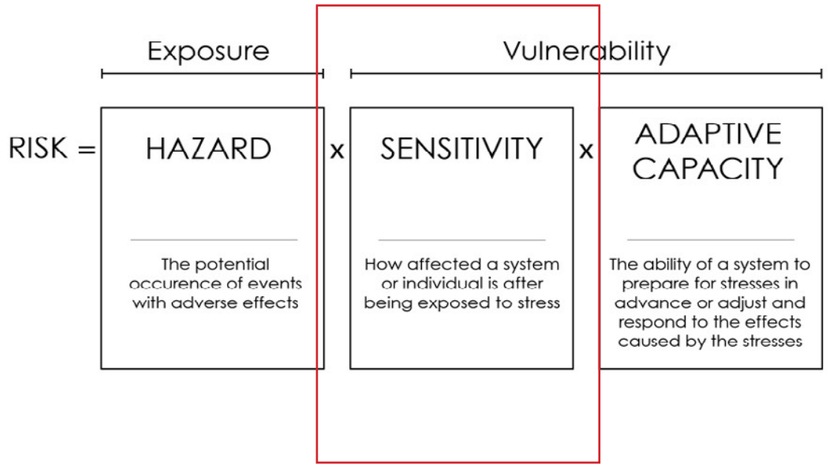

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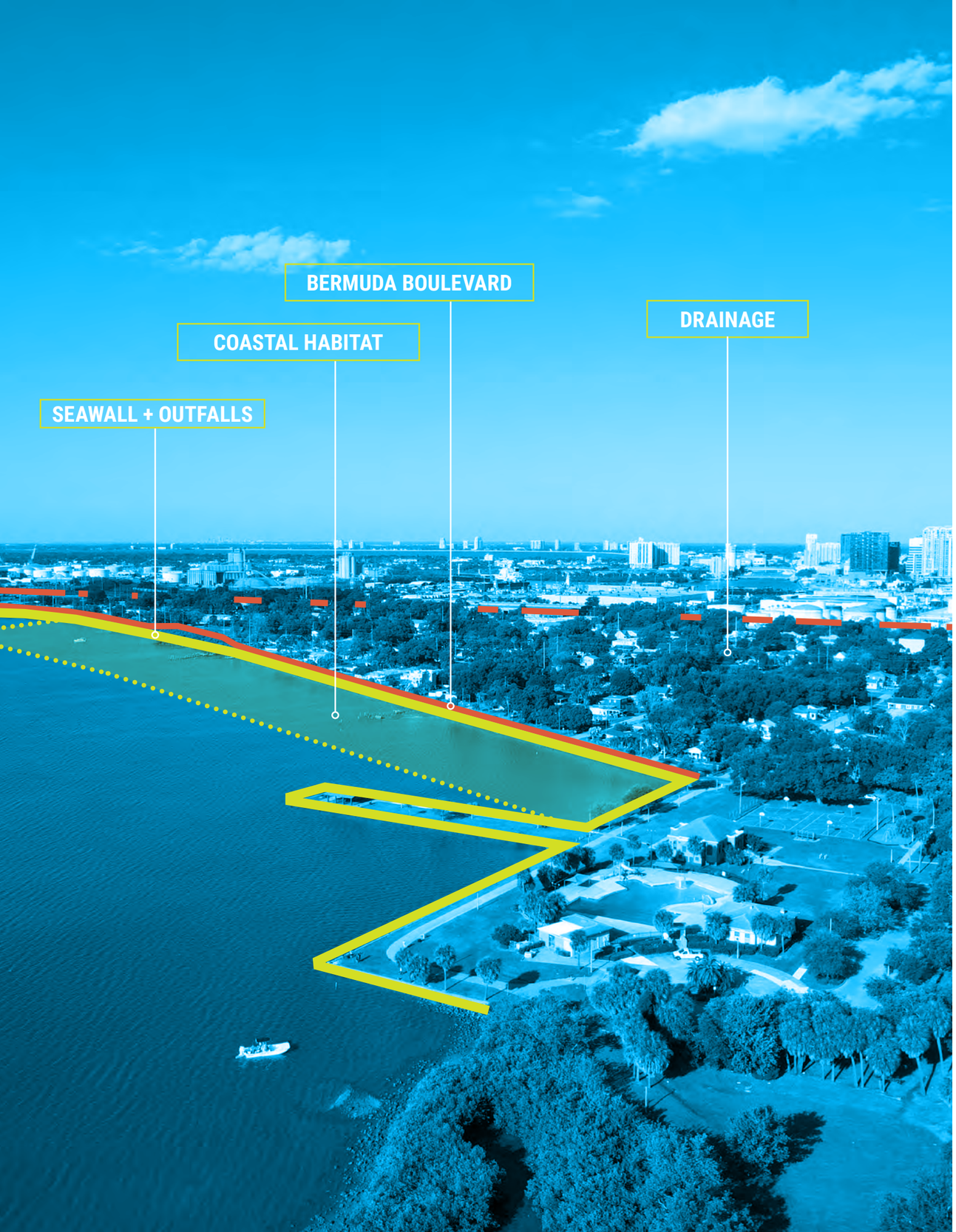
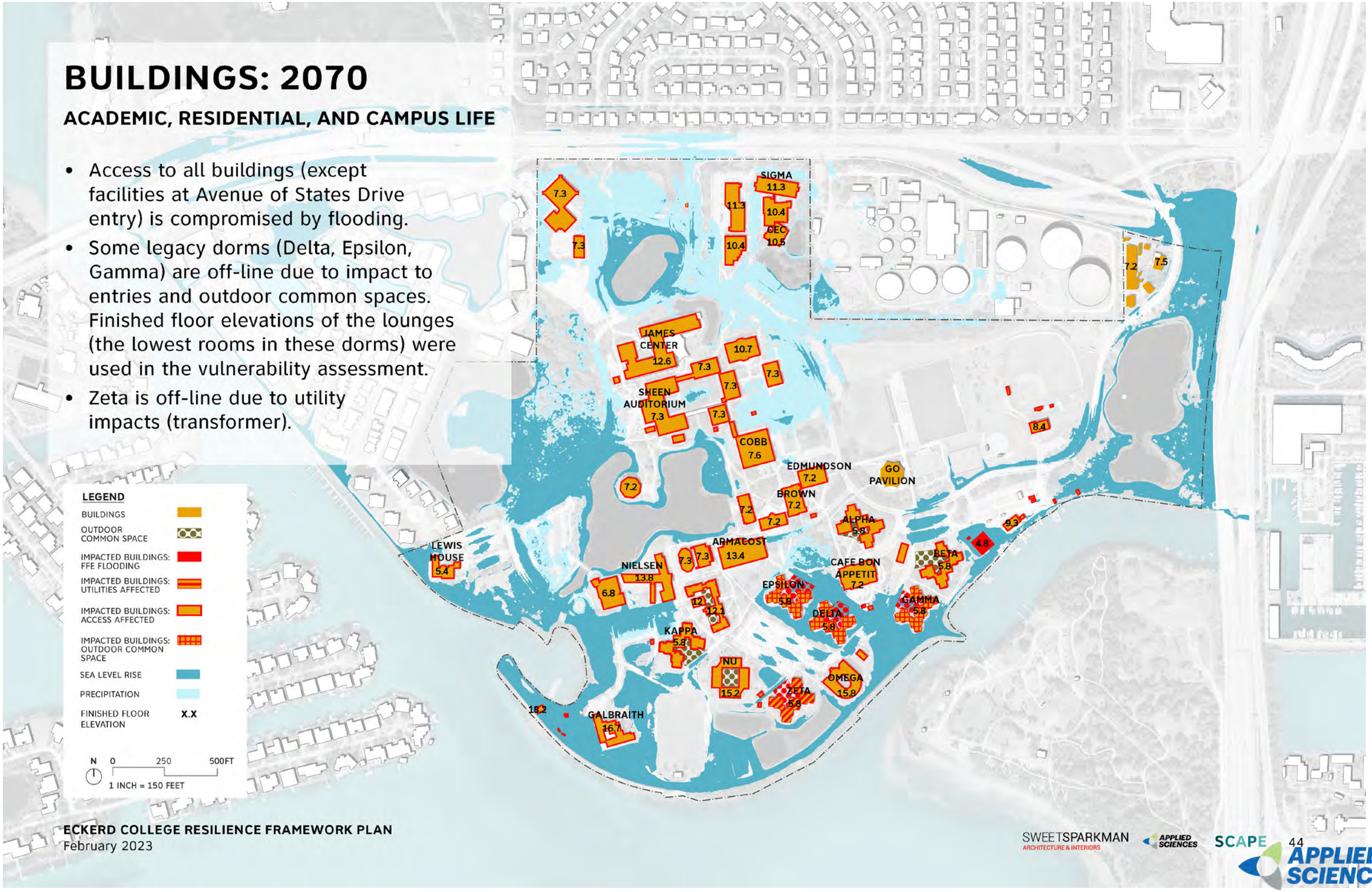

BERMUDA BOULEVARD
COASTAL HABITAT
DRAINAGE
SEAWALL + OUTFALLS


APPLIED SCIENCES

BUILDINGS: 2070

ACADEMIC, RESIDENTIAL, AND CAMPUS LIFE

- Access to all buildings (except facilities at Avenue of States Drive entry) is compromised by flooding.
- Some legacy dorms (Delta, Epsilon, Gamma) are off-line due to impact to entries and outdoor common spaces. Finished floor elevations of the lounges (the lowest rooms in these dorms) were used in the vulnerability assessment.
- Zeta is off-line due to utility impacts (transformer).



ECKERD COLLEGE RESILIENCE FRAMEWORK PLAN
February 2023

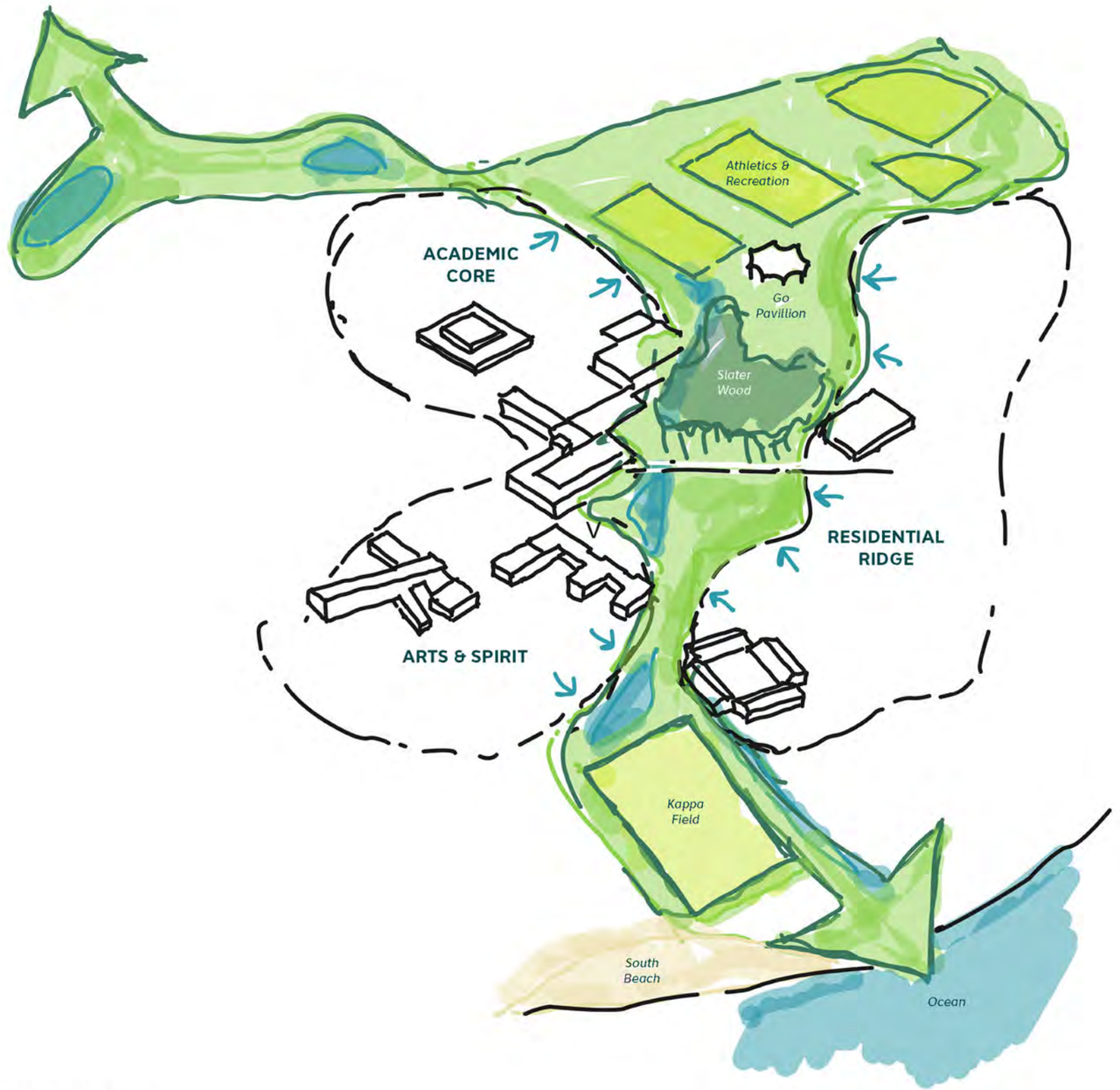
SWEETSPARKMAN ARCHITECTURE & INTERIORS
APPLIED SCIENCES
SCAPE

APPLIED SCIENCES


APPLIED
SCIENCES


APPLIED
SCIENCES

CAMPUS GREENWAY



ADAPTATION PATHWAY A: RENATURE WEST CAMPUS

LONG-TERM (BY 2070)

*All elevations are in NAVD88

ECKERD COLLEGE RESILIENCE FRAMEWORK PLAN
February 2023

SWEETSPARKMAN ARCHITECTURE & INTERIORS

APPLIED SCIENCES

BRIAN COOK | DIRECTOR OF URBAN AND ENVIRONMENTAL DESIGN | APPLIED SCIENCES
FOR THE AMERICAN INSTITUTE OF ARCHITECTS (AIA) | 04.11.2023

BCOOK@APPLIEDFL.COM

AIA Florida

Sea Level Rise Panel

Tampa Bay Regional Resiliency Coalition

Cara W Serra

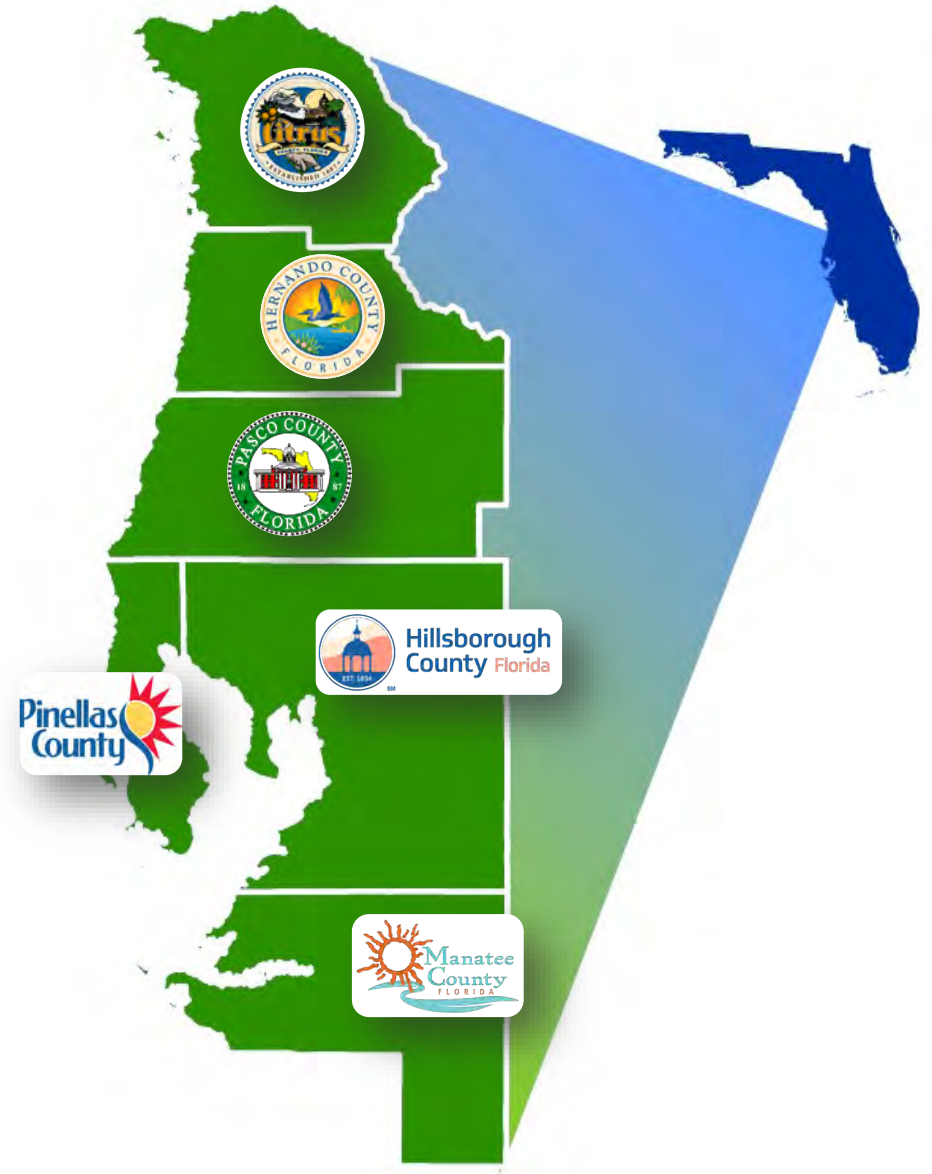
April 11, 2023

TBRRC

Tampa Bay Regional Resiliency Coalition

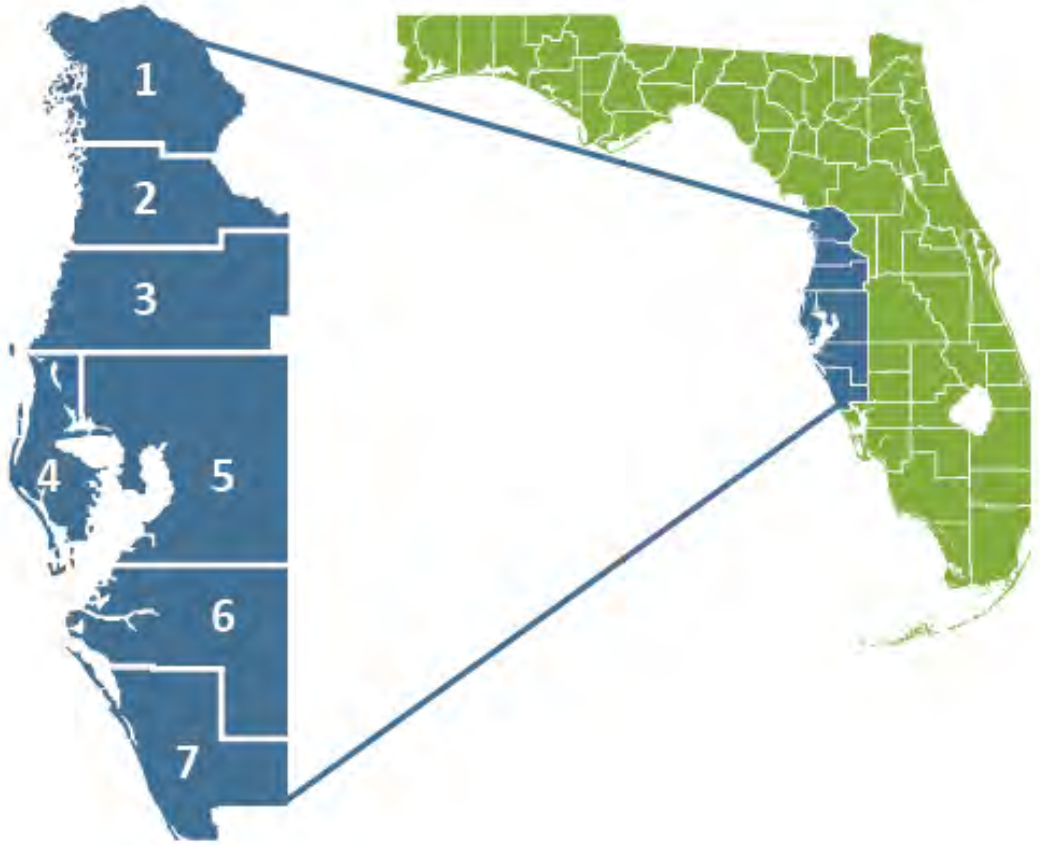
TBRPC

- Expand Council Conversations
- Promote Public Private Partnerships
- Promote Regional Leadership/Stewardship
- Take Ownership of Trending Issues
- Bring Governments to the Table
- Resiliency to Sea Level Rise & Climate Change

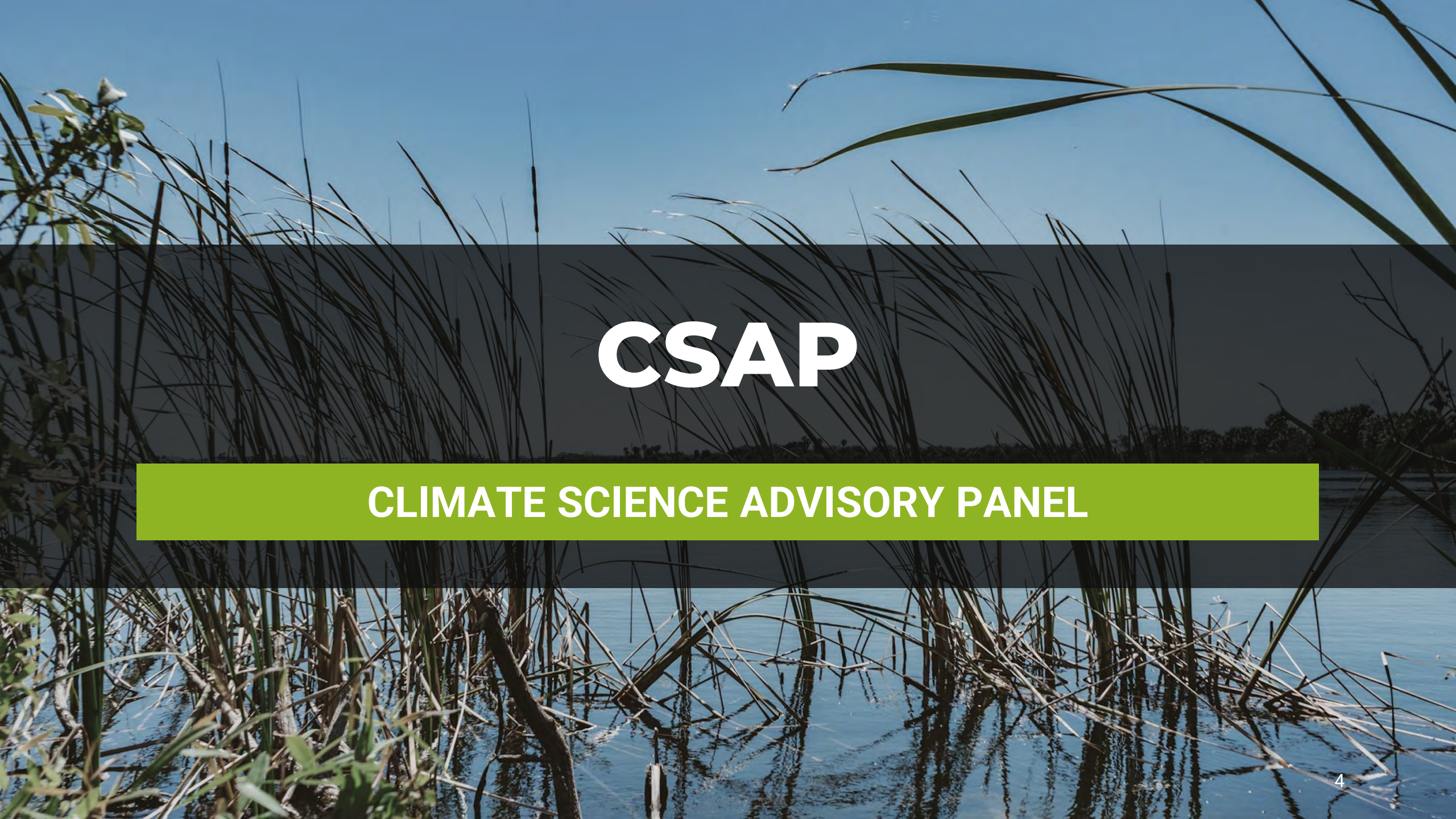


REGIONAL RESILIENCY COALITION

1. Citrus County
2. Hernando County
3. Pasco County
4. Pinellas County
5. Hillsborough County
6. Manatee County
7. Sarasota County



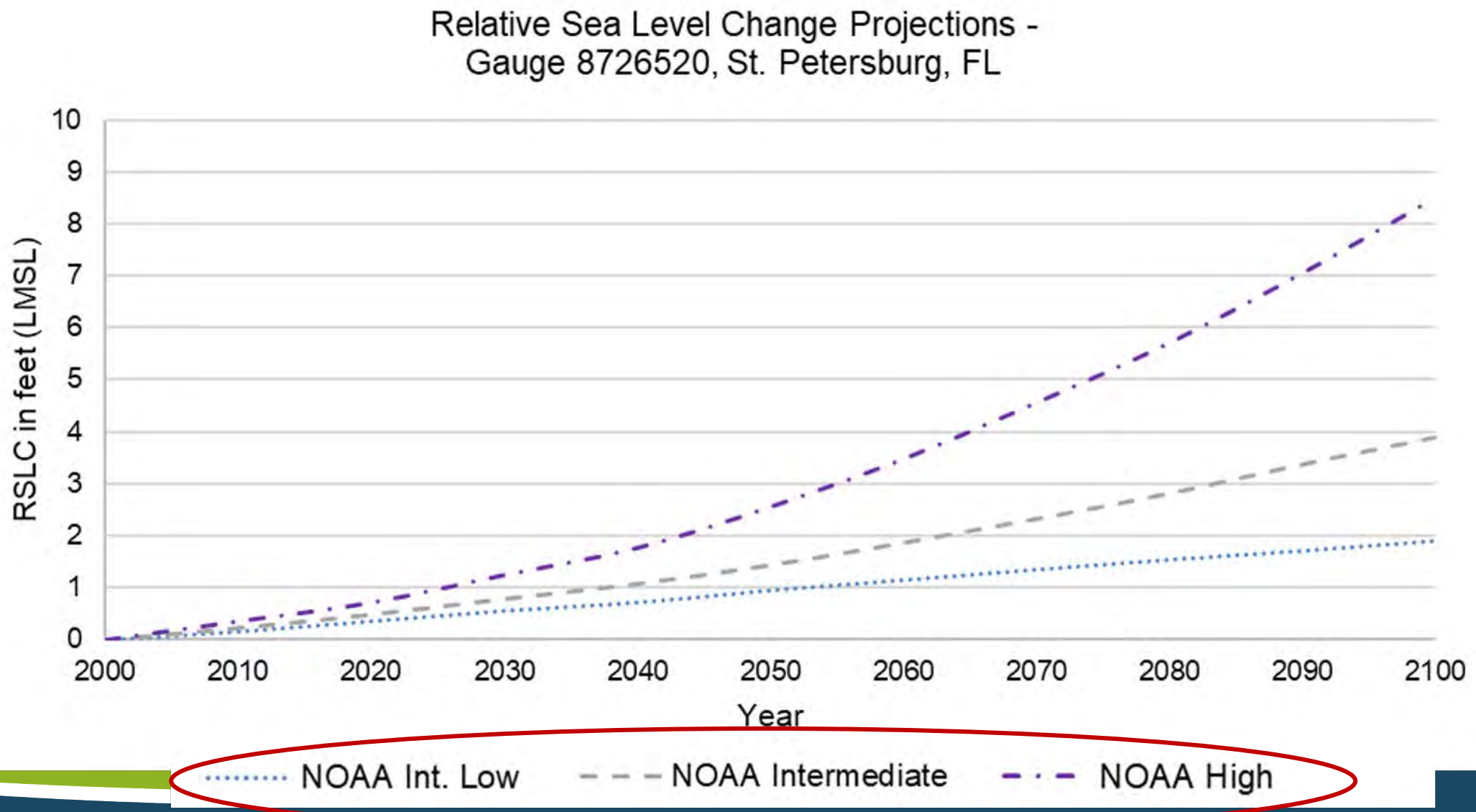
- Established by MOU in 2018.
- 2nd collaborative/coalition in the state
- 18th in the U.S.
- 33 Resiliency Coalition Members
- Over 100 Private Sector Partners



CSAP

CLIMATE SCIENCE ADVISORY PANEL

3 Curves Recommended – 2019 Update

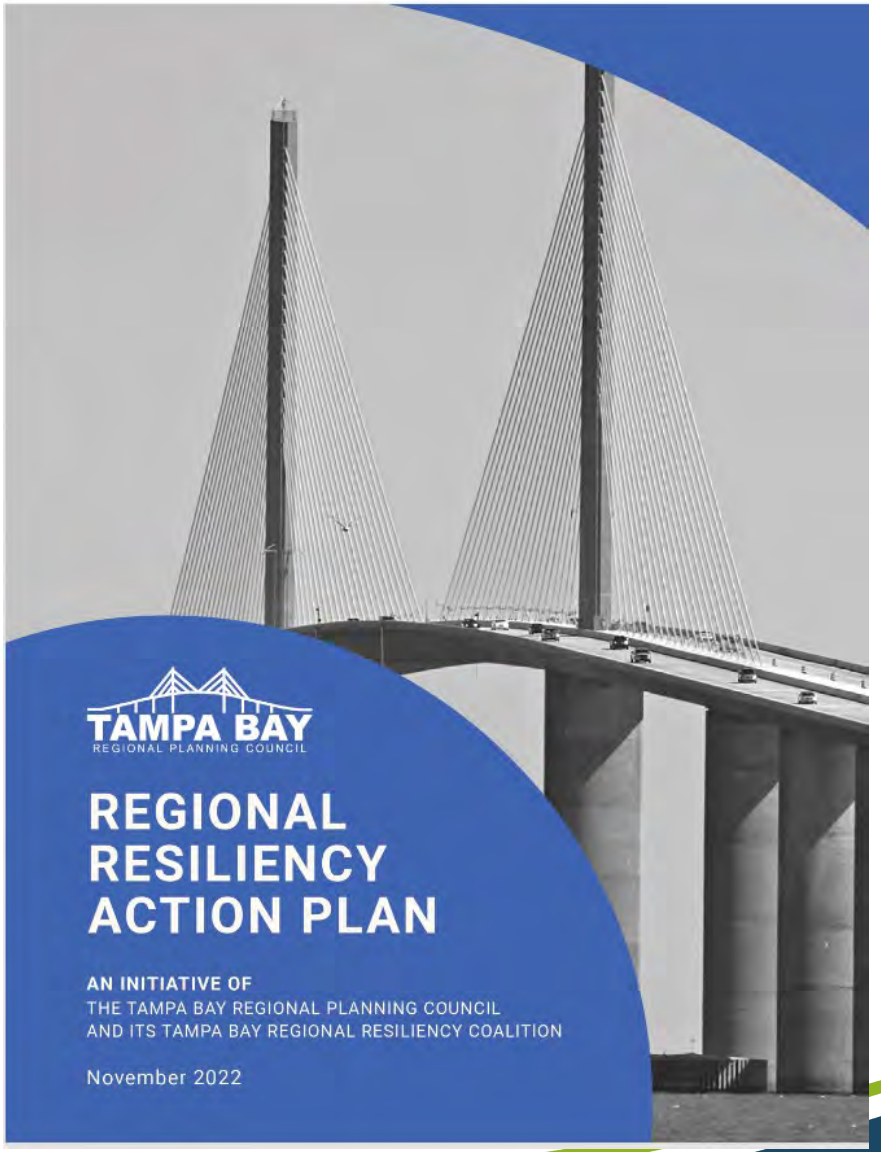


REGIONAL RESILIENCY

PROJECTS AND PROGRAMS

RRAP

- Totally voluntary
- Priority is regional collaboration
- Identifies local options for implementation
- Considers capacity (size/resources)
- Positive aspirational vision
- Aligns with state and federal priorities
- Integrates equity



SAFE SHELTER PROJECT

Florida Resilient Coastlines Program -- Regional Resilience Entity Category
Awardee: City of Tampa, led by TBRPC

- Conduct a region-wide vulnerability assessment of current shelters from sea level rise and combined storm surge (NOAA 2017 Intermediate Low and Intermediate High in 2040 and 2070).
- 2 workshops with local emergency management staff to review risks and identify prospective buildings in low-risk areas which can serve as potential future shelters.
- Produce maps, GIS data for local users and provide to FDEP
- Produce a report regional and by county defining risks and recommendations

Resilient Ready Tampa Bay

- Technical design assistance grant to enhance capacity to assess, plan for, and adapt to flood impacts using **multi-functional, nature-based infrastructure**.
- Charrettes, vulnerability assessments and engineering designs.
  - **Barrier Islands** – City of St. Pete Beach Pass-A-Grille
  - **Waterfront Area** – City of Oldsmar R.E. Olds Park
  - **Inland Area** – City of Tampa North Tampa Closed Basin
- Technical Design Resources (report)
- June Symposium – showcase and networking

REACH PROJECT

REACH
Resilience and Energy Assessment of Communities and Housing

Report on Affordable Housing Flood Risks underway

- Regional, county level analysis with hot spot analysis (local jurisdictions)
- Housing types: assisted/unassisted multi-family, single family (below 200K), mobile homes
- UF Shimberg and Florida Housing Coalition partners

Technical Workshops for Staff

- REACH Housing Mapper/Database for HUD and other Assessments
- Heat and Energy Burden

HOUSING AFFORDABILITY AND RESILIENCE CONFERENCE

- Held in May 2022

https://tbrpc.org/reach/

JPMorganChase FOUNDATION

Shorelines Policy Guide and Model Language

Support adoption of best practices for creating and maintaining living shorelines, enhanced shorelines, and hardened shorelines including seawalls/bulkheads, to achieve a greater level of resilience in the region.

Document will define recommendations for:

- establishing a hierarchy of shoreline policies and principles to support resilient adaptation, and habitat preservation and restoration;
- establishing uniform heights for bulkheads and seawalls for SLR and predicted tidal flooding up to 2070;
- coordinated installation, maintenance, repair, oversight, enforcement and permitting of living shorelines or seawall enhancement options;
- avoiding negative impacts, liability;
- model language options for Comp plan, LDR, Code.

Funded by a Grant from FDEP
Florida Resilient Coastlines Program
FY21

TAMPA BAY
REGIONAL PLANNING COUNCIL

THANK YOU!

QUESTIONS?

WWW.TBRPC.ORG/

Cara Woods Serra cara@tbrpc.org

Ground-Zero: Sea Level Rise Adaptation

American Institute of Architects (AIA) Florida Webinar

April 11, 2023

Miami-Dade County
Office of Resilience

Agenda

1) Miami-Dade Context
2) Sea Level Rise Strategy
3) County Staff Resilient Design Trainings
4) U.S. Army Corps of Engineers ‘Back Bay’ Study

~3 million people

~16 % Black; ~70% Hispanic or Latino; > 50% foreign-born

Ancestral lands of the Taino, Seminole, and Miccosukee peoples

Spatially: 1/3 urban; 2/3 ‘natural’ (2 National Parks)

- 13 County Commissioners/Districts
- 34 municipalities + Unincorporated

MIAMI-DADE COUNTY

OFFICE OF RESILIENCE

REGULATORY AND ECONOMIC RESOURCES

miamidade.gov/resilience

ENERGY AND CLIMATE MITIGATION	ADAPTATION	COMMUNICATION	BISCAYNE BAY	EXTREME HEAT	FUTURE READY	ZERO WASTE
Reduce Sources of Climate Change	Address Sea Level Rise Impacts	Engage & Connect Stakeholders	Protect and Restore	Implement Heat Risk Reduction Efforts	Resilience Implementation & Planning	Minimize Waste & Reduce Consumption

Connected Strategies


Sea levels have already risen 10 inches in last 100 years
4 inches since 1992
Ocean Conservancy®
Little River C-7 Canal

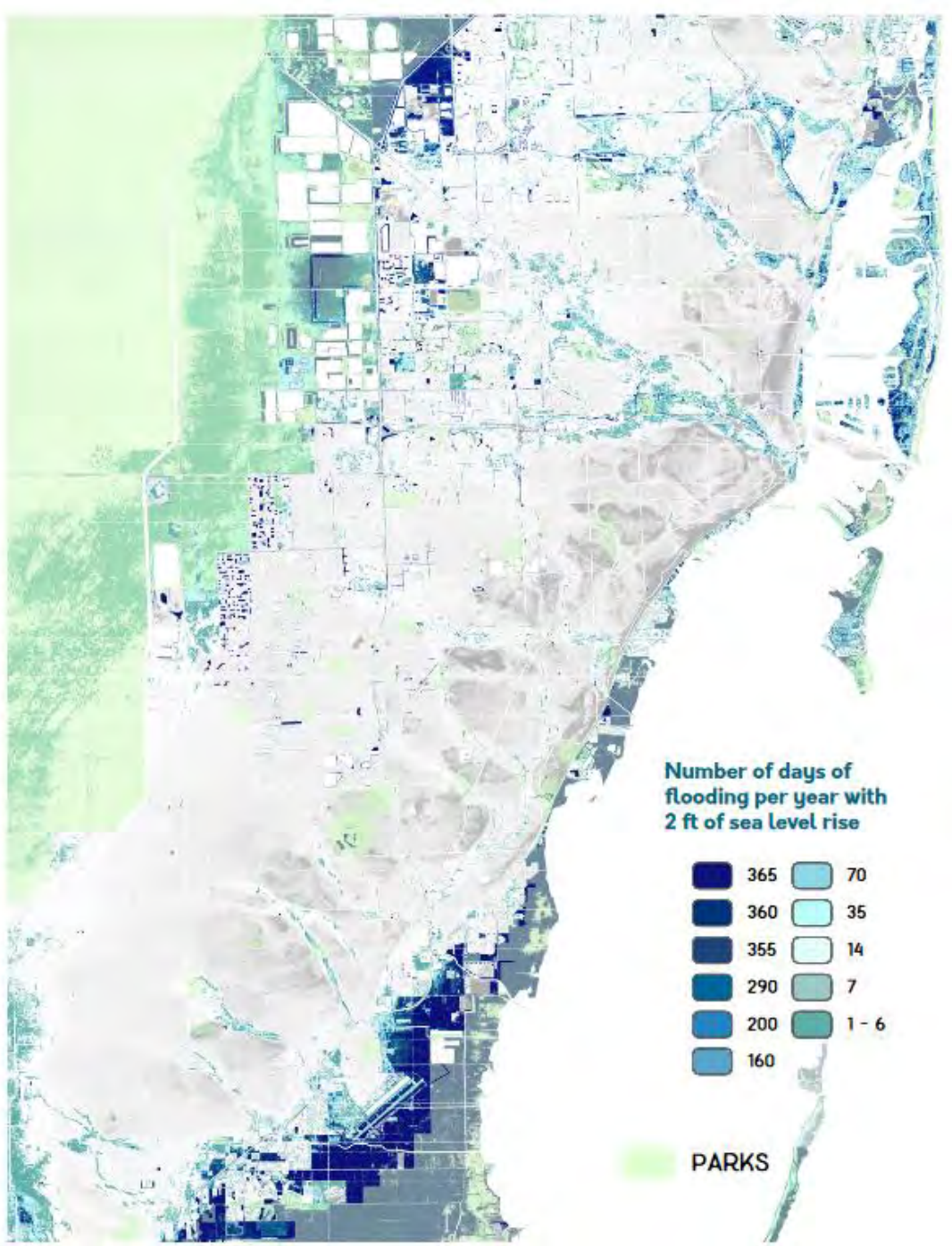
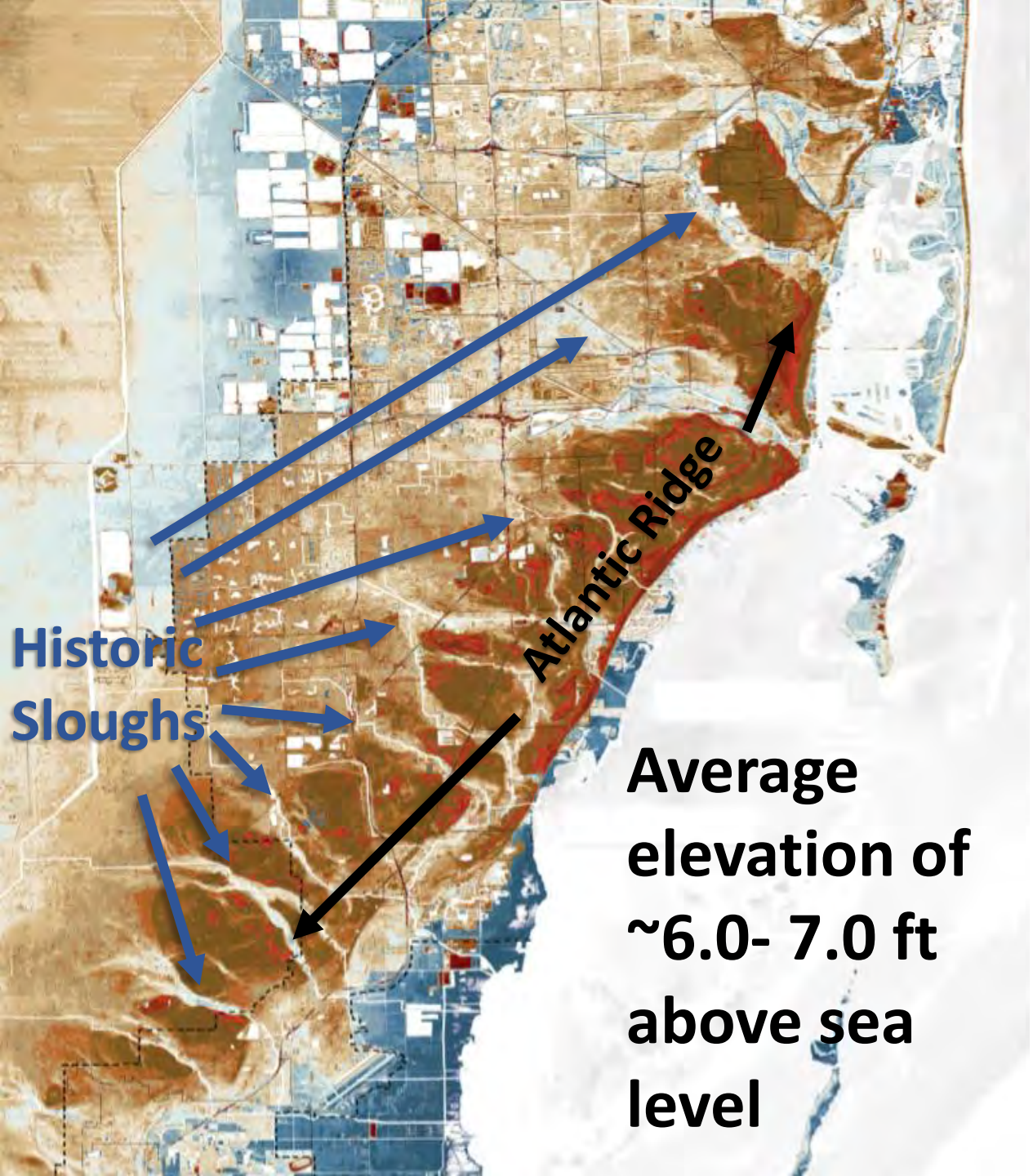
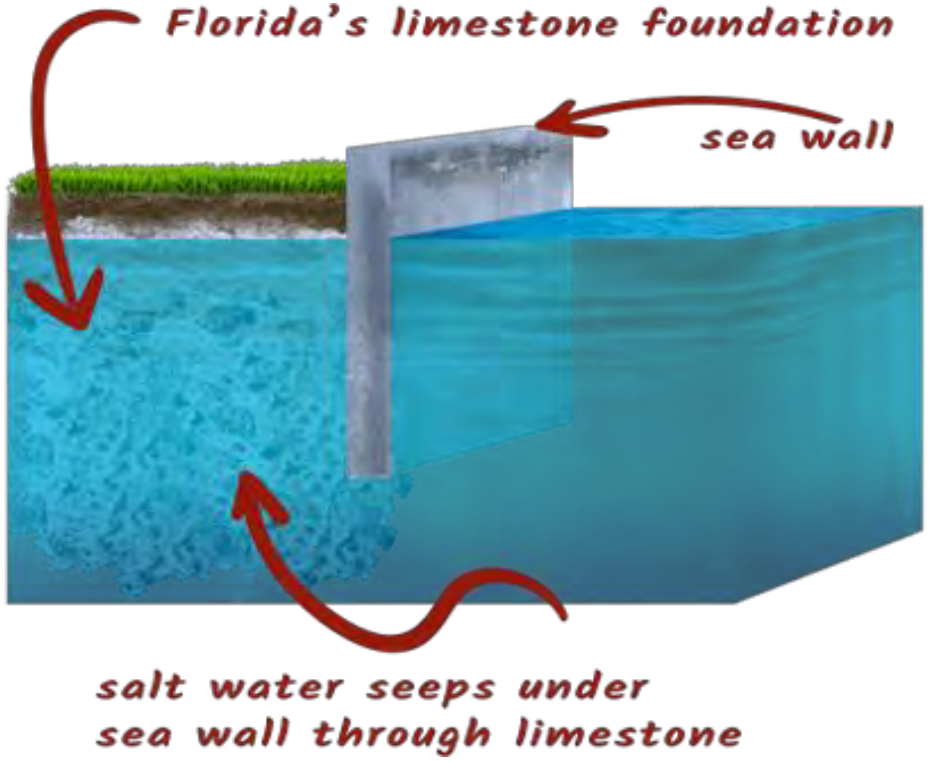


Figure 5-1. Map of days with flooding a year with 2 feet of sea level rise if no action is taken

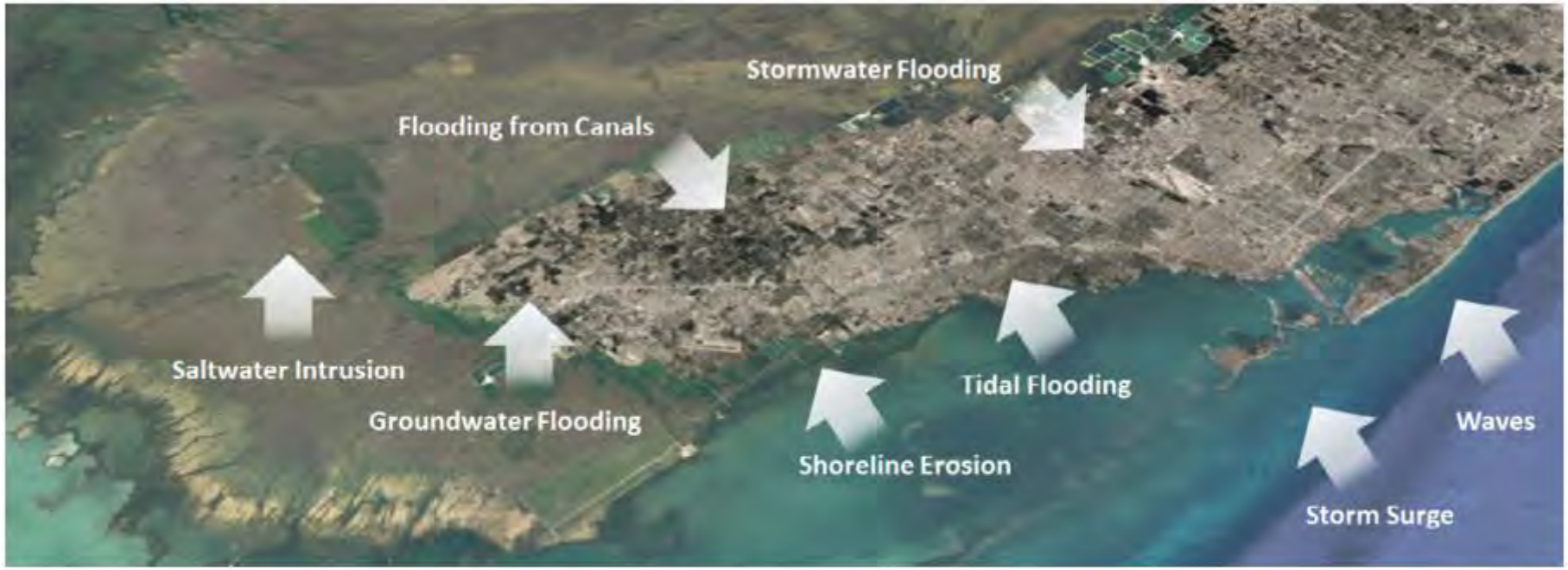


Average elevation of ~6.0- 7.0 ft above sea level

- Water
- 0 - 0.1 ft
- 0.1 - 1 ft
- 1 - 2 ft
- 2 - 3 ft
- 3 - 4 ft
- 4 - 5 ft
- 5 - 6 ft
- 6 - 7 ft
- 7 - 8 ft
- 8 - 9 ft
- 9 - 10 ft
- 10 - 11 ft
- 11 - 12 ft
- 12 - 13 ft
- 13 - 14 ft
- 14 - 15 ft
- 15 - 20 ft
- 20 - 25 ft
- > 25 ft



Sea level rise will increase the frequency and impact of other hazards



Less Frequent → **Most Frequent**

Storm Surge	Flooding from Canals	Tidal Flooding	Saltwater Intrusion	Groundwater Flooding	Stormwater Flooding	Shoreline Erosion	Waves
Rise in ocean water levels from coastal storms	Overtopping of canal banks from heavy rains, and higher than normal high tides in coastal areas	Higher than normal high tides which may occur absent storm conditions and compromise drainage infrastructure	Movement of saline ocean water into freshwater acquirers	Elevated groundwater tables due to rising tides	Caused by heavy rains overwhelming drainage infrastructure and natural percolation	Loss of beach sediment due to natural processes and accelerated by sea level rise and heavy storms	Ocean waves can lead to erosion and cause damage to structures during storm events

regional unified sea level rise projections

Link

Unified Sea Level Rise Projection
(Southeast Florida Regional Climate Change Compact, 2019)

Year	IPCC Median (inches)	NOAA Intermediate High (inches)	NOAA High (inches)
2040	10	17	21
2070	21	40	54
2120	40	92	136

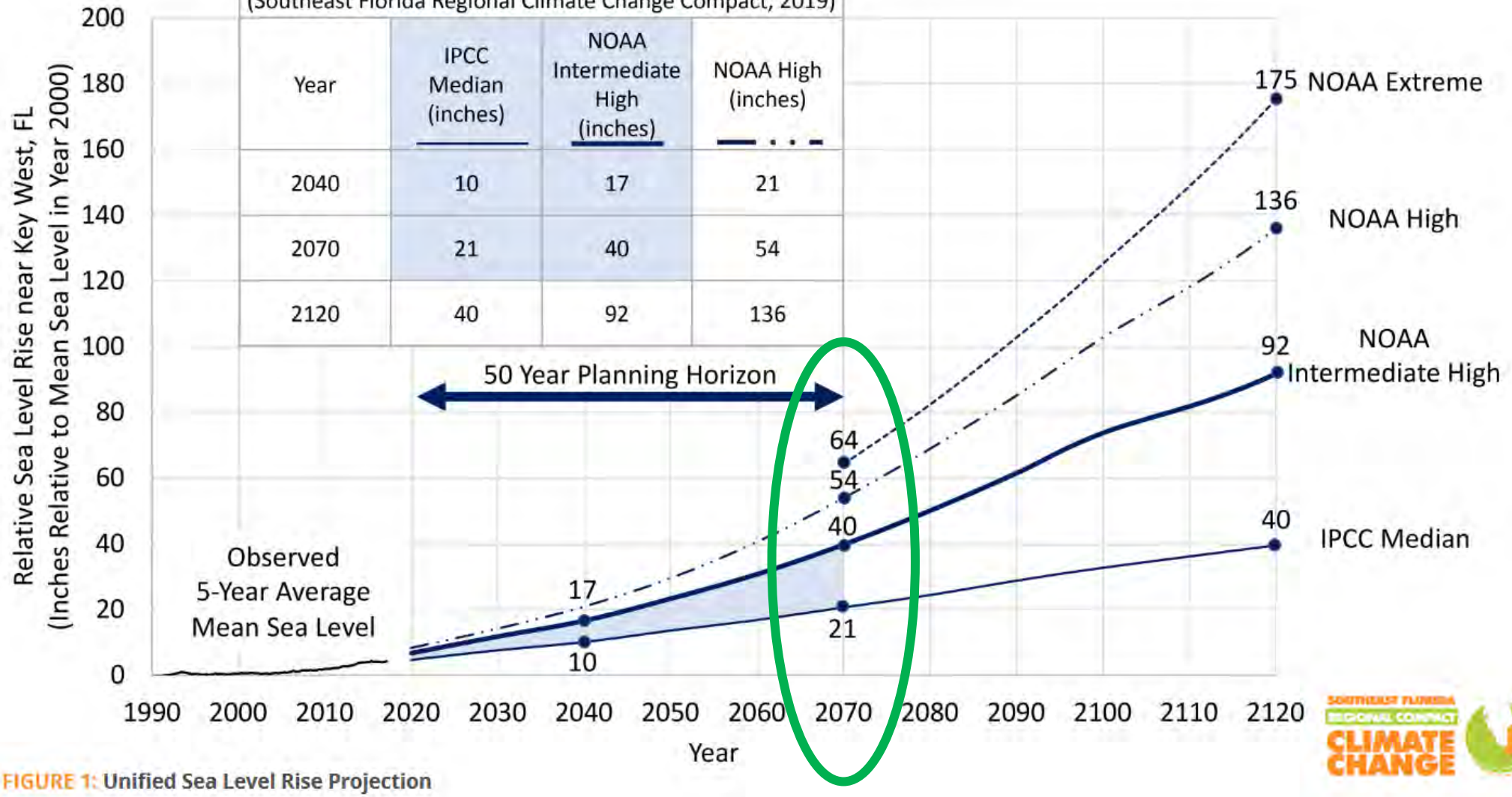
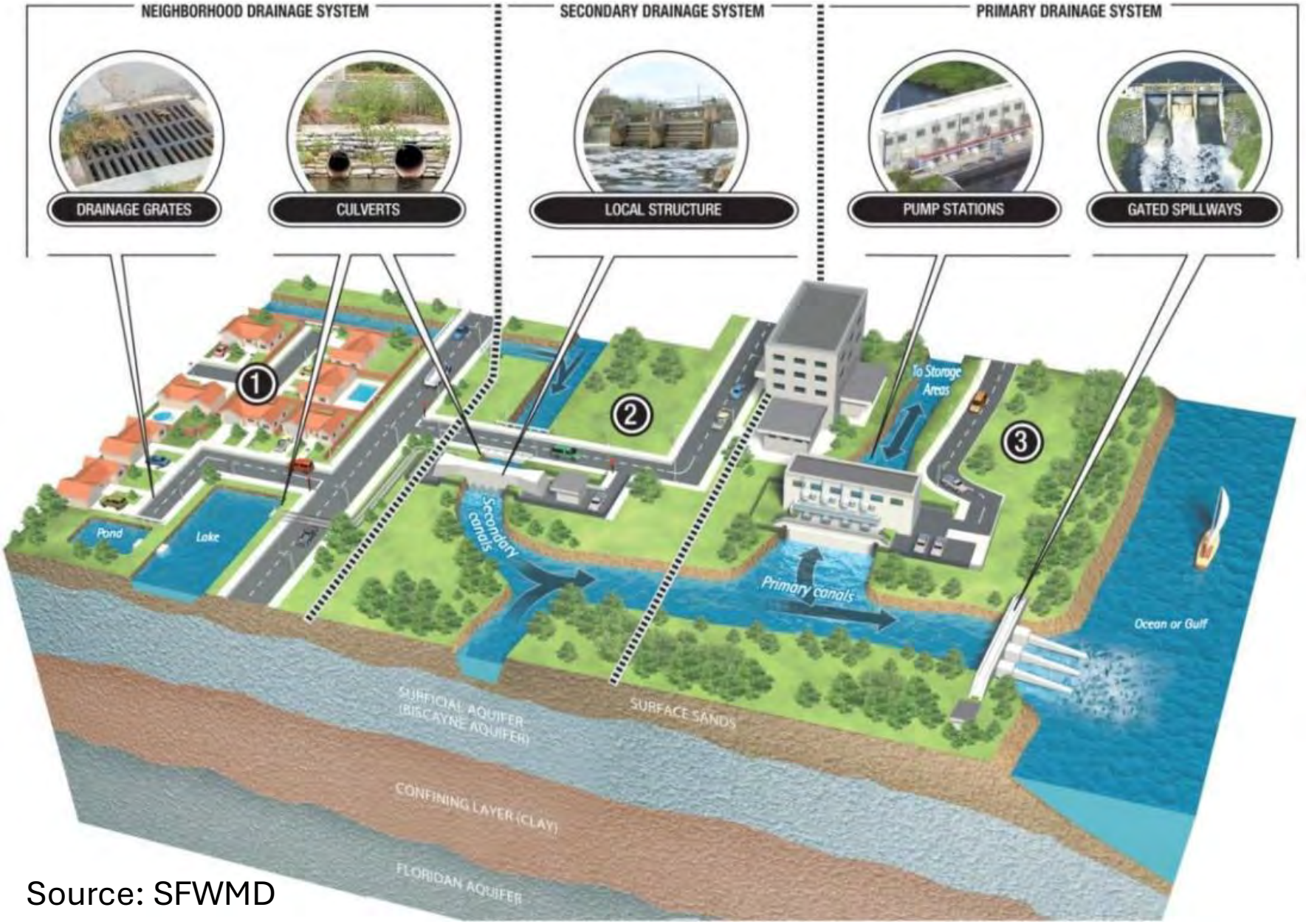


FIGURE 1: Unified Sea Level Rise Projection

Drainage System: Central & Southern Florida (C&SF) Flood Control Project



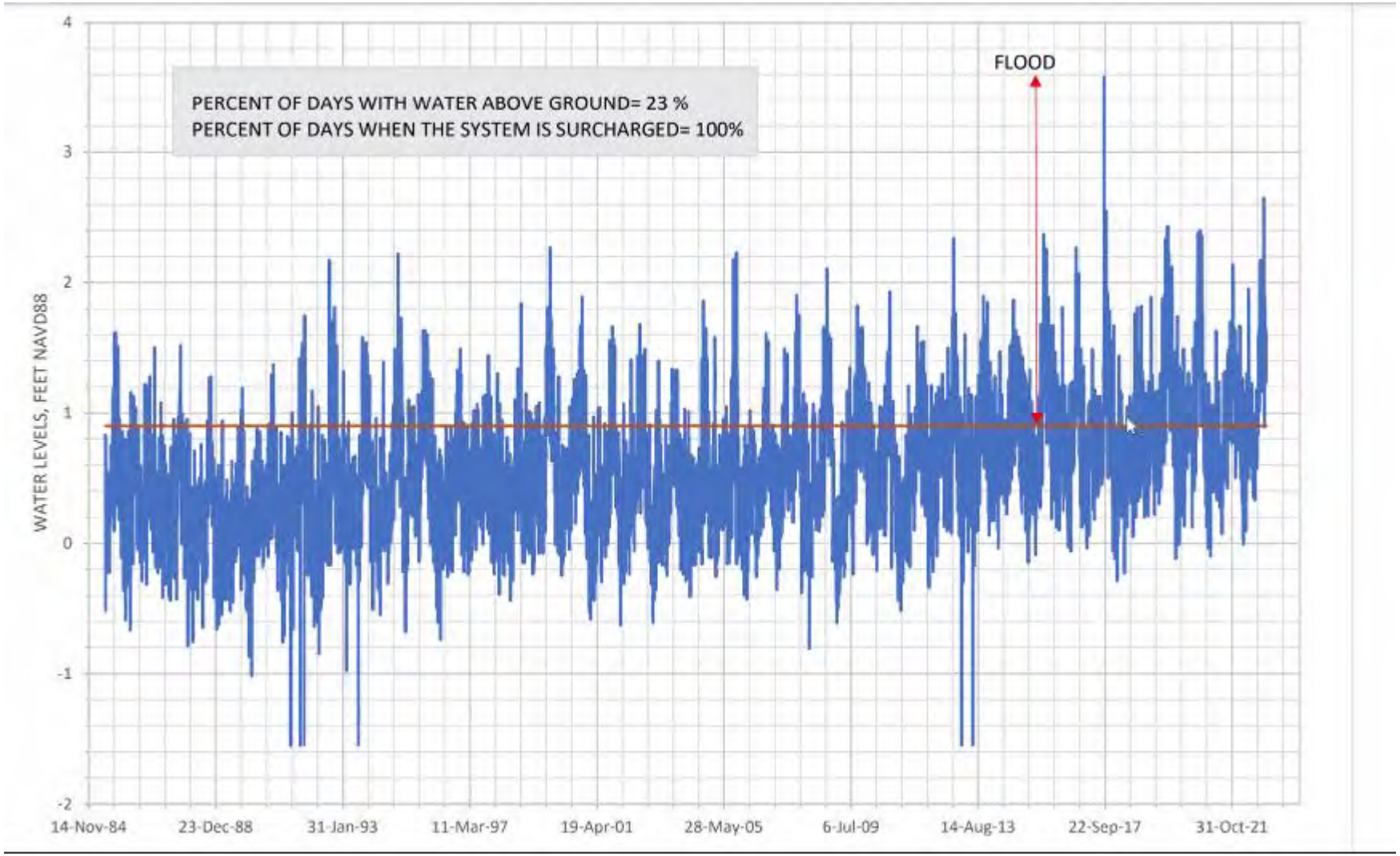
Source: SFWMD

KEY POINT:

Most canals rely on gravity to drain which is limited by sea level rise.

Canals have decades old salinity control structures that are being retrofitted by SFWMD for storm surge and combined with new large forward pump stations to maintain or improve the flood protection level of service (FPLOS)

Historic Water Levels – Mouth of Biscayne Canal



Over last ~40 years, average and peak water levels are increasing at mouth of Biscayne Canal and in some cases exceeding lowest stormwater drainage inlets (red line)


El Portal
95
YouFit Gyms
Pelican Harbor Marina
North Bay Village
Little River Adaptation Action Area (AAA)
~60-100
DAYS
PER YEAR
NO ACTION
SEA LEVEL RISE PROGRESSION
savinomiller

Adaptation Approaches

https://www.miamidade.gov/sealevelrisestrategy

GUIDING PRINCIPLES

ALL ADAPTATION ACTIONS MUST :

1. **Make us safer** over time by helping protect lives and incrementally protecting the community from storms and multiple flood risks. Actions should not increase vulnerability to other hazards.
2. **Be equitable** by recognizing that historic, unjust discriminatory policies. Actions should be driven by inclusive engagement, fair policies, and direct investments and resources to target these disparities.
3. **Reduce environmental pollution** by not adding greenhouse gas emissions or other pollutants to our air and waterways. Actions should not be implemented at the expense of the environment and human health.
4. **Be flexible** and able to respond to changing conditions such as faster rates of sea level rise.
5. **Build with nature** by working with natural processes and natural materials to address long-term flooding hazards.
6. **Align with other initiatives** and plans such as the Miami- Dade County Comprehensive Development Master Plan, the Long-Range Transportation Plan, the Parks and Open Space Systems Master Plan, the Resilient305 Strategy, the Central and Southern Florida Flood Resiliency Study, and others.

https://www.miamidade.gov/sealevelrisestrategy

Sea level rise requirements

Resolution R451-14, Ordinance 14-79

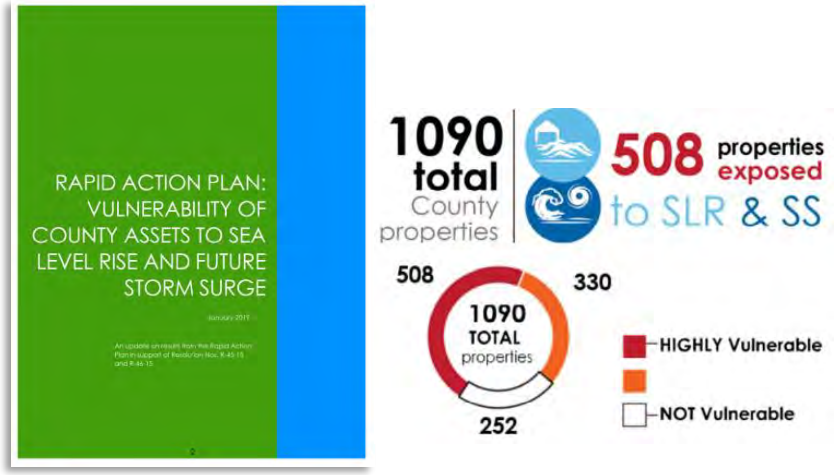
"all County infrastructure projects, ... shall consider sea level rise projections and potential impacts as best estimated at the time of the project, using the regionally consistent **unified sea level rise projections**, during **all project phases** including but not limited to planning, design, and construction, **in order to ensure that infrastructure projects will function properly for fifty (50) years** or the design life of the project, whichever is greater."

- In order to comply with Resolution No. R-451-14, Ordinance No. 14-79, and CDMP policy LU-13E

Return on Investment

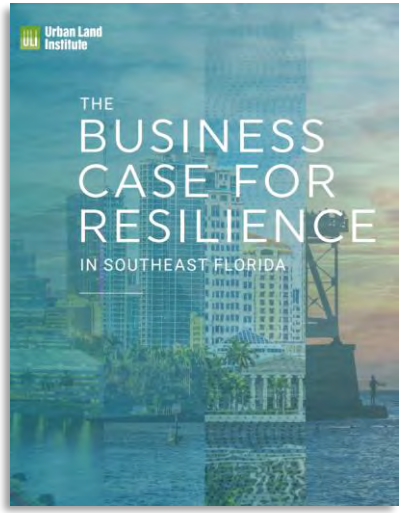
Water & Sewer Department (WASD)

A relatively **small initial increase in construction costs (~5%)** to reduce vulnerability is significantly less expensive than the costs to repair and replace unprotected assets



MDC Rapid Action Plan: Vulnerability to Sea Level Rise & Storm Surge:

An additional $6 million investment in resilience measures could protect more than $158 million in capital projects and avoid $24 million in damage and repairs. Preliminary cost-estimates suggested that potential damages could be mitigated with a **4% increase in project budgets**.



Regional & National Reports

Regional study: Can achieve **benefit-cost ratios of 4:1 to 8:1** for implementing adaptation measures.

National studies: Investing **$1 today** in flood hazard mitigation **can save $7 in the future**

Applying the SLR projections

"…in order to ensure that infrastructure projects will function properly for fifty (50) years or the design life of the project, whichever is greater."

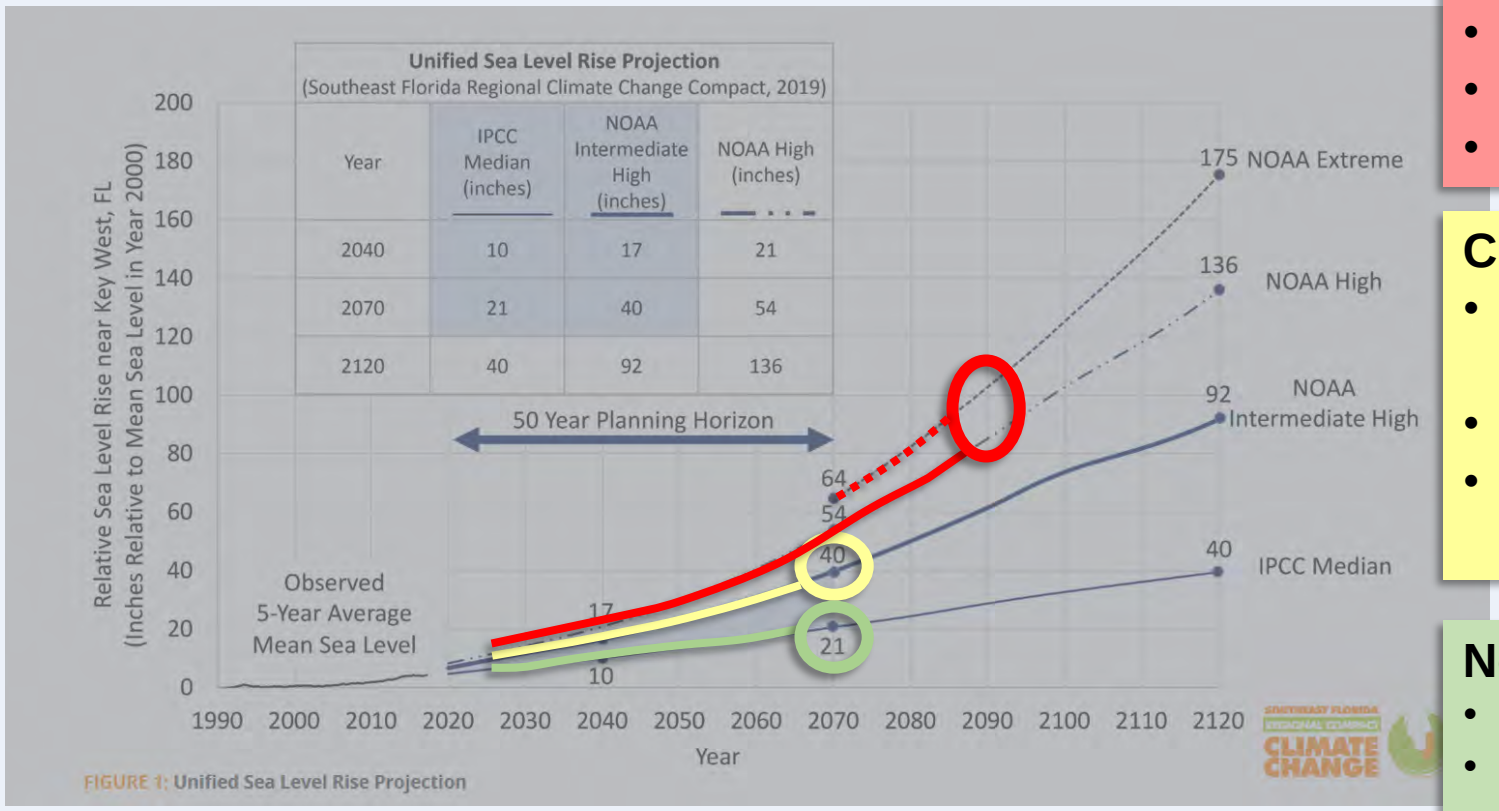


FIGURE 1: Unified Sea Level Rise Projection

Very Critical ---- > NOAA High/Extreme

- Project or asset failure is not acceptable
- Design life > 50-70 years, highly interdependent
- Ex: water treatment plant, bridge, power plant

Critical ---- > NOAA Intermediate-High

- Project or asset with serious consequence of failure
- Design life > 50 years, our services rely on funct
- Ex: government facilities, pump station, access road

Not Critical ---- > IPCC Median

- Project or asset with limited consequence of failure
- Easily replaced, short lifespan (<30 years), adaptable, limited interdependence
- Ex: small culvert in isolated area, small park

Project Example: DTPW

MIAMI-DADE COUNTY

SOUTH-DADE ELECTIC BUS MAINTENANCE FACILITY SOUTH-DADE ELECTIC BUS MAINTENANCE FACILITY

60% DESIGN RECOMMENDATIONS, CLIMATE RISK ASSESSMENT

Prepared by

WSP USA Inc
7650 Corporate center Drive, suite 300
Miami, FL 33126

Prepared for

Department Transportation and Public Works, Office of Resilience, Miami-Dade County

1 EXECUTIVE SUMMARY 1

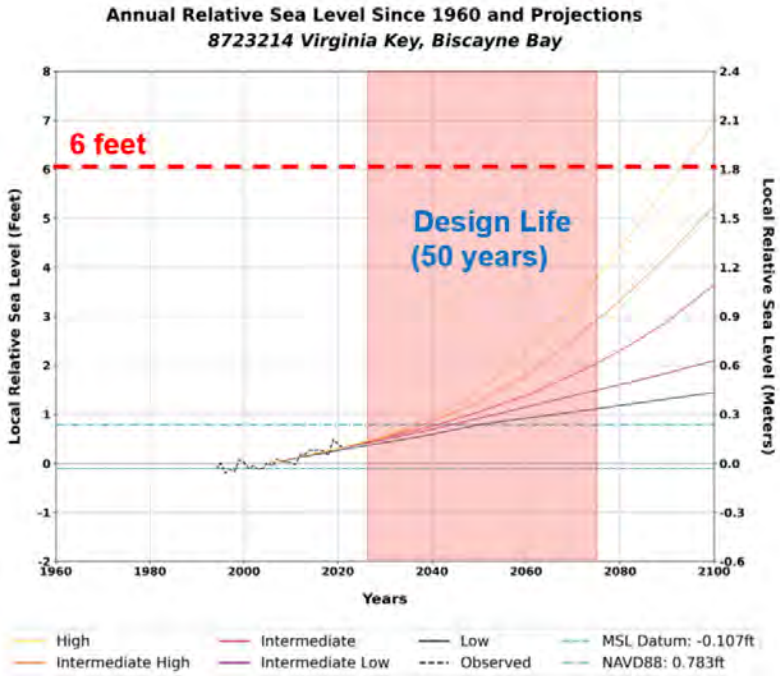
2 INTRODUCTION 3

3 CONTEXT 4

4 CLIMATE HAZARDS ANALYSIS 8

5 ASSET VULNERABILITY, PRELIMINARY STRATEGIES TO INCREASE RESILIENCE 26

6 RECOMMENDATIONS TO REDUCE CLIMATE RISK 31



Storm Surge Event Probability	Return Period	Probability of occurring over project design life* of 50 years	Current Conditions *(Feet above NGVD29)*	2.73ft of Sea-Level Rise *(Feet above NGVD29)*
1% annual chance	100 years	39.5%	8.8ft (7.2-10.6ft)	10.2ft (8.4-12.0ft)
0.5% annual chance	200 years	22.2%	10.3ft (8.4-12.1ft)	11.9ft (10.0-13.7ft)
0.2% annual chance	500 years	9.5%	12.5ft (10.6-14.4ft)	13.9ft (12.0-15.8ft)

Table 3: The water surface elevation at the facility site for storm surge events with selected frequencies in both current conditions and with 2.73 feet of local sea-level rise. *Probability of occurring over the project design life assumes no sea-level rise, and the probabilities are given for illustrative purposes only.

ADAPTIVE PLANNING AND DESIGN

PATHWAYS

Table 1. Project typical design life

Project components	Design Life
Street asphalt pavement, pavers, and green infrastructure	10-20 years
Drainage systems, concrete pavement, most building retrofits	20-30 years
Most buildings, seawalls	30-50+ years

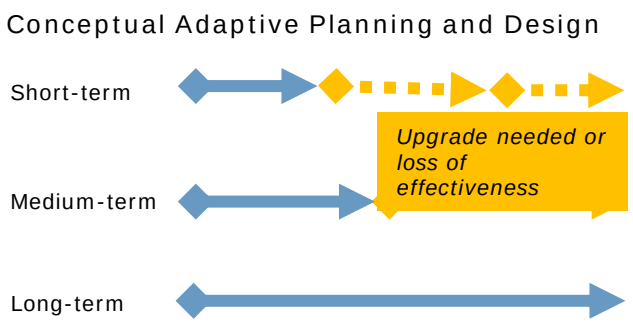
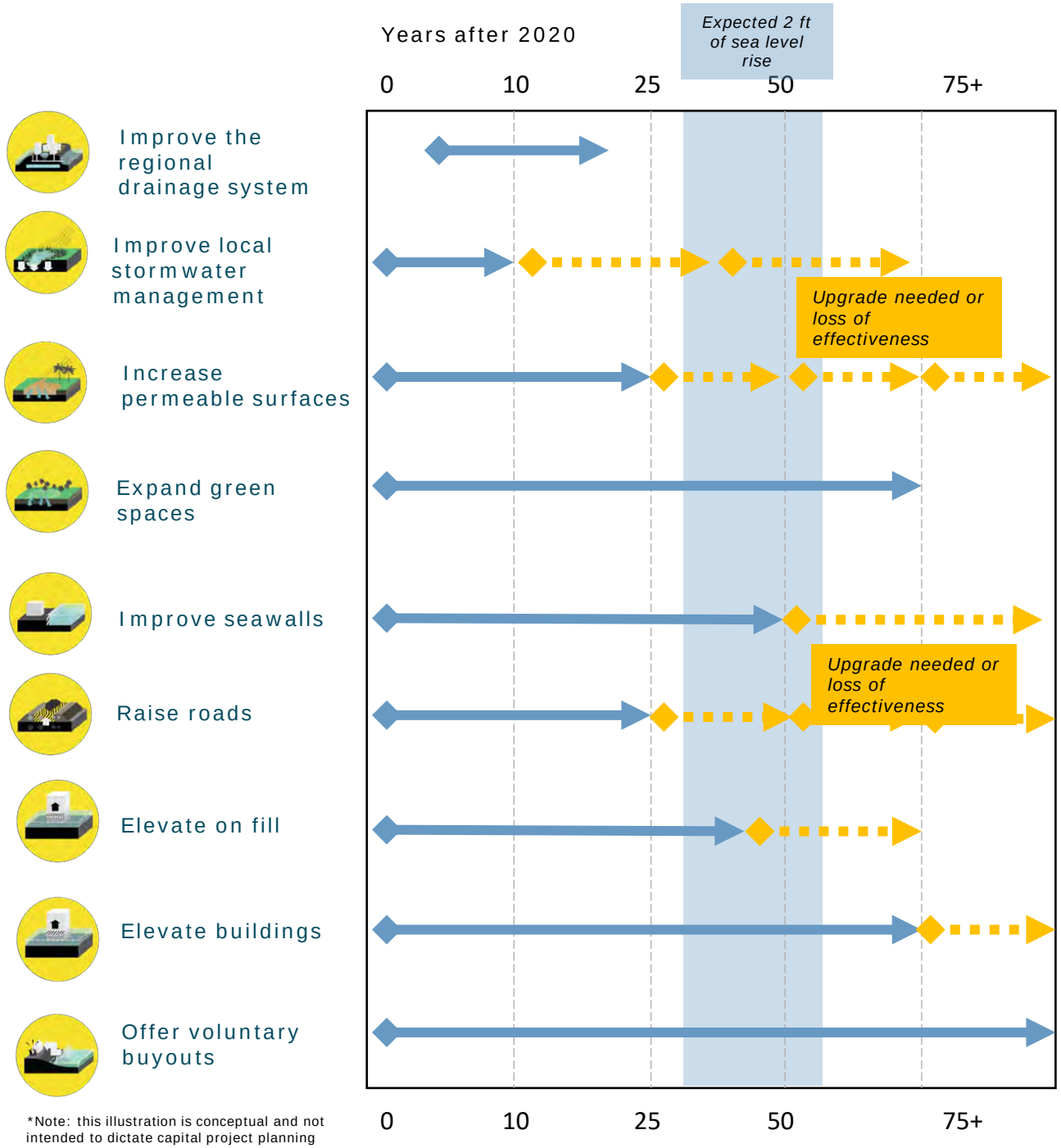
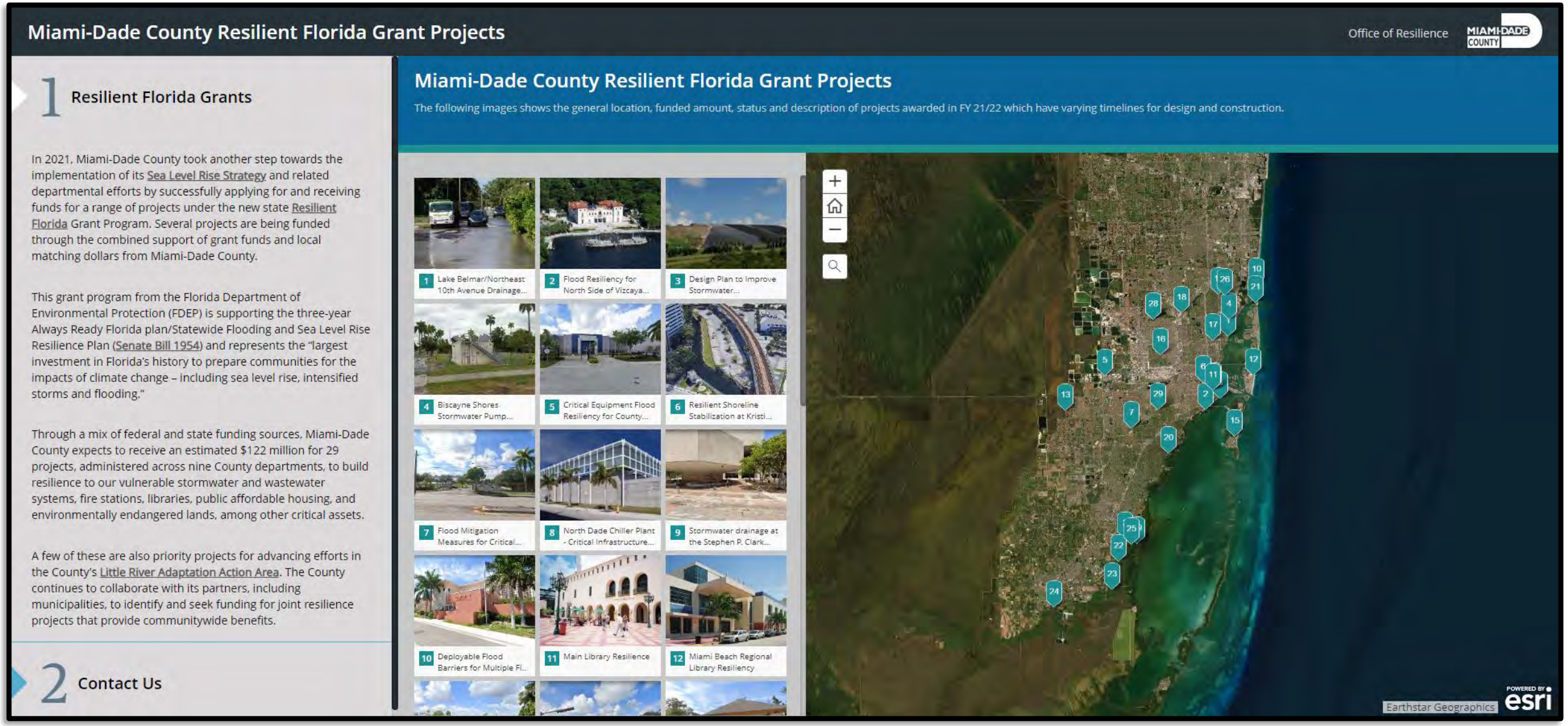


Figure 75. Illustration of adaptative planning and design, including short, medium and long-term.



*Note: this illustration is conceptual and not intended to dictate capital project planning



https://mdc.maps.arcgis.com/apps/MapSeries/index.html?appid=8987efa644d24f54a2f6ee5d3cb937d8

Strengthening Systems Through Related Studies

Everglades (CERP & BBSEER)

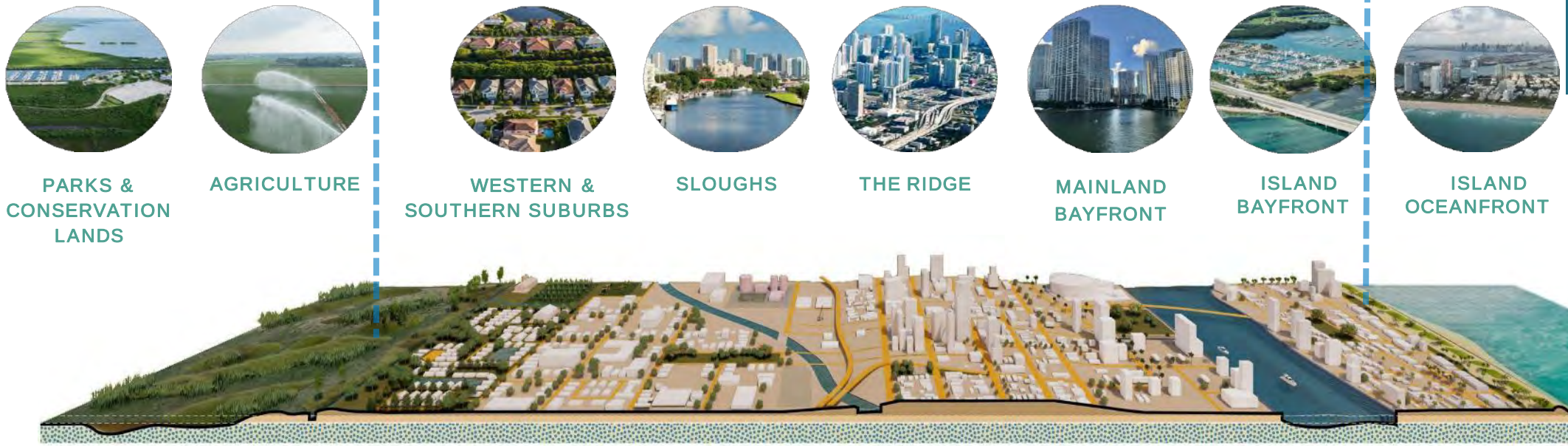
'Back Bay' CSRM Study

Central and Southern Florida (C&SF) '216' Resiliency Study
emphasis on canal system

'Beach' CSRM Reauthorized in 2022
renourishment & dune enhancement

PortMiami CSRM

Key Biscayne CSRM
Combined ocean front & back bay study



Other Efforts: SFWMD Level of Service (LOS) | County & Municipal Resilience, Stormwater Master Plans, etc. | Biscayne Bay Reasonable Assurance Plan

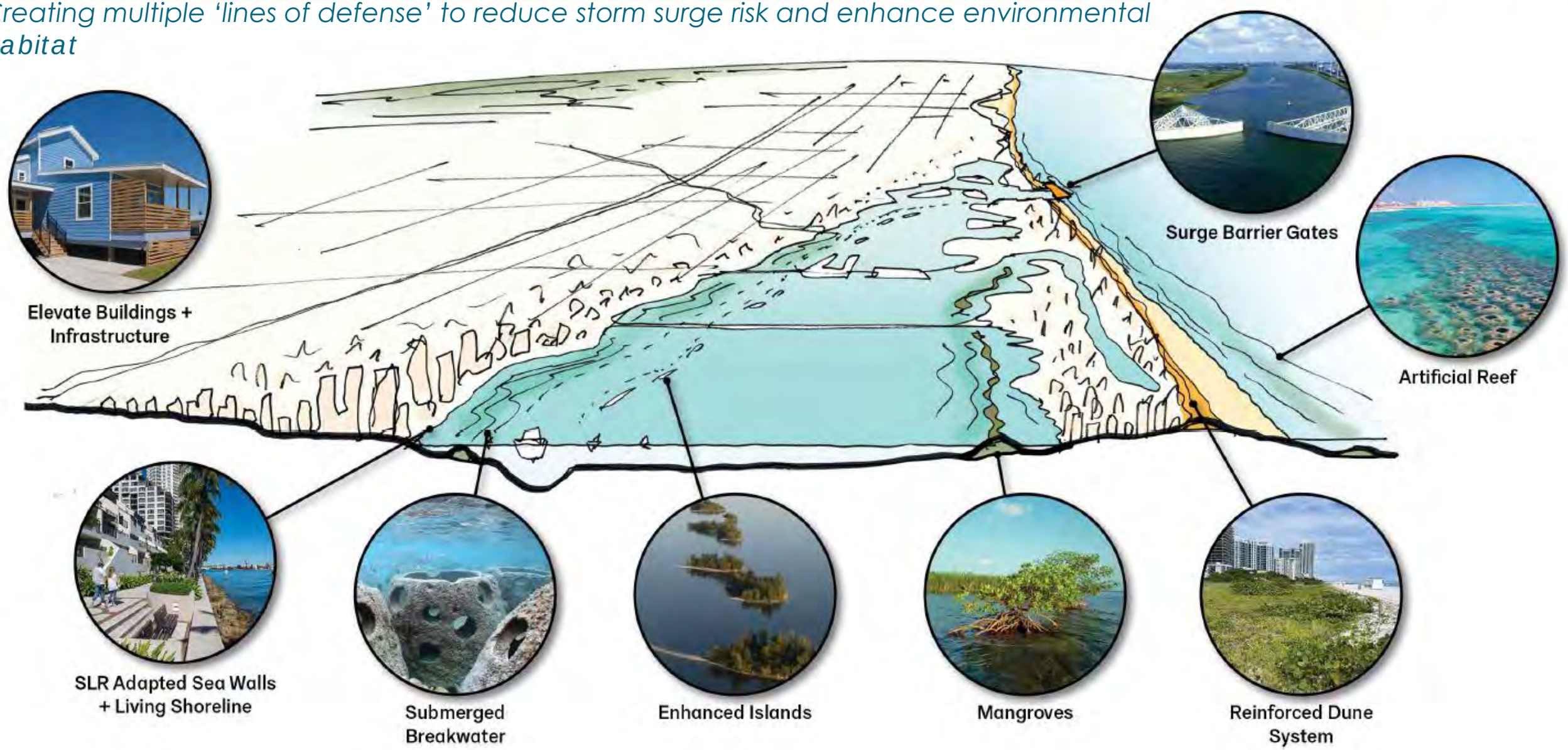
Proposed Atlantic Coastline Alternative

Illustrative concepts inclusive of November 2022 Charrette and January 2023 Meetings

MIAMI-DADE COUNTY

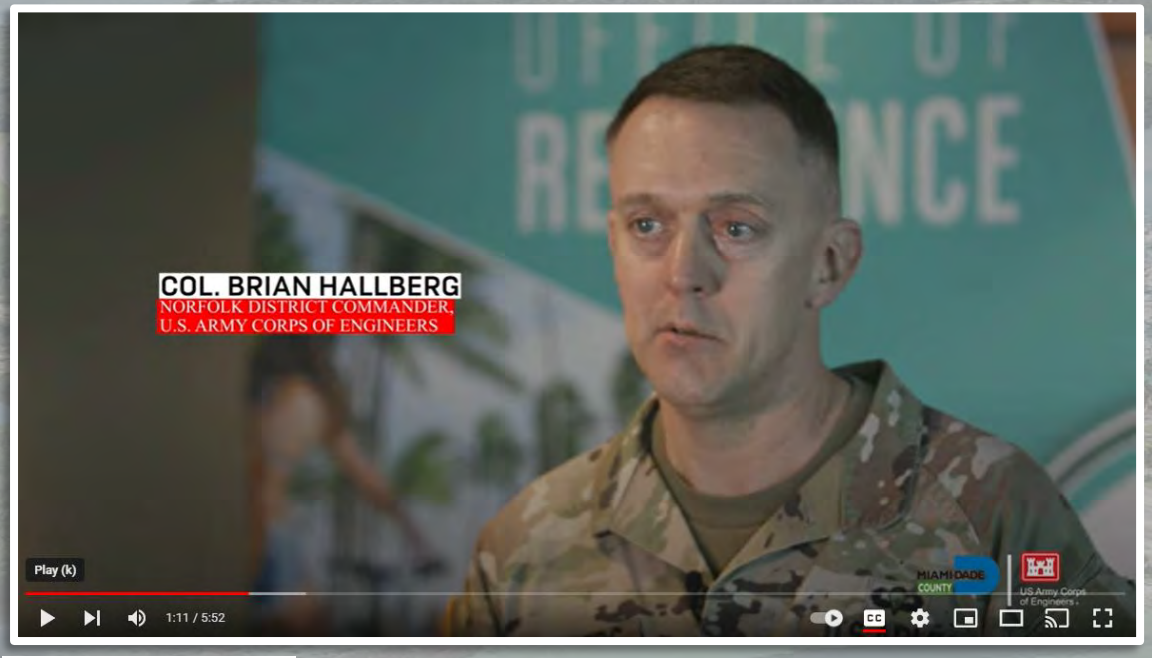
moffatt & nichol

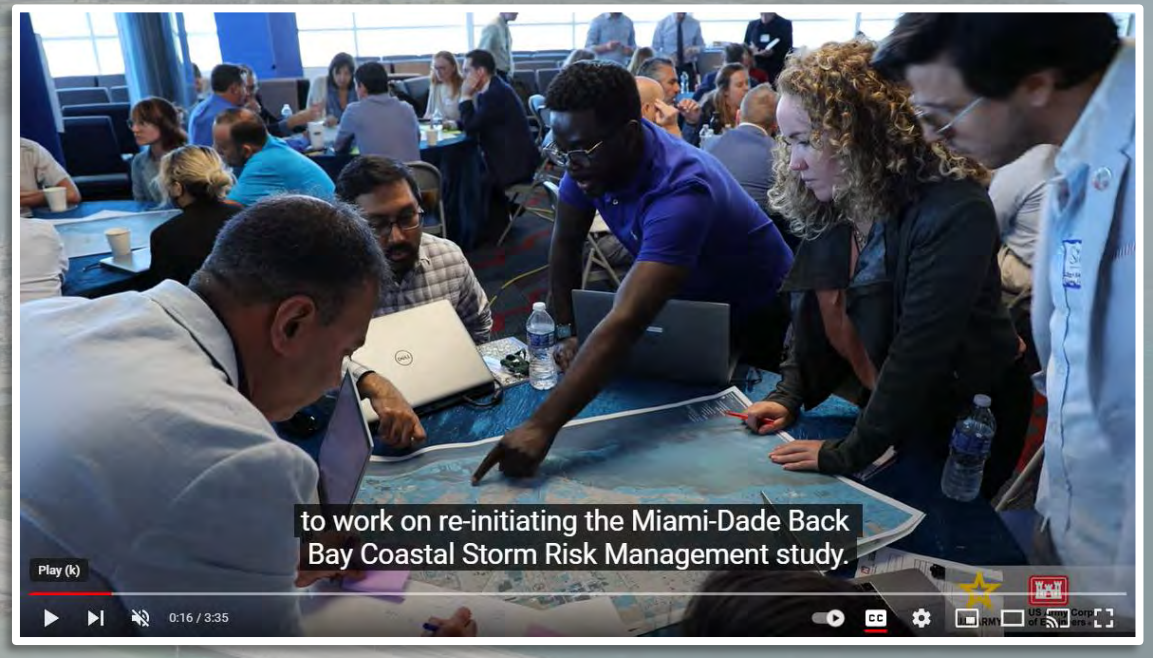
Creating multiple 'lines of defense' to reduce storm surge risk and enhance environmental habitat



March 2023 Design Charrette

YouTube Videos & Takeaways





Scan to watch YouTube Video

https://www.youtube.com/watch?v=WFevVcID5P0

Explored range of storm surge risk reduction strategies by **creating 'Lines of Defense"**:

- hybrid reefs offshore,
- reinforced and elevated dune & beachwalk
- *surge gates at inlets, line or protection for Fisher Island, Virginia Key, to Rickenbacker Cswy
- living shorelines and restored mangrove islands,
- elevation of homes & floodproofing of businesses,
- expanded restoration near Cutler Bay,
- protection of critical facilities

Scan to watch YouTube Video

https://www.youtube.com/watch?v=J_b3vTizzYU

Thank you ☺

Contact me any time at:

Christian Kamrath
Resilience Program Manager | Adaptation
Miami-Dade County Office of Resilience

Christian.kamrath@miamidade.gov

symbiotic house

Non-County initiatives

Symbiotic House is a project catalyzed by Lee Pivnik in 2022 to research and develop adaptive architectural solutions to Miami's environmental precarity, and to conceptualize and design a "multi-use space for multi-species survival". The project's aim is to reimagine the home as a potential site for climate care, an active hub for offsetting carbon emissions, rewilding landscape, supporting biodiversity, and adapting to environmental change. *Symbiotic House* will ultimately manifest as a living earthwork that functions as a regenerative shelter and center for interdisciplinary art and ecology research in South Dade.

The project intends to broaden the design process so that the space emerges organically through communal workshops, open research, and constant feedback. It is meant to invite the local community of South Florida into a collective act of dreaming up new practices for how to best adapt to the intersecting climate and housing crises, so that the people living at the epicenter of these issues are treated as the experts in mitigating them.

https://symbiotic.house/

- →00 HABITAT
- →01 INDIGENOUS STRUCTURES + CULTURAL LANDSCAPES
- →02 SETTLER VERNACULAR
- →03 HURRICANE HARDENING
- →04 AQUATECTURE
- →05 FLORIDA FUTURISM
- →06 FOOD FORESTS & PERMACULTURE
- →07 LIVING MATERIALS
- →08 REGENERATIVE DESIGN
- →09 SOCIAL SPACE
- →10 ORGANICISM

AI VISIONING

"A coastal house made of oolite and shells, located by mangroves, where manatees and humans live and swim in harmony" Monica Uszerowicz

https://symbiotic.house/AI-VISIONING-2