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TAYLOR ENGINEERING, INC.

FLORIDA SHORE & BEACH PRESERVATION ASSOCIATION

A League of Cities and Counties on Beach and Coastal Issues

38th Annual National Conference on Beach Preservation Technology

Weathering the Storm: Lessons from the Resilient Pasco Project on Building Coastal Resilience

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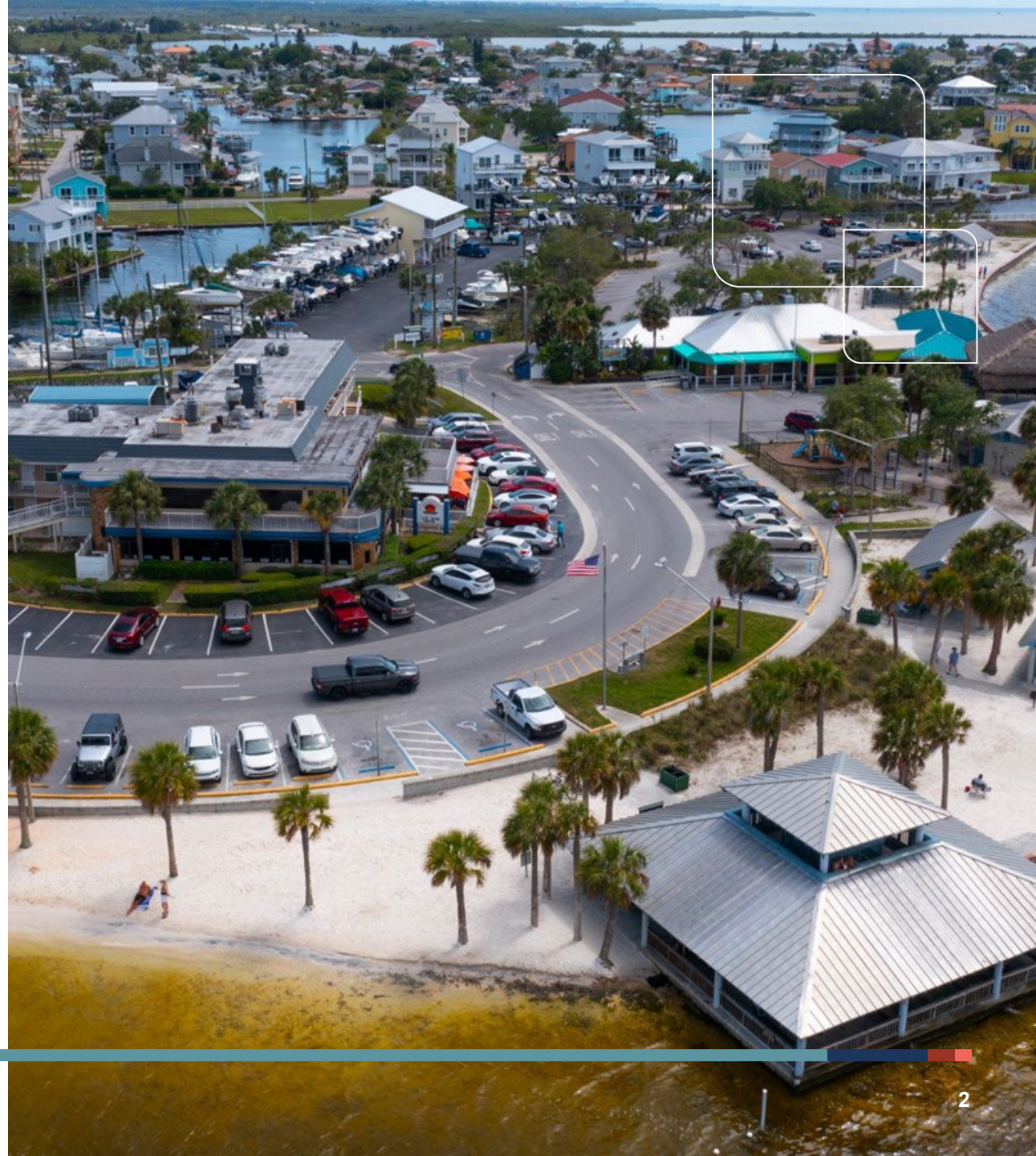
ACKNOWLEDGMENTS

- **CDBG-MIT Grant Funding:** HUD
- **Grant Administration:** FloridaCommerce
- **Client:** Pasco County, Florida
- **Prime Consultant:** Halff
- **Coastal Expertise:** Taylor Engineering
- **Resilience Expertise:** Fernleaf

Resilient PASCO

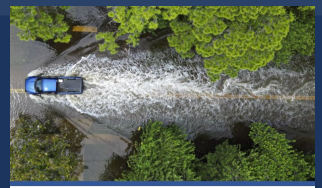


INTRODUCTION

- The Resilient Pasco Project (RPP) is a community sustainability and resilience initiative to assess extreme weather and climate-related threats.
- The RPP consists of:
  - Countywide Risk & Vulnerability Assessment
  - Resilience & Sustainability Action Plan
  - Living Shorelines Plan
- Developed between 2023 and 2025, the purpose was to evaluate vulnerabilities applicable to tidal flooding, storm surge, sea level rise (SLR), rainfall, compound flooding, and heat intolerance.
- Highly collaborative and stakeholder-driven effort with contributions from hundreds of people.

PROCESS

Establishing Context



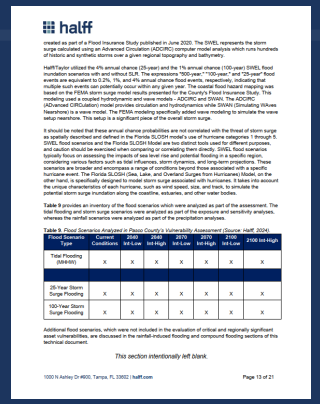
Resilient PASCO

Phase 1: Priority Analysis

Prepared by Halff, Taylor Engineering, Fernleaf

Prepared for PASCO County Florida

Data Collection and Analysis



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created as part of a Flood Insurance Study published in June 2020. The SWEL represents the storm surge calculated using an Advanced Circulation (ADCIRC) computer model analysis which runs hundreds of historic and synthetic storms over a given regional topography and bathymetry.

Halff/Taylor utilized the 4% annual chance (25-year) and the 1% annual chance (100-year) SWEL flood inundation scenarios with and without SLR. The expressions "500-year," "100-year," and "25-year" flood events are equivalent to 0.2%, 1%, and 4% annual chance flood events, respectively, indicating that multiple such events can potentially occur within any given year. The coastal flood hazard mapping was based on the FEMA storm surge model results presented for the County's Flood Insurance Study. This modeling used a coupled hydrodynamic and wave models – ADCIRC and SWAN. The ADCIRC (ADvanced CIRCulation) model provides circulation and hydrodynamics while SWAN (Simulating WAves Nearshore) is a wave model. The FEMA modeling specifically added wave modeling to simulate the wave setup nearshore. This setup is a significant piece of the overall storm surge.

It should be noted that these annual chance probabilities are not correlated with the threat of storm surge as spatially described and defined in the Florida SLOSH model's use of hurricane categories 1 through 5. SWEL flood scenarios and the Florida SLOSH Model are two distinct tools used for different purposes, and caution should be exercised when comparing or correlating them directly. SWEL flood scenarios typically focus on assessing the impacts of sea level rise and potential flooding in a specific region, considering various factors such as tidal influences, storm dynamics, and long-term projections. These scenarios are broader and encompass a range of conditions beyond those associated with a specific hurricane event. The Florida SLOSH (Sea, Lake, and Overland Surges from Hurricanes) Model, on the other hand, is specifically designed to model storm surge associated with hurricanes. It takes into account the unique characteristics of each hurricane, such as wind speed, size, and track, to simulate the potential storm surge inundation along the coastline, estuaries, and other water bodies.

Table 9: *Flood Scenarios Analyzed in Pasco County's Vulnerability Assessment (Source: Halff, 2024).*

Flood Scenario Type	Current Conditions	2040 Int-Low	2040 Int-High	2070 Int-Low	2070 Int-High	2100 Int-Low	2100 Int-High
Total Flooding (NWHR)	X	X	X	X	X	X	X
25-Year Storm Surge Flooding	X	X	X	X	X	X	X
100-Year Storm Surge Flooding	X	X	X	X	X	X	X

Additional flood scenarios, which were not included in the evaluation of critical and regionally significant asset vulnerabilities, are discussed in the rainfall-induced flooding and compound flooding sections of this technical document.

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Risk & Vulnerability Assessment (R&VA)

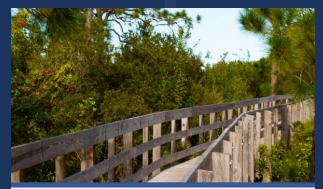
Resilient PASCO

Risk & Vulnerability Assessment Executive Summary

Prepared by Halff, Fernleaf, Taylor Engineering

Prepared for PASCO County Florida

Resilience & Sustainability Action Plan (RSAP)



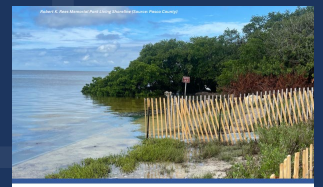
Resilient PASCO

Resilience & Sustainability Action Plan (RSAP)

Prepared by Halff, Fernleaf, Taylor Engineering

Prepared for PASCO County Florida

Living Shorelines Plan (LSP)



Resilient PASCO

Phase 5: Living Shorelines Plan

Prepared by Halff, Taylor Engineering

Prepared for PASCO County Florida

CONTEXT

- Pasco County encompasses 868 square miles of land, water, and wetlands.
- 12th most populous county in Florida, with a population nearing 600,000 residents.
- Low-lying topography with large population densities in coastal areas (i.e., Port Richey, New Port Richey).
- Coastal communities faced notable storm surge during Hurricanes Idalia (2023), Debby (2024), Helene (2024), and Milton (2024).
- Fragmented and siloed local government efforts resulted in the need for a comprehensive approach to long-range infrastructure planning.

Outcomes

Phase 1 Priority Analysis Report (143 Pages)

Hurricane Idalia After Action Report (12 Pages)


Hurricane Idalia (2023)


Hurricane Debby (2024)


Hurricane Helene (2024)


Hurricane Milton (2024)

RISK ASSESSMENT

- Incorporates both technical data and local factors to evaluate current conditions and the planning horizons of 2040, 2070, and 2100.
- Extended beyond Section 380.093, Florida Statutes, to evaluate:
  - Extreme Heat Vulnerabilities
  - Social Vulnerabilities
  - Depth-Damage Functions (DDFs)
  - Detailed Mapping of Focus Areas
  - Fiscal Analysis
  - Integration of AccelAdapt

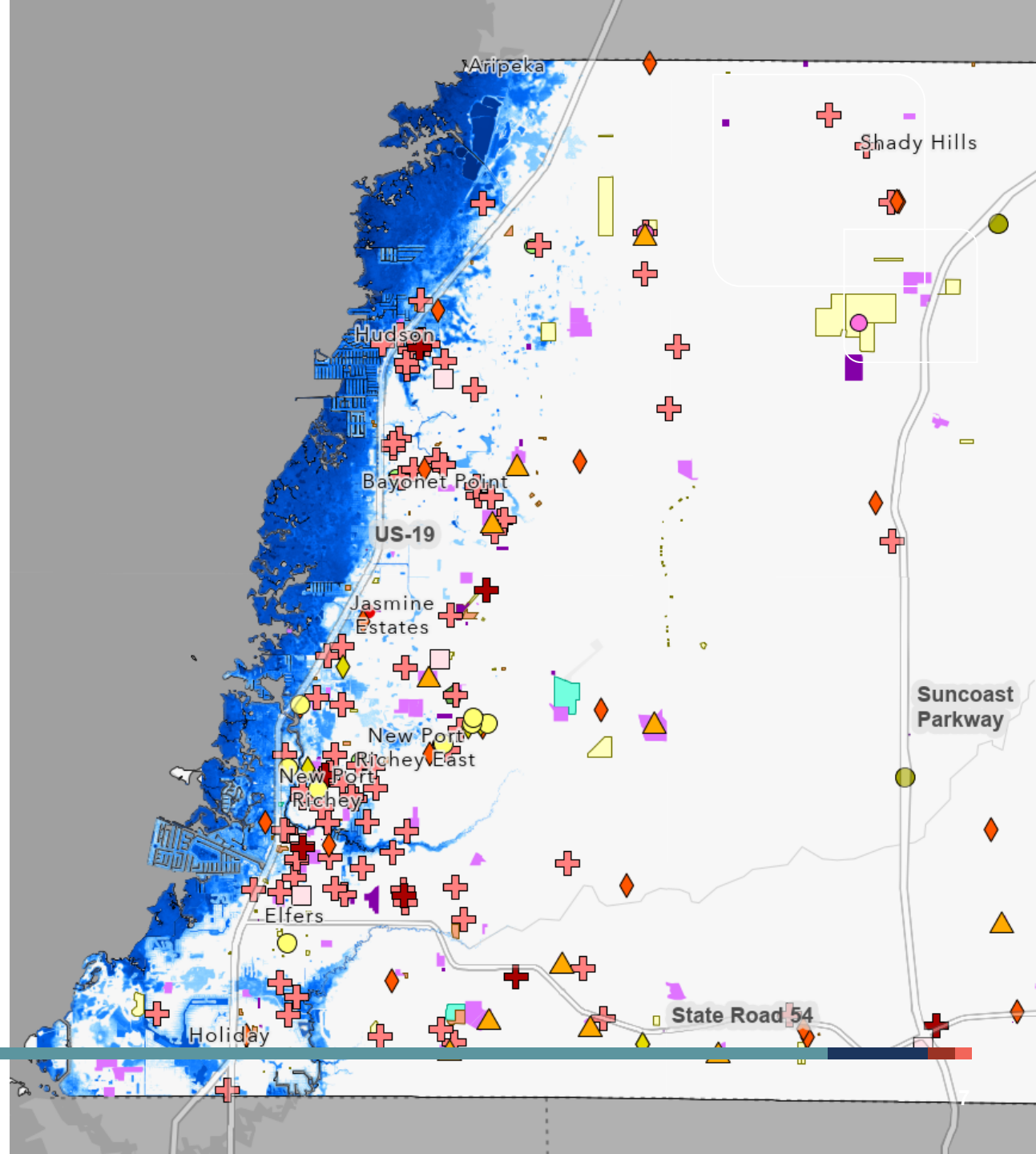
Outcomes

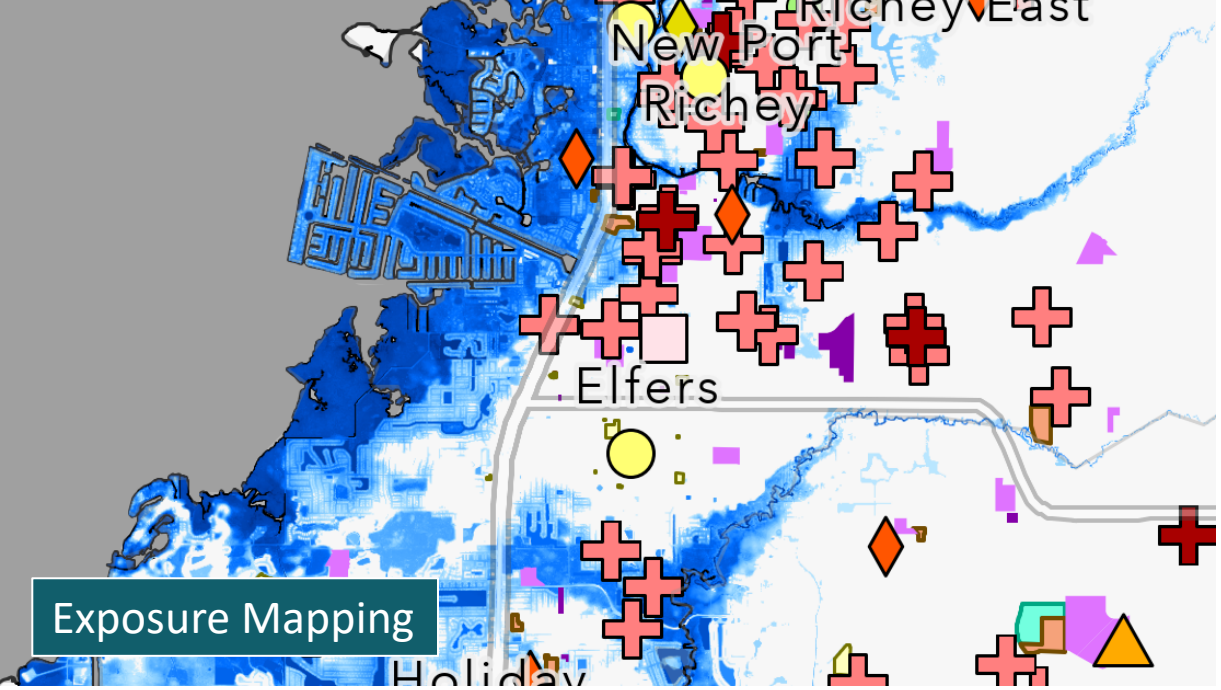
Critical Asset Geodatabase and Flood Rasters

Final Report and Technical Appendices (159 Pages)

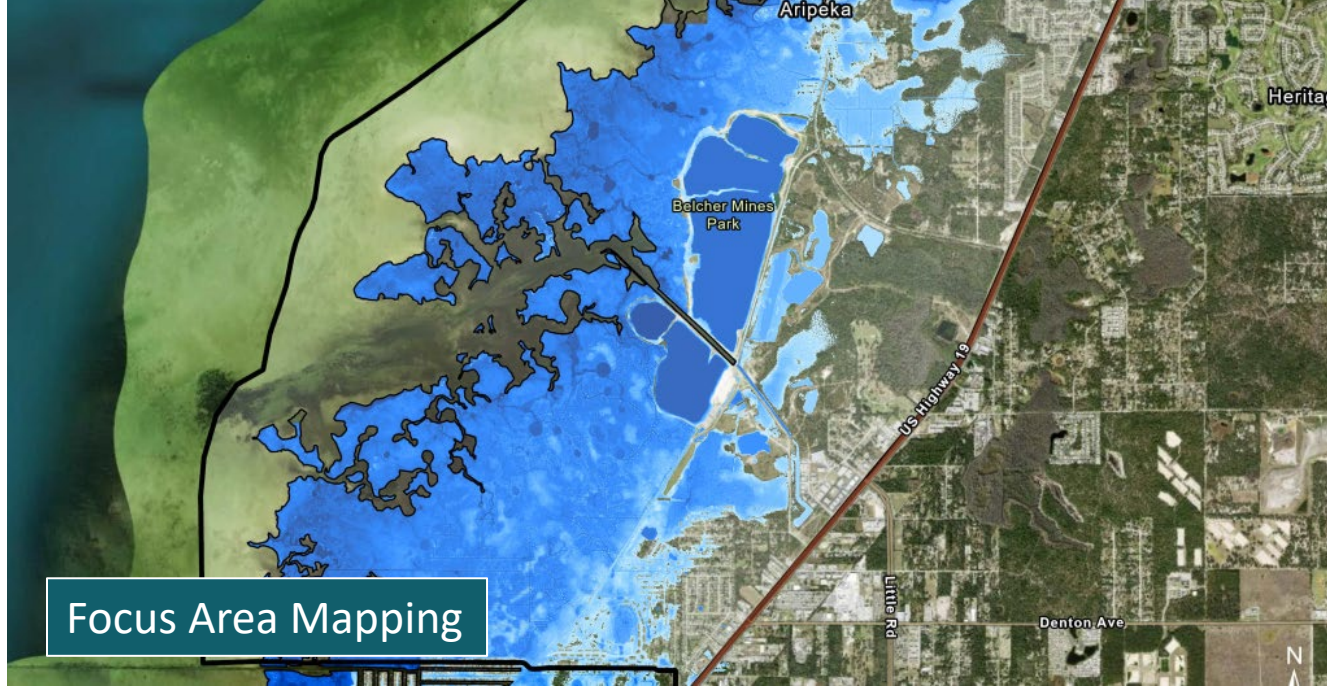
88 Exposure Maps, 8 Rainfall Maps, 1 Compound Map, 4 Extreme Heat Maps, and 70 Focus Area Maps

AccelAdapt Digital User Interface

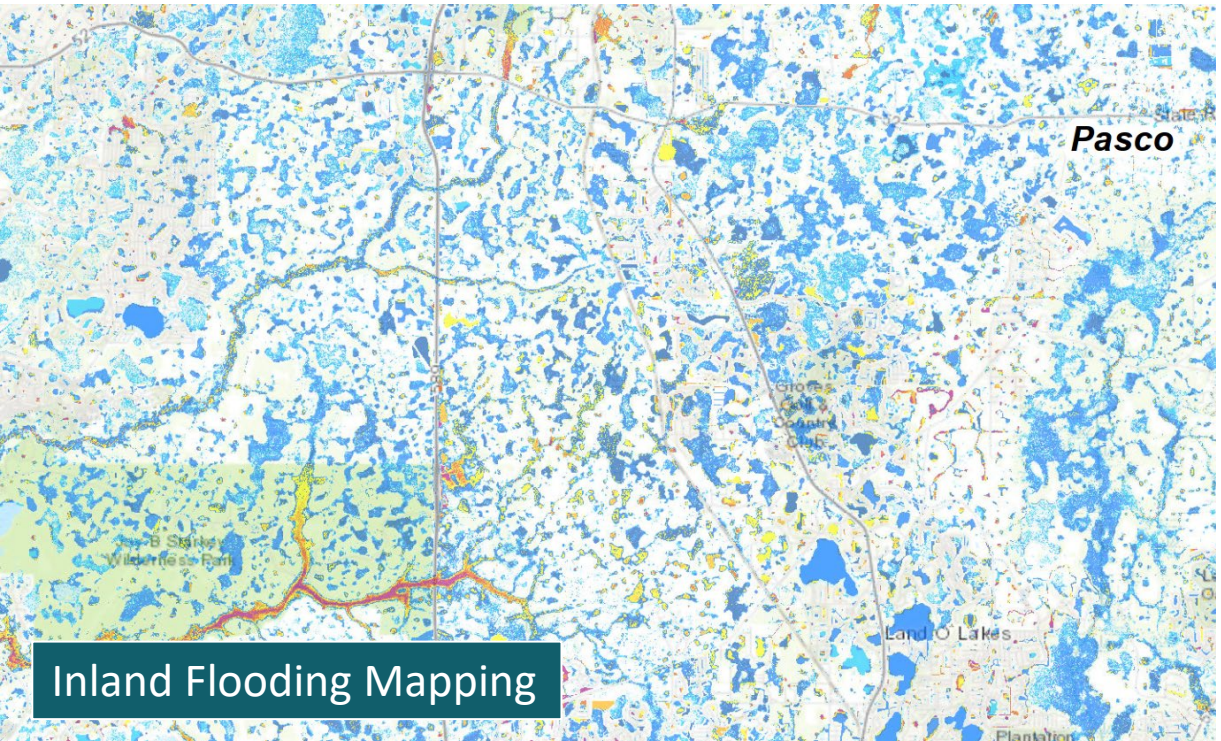




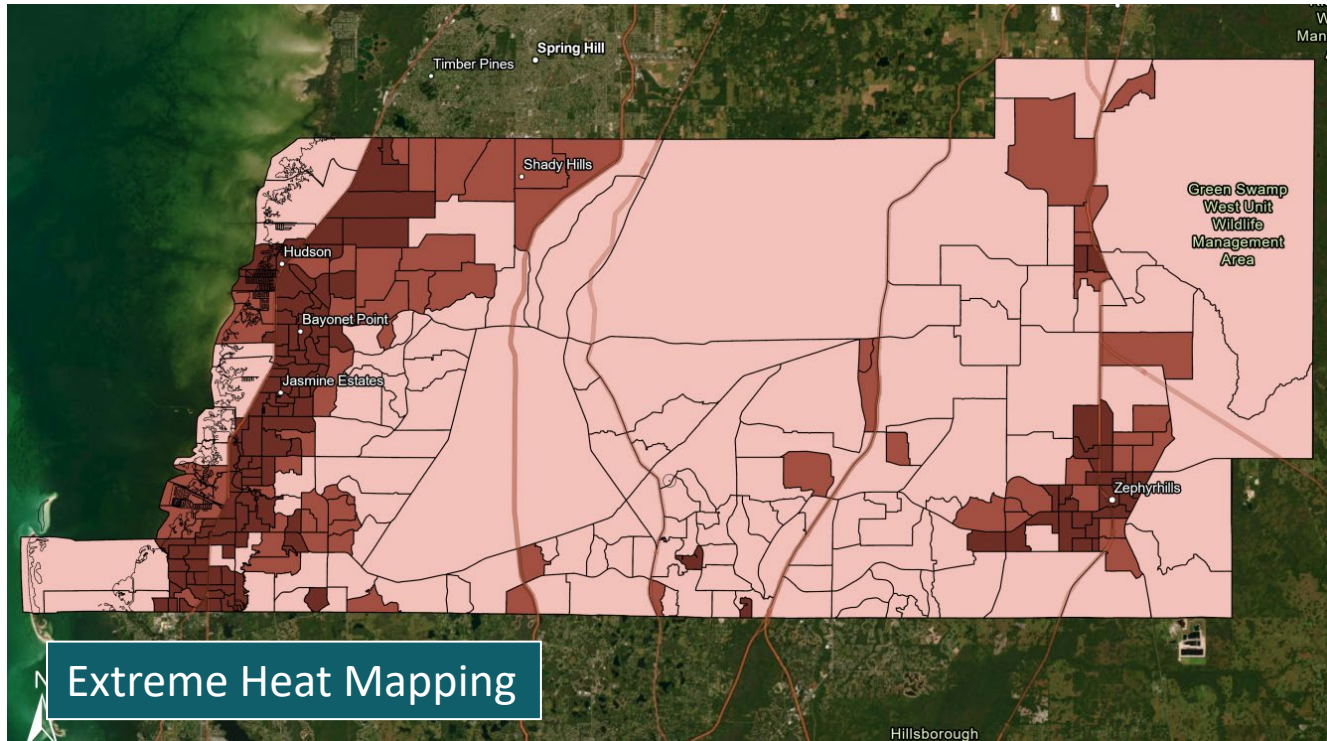
Exposure Mapping



Focus Area Mapping



Inland Flooding Mapping



Extreme Heat Mapping

ACTION PLAN

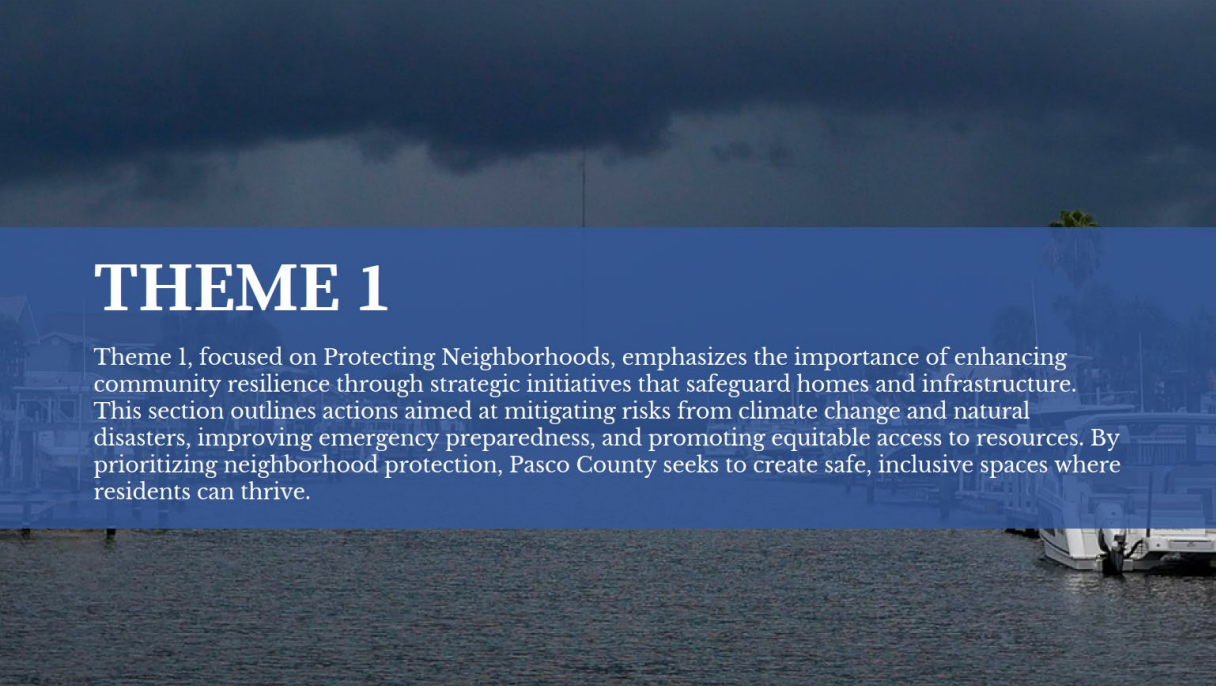
- Resilience & Sustainability Action Plan (RSAP) organized around five respective themes:
  - Protecting Neighborhoods
  - Adaptable & Transparent Government
  - Responsible Resource Management
  - Healthy & Connected Communities
  - Targeted Economic & Cultural Development
- Five themes, 35 goals, and 120 action items addressing both resilience and sustainability.
- Includes case studies, cost estimates, department champions, partner organizations, grant funding programs, and implementation timeframes.

Outcomes

Final Action Plan Report (92 Pages)

Goals and Action Items Tracking Spreadsheet with Metrics

Project Story Map



THEME 1

Theme 1, focused on Protecting Neighborhoods, emphasizes the importance of enhancing community resilience through strategic initiatives that safeguard homes and infrastructure. This section outlines actions aimed at mitigating risks from climate change and natural disasters, improving emergency preparedness, and promoting equitable access to resources. By prioritizing neighborhood protection, Pasco County seeks to create safe, inclusive spaces where residents can thrive.

THEME 2

Theme 2, focused on Adaptable and Transparent Government, highlights the need for responsive and accountable governance in the face of evolving environmental challenges. This section outlines strategies to enhance governmental adaptability through improved policies, streamlined processes, and proactive communication. By fostering transparency and community engagement, Pasco County aims to build trust among residents and empower informed decision-making.

THEME 3

Theme 3, focused on Responsible Resource Management, underscores the importance of sustainable practices in the stewardship of Pasco County's natural resources. This section outlines strategies for conserving water, promoting energy efficiency, and managing waste responsibly, ensuring that resources are utilized wisely to benefit both the environment and the community. By prioritizing sustainable resource management, Pasco County aims to protect ecosystems, reduce environmental impact, and enhance quality of life.

THEME 4

Theme 4, focused on Healthy and Connected Communities, emphasizes the importance of fostering social, physical, and environmental well-being within Pasco County. This section outlines strategies to enhance access to health services, promote active lifestyles, and improve transportation networks, ensuring that all residents can connect with each other and their environment. By prioritizing health and connectivity, Pasco County aims to create vibrant communities where individuals thrive and relationships strengthen.

LIVING SHORELINES

- Phase 5 of the project emerged in response to worsening conditions presented by coastal flooding along public park locations adjacent to the Gulf of Mexico.
- Halff and Taylor developed detailed living shoreline construction plans for Anclote River Park, Key Vista Nature Park, and Robert K. Rees Memorial Park.
- Design process included site visits, upland and subaquatic vegetation surveys, coastal wave analysis, and the development of final plans.

Outcomes

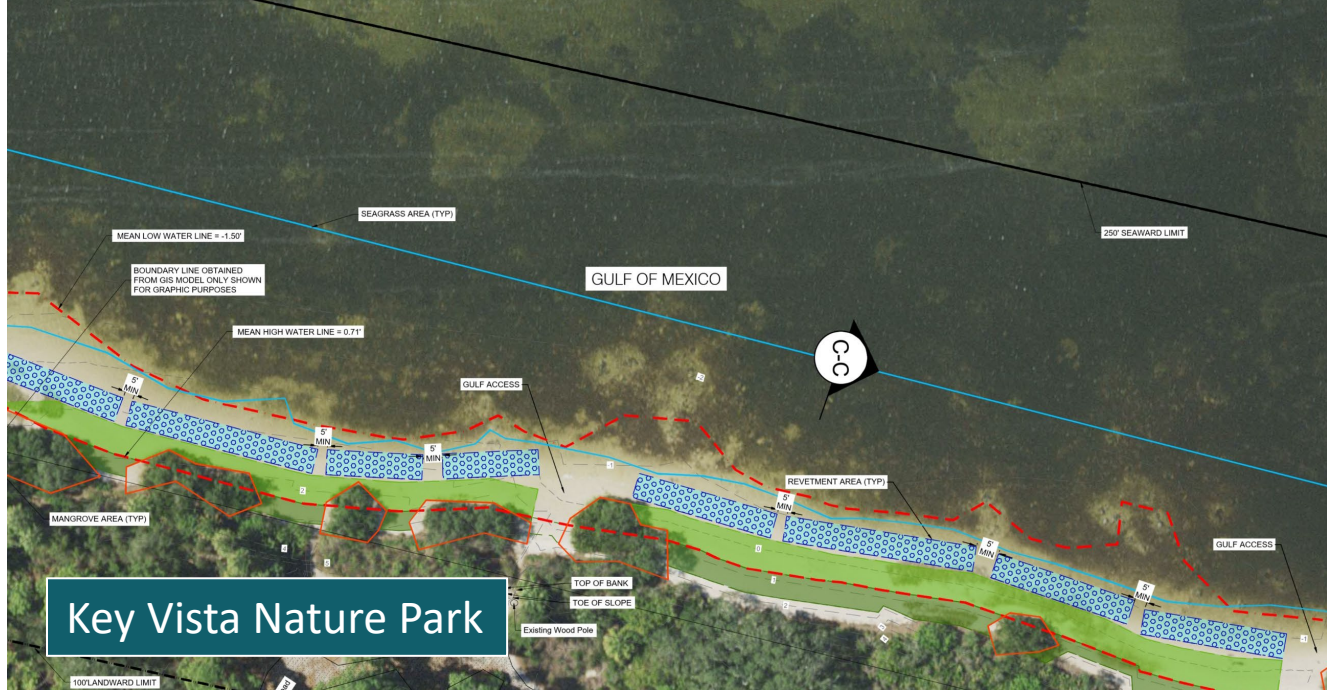
Living Shorelines Plan (84 Pages)

Homeowner's Guide to Living Shorelines (28 Pages)

Detailed Construction Plans (Three Sites)

Living Shorelines Plan Story Map

Anclote River Park



Key Vista Nature Park

Robert K. Rees Memorial Park

Key Vista Nature Park

ENGAGEMENT

- Hundreds of internal and external stakeholders engaged in the development of strategies.
- Internal meetings, public workshops, and special interest groups presentations included:
  - ***Kickoff Meeting***
  - ***Resilience Working Group***
  - ***New Port Richey Public Workshop***
  - ***Pasco County LMS Workshop***
  - ***Hudson Public Workshop***
  - ***Tampa Bay Builders Association***
  - ***Pasco County EDC***
  - ***Dade City Public Workshop***
  - ***Land O'Lakes Public Workshop***
  - ***Intergovernmental Workshop***
  - ***Internal Stakeholder Workshop***
  - ***Planning Commissioner Meetings***
  - ***BOCC Commissioner Meetings***
- Digital public survey, interactive mapping and strategy development activities, and live polling were all deployed throughout the process.
- Pasco County Resilience Working Group (RWG) reviewed and vetted all deliverables.

TECHNICAL COMPONENTS

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HURRICANE IDALIA REPORT

Table 4.3 FEMA Water Levels by Return Period (Annual Exceedance Probability) for Hurricane Idalia Water Level Record Stations

Station	FEMA Transect	FEMA Water Levels at Shoreline (ft NAVD)			
		10-yr (10%)	25-yr (4%)	50-yr (2%)	100-yr (1%)
Cedar Key NOAA 8727520	Levy Co., 73	7.3	9.2*	10.7	12.2
Bayport, FL (Hernando Co) USGS 02310600	Hernando Co., 14	6.5	8.2	9.6	11.3
Aripeka, FL (Pasco Co) NDBC ARPF1	Pasco Co., 1	6.3	7.9	9.4	11.0
Bear Creek, Bayonet Point (Pasco Co) USGS 02310368	Pasco Co., 17	6.0	7.4	8.8	10.5
Pithlachascotee River at Main St, New Port Richey (Pasco Co) USGS 02310308	Pasco Co., 30	5.8	7.2	8.4	9.9
Clearwater Beach NOAA 8726724	Pinellas Co., 173	5.1	6.3	7.3	8.6

* Interpolated value. Not provided in FEMA Flood Insurance Study Report

Table 4.4 Hurricane Idalia Recorded Water Levels and Approximate Return Periods

Station	Peak Water Surface Elevation (ft NAVD)	Approximate Return Period (yrs)
Cedar Key NOAA 8727520	+8.43	17
Bayport, FL (Hernando Co) USGS 02310600	+7.68	19
Aripeka, FL (Pasco Co) NDBC ARPF1	+6.78*	14
Bear Creek Near Bayonet Point (Pasco Co) USGS 02310368	+5.99	10
Pithlachascotee River at Main St, New Port Richey (Pasco Co) USGS 02310308	+5.74*	10
Clearwater Beach NOAA 8726724	+4.81	9

*Gauge failed during storm, water level recorded prior to peak.

- Between 1970 and 2023, 39 systems passed within 70 miles of Pasco County.
- 8 Tropical Depressions, 16 Tropical Storms, and 15 Hurricanes (8 Major).
- Only an unnamed tropical depression in November 1980 made landfall in Pasco between 1970 and 2023.
- The 1993 “Storm of the Century” produced storm surge of 6-9 ft in Pasco County.
- Hurricane Idalia made landfall as a Category 3 in August 2023, passing within about 100 miles of Pasco County as a Category 3.
- Based on the values in **Table 4.4**, Hurricane Idalia produced approximately 10- to 15-yr water levels in Pasco County.

VULNERABILITY ASSESSMENT

Table 9. *Flood Scenarios Analyzed in Pasco County's Vulnerability Assessment (Source: Halff, 2024).*

Flood Scenario Type	Current Conditions	2040 Int-Low	2040 Int-High	2070 Int-Low	2070 Int-High	2100 Int-Low	2100 Int-High
Tidal Flooding (MHHW)	X	X	X	X	X	X	X
25-Year Storm Surge Flooding	X	X	X	X	X	X	X
100-Year Storm Surge Flooding	X	X	X	X	X	X	X

- Challenges with regional SLR accuracy because of timetables associated with changes to statutory requirements (e.g., use of 2017 vs. 2022 NOAA projections).
- Pasco County located between tide gauges at Cedar Key (8727520) and Clearwater Beach (8726724).
- Nuances with statutory requirements (i.e., adding +2ft to MHHW tidal flooding rasters).

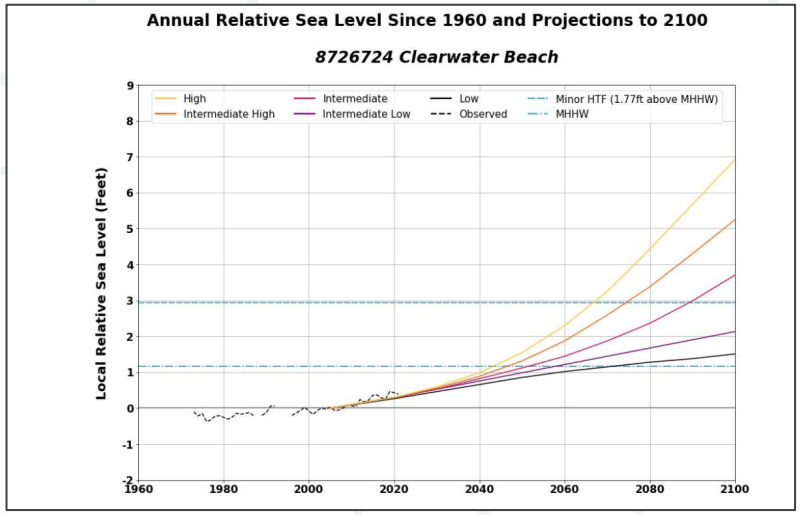
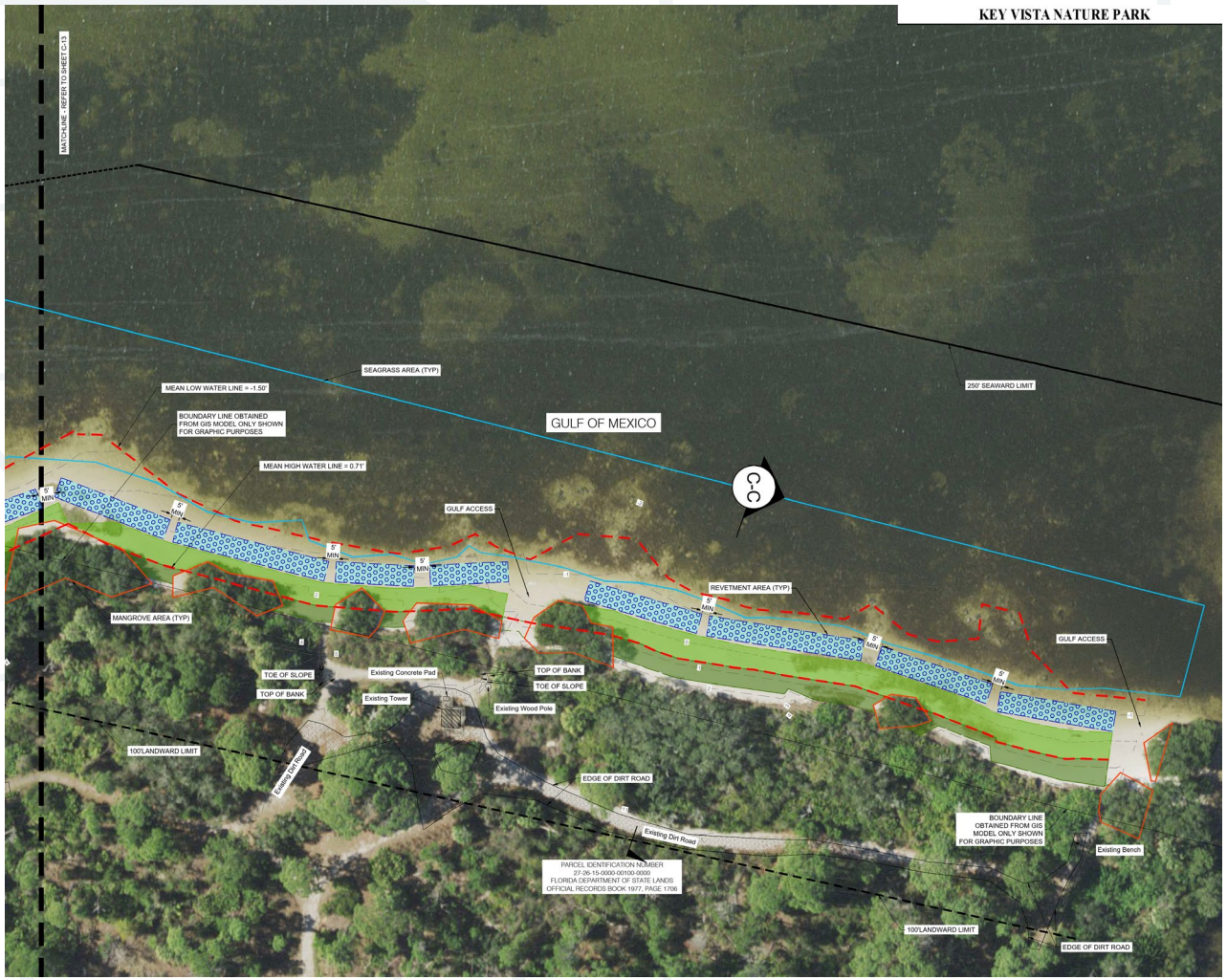


Table 8. *NOAA 2017 Intermediate-Low and Intermediate-High SLR Projections (Source: Taylor Engineering, 2024).*

Period	Sea Level Rise Scenario	Pasco County Sea Level Rise (ft)
2020 – 2040	Intermediate-Low	0.4
2020 – 2070		1.0
2020 – 2100		1.5
2020 – 2040	Intermediate-High	0.8
2020 – 2070		2.8
2020 – 2100		5.5

LIVING SHORELINE WAVE ANALYSIS



- Wave energy was assessed through shore orientation, proximity to buffers, and wave height, categorized as small (<2 ft), medium (2-5 ft), or high (>5 ft).
- High wave energy accelerates shoreline erosion without protective features like vegetation or barriers.
- Salinity levels were documented to understand their impact on shoreline vegetation and inform the design of effective living shoreline solutions.

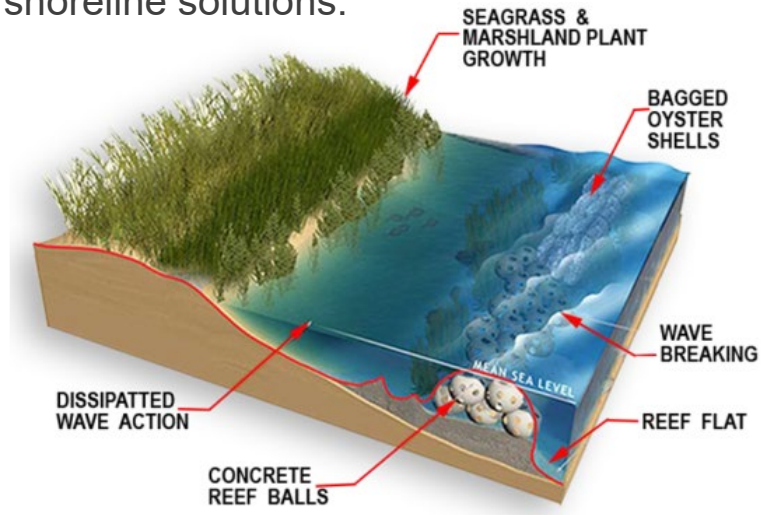


Figure 2 *Combined Structural and Non-Structural Living Shoreline Installation, Pre-Storm Condition (Source: USACE Engineering with Nature (EWN); USACE Engineer Research and Development Center (ERDC).*

REFLECTIONS

- **Real-World Applications:** Lessons from recent hurricanes underscored the real-world impacts of climate risks and the need for effective resilience measures based on past events.
- **Importance of Engagement:** Community and stakeholder involvement is essential for understanding vulnerabilities, fostering shared ownership, and ensuring solutions are locally relevant.
- **Adaptive Management:** Ongoing evaluation and the ability to adjust strategies based on emerging data are crucial for responding to rapidly changing conditions.
- **Flexibility:** Resilience planning must remain flexible, evolving with new climate information and unforeseen challenges to maintain long-term sustainability.
- **Think Big:** Developing bold, large-scale solutions like living shorelines and comprehensive vulnerability assessments can set the foundation for transformative, future-proof resilience strategies.

GET IN TOUCH

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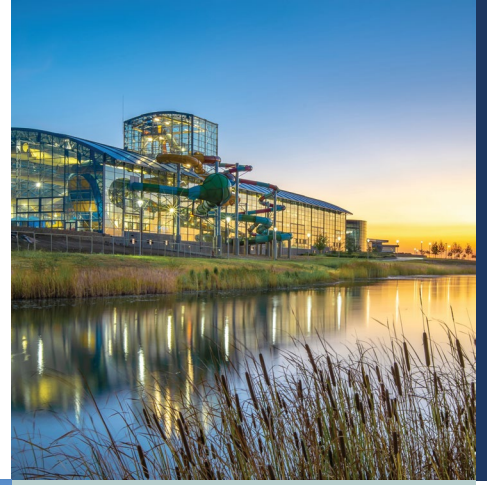

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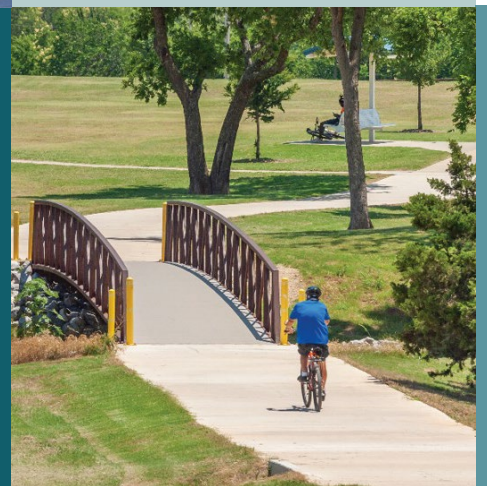

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