Nature-Based Solutions for Coastal Management

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Coastal & Marine Engineering

GSAC 3rd Annual Water Forum:

Building Naples Coastal Resiliency

February 25, 2025

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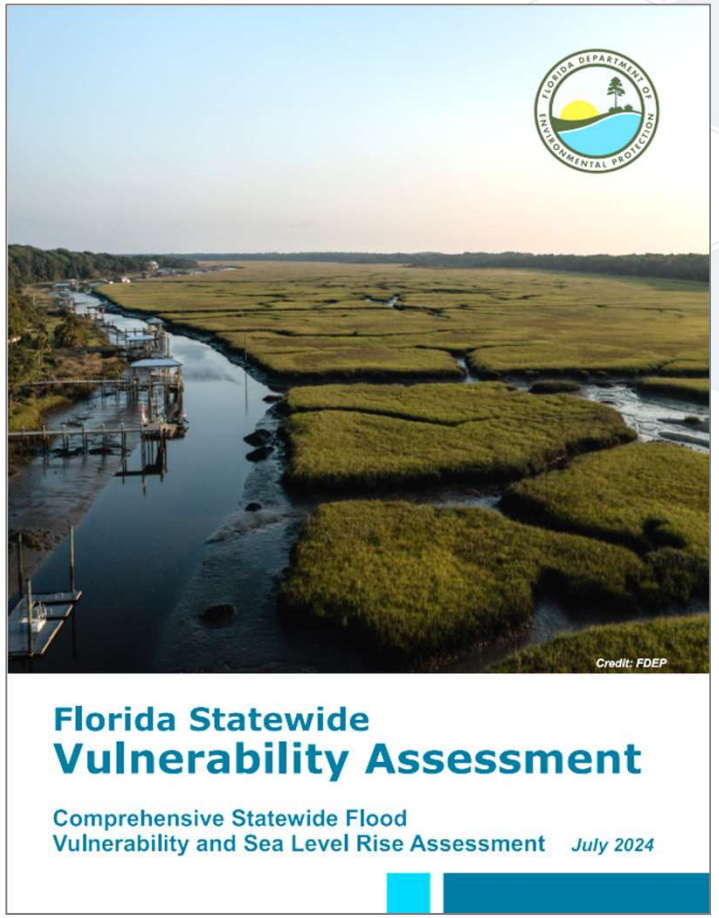
Senior Director

Resilient Florida Program

Since May 2021, s. 380.093, F.S., a comprehensive and coordinated approach to local and statewide resilience.

- Vulnerability of Critical Assets to floods from high tides, SLR, storm surge, rainfall, and compound flooding
- New VA's to comply with NOAA 2022 SLR Intermediate-Low and Intermediate curves
- Planning horizons updated to 2050 & 2080

- Grant Funding Opportunities
  1. Planning grants (VA's, APs, Peril of Flood Comp Plan Amendments, *SWMPs and WMPs* consistent with NFIP CRS program)
  2. Feasibility studies and permitting for NBS that reduce impacts to flooding and SLR
  3. Implementation Grants



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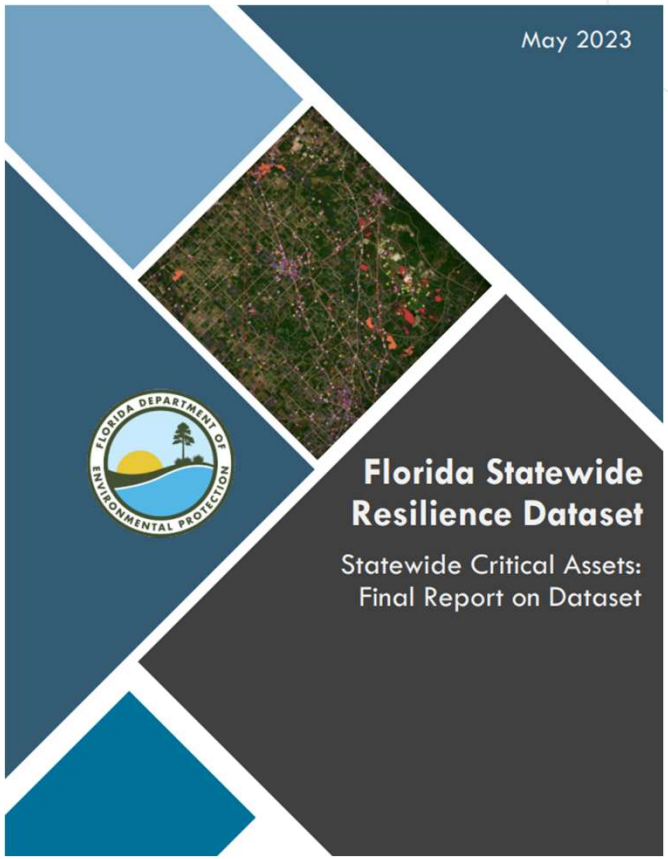
Statewide Critical Asset Inventory

1. Transportation and Evacuation Routes
2. Critical Infrastructure
3. Critical Community and Emergency Facilities
4. Natural, Cultural, and Historical Resources:
    - Conservation Lands and Parks
    - Shorelines
    - Surface Waters and Wetlands
    - Historical and Cultural Assets



Statewide Critical Asset Inventory

1. Transportation and Evacuation Routes
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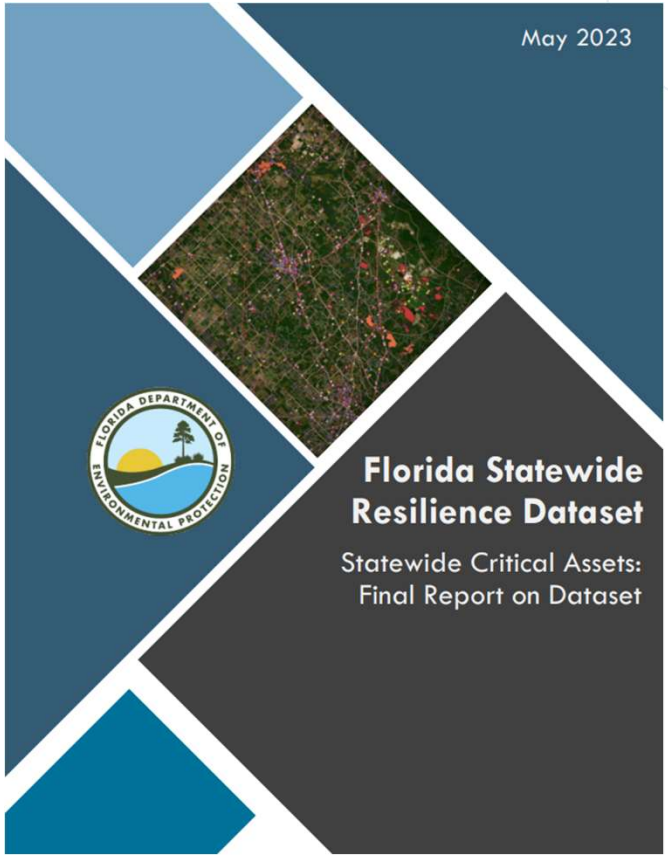
    - Conservation Lands and Parks
    - Shorelines – ***our first line of defense!***
    - Surface Waters and Wetlands
    - Historical and Cultural Assets

*Shoreline locations and type classifications were sourced from **Florida Fish and Wildlife Conservation Commission** (FWC) Environmental Sensitivity Index (ESI).*



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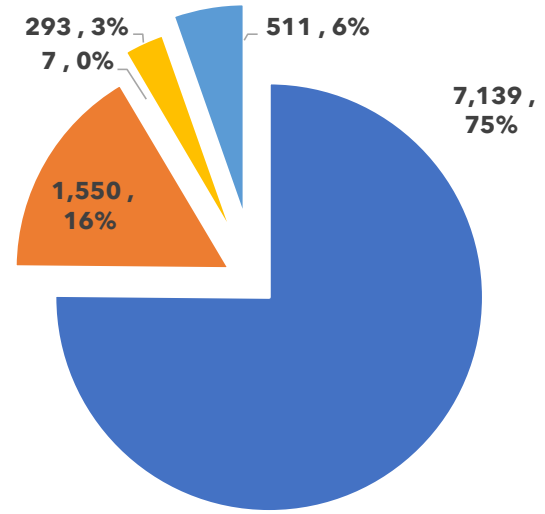
FWC Shoreline Statewide Dataset



FWC Shoreline Classification	Sum of Shape Length	Miles
10A/10D: Salt- and brackish- water marsh/Scrub-shrub wetlands	728,682	138.01
10A: Salt- and brackish- water marsh	15,170,964	2,873.29
10B: Freshwater marsh	1,202,036	227.66
10C: Swamps	4,803,475	909.75
10D: Scrub-shrub wetlands	15,788,079	2,990.17
1A: Exposed rocky shores; Exposed rocky banks	939	0.18
1B: Exposed, solid man-made structures	536,602	101.63
2A: Exposed wave-cut platforms in bedrock, mud, or clay	6,302	1.19
2B: Exposed scarps and steep slopes in clay	35	0.01
3A: Fine- to medium- grained sand beaches	1,514,572	286.85
3B: Scarps and steep slopes in sand	1,560	0.30
4: Coarse-grained sand beaches	591,544	112.03
5: Mixed sand and gravel beaches	589,441	111.64
6A: Gravel beaches	1,453	0.28
6B: Exposed riprap	467,727	88.58
7: Exposed tidal flats; Sand flats	508,290	96.27
8A: Sheltered rocky shores and sheltered scarps in bedrock, mud, or clay	28,717	5.44
8B: Sheltered solid man-made structures	6,919,631	1,310.54
8C: Sheltered riprap	259,431	49.13
9A: Sheltered tidal flats; Mud flats	23,172	4.39
9B: Vegetated low banks	1,016,315	192.48
9C: Hypersaline tidal flats	1,215	0.23
Grand Total	**50,160,181**	**9,500**

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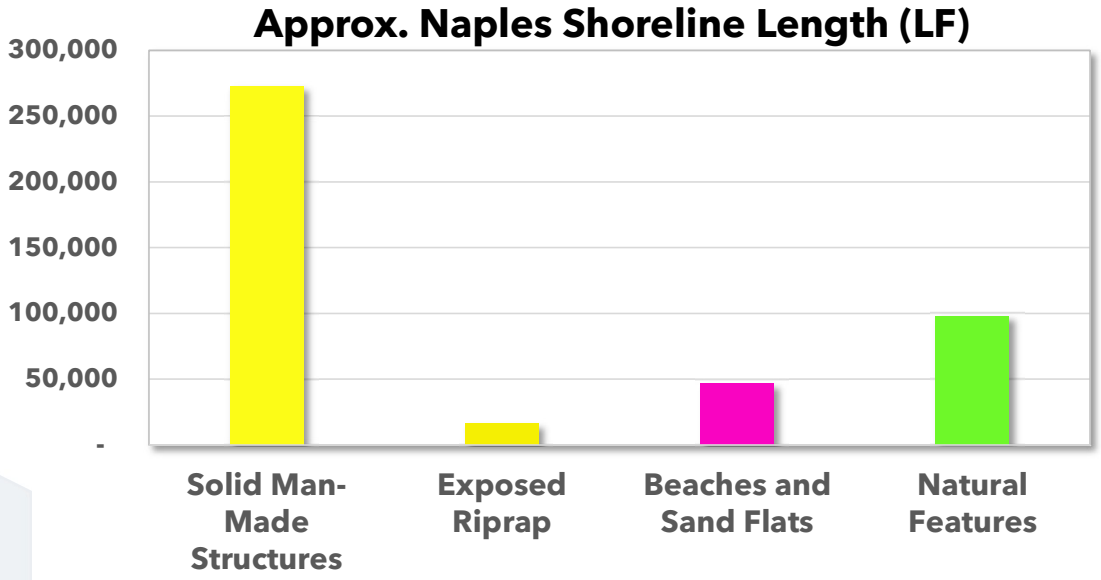
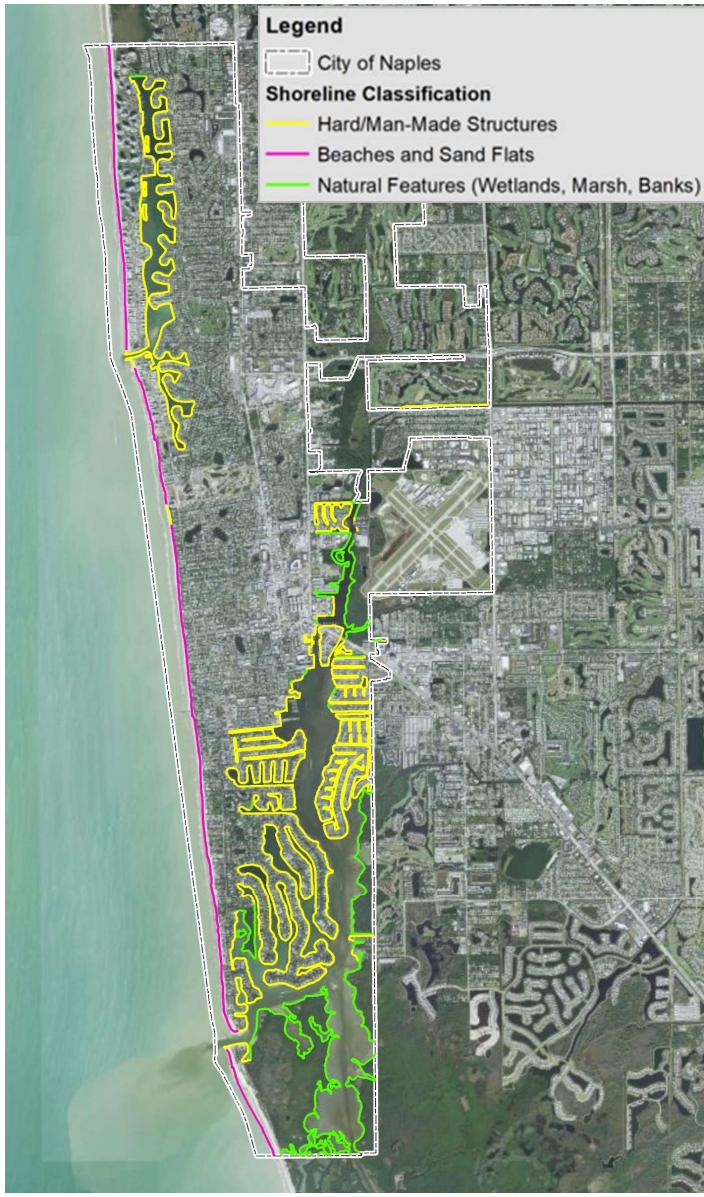
City of Naples FWC Shoreline Data



Total Shoreline Length in Naples = 433,777 LF
(~82 miles)



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Traditional Approaches

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Seawalls / bulkheads

- Protection from:
  - *Wave energy*
  - *Shoreline erosion*
  - *Tidal flooding*
  - *Storm surge*

Upside:

- *Easy to permit*
- *Known installation practices*
- *Contractor knowledge*
- *Low maintenance*

Downside:

- Expensive to build and maintain
- Reflect wave energy rather than dissipate it
- Cause scour, offsite erosion
- Can be unattractive
- Disturb habitat
- Alter sediments flow

Resiliency and Shorelines

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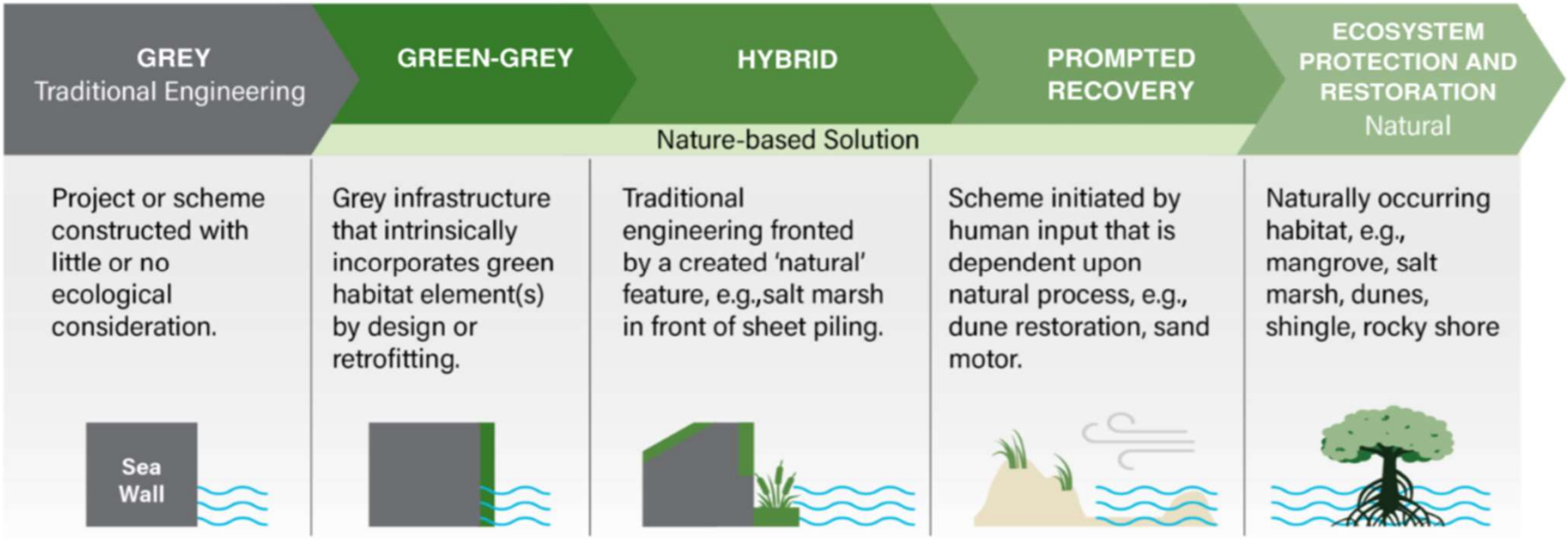
- Our future will be wet and stormy… shorelines are first line of defense
- Balance resilience, ecology, and access
- Funding sources available, especially for nature-based solutions

- Create habitat, provide ecosystem services, dissipate wave energy
- Can cost less to implement than traditional methods
- Less familiarity with contractors and permitting



Living Shoreline Types/Applications

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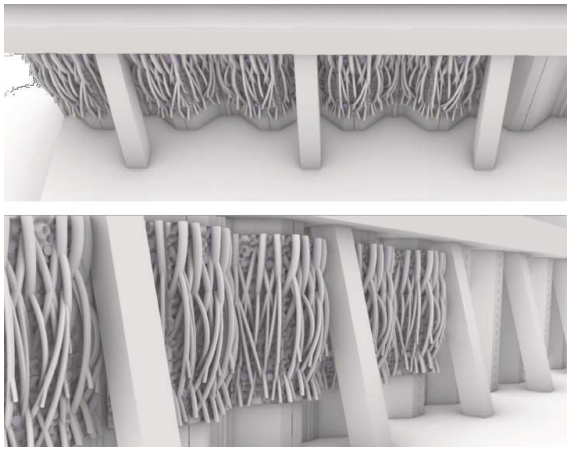
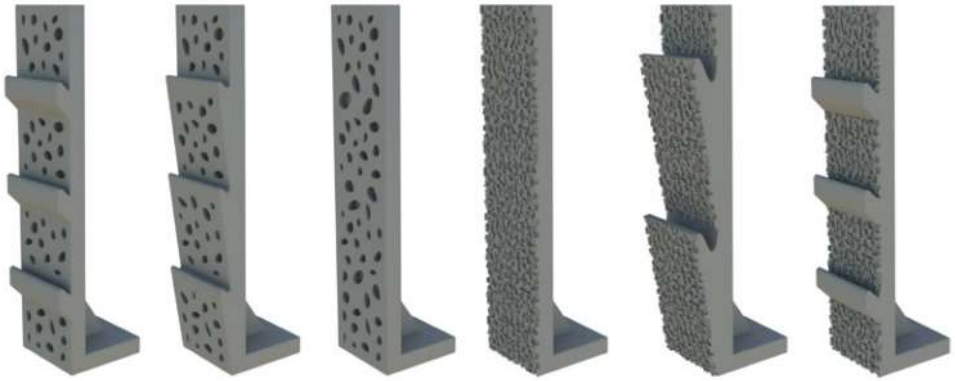


Ecological Enhanced Seawall



Reef Wall Paneling

Examples of Typical Living Shorelines

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Design Considerations

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Wave Loads

Overtopping

Hydraulic Stability

Currents

Scour

Storm Surge

Site Selection

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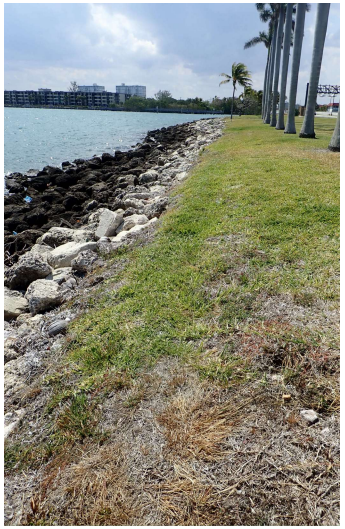
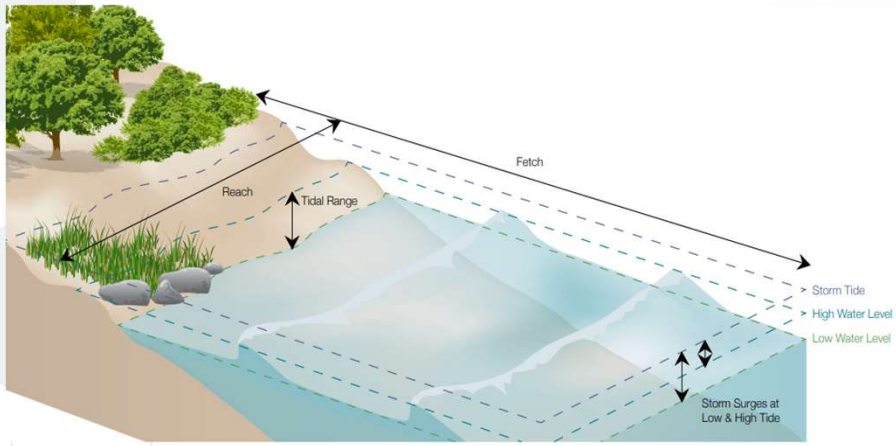
- Upland space, use, and functionality
- Length of shoreline
- Existing marine resources
- Water depth
- Wave exposure





State Regulations

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62-330.051(12) – Other Shoreline Stabilization *(Exemption)*

- Should include **mostly native wetland plants**
- Can include oyster reefs, coir, rock sill/breakwater
- Cannot extend more than **10' from MHW**
- Cannot exceed **500' along shore**
- **Minimum discharge of fill / size**
- Requires maintenance, periodic repair
- Breakwater opening every 75' for flow of water & movement of fish/wildlife

All others get an Individual Permit.

62-330.631 – Gov't Entities, Limited Restoration/Enhancement *(General Permit)*

- Cannot extend more **than 15' from MHW**
- **Not in Aquatic Preserve or w/in 3' of SAV** with 1% cover

62-330.632 – Low Profile Oyster Habitat *(General Permit)*

- **Less than 0.25 acres** total footprint,
- No work w/in 100 m of wading bird colonies, 180 m of tern / skimmer colonies, 100 ft from marked channel
- Clean, sediment free cultch, quarantined recycled shell, fossil shell, limerock w/20%+ calcium carbonate, concrete
- Fixed on substrate or bagged, Max ht. 18" from bottom, below MHW

Policy and Regulatory Challenges

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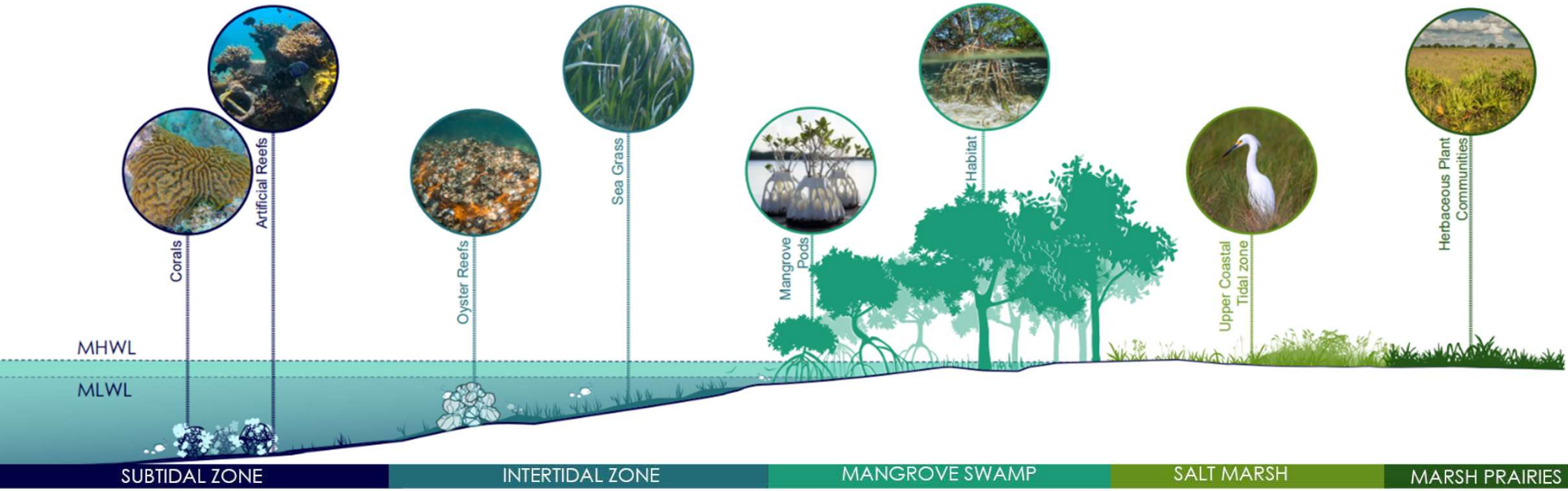
- State preference for upland excavation (upland of MHWL)
- Local government "no net loss" of public land
- Mangroves regulated two different ways
  - Trimming & Preservation Act and Environmental Resource Permit (subject to conditions)
  - Mangroves planted along MHWL trigger Sovereign Submerged Lands



Case Studies

Dinner Key Breakwaters Mitigation

Miami Beach Living Shorelines

Jose Marti Park Adaptive Redesign

Currie Park Adaptive Redesign

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Dinner Key Breakwaters Mitigation

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Unique Site: Historic seaport, spoil islands created as part of federal project.

Marina destroyed in 2017 Hurricane Irma.

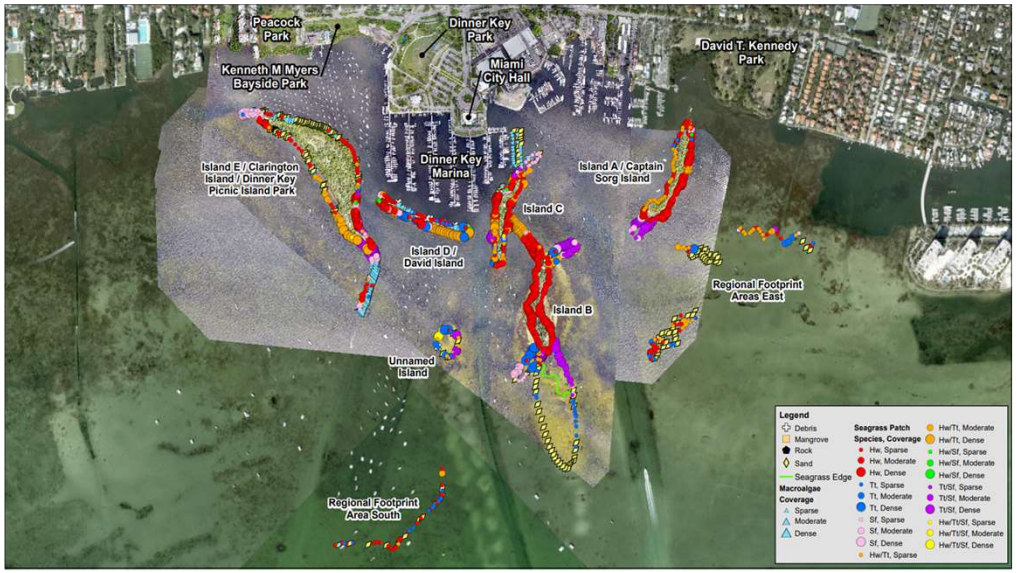
Island D mostly submerged during King Tides.

High marine traffic and recreational day users.

Project Goal: Enhance storm protection.

Dinner Key Environmental Considerations

- Islands relatively low 0 to +3 ft NAVD88
- MHHW approximately +0.2 ft NAVD88
- King Tide Elevations up to +2.2 ft NAVD88
- Surrounded by seagrasses
- Support mangrove fringe vegetation
- Contain invasive vegetation species



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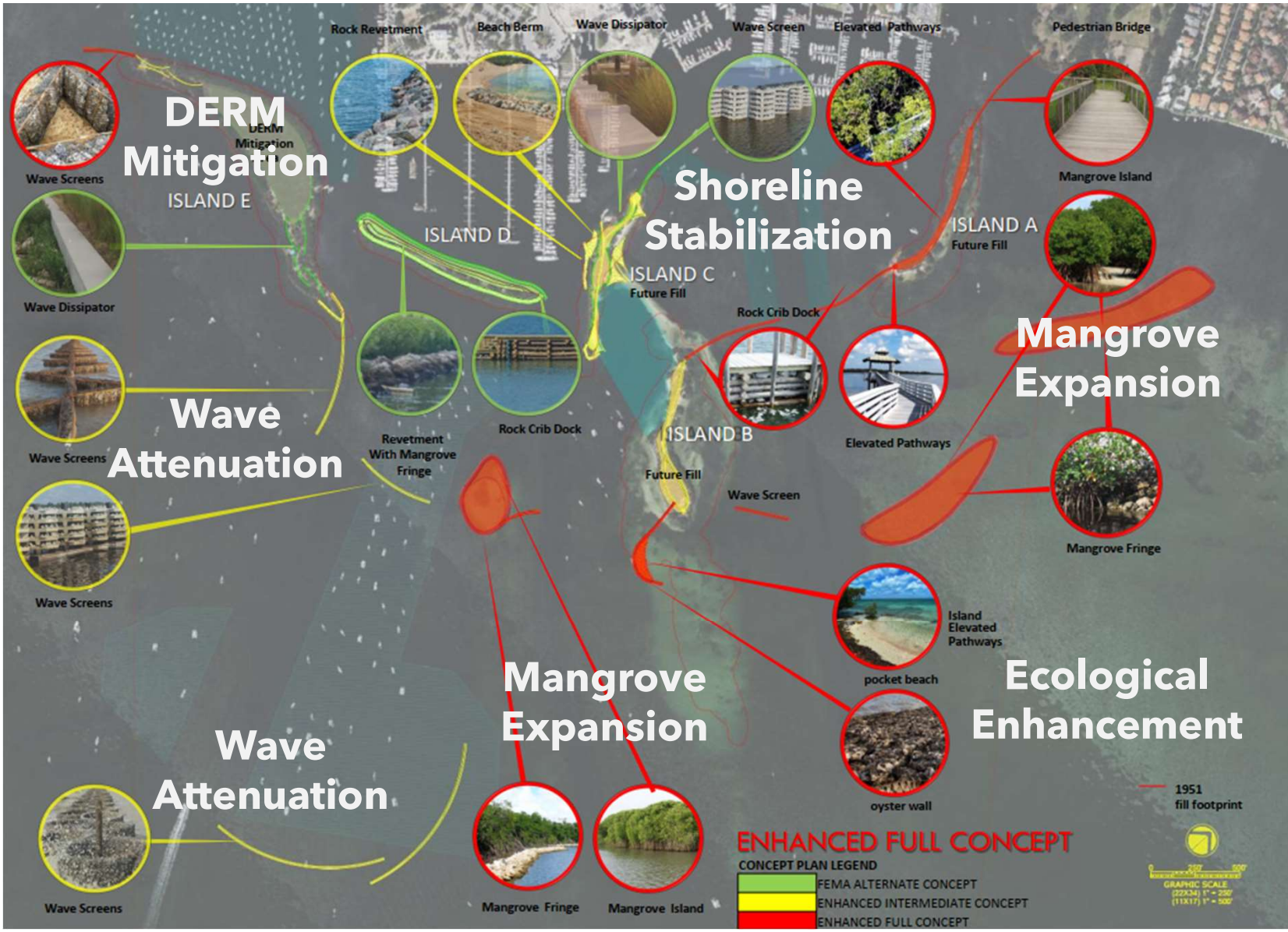
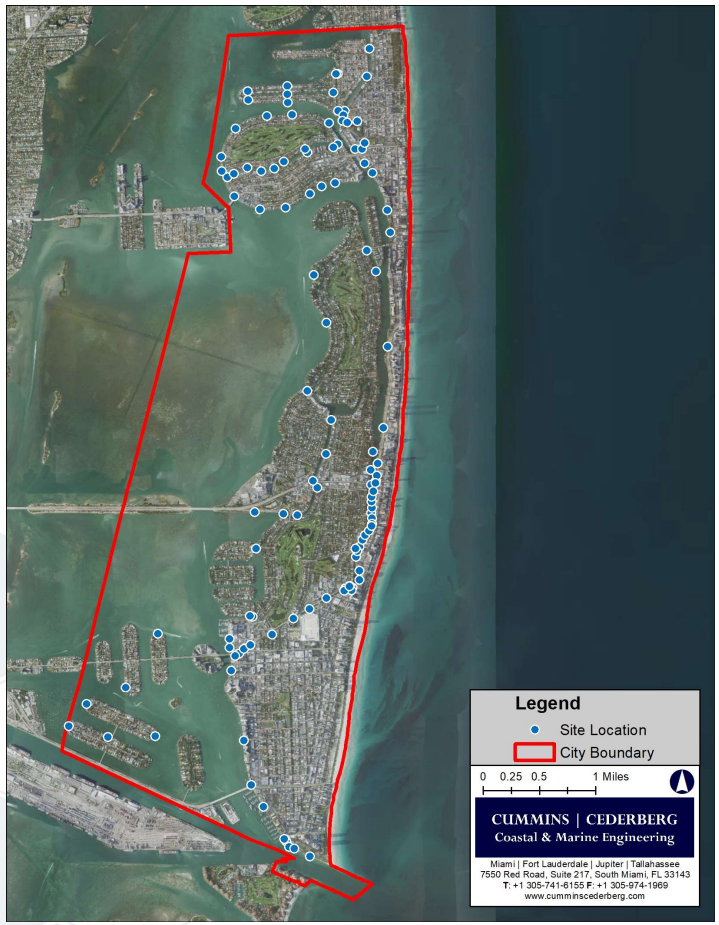


Miami Beach Living Shorelines



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- Performed **Living Shoreline Suitability Index** for all 118 publicly owned shoreline segments within the City.
- Site suitability analysis / considerations:
  - Upland space, use, and functionality
  - Length of shoreline
  - Existing marine resources
  - Water depth
  - Wave exposure
    - Selected **10** for living shorelines.

Miami Beach Living Shorelines

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Challenges of one site:

- little upland area
- along high traffic road
- busy waterway
- 600 feet of shoreline

Miami Beach Living Shorelines

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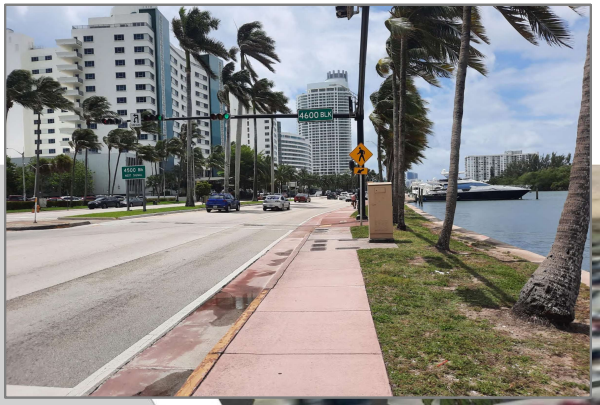

Challenges of one site – little upland area along high traffic road, busy waterway, 600 feet of shoreline.

- Expanding waterward
- Used as mitigation project
- Rock, vegetation, boardwalk solution
- Meets engineering performance requirements
- Blending components to provide better user experience

Jose Marti Park Adaptive Redesign

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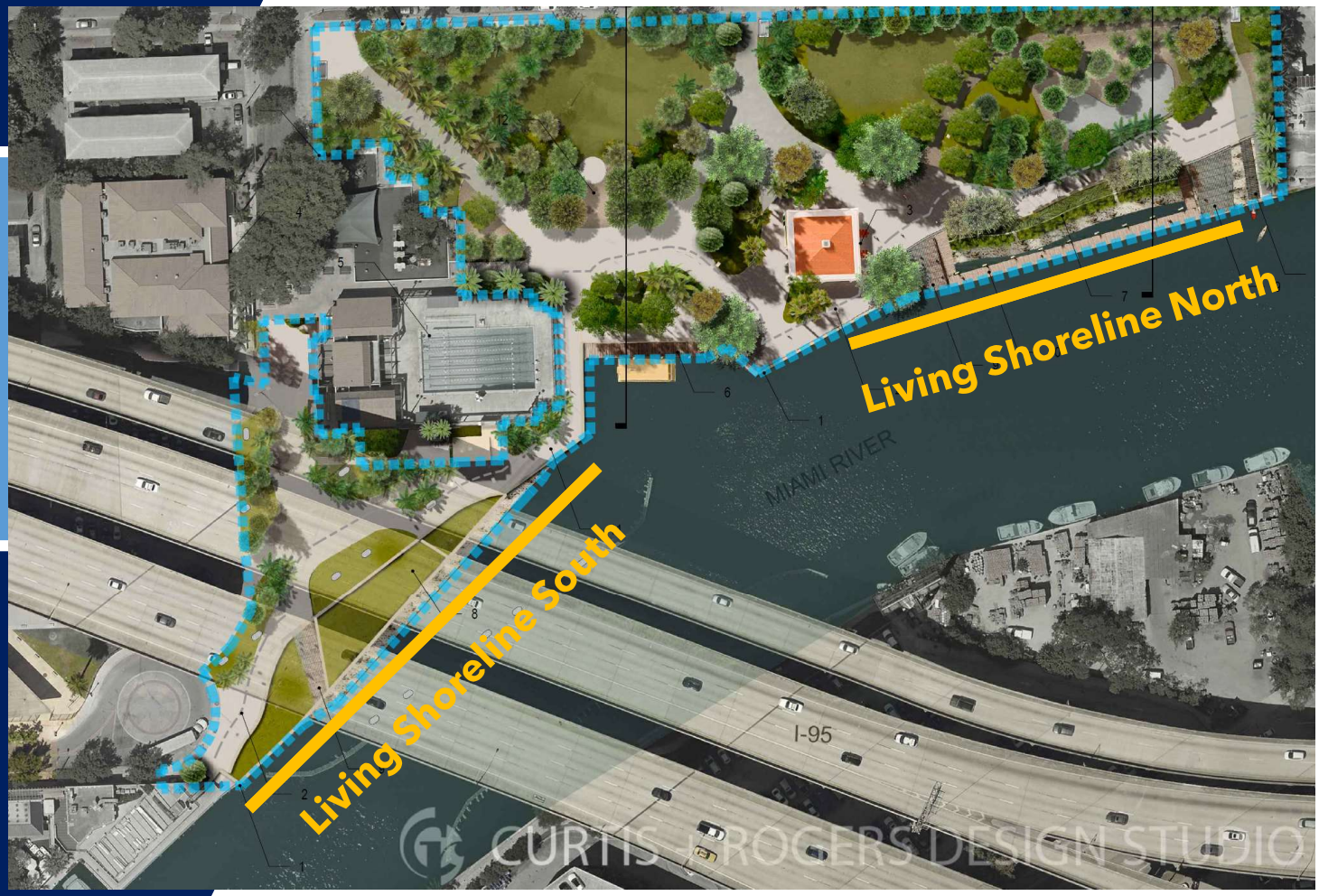

Challenges:

Miami River - Federal navigational channel – limited space.

King Tides and SLR frequent flooding.

Jose Marti - Water Levels

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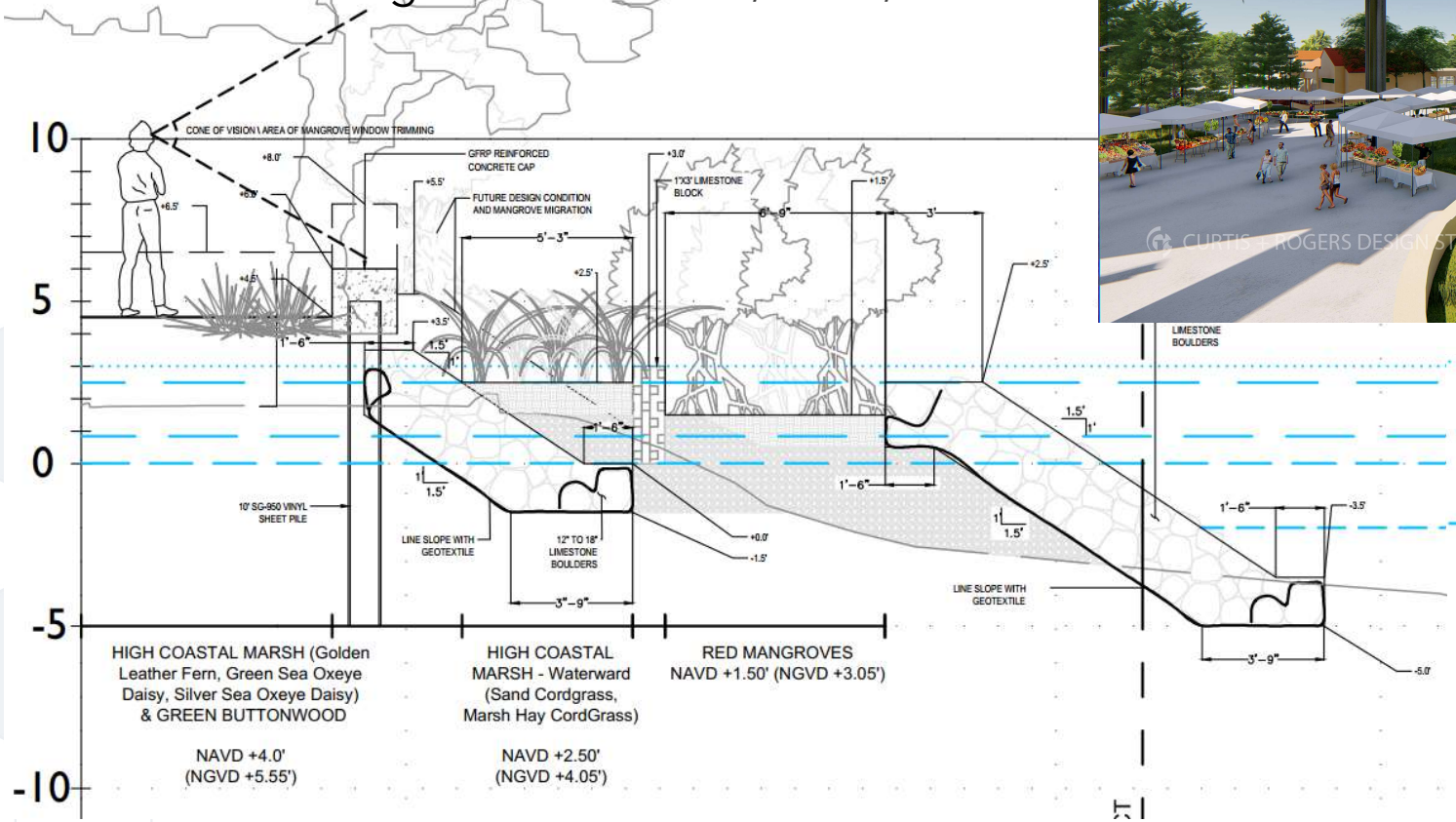
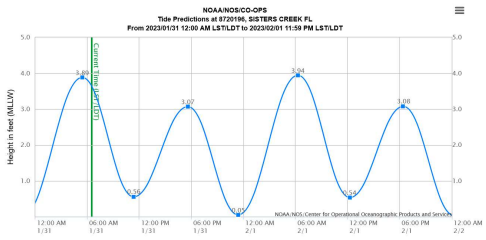
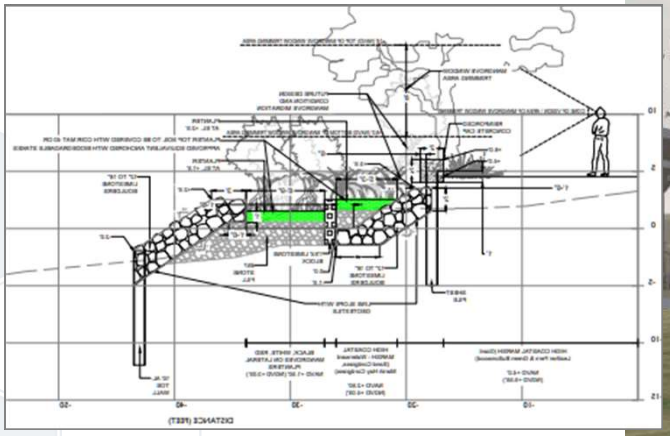
- MHW, MLW, tide range
- Seasonal High Tides
- SLR Projections
- Planning horizons - 2050, 2080, 2100





Jose Marti Park Adaptive Redesign

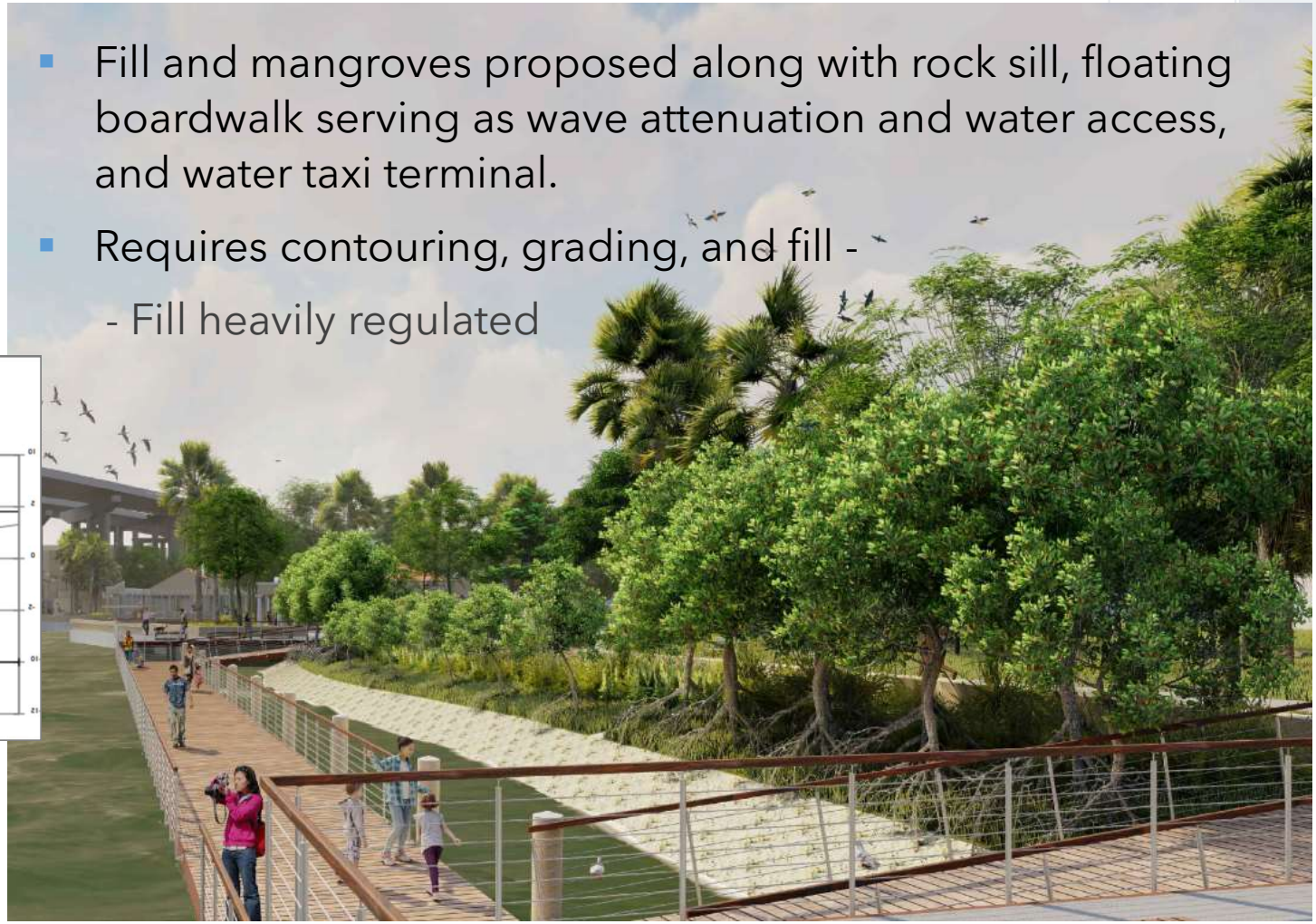
- Using layered natural design approach.
- Mangroves, marsh grass, button woods.



100% Design / Permitting

- Fill and mangroves proposed along with rock sill, floating boardwalk serving as wave attenuation and water access, and water taxi terminal.
- Requires contouring, grading, and fill -

  - Fill heavily regulated



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Currie Park Funding Strategy

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$16,764,610

Florida Commerce Community Development Block Grant-Mitigation

- Elevation raising
- Rock Revetments, Living Shoreline Planters
- Landscaping & irrigation
- Water sampling
- Seawall refurbishment
- Mangrove reef wall planters or green infrastructure
- Resilience Hub
- Stormwater Pipe, Baffle Box, Outfall Pipe

$2,000,000

Florida Commerce Community Development Protection Land and Water Conservation Fund

- New playground
- Kayak/Canoe Launch
- Performance/Event Lawn
- Renovation of fishing pier
- Waterfront Picnic Facility
- Waterfront Trails
- Parking area
- Installation of new landscaping and site lighting

$3,750,000

Florida Department of Environmental Protection Resilient Florida Grant

- Drainage Improvements
- Natural Stormwater elements improvement
- Seawall Construction
- Hardscape and landscaping

TOTAL GRANT FUNDING AWARDED

$23,838,606

$923,996

Florida Department of State Cultural Facilities Grant

- Site lighting in the Currie Park Performance Area

$400,000

Florida Inland Navigation District Waterway Assistance Program

- Final Engineering & Construction Specifications
- Permitting

Currie Park Adaptive Redesign

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Portosueno Park Living Shoreline

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- Manatee County Park
- Connects to Palma Sola Bay
- Removal of 1960's era deteriorating bulkhead
- Relatively low energy within basin
- Features include pedestrian path, boardwalk, vegetated planters, mangroves, and natural shoreline
- Increases resilience to sea level rise

Thank You!

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SCAN ME

Key Takeaways

- Recognize resilient shorelines and additional first lines of defense – including back bay areas.
- Define clear project goals with co-benefits, add NBS where possible (leverage funding opportunities)
- ID competing constraints (upland space, natural resources, etc)
- Consider future conditions as part of design
- Don't box yourself in – Be Creative!
- Use innovative, layered design and strategic permitting approach/team.