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Coastal & Marine Engineering

Adaptation Solutions for Florida's

Coastal Communities

2025 FSBPA
Panama City Beach, Florida

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Resilient Florida Program

- May 12, 2021, Gov. DeSantis signed SB1954 into law
- Comprehensive legislation ensures a coordinated approach to Florida's coastal and inland resilience
- Established Resilient FL Program and <u>S.380.093 F.S.,</u> which defines:
 - Flood vulnerability parameters associated with high tides,
 SLR, storm surge, rainfall, and compound flooding
 - Publicly owned/maintained <u>critical & regionally significant</u>
 <u>assets</u>



Critical Asset Classes & Types

1. Transportation and **Evacuation Routes** Airports Bridges **Bus Terminals Ports** Major Roadways Marinas Rail Facilities Railroad Bridges

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2. Critical Infrastructure

- Wastewater Treatment
 Facilities and Lift Stations
 - Stormwater Treatment
 Facilities and Pump Stations
 - Drinking Water Facilities
- Water Utilities Conveyance
 Systems
- Electric Production and Supply Facilities
- Solid and Hazardous Waste Facilities
- Military Installations
- Communications Facilities
- Disaster Debris Management Sites

3. Critical Community and Emergency Facilities

- Schools, Colleges, Universities
- Community Centers
- Correctional Facilities
- Disaster Recovery Centers
- Emergency Medical Service Facilities
- Emergency Operation Centers
- Fire Stations
- Health Care Facilities, Hospitals
- Law Enforcement Facilities
- Local Government Facilities
- Logistical Staging Areas
- Affordable Public Housing
- Risk Shelter Inventory
- State Government Facilities

4. Natural, Cultural, Historical Resources

- Conservation Lands
- Parks
- Shorelines
- Surface Waters
- Wetlands
- Historical and Cultural Assets

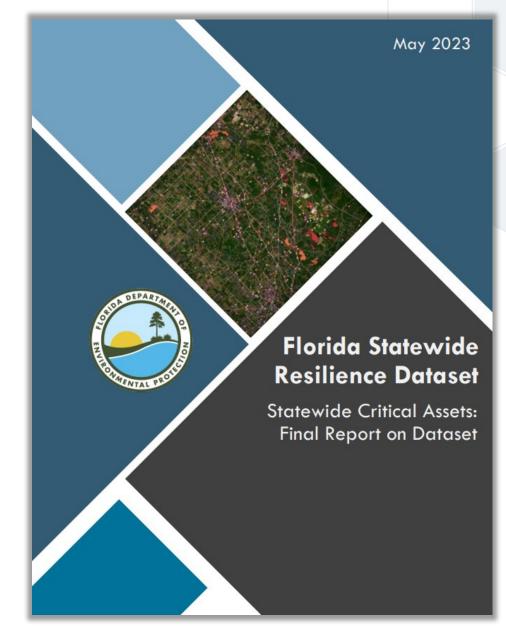
Shorelines are the first line of defense!

Statewide Resilience Dataset

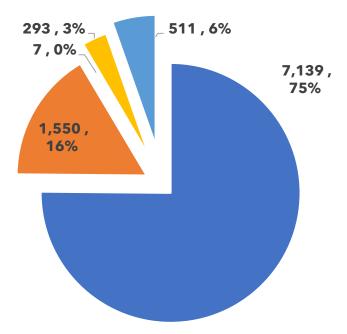
- Natural, Cultural, and Historic Resources
 - 1,301,958 counts
 - **Shorelines** = 59,204 Counts

"Shoreline locations and classification of shoreline type were sourced from **Florida Fish and Wildlife Conservation Commission** (FWC) Florida Shoreline dataset."

- FWC Environmental Sensitivity Index (ESI)
 - ID's shorelines sensitivity to oil spills
 - Florida ESI data updated 2010-2013
 - ESI Shoreline Classification Lines are a compilation of most recent ESI mapping



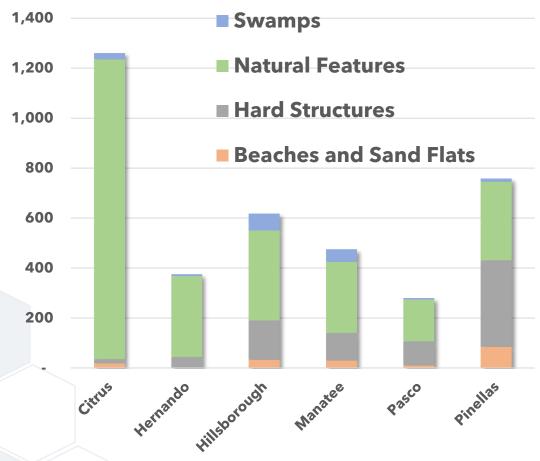
FWC Shoreline Statewide Dataset



- Marsh, wetlands, swamp
- Man-made structures and riprap
- Rocky shore and banks, wave-cut platforms, scarps
- Tidal flats, mud flats, vegetated low banks
- Beaches (sand, sandy slopes and scarps, gravel and mixed beaches)

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

FWC Shoreline Inventory



FWC-ESI Shoreline Linear Miles by County

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Tampa Bay Region

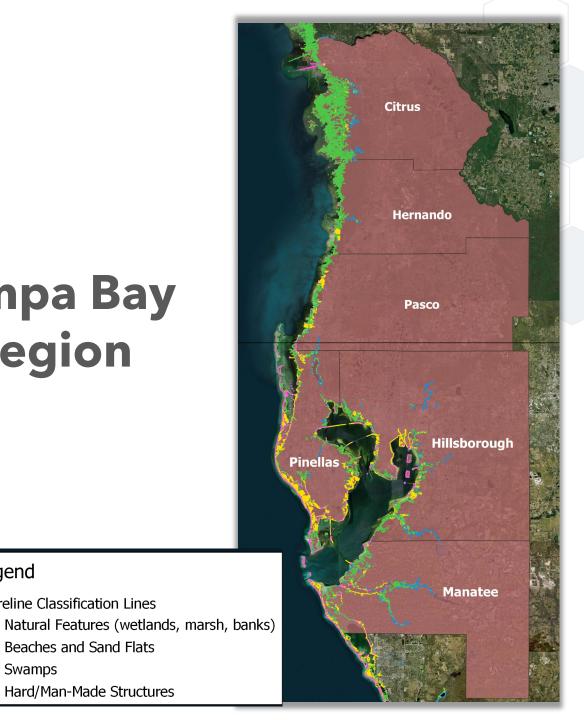
Legend

Swamps

Shoreline Classification Lines

Beaches and Sand Flats

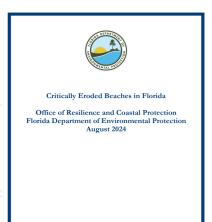
Hard/Man-Made Structures

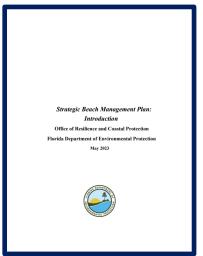


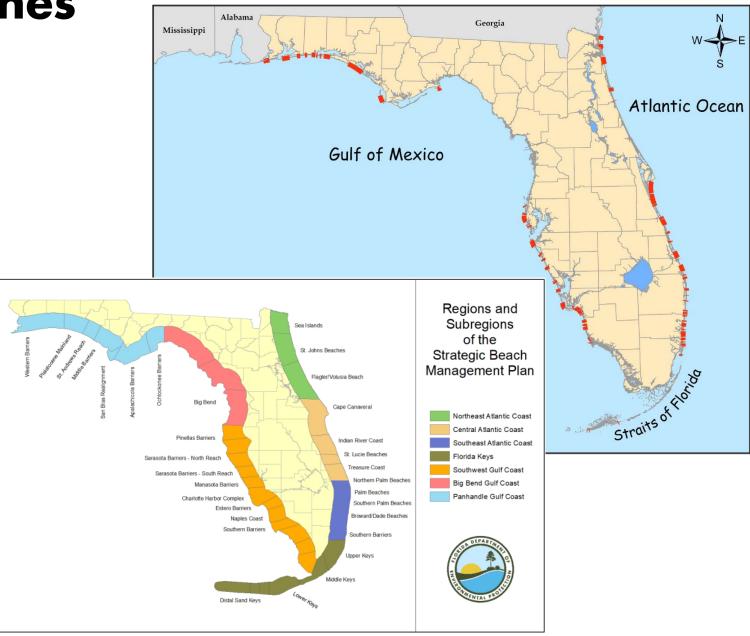
Sandy Beach Shorelines

Shoreline Stats

- 8,426 Mi of detailed tidal shoreline
- 2,276 Mi of general tidal shoreline
- 1,350 Mi of general coastline
- 825 Mi of sandy beaches
- 426 Mi critically eroded beaches
- 253 Mi of restored/managed beaches
- 85 Projects (35 Federal)







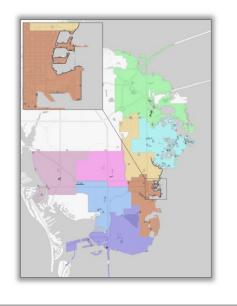


Resilient Shoreline Adaptation Case Studies

Sarasota Bayfront Park



St. Pete Seawall CIP Study



Portosueno
Park Living
Shoreline

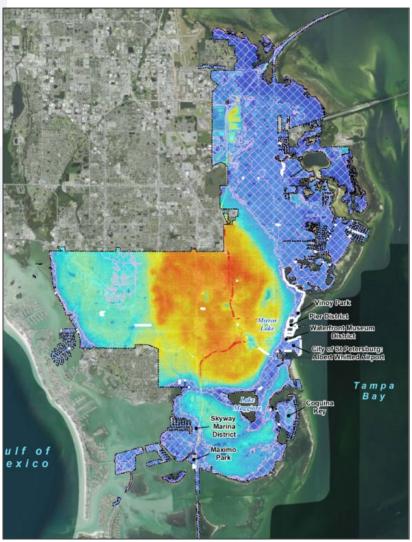


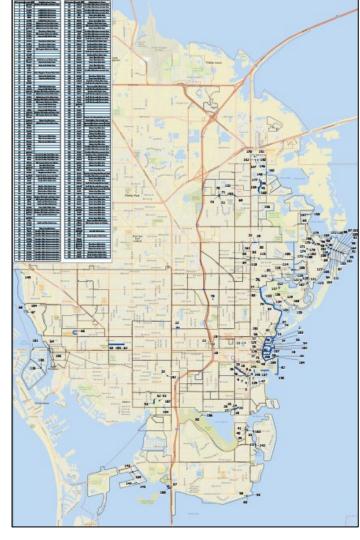


City of St. Pete Strategic Seawall CIP Plan

- FDEO CDBG-MIT Grant = ~\$900K
- ~73,000 LF of Seawall
- Perform conditions inspections
- Develop seawall inventory & geodatabase
- Evaluate flood vulnerability associated with storm surge, tides, SLR and rainfall
- Develop recommendations to improve resilience
- Emphasize NBS















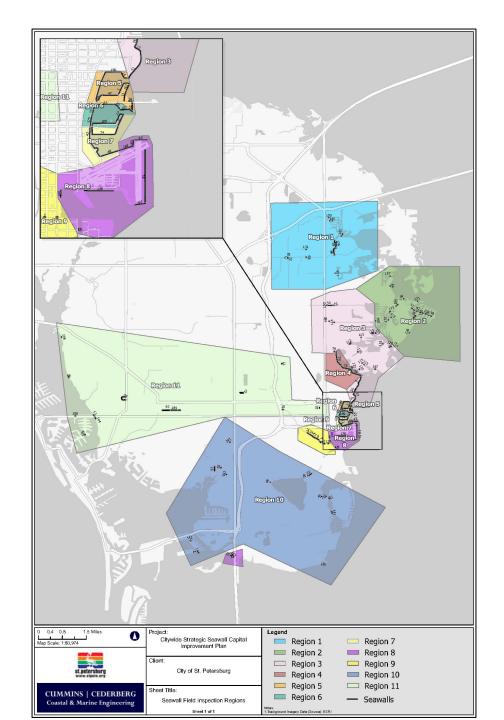


Field Region Map Overview

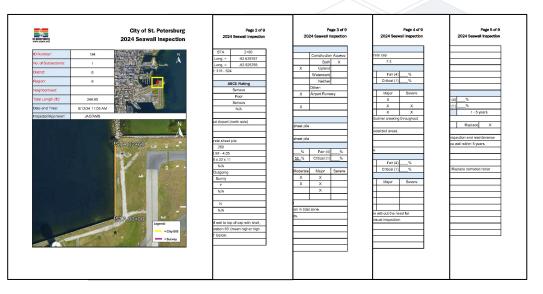
Region	Linear Feet of Seawall	Quantity of Wall Segments	Quantity of Report Cards with Subsections
1	6151.27	21	30
2	5444.17	43	47
3	9108.4	34	47
4	6194.42	3	17
5	6317.86	9	16
6	4993.77	10	25
7	5171.57	4	14
8	8238.28	10	17
9	5064.83	13	19
10	5414.92	29	37
11	9979.69	19	31
Totals	72079	195	300

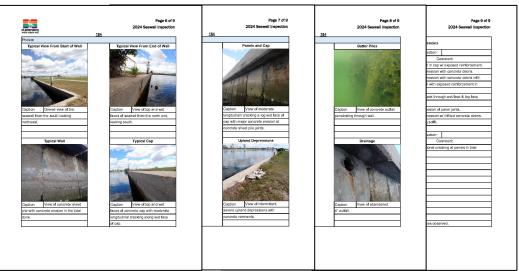






Field Data Collection





ASCE Condition Assessment Ratings

Rating Description		
6	Good	No visible damage, or only minor damage is noted. Structural elements may show very minor deterioration, but a overstressing is observed. No Repairs are required.
5	Satisfactory	Limited minor to moderate defects or deterioration are observe but no overstressing is observed. No Repairs are required.
4	Fair	All primary structural elements are sound, but minor to moderate defects or deterioration is observed. Localized areas of moderate to advance deterioration may be present but do not significantly reduce the load-bearing capacity the structure. Repairs are recommended, but the priority of the recommended repairs is low.
3	Poor	Advanced deterioration or overstressing is observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure. Repairs may need to be carried out with moderate urgency.
2	Serious	Advanced deterioration, overstressing, or breakage may have significantly affected the load-bearing capacity of primary structural components. Local failures are possible and loading restrictions may be necessary. Repairs may need to be carried out on a high-priority basis with urgency.
1	Critical	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary. Repairs may need to be carried out on a very high priority basis with strong urgency.

Ratings are used to describe the existing structure compared with the structure when newly built. The possibility that the structure may have been designed for loads that are lower than the current standards for design should have no influence on the ratings.

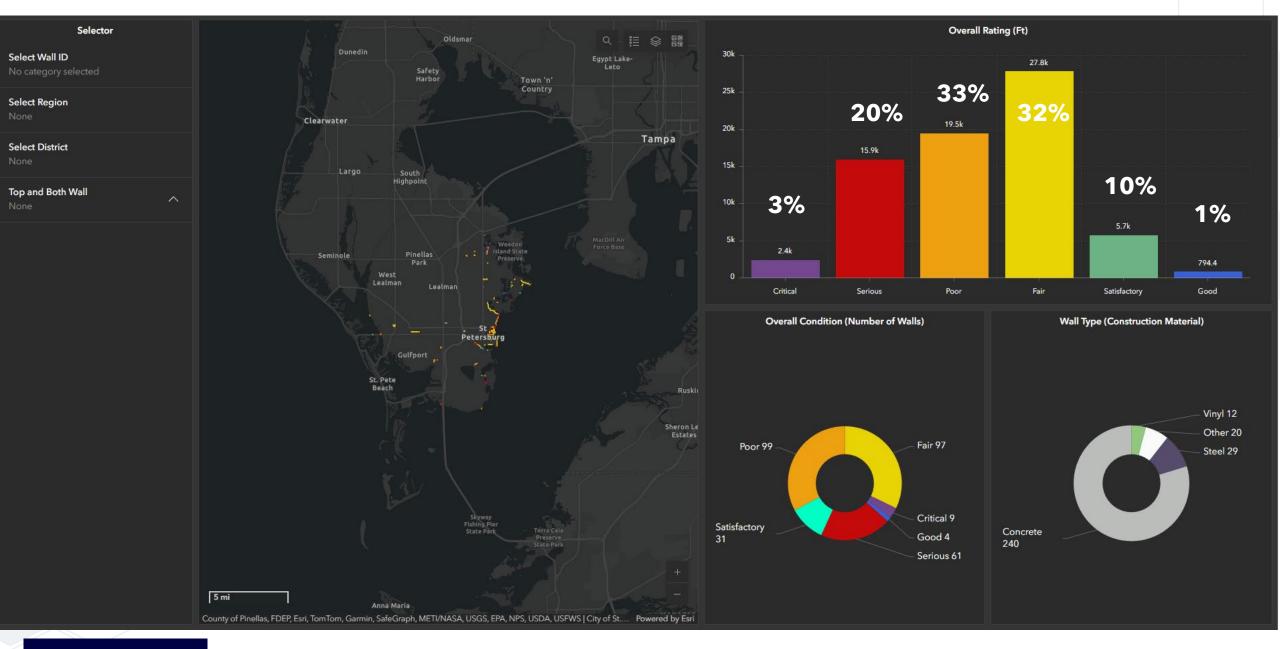












Preliminary Wall Condition

Mapping



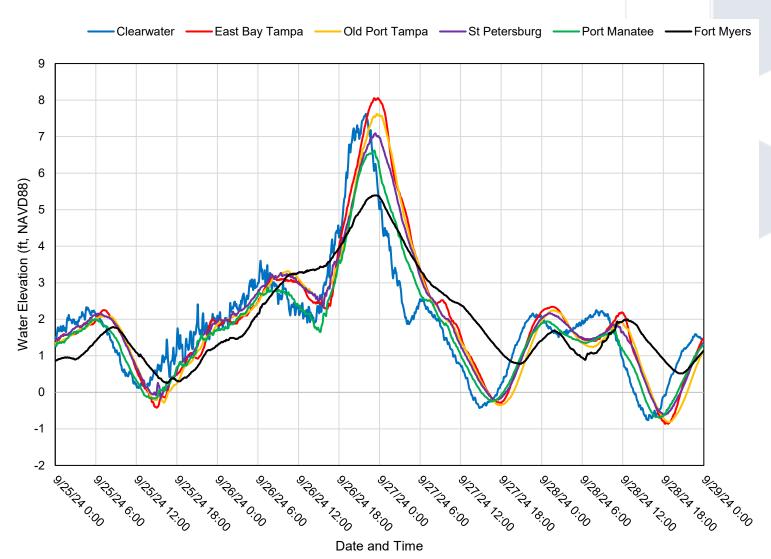
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Post-Storm Challenges



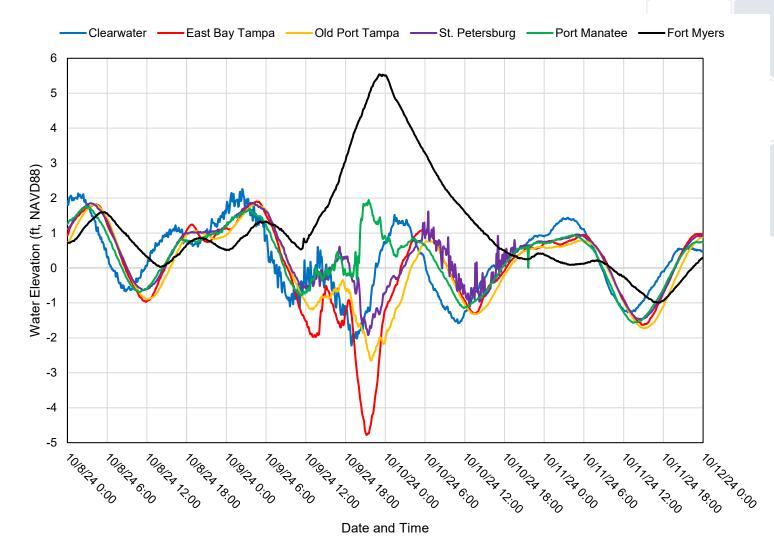
Storm Surge Vulnerability – Helene

- Category 4 hurricane at landfall in Perry, FL
- Helene moved quickly at 23mph
- Eye of the storm approx. 170 miles south-southwest of Tampa
- St. Petersburg NOAA station peak surge = +7.09 feet NAVD (per FEMA FIS is between a 25-year and 50-year return period storm)



Storm Surge Vulnerability – Milton

- Category 3 hurricane at landfall in Siesta Key, FL on October 9th, 2024
- 24-hr rainfall of 18.54 inches and a peak 3-hour rainfall total of 9.04 inches on October 9th
- St. Petersburg NOAA station peak surge reached +1.86 feet, NAVD88
- Reverse storm surge in the Tampa Bay with recorded water level at East Bay station of -4.78 feet, NAVD88

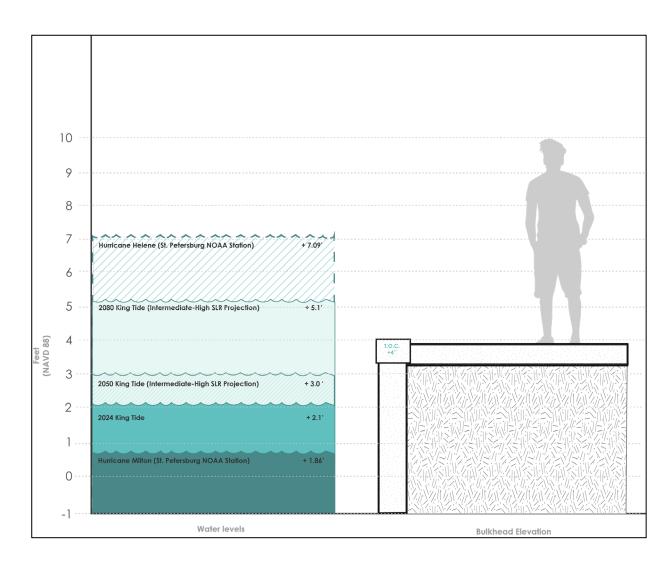


Cap Elevations & Vulnerability



Seawall Elevation Summary

Cap Elevation (ft- NAVD)	Length of Wall (LF)	% of Total Length
< +2.0 ft	1,270	2%
+2.0 to +3.0 ft	9,371	13%
+3.0 to 4.0 ft	19,816	28%
+4.0 to 5.0 ft	12,920	18%
> +5.0 ft	24,156	34%



Coastal Toolbox

Categories		Categories	Description
	1	Repair only	Wall rating of Fair or better. Adequate remaining service life (10 yrs<)
	2	Replace in-kind, raise cap elevation	Where space is a constraint. Wall rating of Poor or less
	3	Environmental enhancement	Living panels, oyster domes, toe rock, upland planting/swale
	4	Rock revetment/planters	Replacement of vertical walls to include vegetation while maintaining smaller footprint
	5	Hybrid shoreline (Alternative 1)	Rock sill/vegetated slope/ planters
	6	Hybrid shoreline (Alternative 2)	Rock breakwater/pocket beaches/groins
	7	Natural living shoreline	Vegetative plantings















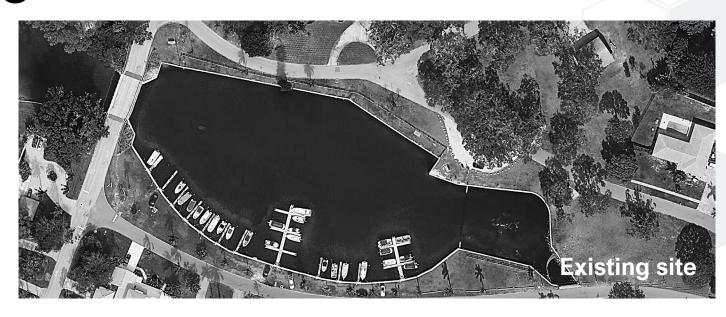




Portosueno Park Living Shoreline



- Connects to Palma Sola Bay in Bradenton
- Existing concrete weir
- 1960's era deteriorating bulkhead
- Relatively low energy in basin
- Project goals Combines:
 - Remove existing wall to create more natural shoreline
 - Enhance recreational use of park
 - Boardwalk, pathway
 - Native vegetation, oyster domes
- Stakeholder engagement







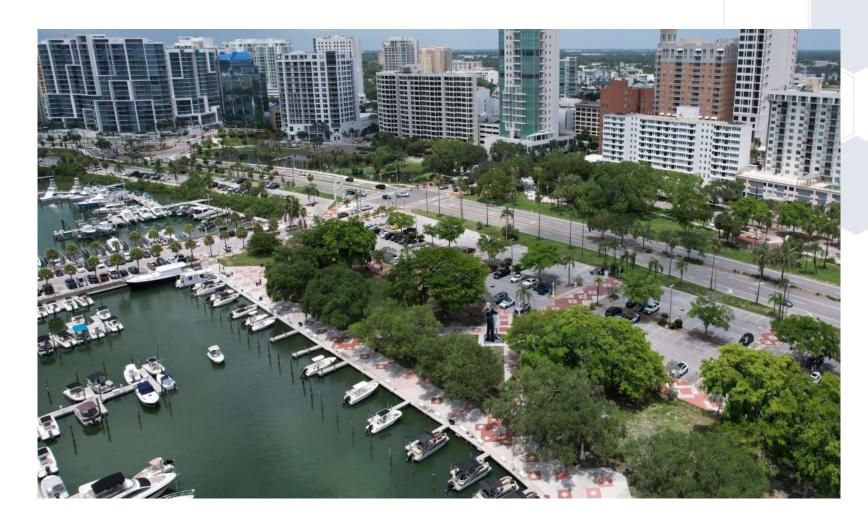




Preliminary Plan Concept

Sarasota Bayfront Park Bulkhead

- \$3.6M Resilient FL Grant +
 \$500K WCIND Grant + City
 Match = \$6.73M
- Goal to reduce flood risks
- Cap elevation = +2.17'NAVD
- Performed topside & underwater inspection
- Inspection report identified ASCE Rating of Poor to Fair
- Engineering alternatives analysis
- Stakeholder engagement with marina operators
- Design & Permitting



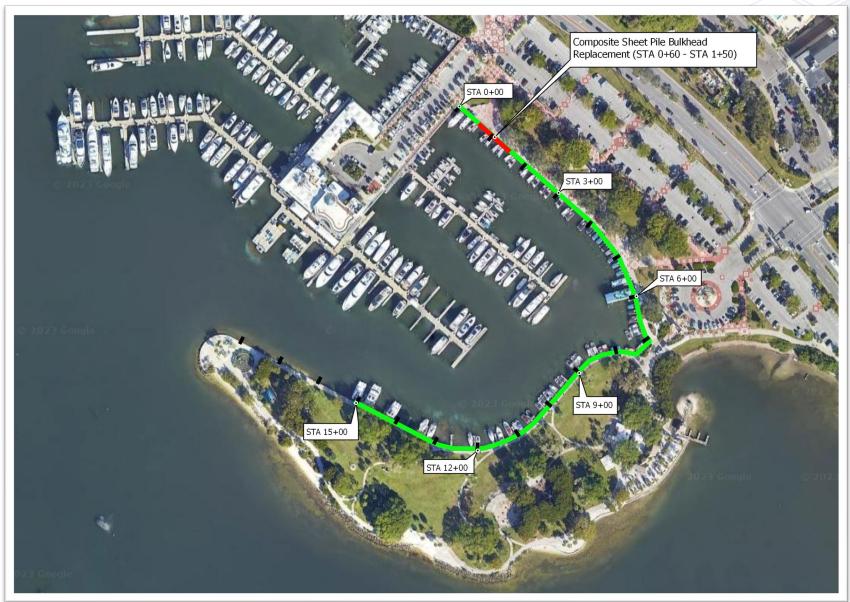


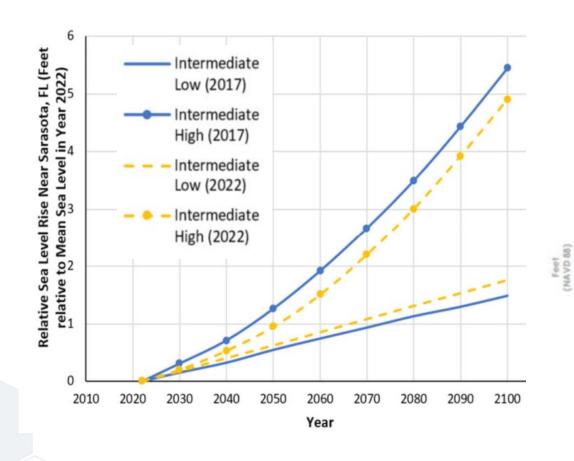


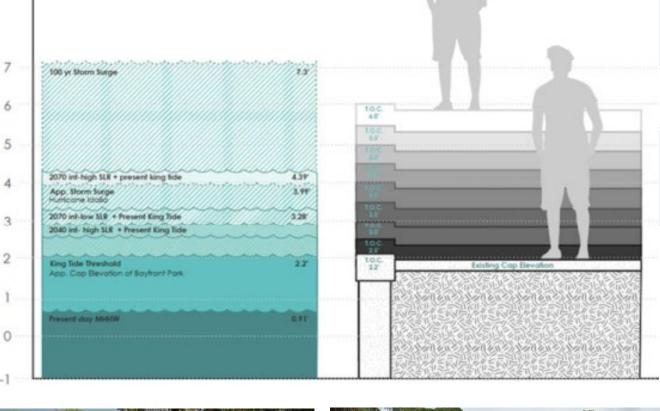










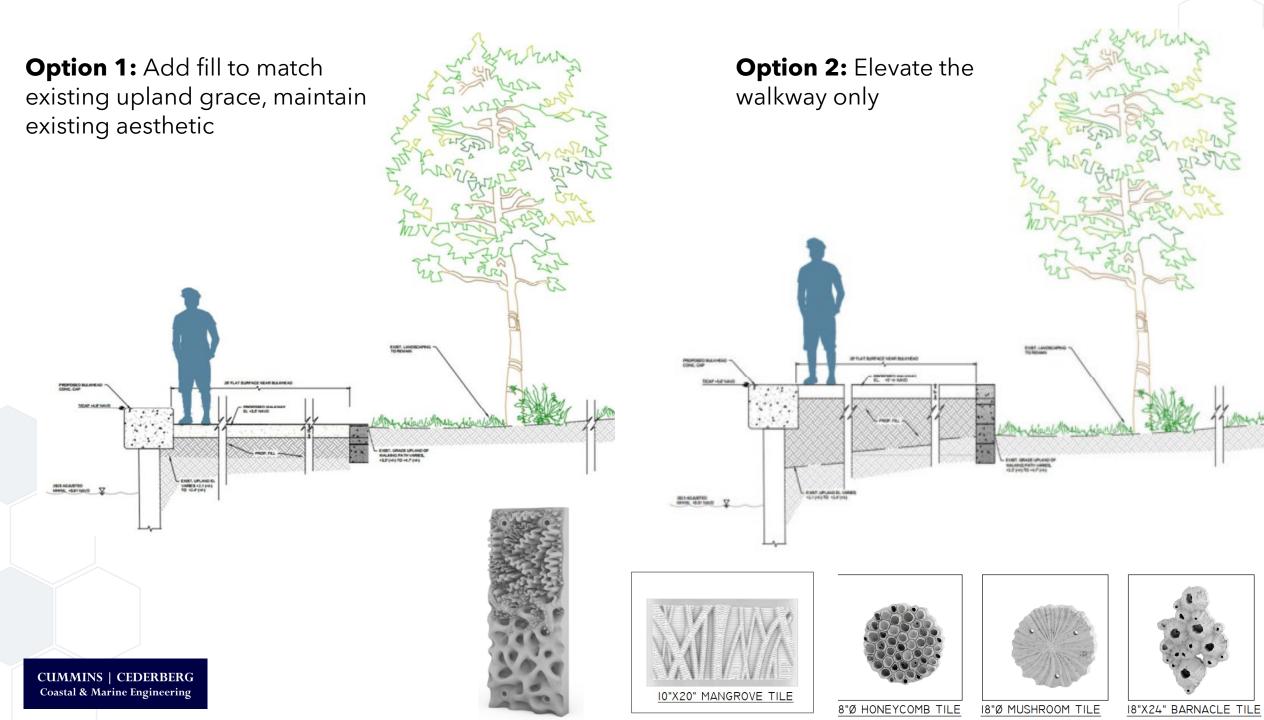








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Some Takeaways:

- Recognize shorelines as the 'first line of defense'
- Don't forget about the back bay shorelines!
- Consider development of a shoreline inventory - use available resources as a starting point
- Understand infrastructure service life and conditions
- Look for opportunities to add NBS
- Leverage funding opportunities when possible.