


# Living Seawalls

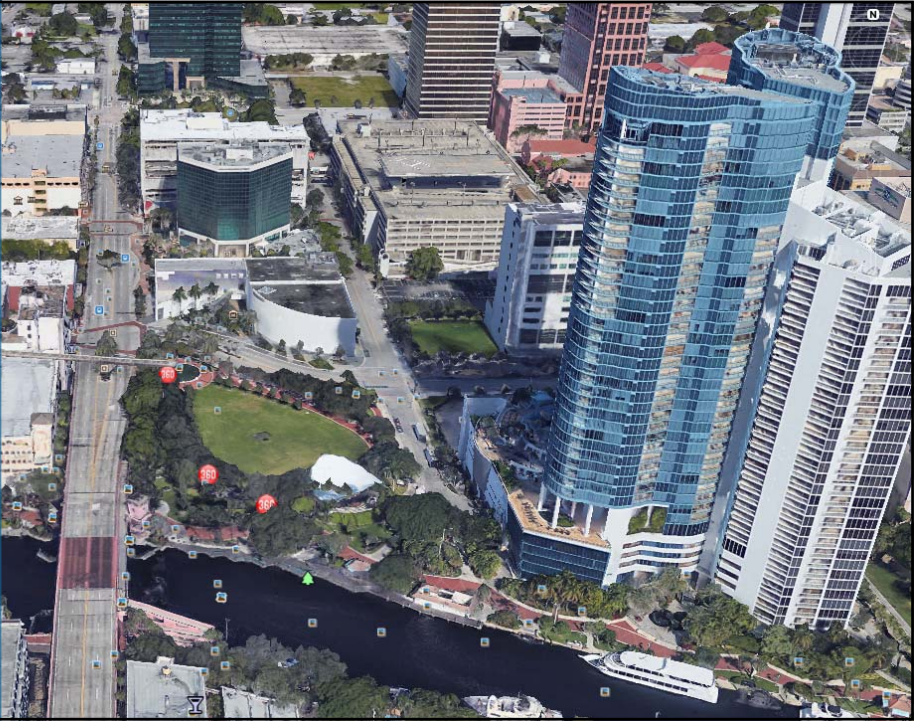
## A Tool in the Resilience Toolbox

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Commission Conference Meeting




# THE MANY BENEFITS OF NATURAL SHORELINES




## LIVING SHORELINES SUPPORT RESILIENT COMMUNITIES


Living shorelines use plants or other natural elements—sometimes in combination with harder shoreline structures—to stabilize estuarine coasts, bays, and tributaries.




**One square mile** of salt marsh stores the carbon equivalent of **76,000 gal of gas** annually.




Marshes trap sediments from tidal waters, allowing them to **grow in elevation** as sea level rises.




Living shorelines improve **water quality**, provide **fisheries habitat**, increase **biodiversity**, and promote **recreation**.




Marshes and oyster reefs act as natural **barriers** to waves. **15 ft** of marsh can **absorb 50%** of incoming wave energy.




Living shorelines are **more resilient** against storms than bulkheads.



**33%** of shorelines in the U.S. will be **hardened** by **2100**, decreasing fisheries habitat and biodiversity.



Hard shoreline structures like **bulkheads** prevent natural marsh migration and may create seaward **erosion**.



The National Centers for Coastal Ocean Science | [coastalscience.noaa.gov](https://coastalscience.noaa.gov)

Some graphics courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science ([ian.umces.edu/symbols/](https://ian.umces.edu/symbols/))

<https://www.fisheries.noaa.gov/insight/understanding-living-shorelines>

## FORT LAUDERDALE SHORELINES – GREEN OR GRAY?

HOW GREEN OR GRAY SHOULD YOUR SHORELINE SOLUTION BE?

GREEN - SOFTER TECHNIQUES

GRAY - HARDER TECHNIQUES

### Living Shorelines

**VEGETATION ONLY** - Provides a buffer to upland areas and breaks small waves. Suitable only for low wave energy environments.

**EDGING** - Added structure holds the toe of existing or vegetated slope in place.

**SILLS** - Parallel to existing or vegetated shoreline, reduces wave energy, and prevents erosion. Suitable for most areas except high wave energy environments.

### Coastal Structures

**BREAKWATER** - (vegetation optional) - Offshore structures intended to break waves, reducing the force of wave action, and encourage sediment accretion. Suitable for most areas.

**REVETMENT** - Lays over the slope of the shoreline and protects it from erosion and waves. Suitable for sites with pre-existing hardened shoreline structures.

**BULKHEAD** - Vertical wall parallel to the shoreline intended to hold soil in place. Suitable for areas highly vulnerable to storm surge and wave forces.

**Oceanic Shoreline**  
Wave wall upland to sandy beaches with vegetated dunes and coral reefs as natural break waters.

**Tidal Waters Shoreline**  
Heavily bulkheaded (sea-walled) with living shorelines in limited locations.

Mangrove shoreline – Bill Keith Preserve

<https://www.fisheries.noaa.gov/insight/understanding-living-shorelines>

## WHAT IS A LIVING SEAWALL?

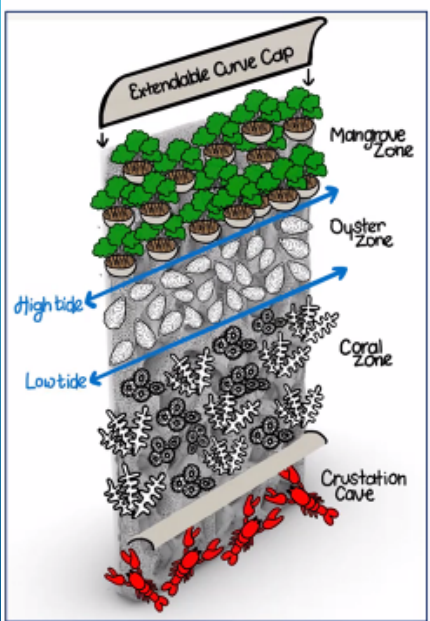
- Bulkhead (seawalls) that provides:
  - Habitat Value
    - e.g. Shelter for crabs, small fish
  - Resilience to Wave Impacts
    - Rough surface to absorb rather than reflect energy
  - Supports waterway quality
    - Growth of sessile organism that filter the surrounding water

Oysters –Downtown Fort Lauderdale  
May 22, 2023

CAM 23-0402  
Exhibit 1  
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## LIVING SEAWALLS: WHERE AND HOW

- 165 miles of waterway
  - 5 miles of City-owned seawall /All others are private
  - Ordinance to elevate for protection from tidal flooding, habitat enhancement “encouraged”
  - Projects under construction do not include a living seawall component, considering for future projects
  - Concerns about compromising seawall integrity
- Brackish environment continuum
  - Things live where they can live, not necessary where we put them
  - With sea level rise, habitats will shift upward
- Availability
  - Many living seawall products are just coming into the market place
  - Lacking proof of concept, permitting challenges
- Right solution, right place
  - What habitat or water quality problem are you trying to solve?

## WHAT IS WATERWAY QUALITY?

- Physical component
  - Color
  - Temperature
  - Water Clarity
- Biological component
  - Algae
  - Bacteria
- Chemical component
  - Oxygen
  - Nutrients
  - Chlorophyll



<https://www.fortlauderdale.gov/home/showpublisheddocument/53477/637749972940770000>

### MUNICIPAL CHALLENGES WITH LIVING SEAWALLS



3-D printed seawall panel

- **Cost/Funding**
  - Must choose between raising more seawalls or providing habitat enhancement
  - Long term maintenance and viability
- **Location**
  - Right habitat enhancement in the right place to prevent conflicts with navigation and waterway access and views
- **Market Readiness**
  - Can we use a competitive bid process?
  - Are there vendors who can provide these products or still in research phase?
- **Permitting**
  - Few if any projects permitted to date



Mangrove Root Panel




Custom style rip rap




Seahive mangrove planter

### PERMITTING LIVING SEAWALLS & HABITAT ENHANCEMENT

City	Broward County	SFWMD	FDEP or TIFF	Army Corp	FFWC
Building/ Structural	Delegated authority for all seawalls permits NOT on ICW (General and Environmental Resources Licenses- ERL)	Sovereign submerged lands (SSL)	SSL	General permit delegated to County	Applies to existing if there are coral or oyster beds*



**Any work in, on or underwater will require a permit** – usually a general permit for smaller scale projects and an Environmental Resources License (ERL) for larger projects.



### Right Solution, Right Place: Challenges and Trade-offs of Habitat Enhancement in the Urban Environment

PROJECT: Mangrove planters at the seawall

Pros

- Habitat enhancement
- Wave attenuation
- Wildlife

Cons

- Required maintenance (trimming and trash removal)
- Blocking vista

Public seawall

Private seawall

PROJECT: Mangrove Island nearshore

Pros

- Habitat enhancement
- Wildlife
- Less impact to vista

Cons

- Trash accumulation
- Impact to navigation
- Permitting

### Overview of Proposed Living Shoreline At New River Middle School

Perimeter berm

Open water area

Boardwalk

Outdoor classroom

Mangrove planting area

Rip rap planters

Floating dock

ADA access

Gangway

Pre-cast concrete planters

Rip rap



