Engineering Distinctions between Living Shorelines & Shoreline Stabilization for Backbay Areas

CUMMINS | CEDERBERG
Coastal & Marine Engineering

FSBPA 37th Annual National Conference on Beach Preservation Technology
February 8, 2024

Jenna N. Phillips, M.S., Sr. Director
jphillips@cumminscederberg.com

Jannek Cederberg, M.Sc., Principal
jcederberg@cumminscederberg.com

Traditional Approaches

+ Seawalls / bulkheads
+ Protection from:
    - Wave energy
    - Shoreline erosion
    - Tidal flooding
    - Storm surge
+ Upside:
    - Easy to permit
    - Known installation practices
    - Contractor knowledge
    - Low maintenance

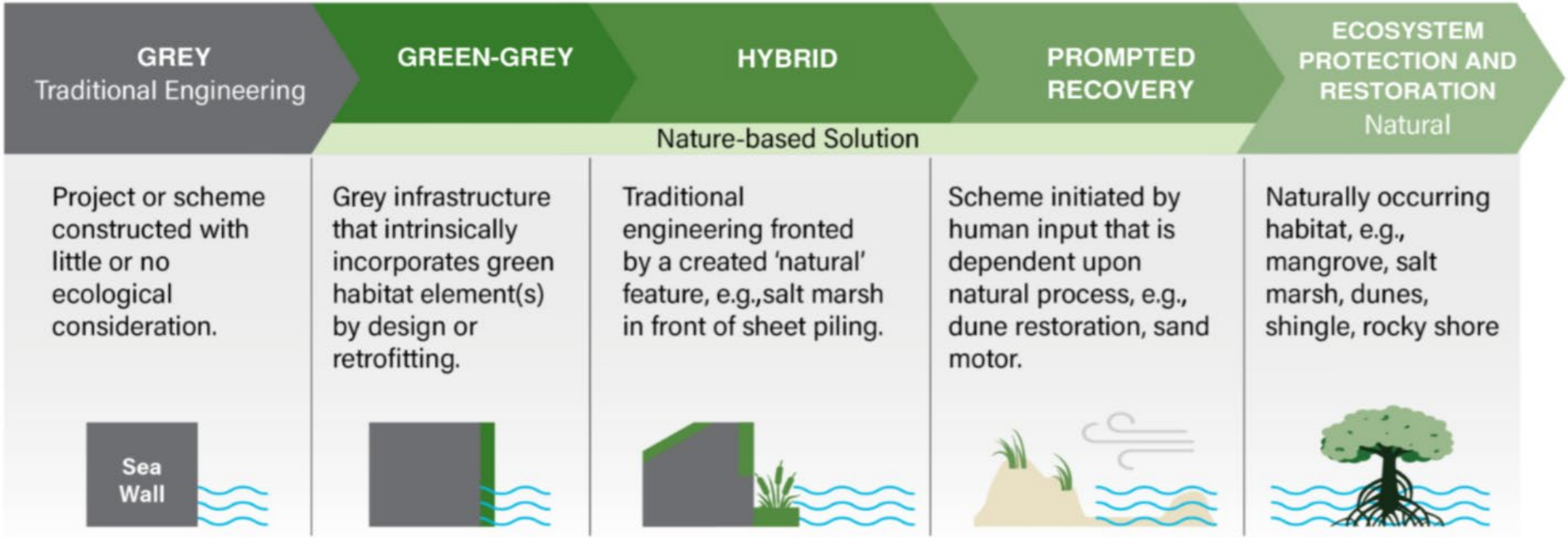
Disadvantages of Seawalls

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

Resiliency and Shorelines

CUMMINS | CEDERBERG
Coastal & Marine Engineering

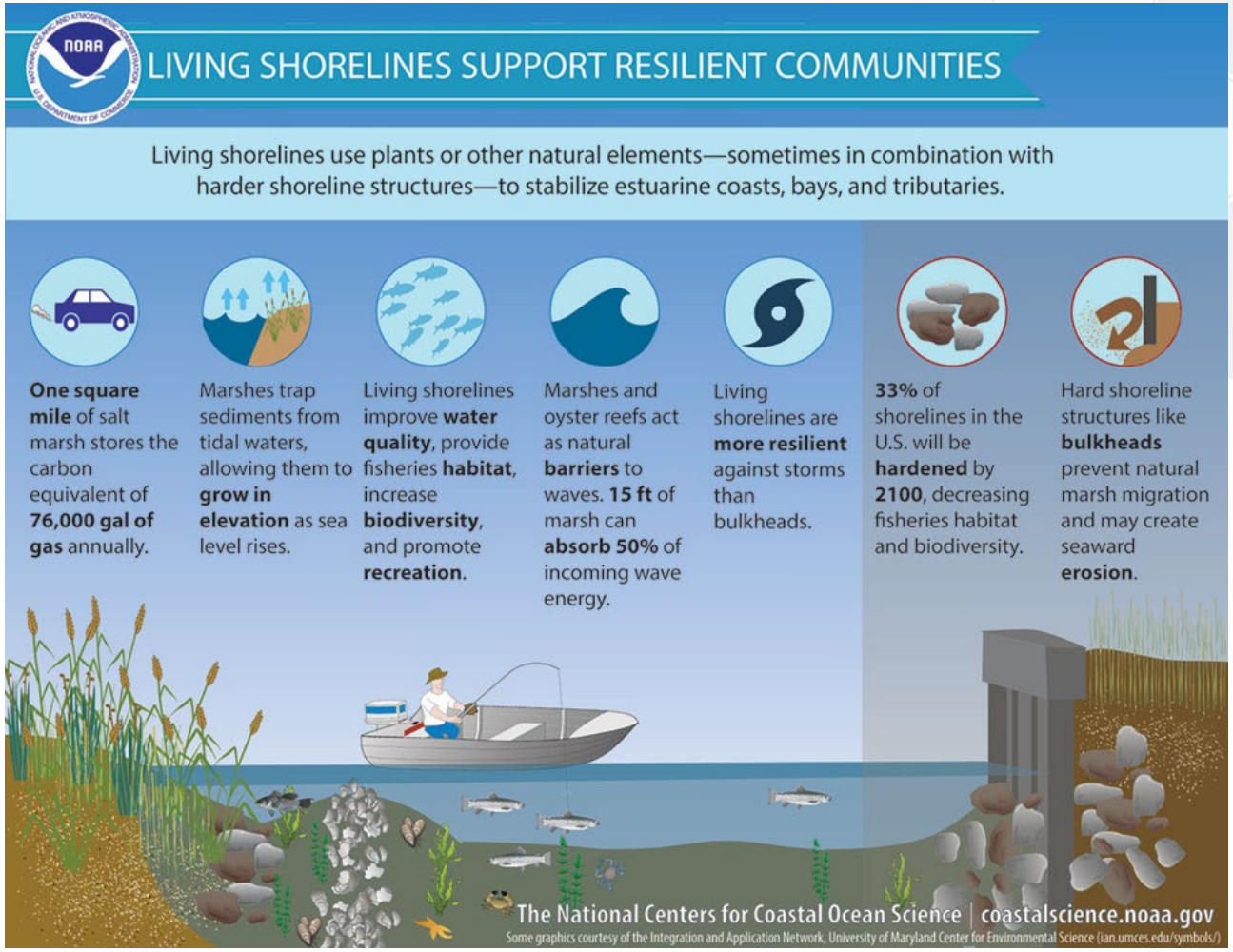
+ Our future will be wet and stormy... shorelines are first line of defense
+ Back bays more at risk than ocean front
+ Balance resilience, ecology, and access
+ Funding sources available, especially for nature-based solutions



Definitions

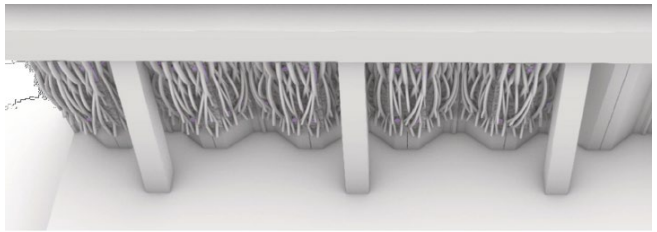
CUMMINS | CEDERBERG
Coastal & Marine Engineering

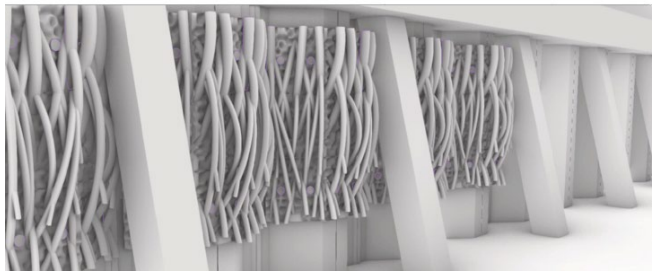
- **Natural features** created through action of physical, biological, geologic, and chemical processes operating in nature (marshes, oysters, dunes, mangroves)
- **Nature based** features created by human design, engineering to mimic nature, such as a living shoreline
  - **Living Shoreline** – protected and stabilized coastal edge made of natural materials such as plants, sand or rock; grow over time; to stabilize estuarine coasts, bays, or tributaries
  - **Ecosystem Restoration** – the process of repairing sites in nature whose biological communities and ecosystems have been degraded or destroyed



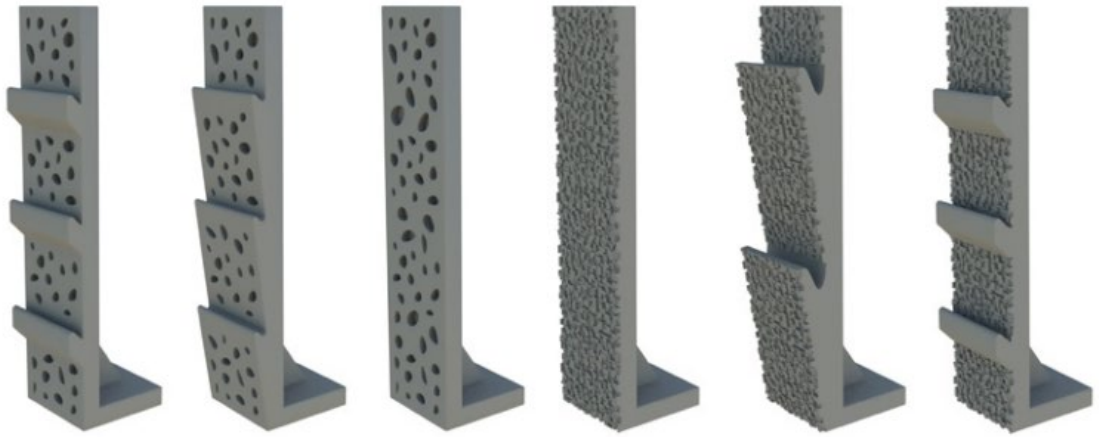
Living Shoreline Types/Applications

CUMMINS | CEDERBERG
Coastal & Marine Engineering





Ecological Enhanced Seawall



Reef Wall Paneling

Living Shoreline Types/Applications

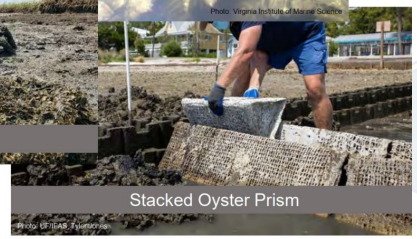
CUMMINS | CEDERBERG
Coastal & Marine Engineering


Oyster Castle


Riprap/recycled concrete


Reef balls

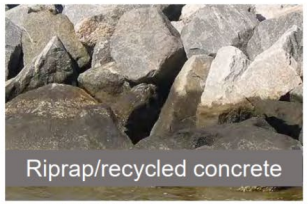

Tabletops


Stacked Oyster Prism

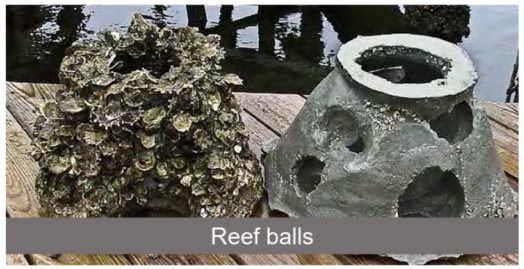
*Could involve one or more structure types


Perimeter of larger objects

Interior filled with loose cultch (rock/rubble/shell)


Riprap/recycled concrete


Oyster Castles

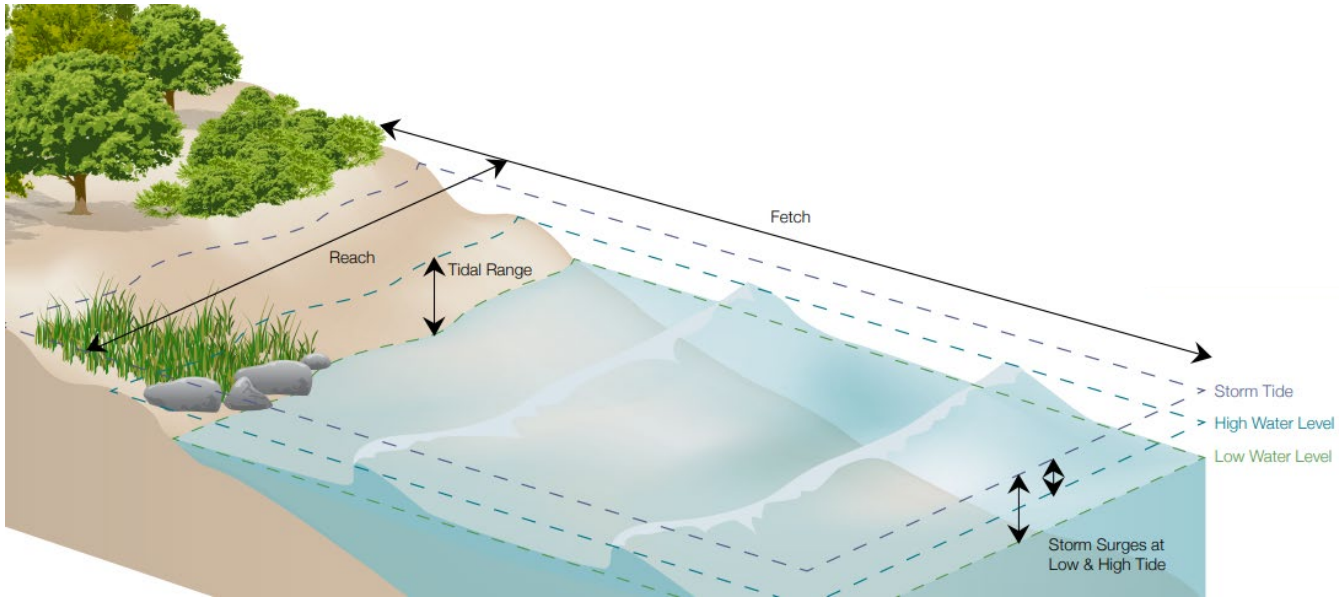

Reef balls


Oyster Catcher Tabletops

Site Selection & Design Criteria

CUMMINS | CEDERBERG
Coastal & Marine Engineering

- Upland space, use and functionality
  - Public spaces, parks, RoWs
- Reach (Length of shoreline)
- Water depth
- Tidal Range
- Fetch distance
- Cross-sectional location – above, at or below MHWL

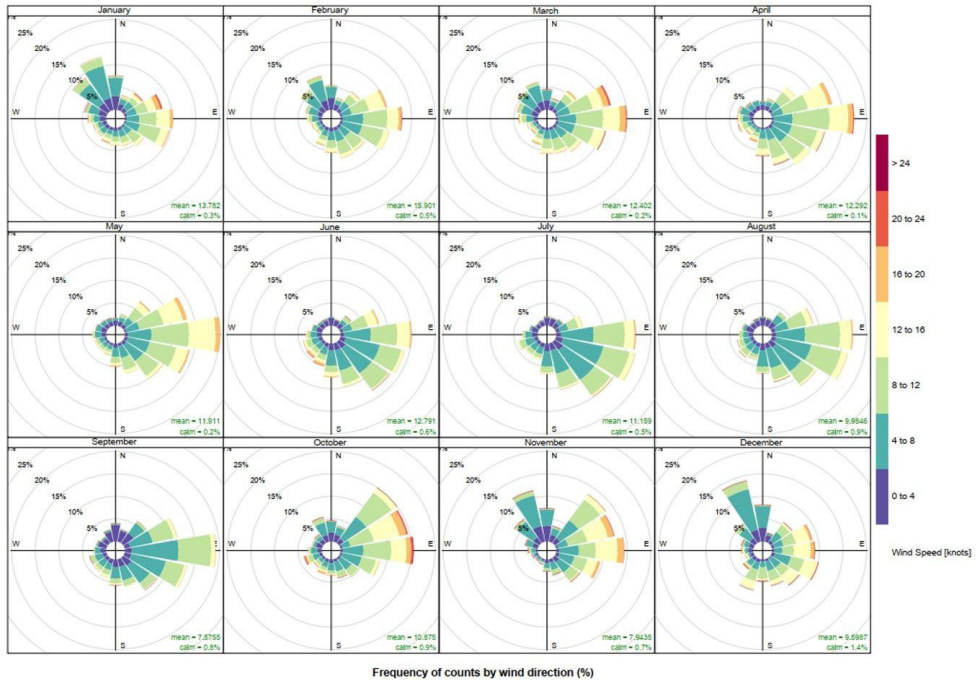


Wave Climate

CUMMINS | CEDERBERG
Coastal & Marine Engineering

- Degree of exposure
- Fetch, surge, runup, width of waterway
- Prevailing wind
- Boat wakes - speed zones
- Proximity to channel or inlet

FIGURE 5: MONTHLY WIND ROSE PLOT



Water Levels

CUMMINS | CEDERBERG
Coastal & Marine Engineering

- MHW, MLW, tide range
- Seasonal High Tides
- SLR Projections
- Planning horizon - Today, 2040, 2070

State Regulations

CUMMINS | CEDERBERG
Coastal & Marine Engineering

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

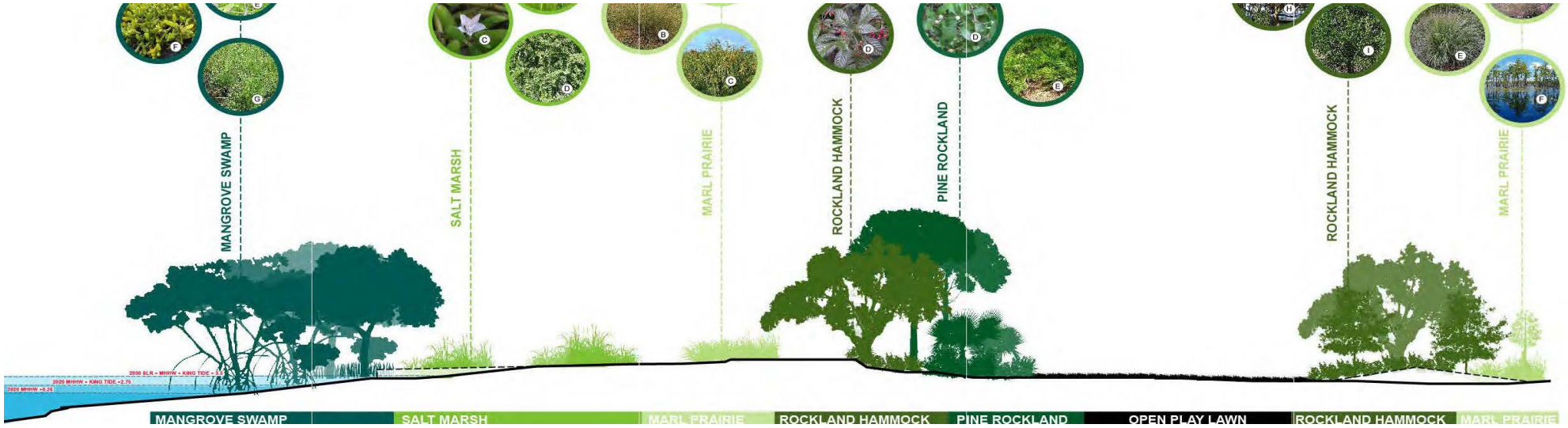
62-330.632 – Low Profile Oyster Habitat General Permit

- **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

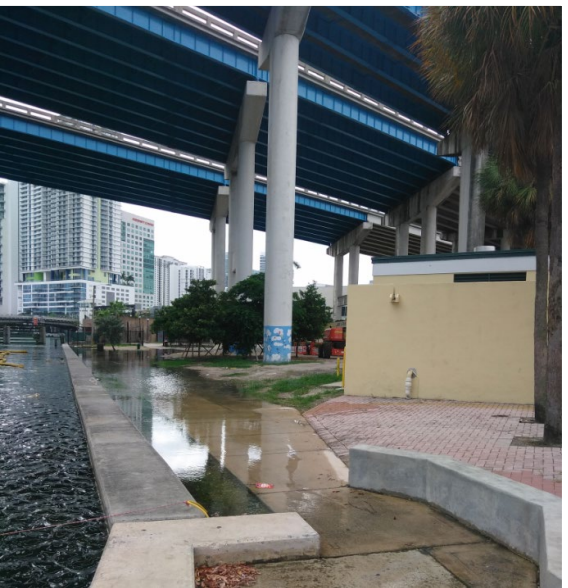
Challenges

CUMMINS | CEDERBERG
Coastal & Marine Engineering

- Mangroves planted along MHWL
  - Trigger SSL
- Regulations support mangrove plantings
- Regulated 2 ways:
  - Mangrove Trimming and Preservation Act
  - Environmental Resource Permit Statute
- Under ERP, subject to conditions
- State preference for upland excavation (upland of MHWL)
- Local gov. “no net loss” of Public land



NOAA Intermediate High Sea Level Rise*		MHHW***	King Tide**	King Tide + 1.5' Wake
Year	(ft)	(ft, NAVD 88)	(ft, NAVD88)	(ft, NAVD88)
2000	0.00	0.29	N/A	N/A
2010	0.30	0.58	N/A	N/A
2020	0.56	0.84	2.5	4.0
2030	0.98	1.27	2.9	4.4
2040	1.38	1.66	3.3	4.8
2050	1.94	2.22	3.9	5.4
2060	2.56	2.85	4.5	6.0
2070	3.31	3.60	5.3	6.8
2080	4.17	4.45	6.1	7.6
2090	5.12	5.40	7.1	8.6
2100	6.14	6.42	8.1	9.6

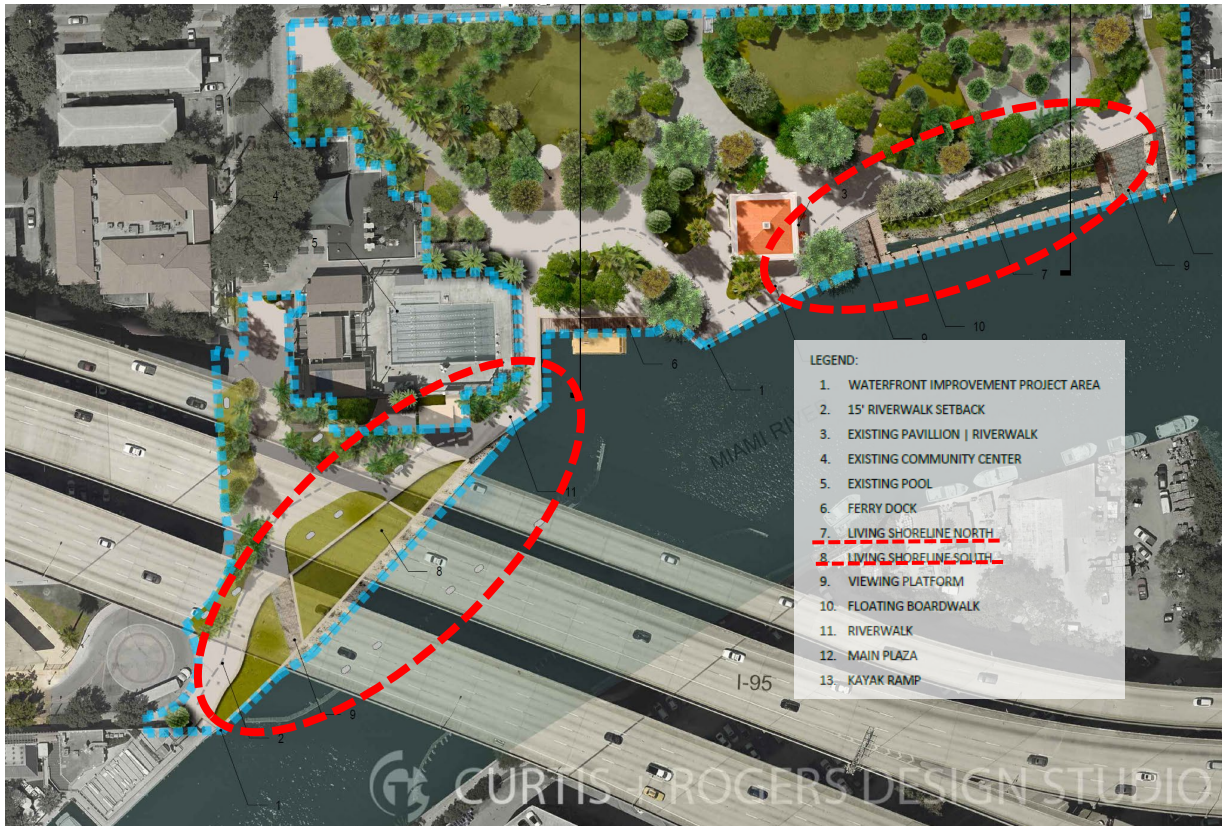


Jose Marti Park (City of Miami)

+ Between Miami River & Little Havana
+ Provides open space & social services
+ Flooding due to sea level rise & king tide

CUMMINS | CEDERBERG
Coastal & Marine Engineering

- Using layered natural design ap
- Mangroves, marsh grass, buttor
  woods
- Requires contouring, grading, and fill
  - Fill heavily regulated
- Significant performance requirements -
  jeopardizing feasibility



Currie Park Adaptive Redesign

CUMMINS | CEDERBERG
Coastal & Marine Engineering

$16.7M CDBG-MIT
FDEO/HUD

cma
chen moore and associates

CRA

Dinner Key Habitat Island Breakwaters

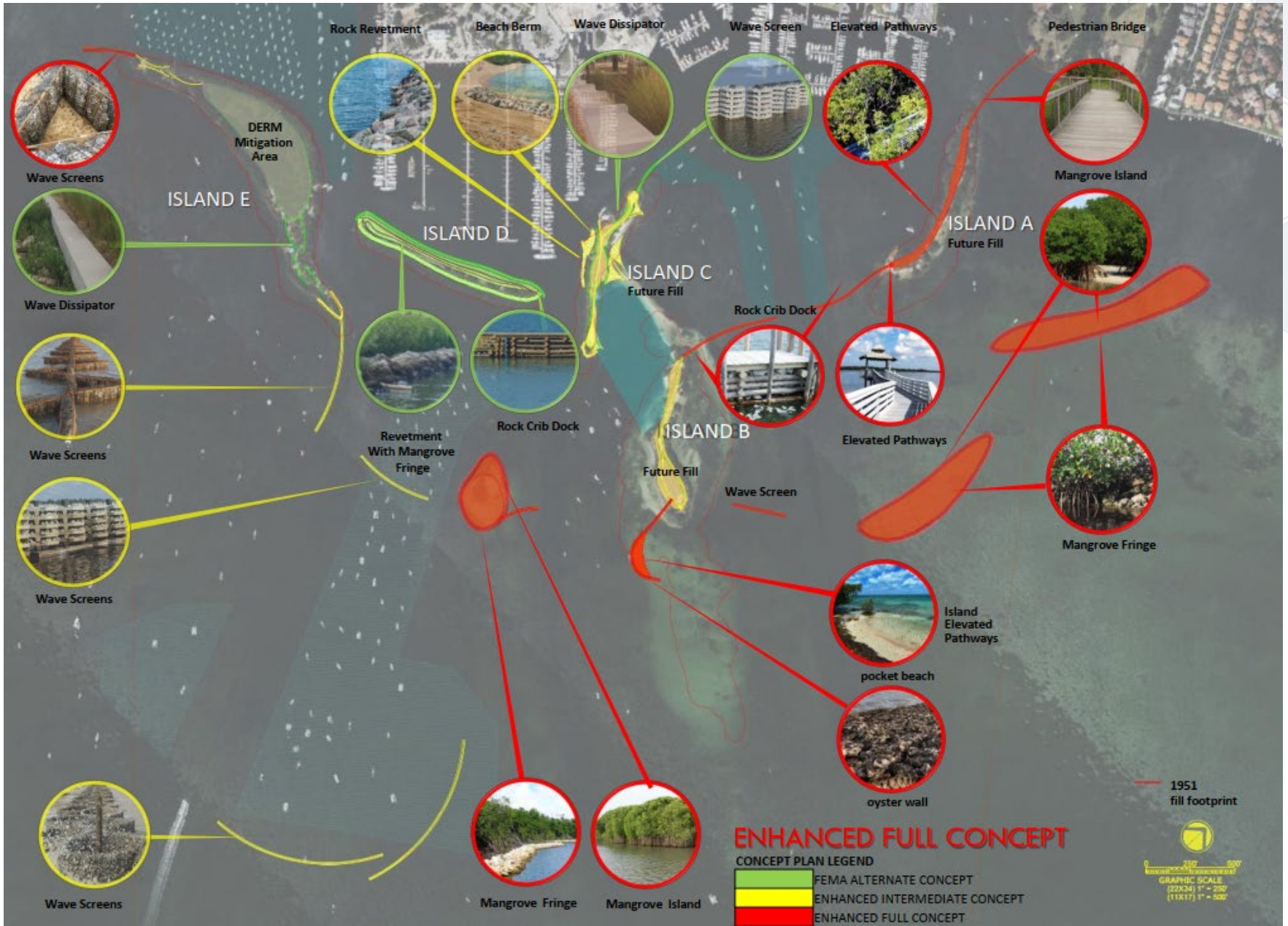
CUMMINS | CEDERBERG
Coastal & Marine Engineering

- Spoil islands are relatively low in elevation, ranging from 0 to 3 ft NAVD88.
- MHHW approximately 0.2 ft NAVD88
- King Tide Elevations observed up to +2.2 ft NAVD88
- Island D mostly submerged during King Tides.

Enhanced Conceptual Design

CUMMINS | CEDERBERG
Coastal & Marine Engineering

- Includes wave attenuation
- Shoreline stabilization
- Ecological enhancement



Key Takeaways

CUMMINS | CEDERBERG
Coastal & Marine Engineering

- Define clear project goal (e.g. wave attenuation, water quality, restoration)
- Identify co-benefits
- Requires engineered approach
- Consider future conditions
- Strong permitting approach/team
- Understand competing constraints:
  - Upland Space, Limited waterward projection
  - Competing resource priorities – mangroves, seagrass, oysters
- Don’t box yourself in, Be Creative!

Thank you!

CUMMINS | CEDERBERG
Coastal & Marine Engineering

Jenna N. Phillips, M.S.

Sr. Director/Sr. Coastal Engineer

jphillips@cumminscederberg.com

SCAN ME

Jannek Cederberg, M.S.

Principal Engineer

jcederberg@cumminscederberg.com

Jose Marti Park