

Ecological Concrete Structure

Flood Adaptation Measure



ECOLOGICAL INFRASTRUCTURE



WATER LEVEL RANGE:

Intertidal to subtidal

SHORELINE LOCATION:



In Water

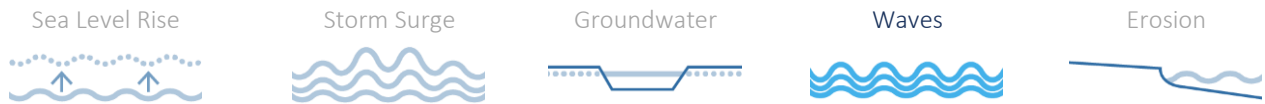


Seattle seawall's textured face panels before installation - Seattle, WA.
©Seattle DOT via Flickr.com

DESIGN LIFE	ADAPTABILITY	IMPACT ON THE WATERFRONT	CONSTRUCTION COST
Decades	Medium	Minor Intervention	TBD

COASTAL FLOOD HAZARDS MITIGATED:

Enhancements can provide flood protection when combined with other physical infrastructure



MEASURES COMPATIBILITY:		ECOSYSTEM SERVICES: Measure may affect these shoreline values			
Flood	Seismic	Aquatic Habitat	Terrestrial Habitat	Water Quality	Carbon Storage
Breakwaters, Seawalls, Raised Marine Structures	N/A	↑	—	— / ↑	—
		—	—	—	—

DESCRIPTION:

Ecological concrete is a bio-enhanced concrete mix, and can be used as an alternative to rock or concrete construction materials. It can be cast into armor units in breakwaters or revetments, wall panels, and piles and pile jackets. Textured and contoured surfaces or cavities can support desired habitats, enhancing biodiversity without decreasing the structural properties of the existing features.

CONSIDERATIONS:

- Suitability and expense of installation are dependent on condition, location, and wave/geotechnical/seismic environment of receiving structures relative to tidal range.

ADVANTAGES:

- Features can be designed to encourage growth of various marine organisms, reduce the influence of invasive species, and enhance biodiversity.

DISADVANTAGES:

- Installation could be expensive depending on location, wave environment, marine climate, and/or equipment required.
- For modifications of existing features, suitability is dependent

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<p>CONSTRUCTION IMPACTS TO THE PUBLIC:</p> <ul style="list-style-type: none"> • Depends on location of structure. Installation of ecological armor units can be completed from the water or landside, while wall panels and piles must be installed from the water. • Access to the shoreline will be restricted during construction. 	<p>SEA LEVEL RISE ADAPTATION OPPORTUNITIES:</p> <ul style="list-style-type: none"> • Successful in areas with moderate or high tidal range due to ability to support a diversity of species. • Subtidal habitats may replace intertidal habitats with sea level rise. 	<p>on condition and shape of receiving structure.</p> <p>CASE STUDIES:</p> <ul style="list-style-type: none"> • None cited
<p>DESIGN OPPORTUNITIES:</p>		
<p>Ecological Enhancements</p> <ul style="list-style-type: none"> • Increase in biodiversity and marine habitat. 	<p>Urban Design</p> <ul style="list-style-type: none"> • Where access/viewing is appropriate, structures can offer educational value in the public realm. 	<p>Form</p> <ul style="list-style-type: none"> • As a material enhancement, ecological concrete can be applied in many forms. Surface shape and texture are designed to support a diversity of habitats and species relative to tidal range.

DESIGN CONSIDERATIONS:

- Ecological concrete features must account for relevant wave, geotechnical, and/or seismic conditions to provide adequate structural stability. These units can either be adapted to or replace existing structures. Where ecological concrete is affixed to existing structures like walls or piles, construction must consider impacts to structural loads.

SITE-SPECIFIC CONSIDERATIONS:

- Water levels, currents/circulation which carry nutrients can have an impact on the ability for species to colonize surfaces.
- Geotechnical conditions and substrate properties are important considerations for armor units and wall panels.
- Pile jackets are best suited for locations with low waves and no seismic activity.

URBAN DESIGN CONSIDERATIONS:

- Features could attract recreational water users. Benefits could be positive (enhanced recreational experience, educational opportunities) or negative (potential hazard to commercial traffic).

INSTALLATION AND CONSTRUCTABILITY CONSIDERATIONS:

- Units for structures like armor layers or panels can be fabricated offsite.
- Ecological concrete piles can be manufactured as pre-cast or onsite.
- In breakwaters, stability of armor layer requires careful placement of units to ensure adequate interlocking to achieve stability and prevent damage in waves.

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OPERATIONS AND MAINTENANCE CONSIDERATIONS:

- Some bio-protection could occur from colonization of various species, potentially reducing the need for maintenance.
- Features should be inspected for cracks or damage in the intertidal area following significant seismic or storm events.