

# The Costs of Shoreline Stabilization



# Installation Cost Comparisons



**INDUSTRY GENERATED COSTS COMPS  
SUPPORTING CALCULATIONS  
VERIFIED COST COMPARISONS  
SUPPORTING CALCULATIONS**

# Industry Generated Costs Comparisons



**NORTH AMERICAN STEEL SHEET PILING ASSOCIATION  
RETAINING WALL STUDY**  
Section 1.2 Summary of Costs and Construction Time  
All Walls

**Wall Properties**

H := 19-ft      Exposed Wall height  
L := 100-ft      Wall Length

Retaining Wall Type	Construction Duration (Days)	Total Cost for 100 ft. Wall	Cost per Linear Ft.	Cost per Square Ft.	Cost Per Linear Foot 8' Wall
Grouted Anchor Steel Sheet Pile Wall	13	\$ 90,607	\$ 906.07	\$ 47.69	\$ 381.52
Cast-In-Place Reinforced Concrete Wall	47	\$ 258,572	\$ 2,585.72	\$ 136.09	\$ 1088.72
Concrete Modular Unit Gravity Wall	31	\$ 144,741	\$ 1,447.41	\$ 76.18	\$ 609.44
Mechanically Stabilized Earth Wall	35	\$ 181,593	\$ 1,815.93	\$ 95.58	\$ 764.64
Solder Pile and Lagging Wall	26	\$ 171,836	\$ 1,718.36	\$ 90.45	\$ 723.6
Slurry Wall*	64	\$ 400,145	\$ 4,001.45	\$ 210.60	\$ 1684.8

# Industry Generated Costs Comparisons



NORTH AMERICAN STEEL SHEET PILING ASSOCIATION  
 RETAINING WALL STUDY  
 Section 1.3 Summary of Costs and Construction Time, Each Wall

Crested Anchor Steel Sheet Pile Wall

Pay Item No	Item	Unit	Quantity	Daily Output (unit/day)	Time (day)	Unit Cost	Cost	
5	Crested Anchor - 1' Dia	LF	288.0	128	3	\$ 20.20	\$ 5,777.20	
02	Sheet piling, 12 ft deep excavation	10 ft pile, left in place	TY	28.0	12.95	3	\$ 1,850.00	\$ 56,150.00
03	Wales, connections & cross	0	1.5	NA	-	\$ 300.00	\$ 450.00	
04	Anchor	TY	8.4	NA	-	\$ 2,500.00	\$ 21,000.00	
07	Backfill structural	101 H.P., 150 ft haul, sand & gravel	LCY	211.0	478	-	\$ 2.00	\$ 422.00
08	Borrow loading	select granular fill	BCY	211.0	NA	-	\$ 13.95	\$ 2,953.45
09	Compaction, riding vibrating roller	12 in lift, 2 passes	BCY	-	528	-	\$ 0.25	\$ -
10	Compaction, walk behind vibrating plate	12 in lift, 2 passes	BCY	211.0	540	1	\$ 0.78	\$ 164.58
12	Excavation, trench, common earth	14 ft to 20 ft deep, 1.7 cy hydraulic backhoe	BCY	211.0	480	1	\$ 3.88	\$ 818.48
11	Drives piles, complete pile driving setup	Mobilization, large	EA	1.0	0.27	4	\$ 21,000.00	\$ 21,000.00
16	Concrete for subsoil drainage	Fabric, laid in trench, adhere conditions	CY	244.4	2800	1	\$ 2.18	\$ 532.79
Totals						13		\$ 90,807.21
							Cost per LF	\$ 906.87
							Cost per SF	\$ 47.89

# Verified Cost Comparison - LSSI



## Bank Stabilization Cost Estimates - Little St Simons Island, GA -

**Bulkheads:** A bulkhead is any shore-parallel vertical structure or wall designed to prevent erosion of the land.

Type	Unit	Materials Cost Only (\$/Unit)	Installed Cost (\$/Unit)
Vinyl bulkhead w/toe protection	Linear Foot	\$283	\$686

A vinyl bulkhead is a vertical sea wall constructed of rigid, interlocking vinyl sections. Each section is 18" wide on average, has tongue and groove type edges which lock together with adjacent sections, and is driven into the ground for stability. Additional stability is provided by tie-backs which extend from the exposed face of the wall into the embankment to a fixed anchor. The toe, or the embankment below the bulkhead that is exposed to the water, is protected from currents and waves by large granite rocks called rip-rap.

*All costs based on heights of 8' of exposed sea wall plus toe protection*

*Total Length of Embankment = 300 Linear Feet*

*Installation Costs include the cost to: extend old dock ramp to meet the new top of bank; backfill; and finish grade.*

*Estimated costs do not include the cost to barge the material to the island or island housing*



# Verified Cost Comparison - LSSI



<b>Wooden bulkhead w/toe protection</b>	<b>Linear Foot</b>	<b>\$241</b>	<b>\$652</b>
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A wooden bulkhead is a vertical sea wall constructed of pressure-treated wood sections. Each section is 12" wide on average, has tongue and groove type edges which fit together with adjacent sections, and is driven into the ground for stability. Additional stability is provided by tie-backs which extend from the exposed face of the wall into the embankment to a fixed anchor. The toe, or the embankment below the bulkhead that is exposed to the water, is protected from currents and waves by large granite rocks called rip-rap.

<b>Concrete bulkhead w/toe protection</b>	<b>Linear Foot</b>	<b>\$476</b>	<b>\$1022</b>
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A concrete bulkhead is a vertical sea wall constructed of concrete sections. Each section is 18"-36" wide on average, has tongue and groove type edges which fit together with adjacent sections, and is driven into the ground for stability. Additional stability is provided by tie-backs which extend from the exposed face of the wall into the embankment to a fixed anchor. The toe, or the embankment below the bulkhead that is exposed to the water, is protected from currents and waves by large granite rocks called rip-rap.



# Verified Cost Comparison - LSSI



**Sloped Revetments** – sloped revetments are constructed features made of hard materials placed on banks in such a way as to absorb the energy of incoming water. Revetments are usually built to preserve the existing uses of the shoreline and to protect the slope, as defense against erosion.

Type	Unit	Materials Cost (\$/Unit)	Installed Cost (\$/Unit)
<b>Granite Type 1 Rip Rap w/ Type 1 toe protection</b> Granite Type 1 Rip Rap, also known as “surge stone,” is comprised of granite stones, each weighing approximately 125 lbs on average and measuring 18” to 24” in diameter. It is used in areas where larger stones are needed for stability or to resist the forces of strong currents or wave action. Geotextile, a woven nylon fabric, is placed under the rip rap to further reduce the energy of the water on the soil and further prevent soil loss.	Linear Foot	\$164	\$469
<b>Granite Type 3 w/ Type 1 toe protection</b> Granite Type 3 Rip Rap is comprised of granite stones, each weighing approximately 15 lbs on average and measuring 6” to 8” in diameter. It is used to reduce the velocity and energy of water currents on the upper portions of the bank. Geotextile, a woven nylon fabric, is placed under the rip rap to further reduce the energy of the water on the soil and further prevent soil loss. Granite Type 1 Rip Rap is used to provide additional stability on the lower portion of the bank.	Linear Foot	\$155	\$443
<b>Granite Type 3 w/ Type 3 toe protection</b> Granite Type 3 Rip Rap is comprised of granite stones, each weighing approximately 15 lbs on average and measuring 6” to 8” in diameter. It is used to reduce the velocity and energy of water currents on all portions of the bank. Geotextile, a woven nylon fabric, is placed under the rip rap to further reduce the energy of the water on the soil and further prevent soil loss.	Linear Foot	\$152	\$440

# Verified Cost Comparison - LSSI



**Living Shoreline** – A living shoreline is a sloped erosion control technique that mimics natural, native habitat, provides increased opportunities for species diversity and productivity, and can serve to improve water quality and the ecological integrity of the area.

Type	Unit	Materials Cost Only (\$/Unit)	Installed Cost (\$/Unit)
Oyster bags w/ Recycled Concrete	Linear Foot	\$120	\$361

## Toe Protection

Oyster bags are plastic mesh bags that are filled with loose oyster shells. Each bag is approximately 10 inches in diameter and weighs 10 lbs on average. Oyster bags are used instead of rip rap to reduce the energy of water currents and also to provide habitat and a growing medium for living oysters. The living oysters in time provide water filtration and natural cementation and structural integrity to the embankment. Native plants are used at the top of the bank to further reduce erosion and provide habitat and water filtration. Granite Type 1 Rip Rap is used on the bottom portion of the bank for additional stability.



### Concrete Bulkhead - 200LF

Mobilization	1 LS	7500	7500
Precast Concrete Sheetpile	1 LS	60000	60000
Concrete Pile Cap	15 CY	500	7500
Tie Backs	10 EA	1500	15000
Weephole Drains/Gravel	10 EA	500	5000
Fabric	1 LS	600	600
Type 1 Rip Rap(Toe Protection)	100 TN	70	7000
Labor	300 HR	120	36000
Equipment	1 LS	20000	20000
Fuel	1 LS	5000	5000
Subtotal			<b>161600</b>
Company Overhead			24540
Estimated Company Return			16360
Total			<b>204500</b>
	Cost/LF	\$1,023	

### Rip Rap Type 3 w/ Type 1 Toe - 200LF w/ 18' slope

Mobilization	1 LS	5000	5000
Rip Rap (embankment)(18")	350 TN	65	22750
Rip Rap (toe)	100 TN	70	7000
Equipment	1 LS	6500	6500
Labor	200 HR	120	24000
Tiebacks	EA	1500	0
Filter Fabric	1 LS	1200	1200
Fuel	1 LS	4500	4500
Subtotal			<b>70950</b>
Company Overhead			10643
Estimated Company Return			7095
Total			<b>88688</b>
	Cost/LF	\$443	

### Vinyl Bulkhead - 200LF

Mobilization	1 LS	4500	4500
Vinyl Sheetpile	1 LS	26000	26000
Timber Pile Cap	1 LS	3000	3000
Tie Backs	10 EA	1500	15000
Weephole Drains/Gravel	10 EA	500	5000
Fabric	1 LS	600	600
Labor	240 HR	120	28800
Type 1 Rip Rap(Toe Protection)	100 TN	70	7000
Equipment	1 LS	15000	15000
Fuel	1 LS	4500	4500
Misc	1 LS		5000
Subtotal			<b>114400</b>
Company Overhead			11440
Estimated Company Return			11440
Total			<b>137280</b>
	Cost/LF	\$686	

### Living Shoreline - 200 LF

Mobilization	1 LS	4500	4500
Oyster Shell	350 TN	60	21000
Prep and Grade	1 LS	1500	1500
Anchors	10 EA	150	1500
Geotech	1 LS	1200	1200
Labor	120 HR	120	14400
Recycled Concrete Toe	100 TN	65	6500
Equipment	1 LS	5000	5000
Fuel	1 LS	4500	4500
Subtotal			<b>60100</b>
Company Overhead			6010
Estimated Company Return			6010
Total			<b>72120</b>
	Cost/LF	\$361	

# Maintain, Repair, Replace Costs



**BULKHEADS**  
**ROCK REVETMENTS**  
**HARD DEFENSES GENERAL**  
**LIVING SHORELINES**

# Bulkheads



## **Little St Simon's Island Bulkhead Repair**

2013 Quoted (with other work): \$5134

Length = 37.5'

2016 Estimate (without other work): \$7600-

\$8600

Length = 37.5 LF

LF Price: \$202 - \$229

# Bulkheads



*How much does Bulkhead construction cost?*

Depending on the local construction market and bulkhead design requirements, repairs may cost \$100-\$400 per linear foot of wall. Bulkhead replacement may cost \$500-\$1,000 per linear foot.

Collapsed Bulkheads will drive the Installation Cost of a new bulkhead up 20% or more.

Coastal Systems International





# Bulkhead Summary

## Coastal Systems International, Inc.



By: Timothy K. Blackwelder, P.E.

The most common form of shoreline stabilization at marinas is a bulkhead. The bulkhead provides an structural shoreline interface between the upland marina area and water slips. The most common, the bulkhead also serves as a source of revenue, whether it be parking decking or perpendicular mooring. Marine management is faced with the maintenance of marine structures, and a proper assessment of the bulkhead with associated mooring service life is essential for budgeting repairs and/or replacement. In addition, there are other concerns relative to loads beyond the bulkhead such as: boats, vehicles, and marine resources.

Assessing the condition of bulkheads in a marine basin can extend the service life of a structure. Performing preventative maintenance is most important as a result of a bulkhead condition study can be completed before they become major concerns. Other issues, bulkhead problems to see "surface" and "in-situ" are: timberline or bulkhead failure can a large a substan-

tial economic impact to marina operations. Unaddressed bulkhead deterioration or other problems such as undermining due to propeller scum are not visible above water and cannot be corrected in a simple fix.

This article will explain the difference between a normal and bulkhead, various classes of bulkhead design, present bulkhead materials of construction, and discuss bulkhead architecture/morphology.

### Normal vs. bulkhead?

Many people refer to all vertical shoreline structures as "seawalls," but there is a difference between a normal and a bulkhead. Normal structures that provide shoreline protection from waves but also retain soil.

Bulkhead: vertical shoreline stabilization structures that primarily retain soil, and provide minimal protection from waves.

Seawalls are typically located in the most breaking location, and are subject to wave impact with prevailing wind, mooring demands, and wave overtopping from

normal wave events. These localized wavefront properties may be subject to significant wave activity, even though they are not exposed to storm waves. The "line of thrust" in bulkhead design is to account for wave impacts of the significant wave height in a project area (expected to be in excess of three feet (3' storm).

### Elements of bulkhead design

The following design considerations need to be addressed, to properly assess the condition of a bulkhead.

- Topography: shoreline, grading, etc.
- Soil Properties: surcharge of soil, clay vs. sand, etc.
- Bulkhead Stability: depth of bulkhead

### Soil stability

- Wave Table: differential wave levels behind and in front of wall can add force additional loading on the wall
- Exposure: climate and substrate vs. structure
- Material Properties: strength and performance in the marine environment
- Berthage: (low loads behind the wall)



Replacement steel sheet pile bulkhead under construction, Bahia Acahuacal Yachting Center, Ft. Lauderdale, Florida

### soil in vehicles

- Low Loads: in northern climates
- Wave Maintenance
- Changes in use

Original or "in-built" piles can provide a wealth of information including the type of the structure and many of the design elements listed in the above geographic. The deteriorated condition of a bulkhead is an indicator that the bulkhead is either in need of maintenance, or that it has fulfilled its service life. In some cases, the bulkhead may be damaged due to loads in excess of loads it was designed to withstand.

### Materials of construction

The material of the bulkhead must be

properly identified during the reviewing process. The following table provides common soil construction materials with comments regarding availability, construction issues, and general performance in the marine environment:

### Concrete

Pilecap and clear piling configurations provide a service life of 10+ years if correct mix design and proper marine structural design implemented. Shear piling can be difficult to install in hard substrates, and concrete pile cap/walls can be subject to undermining.

### Steel

Steel clear piling commonly used for bulkheads. The material provides structural strength characteristics for high wind exposure applications, has no underlying soil, and is generally easy to install, even in harder substrates. It must be properly coated and maintained for long service life of 10+ years.

### Aluminum

Clear piling provides good corrosion resistance, but lighter sections allow the maximum exposed wall height. It is important to recognize corrosion potential of dissimilar metal fasteners. Do not use in contact with low bulkhead with clay/sandy soils. It is difficult to install in hard substrates.

### Timber

A timber pile/wall/clear system is a common structural configuration. It is generally economical material, but has limited strength characteristics for high wind loading. Because a timber bulkhead is essential for marine exposure service life is generally less than 10 years. It is difficult to install in hard substrates.

### Steel/PFRP

This is a relatively new structural product with service life of 30+ years (based on manufacturer warranty) it's available in different sizes, strength characteristics are limited for high wind loading. It is difficult to install in hard substrates.

### Structural evaluation

The American Society of Civil Engineers (ASCE) Underwater Investigations Standard Practice Manual was released in 2011 and provides guidance for the evaluation of marine structures including bulkheads.

The following topics are covered related to structural bulkhead evaluation:

- Qualification of inspection personnel
- Types and methods of inspection
- Typical forms of deterioration
- Condition Rating
- Frequency of Inspection

Marine management should retain the services of a consulting engineering firm that provides above/below water inspection services.

A comprehensive report is essential to document a proper bulkhead evaluation. The report should reference procedures and guidelines from the respective standard. All of the above items should be included along with photographs and sketches of the observed configuration with notes regarding deterioration. Comparison of previous reports provides an indication of the rate of deterioration.

Regulatory recommendations, along with construction cost estimates, should be included to provide marina management with cost engineering advice as they evaluate maintenance repairs or necessary from through a bulkhead in deterioration. It may not require immediate replacement. The report should be sealed by a registered professional engineer experienced in



Two examples of typical concrete bulkheads (Florida, Bahamas)

# Rock Revetment



**2016 Repair Estimate :**

LF Price: \$100 - \$250





# Hard Defenses



- Maintenance costs are another significant and ongoing expense when a hard defense is selected. These costs are ongoing for the life of the structure and are therefore likely to result in significant levels of investment through a project's lifetime. Continued investment in maintenance is highly recommended to ensure defenses continue to provide design levels of protection (Linham et al., 2010).
- It has been noted that construction and maintenance costs are likely to increase into the future in response to SLR (Burgess & Townend, 2004; Townend & Burgess, 2004). This is caused by increases in water depth in front of the structure which, in turn cause increased wave heights and wave loadings on the structure.

- TNA Guidebook Series - Coastal Erosion and Flooding

# Living Shorelines



- Hanging Anchors
- Stability
- Foundation
- Ease of Repair
- Holistic Support
- Next presentation

# Life-Cycle, External Costs



**TRADITIONAL IMPACTS  
SHORELINE INTEGRITY  
ECOLOGY  
SUMMARY OF MARSH VALUE  
COST EVALUATION OF MARSH VALUE  
LIVING SHORELINE IMPACTS  
SHORELINE INTEGRITY  
ECOLOGY**

# Traditional Impacts on Shoreline Integrity

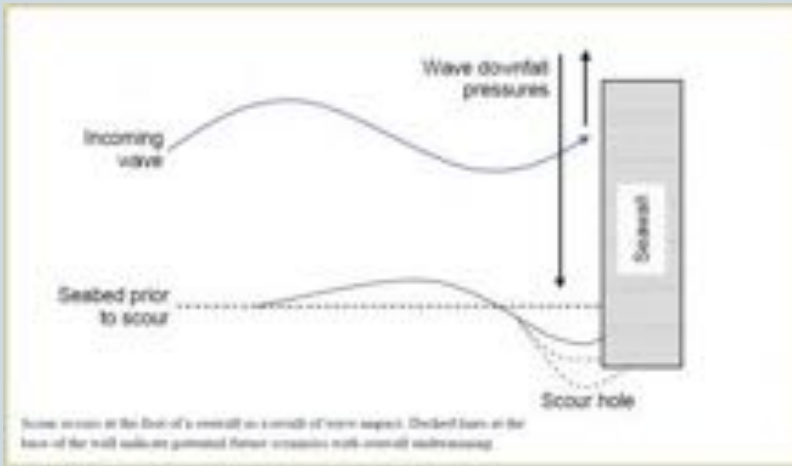


Figure 2: Schematic cross-section illustrating seawall scour (Source: Linham and Nicholls, 2010)

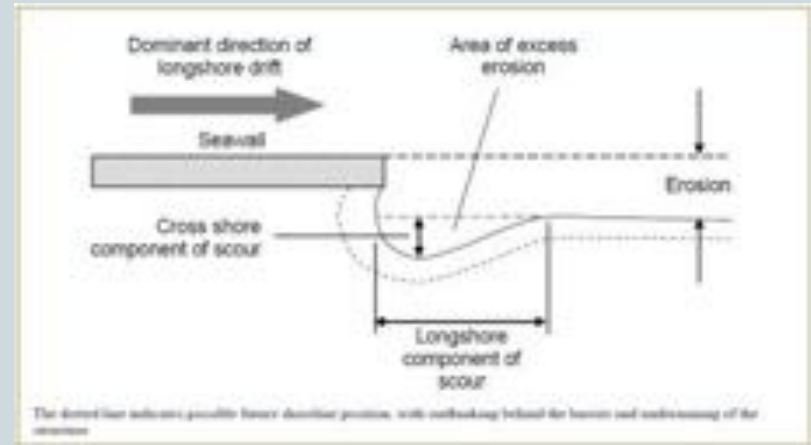


Figure 3: A seawall as viewed from above, showing typical end effects associated with the structure (Source: Adapted from McDougal et al., 1987)

- Smooth, vertical seawalls are the least effective at dissipating wave energy; instead, the structures reflect wave energy seawards. Reflection creates turbulence, capable of suspending sediments (Bush et al., 2004)
- Scour at the foot of a seawall is a particular problem with vertical seawall designs. As a result, seawall maintenance costs can be high (Pilarczyk, 1990a).
- Although seawalls prevent erosion of protected shorelines, where the seawall ends, the coast remains free to respond to natural conditions. This means that undefended areas adjacent to the wall could move inland causing a stepped appearance to the coast (French, 2001). This flanking effect can cause undermining and instability of the wall in extreme cases.

Linham and Nicholls (2010).

# Traditional Impacts on Ecology



- Loss of Marsh
- 132 miles of shoreline impacted by shoreline stabilization in GA 2004-2010 (Alexander, 2010)
- 34,000 acres of marsh impacted in four coastal counties in GA







# Marsh Benefits



- Provision of nursery habitat for commercially and recreationally important species of shellfish and other wildlife
- Control and dissemination of pollutants
- Detention of surface waters and coastal storm surges
- Maintenance of moderated stream flow
- Transformation of nutrients
- Sequestration of carbon
- Retention of sediment and other particulates
- Provision of essential fisheries and aquatic invertebrate habitat
- Provision of waterfowl and water-bird and other wildlife habitat
- National Wetlands Inventory and Landscape Level Functional Assessment
- Provision of aesthetic and recreational value

# Cost - Benefit



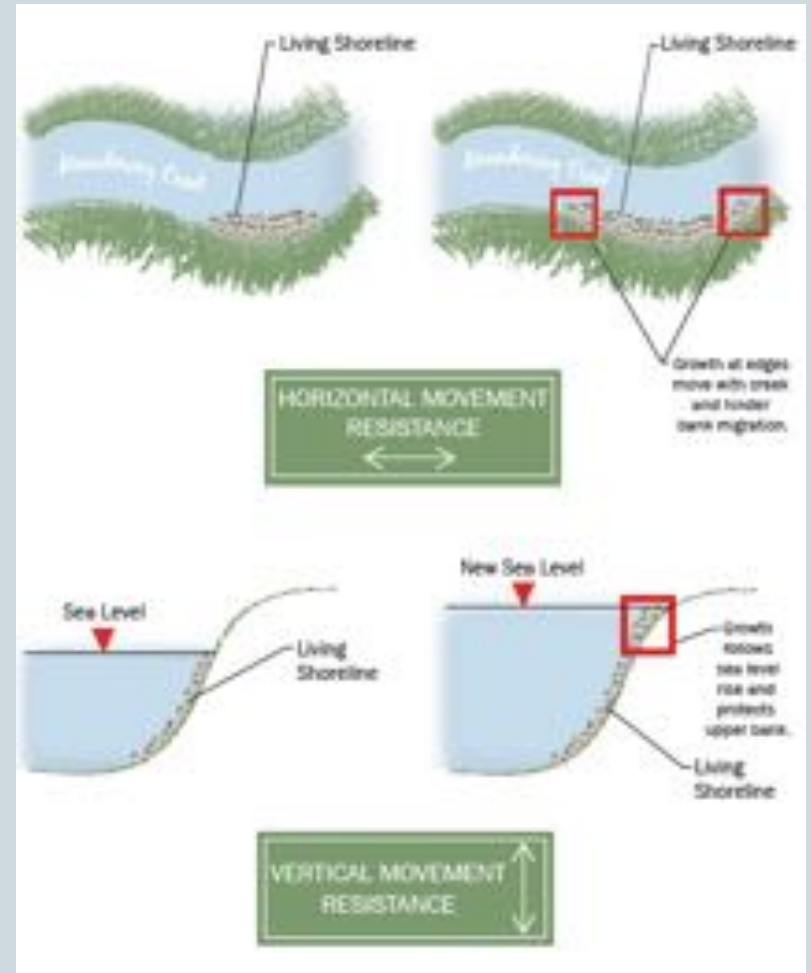
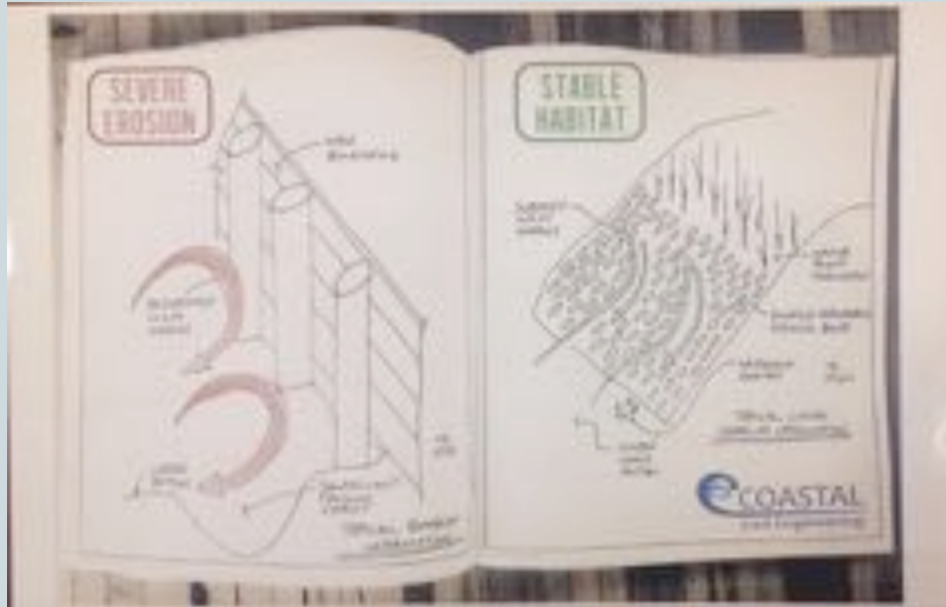
- **Provision of nursery habitat for commercially and recreationally important species of shellfish and other wildlife**
  - 66% of shrimp and 25% of crab in Gulf of Mexico (Zimmerman et al 2000)
  - \$6471 per acre per year of sport fishing in FL (Barbier et al 2011)
- **Provision of aesthetic and recreational value**
  - \$1.9 billion generated in Georgia coastal region by tourism annually (GDITT)
  - 87% of outdoor recreation income comes does not come from hunting or fishing (Landers, 2006, Pg 1)
  - Real Estate
  - \$67 million to National Audubon and \$521 million to Nature Conservancy
- **Control and dissemination of pollutants**
  - Heavy metal removal up to 65% (Birch 2004)
  - Each oyster filters up to 30 gallons of water each day and provides up to \$10,000 of filtration per acre per year
- **Transformation of nutrients**
  - \$10,000-\$15,000 per acre (Grabowski 2012, Barbier et al 2011)
  - N removal from 80%-98% (Zhang 2011)

# Cost - Benefit

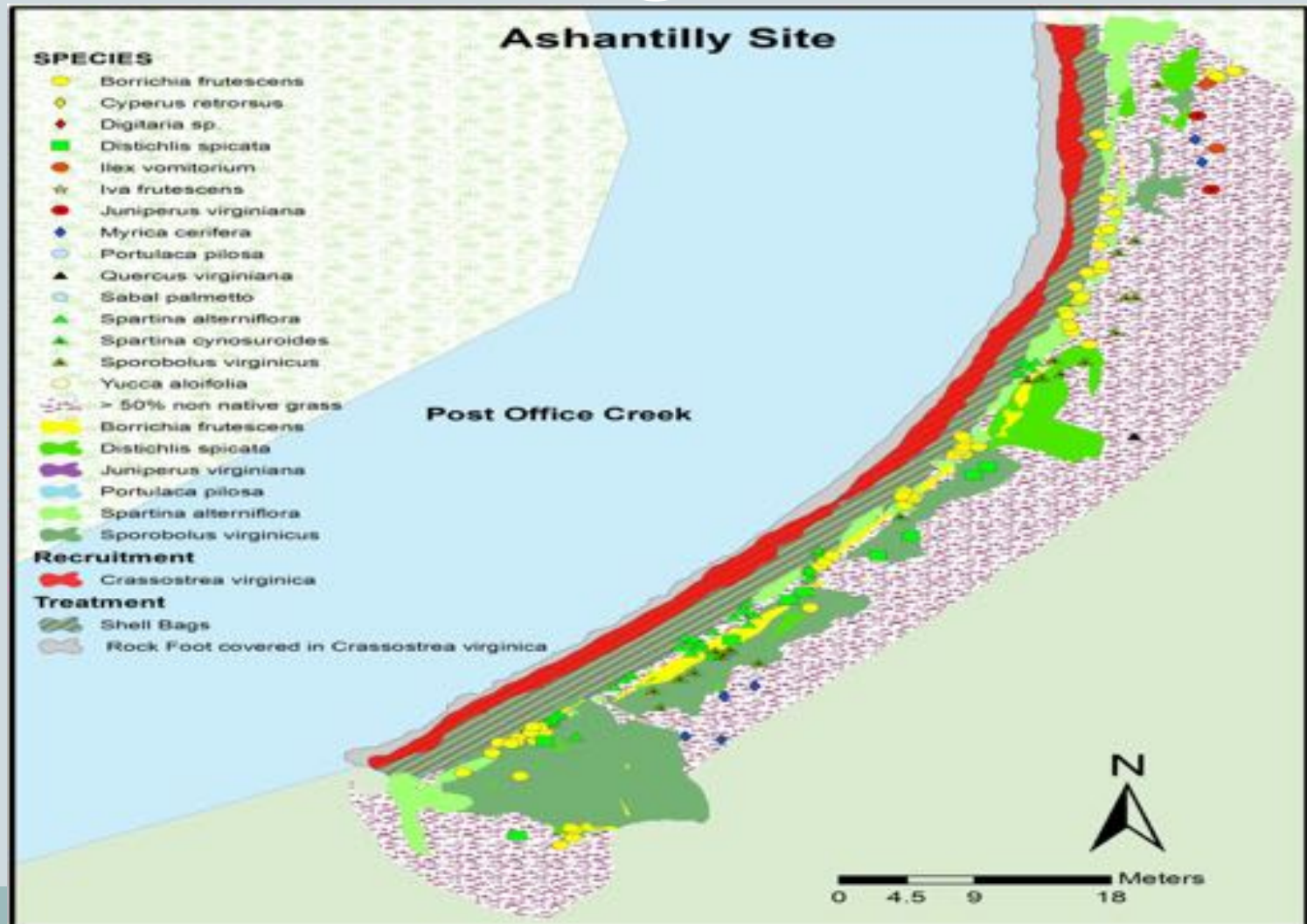


- **Maintenance of moderated stream flow**
  - Flow velocities reduced in proportion to abundance of wetlands (Wharton 1970)
  - Reduce storm surge duration and height (Barbier et al 2011)
- **Detention of surface waters and coastal storm surges**
  - Reduce hurricane damages by \$8236 per acre (Costanza et al 2008)
- **Retention of sediment and other particulates**
  - Highest when plants have long stems (Koch et al 2006)
  - Friction and baffling (Morgan et al 2009)
- **Sequestration of carbon**
  - 50 times more than rainforests (Pidgeon, 2009) and 20 times more than southern Pine per acre per year (Odum, 1961; Gohltz et al 1982)
  - Up to \$29 per ton on global market, Up to 707 tons per acre (Patrick and DeLaune 1990) = \$20,500/acre/year.

# LS Impacts on Shoreline Integrity



# LS Impact on Ecology





## Results

Preliminary results at LSSI site include a 100% increase in finfish species diversity within the LS area after only 6 months of completion (**Table 1, Figure 7**). Notably, the capture of two juvenile individuals within the demersal (bottom dwelling) species of concern stocks (Dogtooth Snapper *Lutjanus jocu*; snapper-grouper complex) were within the post-construction fish assemblage. Post-construction survival of planted vegetation approached 95% at six months with losses attributed to deer browsing. Significant increases in both bay anchovies (**Table 1**) and grass shrimp (Bliss et al., 2014) were noted after construction of the Living Shoreline. Oyster recruitment (cementation) onto the shoreline across all tidal zones achieved densities between 44-108/m<sup>2</sup> by the end of the first season of available spat recruitment (April- October, 2013). Slight erosion of upland soils occurred directly following construction due a combination of the instability of soils (large grained sands) and the lack of extensive root development by the newly planted (and volunteer) vegetation.

Species	Pre-construction	Post-construction
Bay anchovy	1119	1714
Sheepshead	0	4
Blue perch	8	2
Atlantic croaker	0	1
Wahoo	0	2
Weakfish	0	33
Bay flounder	0	3
Flounder	0	9
Atlantic silverside	0	1
Menhaden	6	8
Black drum	15	1
Red drum	0	1
Spot	4	1
Atlantic croaker	0	2
Atlantic croaker	3	8
Atlantic croaker	2	8
Atlantic croaker	10	2
Atlantic croaker	1	1
Atlantic croaker	17	8
Atlantic croaker	0	1

**Table 1.** Metrics for finfish species diversity and abundance pre- and post- construction at the LSSI site.



**Figure 7.** Pictorial display of the finfish diversity captured through-out the first two sample seasons (pre- and post- construction) at the LSSI site. These photos represent, in all cases the adult phase of each species.



# Sapelo Island



# Sapelo Island



# Little St Simon's Island



Before



After





# Canons Point – St Simons



# LS Impact on Ecology



“Living shorelines are crucial to habitat development and to the conservation of fish, birds and other wildlife. We must continue to promote these kinds of restoration activities as they are vital to sustaining the delicate ecological system.”

-Tom Kelsch, Director of Conservation Programs for the National Fish and Wildlife Foundation.

"Living shorelines provide erosion protection benefits and essential habitat for living resources ."

-Keith Campbell, Foundation for the Environment

# Costs Summary



Type	Unit	Installed Cost	Projected Lifespan	Repair Cost	Replace Cost	External Functions	External Cost/Benefit
<b>Vinyl Bulkhead</b>	LF	<b>\$686</b>	50+	\$100-400	120%	Bank Integrity Habitat	Loss
<b>Wooden Bulkhead</b>	LF	<b>\$652</b>	20+	\$100-400	120%	Fisheries Shellfish	Loss
<b>Concrete Bulkhead</b>	LF	<b>\$1,022</b>	30+	\$100-500	120%	Pollution Control Storm Abatement	Loss
<b>Granite Revetment Type 1</b>	LF	<b>\$469</b>	20+	\$100-200	120%	Carbon Sink Nutrient Fix Sediment Retention	Loss
<b>Ganite Revetment Type 3</b>	LF	<b>\$440</b>	20+	\$100-200	120%	Aesthetic Recreation Real Estate	Loss
<b>Living Shoreline</b>	LF	<b>\$361</b>	Indefinite			Wildlife	Gain



# Compounding Costs vs Compounding Gains



VS

