

Delaware Living Shorelines

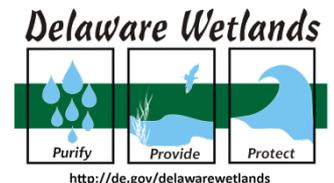
Brittany Haywood

Wetland Monitoring & Assessment Program
DNREC, Division of Watershed Stewardship

Introducing Green Infrastructure for Coastal Resilience

May 5, 2016

St. Jones Reserve





DELAWARE LIVING SHORELINE COMMITTEE

- is a work group formed in 2013 dedicated to facilitating the understanding, peer review and implementation of living shoreline tactics within the State of Delaware.
- *de.gov/livingshoresites*



Participating Organizations

- AECOM
- Cardno
- Delaware Center for the Inland Bays
- **Delaware Department of Natural Resources and Environmental Control**
- Delaware Department of Transportation
- Delaware National Estuarine Research Reserve
- Delaware Nature Society
- Delaware Wild Lands
- New Jersey Department of Environmental Protection
- **Partnership for the Delaware Estuary**
- Rutgers University
- Sovereign Consulting INC.
- The Nature Conservancy
- U. S. Fish and Wildlife Service
- University of Delaware

Projects

- **Living Shorelines (LS) Workshop**
 - Free 2-day training held every spring
 - Design training, site visits, hands-on monitoring
- **Delaware LS Monitoring Strategy**
 - Under development
 - A step thru guide to help the user develop an appropriate monitoring plan to determine if the project is meeting specific goals
- **Standardized signage for sites**
- **Virtual Tour of Living Shorelines in Delaware**

Living Shoreline Site

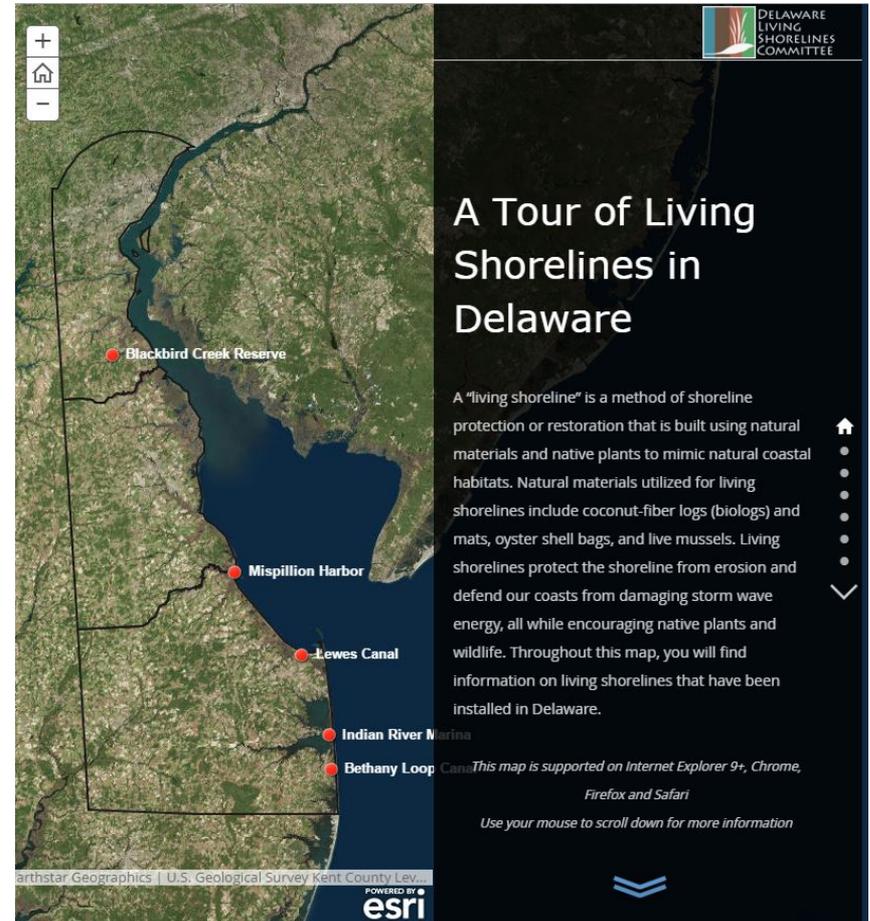


- . Preventing Erosion
- . Providing for Wildlife
- . Improving Water Quality

de.gov/livingshoresites

Virtual Tour of DE Living Shorelines

- de.gov/livingshorelinesites
- Site contains info on
 - What a living shoreline is
 - Resources
 - Committee info
 - DE project examples
 - Site
 - Goal
 - Materials
 - Time series photos
 - Contact



DELAWARE
LIVING
SHORELINES
COMMITTEE

A Tour of Living Shorelines in Delaware

A "living shoreline" is a method of shoreline protection or restoration that is built using natural materials and native plants to mimic natural coastal habitats. Natural materials utilized for living shorelines include coconut-fiber logs (biologs) and mats, oyster shell bags, and live mussels. Living shorelines protect the shoreline from erosion and defend our coasts from damaging storm wave energy, all while encouraging native plants and wildlife. Throughout this map, you will find information on living shorelines that have been installed in Delaware.

This map is supported on Internet Explorer 9+, Chrome, Firefox and Safari

Use your mouse to scroll down for more information

arthstar Geographics | U.S. Geological Survey Kent County Le...
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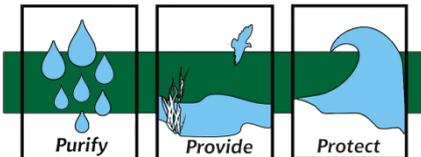
Project Example 1

Blackbird Creek

Blackbird Creek Living Shoreline

- Located at the Blackbird National Estuarine Research Reserve (NERR)
- Low energy, tidal freshwater river system (~5ppt)
- Length: 160 feet
- Project a collaboration between:

Delaware Wetlands



<http://de.gov/delawarewetlands>



Blackbird Creek Kayak Ramp

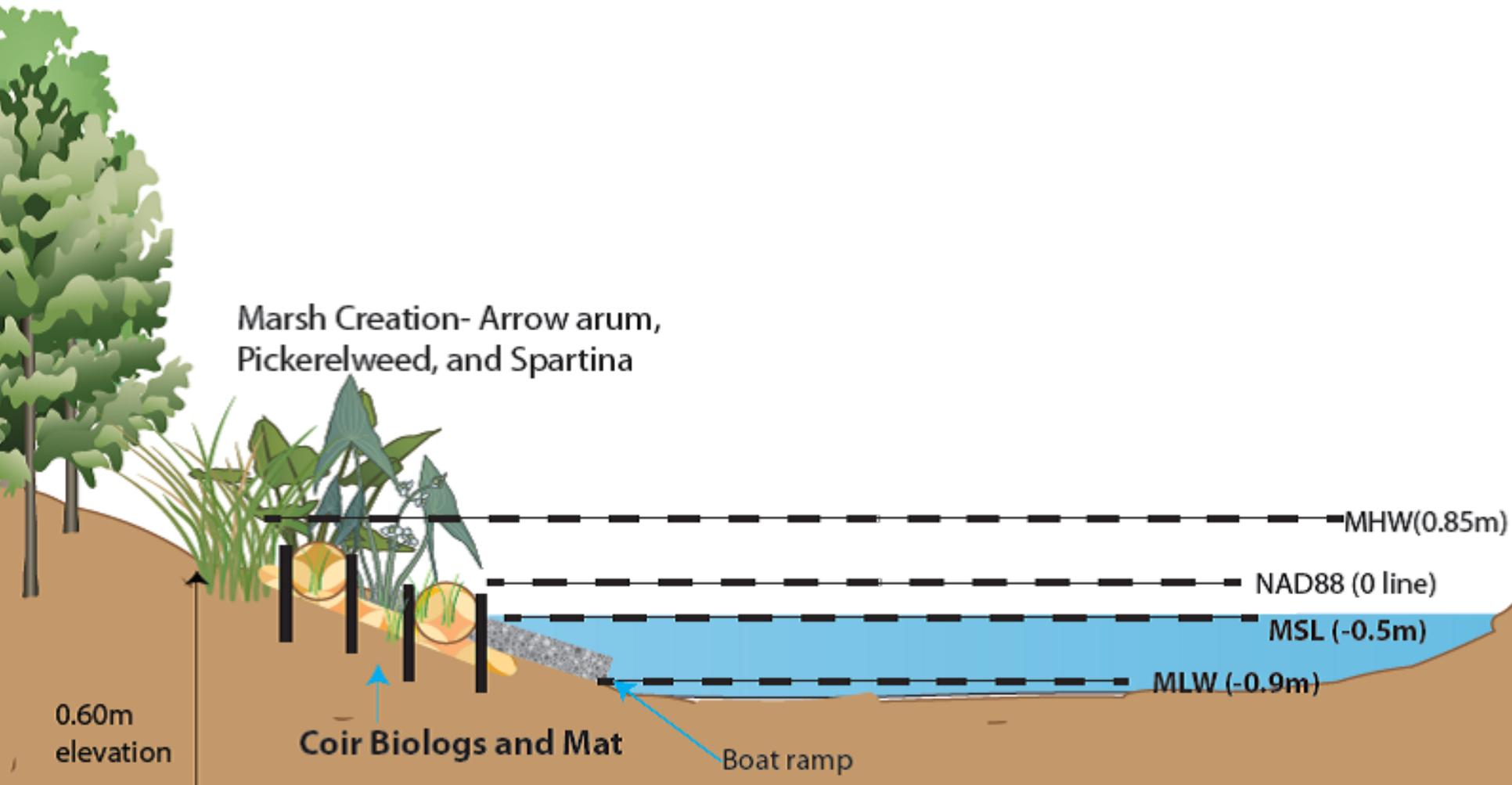
Winter 2014



Project Goals:

1. Address erosion that was causing problems on the east and west side of the Reserve's boat ramp.
2. Serve as a demonstration site to landowners and contractors when bank erosion control is needed.

Blackbird Creek: Design



Installation Phase: Spring 2015



West Side/Upriver



East Side/Downriver



Planting Phase: Spring 2015

(2 Weeks Later)



West Side/Upriver



East Side/Downriver

3 Months After Planting



West Side/Upriver



East Side/Downriver

Blackbird Materials & Costs

Pioneer Materials (Dover)

Clean sand material for backfill \$1200

Iron Source (Smyrna)

Mini-excavator rental \$1194

Survey Supply (in Milford)

120 - 2x2x48" stakes \$226.80

135 - 2x2x60" stakes \$295.65

Pinelands Nursery (New Jersey)

2 rolls Coir Mat \$428.40

5 - 12"x12' Coir Logs \$396.80

18 - 20"x12' Coir Logs \$3,627.00

2 rolls coir twine \$80.00

Delivery \$275.00

Environmental Concern (Maryland)

800 Spartina alterniflora (smooth cordgrass) \$560.00

200 Peltandra virginica (arrow arum) \$220.00

200 Pontederia cordata (pickerelweed) \$220.00

25 Scirpus robustus (saltmarsh bulrush) \$18.75

10 Helenium autumnale (yellow sneezeweed) \$25.00

6 Rosa palustris (swamp rose) \$42.00

10 Hibiscus moscheutos (marsh hibiscus) \$25.00

5 Vernonia noveboracensis (NY ironweed) \$22.50

2 Quercus palustris (pin oak) \$14.00

Env. Concern Total = \$1,101.36

Grand Total = \$8825.01 for 160 feet

**Blackbird living shoreline cost \$55.16 per linear foot
compared to**

Bulkheads/riprap which can cost between \$500-\$1,200 per foot

Other Expenses to Consider

- **Permitting**
 - State - Statewide Activity Approval (SAA) for shoreline Stabilization Projects
 - Federal – U.S. Army Corps Nationwide Permit No. 27 for “Aquatic Habitat Restoration”
 - *de.gov/wetlandpermits*
- **Site access/Repairing damage to surrounding site during construction**
- **Monitoring**



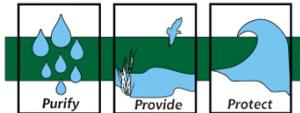
Project Example 2

Indian River Marina

Indian River Living Shoreline

- Located at the Indian River Marina
- Estuarine/saltwater
- 2 installations
 - Marsh (48 linear ft.)
 - Rip Rap (84 linear ft.)
- Project a collaboration between:

Delaware Wetlands



<http://de.gov/delawarewetlands>



DELAWARE CENTER FOR THE
INLAND BAYS
Research. Educate. Restore.



Indian River Living Shoreline Sites

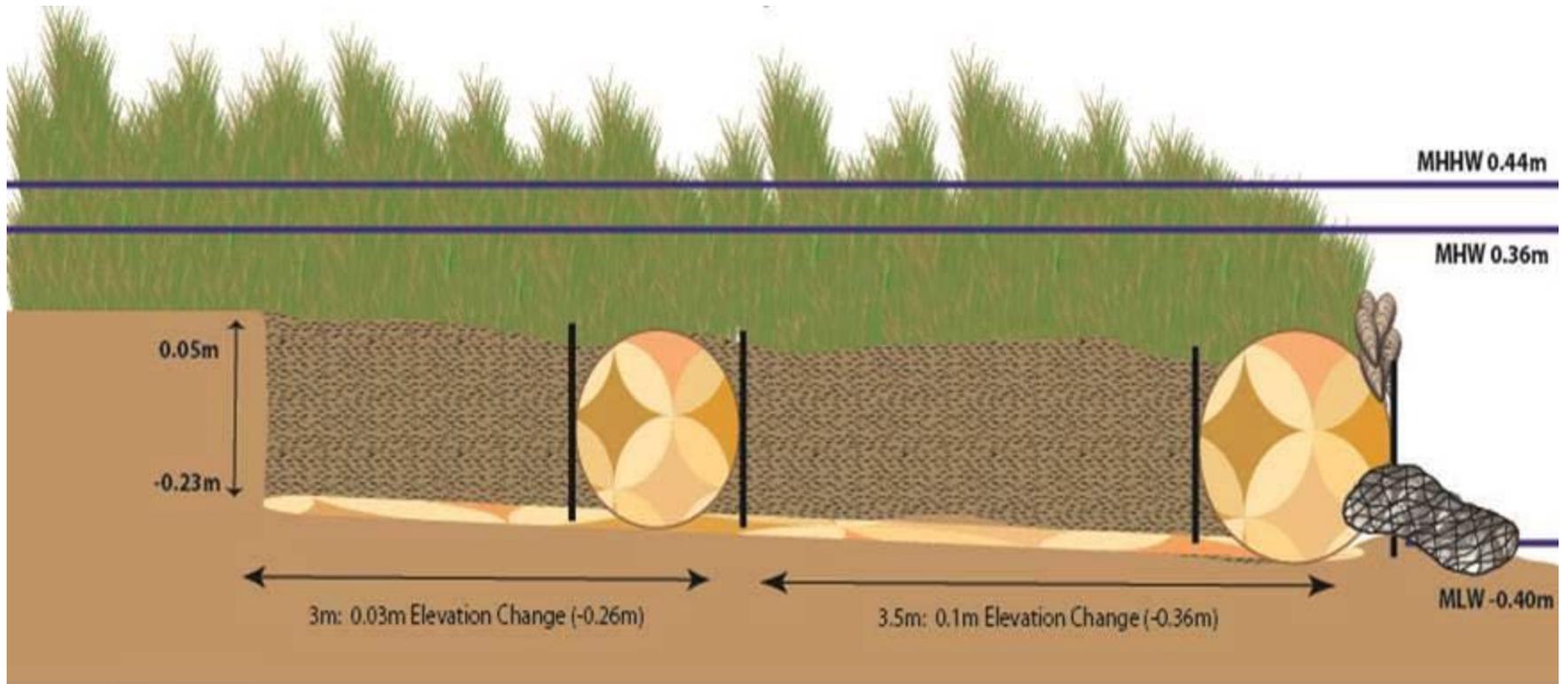


Marsh Project Goals

- Protect existing marsh habitat from erosion
- Prevent bank undercutting



Indian River Marsh Design- Profile



Marsh Installation April 2014

- **Materials:**
 - **Coir logs**
 - **Matting**
 - **Stakes**
 - **Oyster shell bags**
 - **Sand fill**
 - **Plants**



Marsh Planting - July 2014



Marsh Site Visit - October 2014



Marsh Salvage Planting - April 2015



Marsh Site Visit- Early Nov. 2015



Marsh Monitoring- April 2016



Marsh Indian River Materials & Costs

Marsh Site (closest to causeway, 48 linear ft)

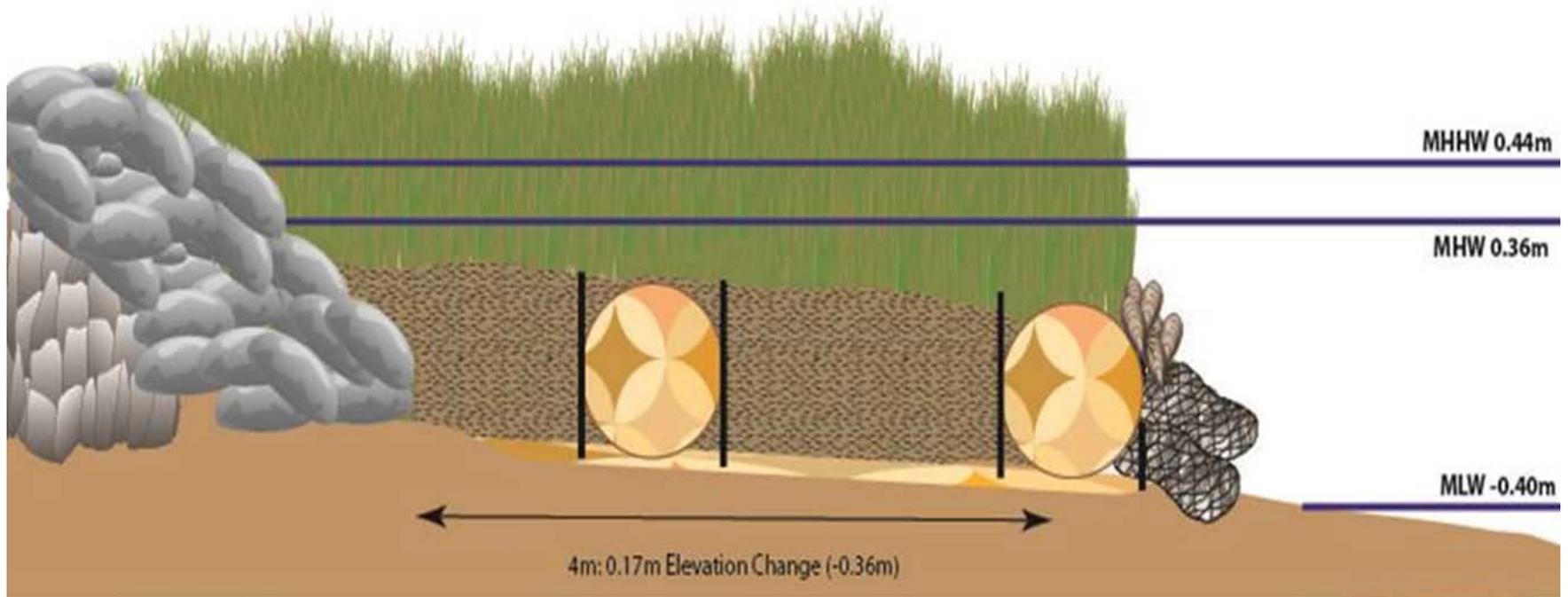
ITEM	PRICE	NOTES	IR Marsh	IR Marsh	per ft
Coir Logs	\$127.89	12' x 16" log	7 logs	\$895.23	\$18.65
Coir Mat	\$201.60	165 linear ft	1 roll	\$201.60	\$4.20
Twine	\$40.00	1 roll	1 roll	\$40.00	\$0.83
Spartina plugs	\$0.50	1 per sq ft	366 plugs	\$183.00	\$3.81
4' stakes	\$1.95	12 per log	84 stakes	\$163.80	\$3.41
Oyster shell	\$5.00	per linear ft	48 ft	\$240.00	\$5.00
Sand	varies		\$300	\$300	\$6.25
			TOTAL=	\$2,023.63	\$42.16

Riprap Project Goals

- Create additional marsh habitat that is not supported by riprap
- Demonstration site to show how to include riprap in design and protect the marina building and the boat ramp from erosion



Indian River Marsh Design- Profile



Riprap Installation- April 2014

- **Materials:**
 - **Coir logs**
 - **Matting**
 - **Stakes**
 - **Oyster shell bags**
 - **Sand fill**
 - **Plants**



Riprap Planting- June 2014



Riprap Site Visit- October 2014



Riprap Salvage Planting- April 2015



Riprap Site Visit- October 2015



Riprap Monitoring- April 2016



Riprap Indian River Materials & Costs

Rip-Rap Site (closest to loading dock, 84 linear ft)

ITEM	PRICE	NOTES	<u>IR Rip-rap</u>	<u>IR Rip-rap</u>	<u>per ft</u>
Coir Logs	\$127.89	12' x 16" log	12 logs	\$1,534.68	\$18.27
Coir Mat	\$201.60	165 linear ft	1 roll	\$201.60	\$2.40
Twine	\$40.00	1 roll	1 roll	\$40.00	\$0.48
Spartina plugs	\$0.50	1 per sq ft	867 plugs	\$433.50	\$5.16
4' stakes	\$1.95	12 per log	144 stakes	\$280.80	\$3.34
Oyster shell	\$5.00	per linear ft	84ft	\$420.00	\$5.00
Sand	varies		\$500	\$500	\$5.95
			TOTAL=	\$3,410.58	\$40.60

Adapting to Surprises

- **Issue: Nursery plant plugs “taking” in sandy sediments**
 - Possible solution: Use plant materials that have fallen off the marsh in the same area
- **Issue: Horseshoe crabs shredded coir logs**
 - Possible solution: Place oyster bags along coir log
- **Issue: Ice shearing**
 - Possible solution: Fill in gaps with oyster bags



Project Resources

- [Project Fact Sheets](#)
- [Living Shorelines Video: Indian River](#)
- [Wetlands 101 Video: Restoration Stories](#)
- **Virtual Tour:** de.gov/livingshorelinesites

Learn More

- [Livingshorelinesacademy.org](http://livingshorelinesacademy.org)
- [Livingshorelinesforum.org](http://livingshorelinesforum.org)