DEMONSTRATION PROJECTS

DEMONSTRATION PROJECTS

Project Number	Project Proposals
DEMO-01	Shore-links
DEMO-02	Enhancing Restoration Transplant Survival via Stress Acclimation
DEMO-03	Sediment Accretion and Marsh Restoration Using Modified ReefBlk Design
DEMO-04	Ecobale Containment Barrier for Shoreline Protection and Marsh Creation
DEMO-05	Novel Techniques for the Efficient Use of Spoil Material in the Backfilling of Canals
DEMO-06	Explosive Ditching
DEMO-07	Marine Gardens LLC Geopolymer Composites
DEMO-08	Earthen Berms

DEMO-01

Shore-links

Demo - 01

SHORE | LINKS®

PPP26 Demonstration Project

PROJECT LOCATION

Coastwide: Navigation channels, shorelines, containment dikes, terraces, construction impacts.

PROBLEM

Many Louisiana coastal restoration projects are faced with the combined challenges of foundation issues and shallow, environmentally sensitive access routes. Often, shorelines and similar man-made features are subject to erosion from waves and currents. Combating erosion with heavy materials (e.g. articulated concrete mats or rock requires heavy equipment) often requires access dredging. Depending on the project scale, the equipment and dredging requirements may make projects impracticable. Additionally, poor foundations may not support heavier stabilization materials.

GOALS

The specific goal of this proposal is to equip the CWPPRA program with the SHORE|LINKS® system, a scalable tool for economically and effectively mitigating the effects of scour and erosion. SHORE|LINKS® will allow the CWPPRA program to efficiently create vegetated earthen berms resistant to erosion.

PROPOSED SOLUTION

Patented by the LSU AgCenter with exclusive license rights to Delta Land Services, SHORE|LINKS® products comprise a lightweight, clay aggregate in a poly mesh fabric casing. The mesh material contains multiple, aggregate-filled lobes, which minimizes the weight of the units while maximizing unit height. These features allow for interlocking of the units and the entrapment of sediments to facilitate growth of vegetation. The SHORE|LINKS® system offers Articulating Revetments (10' x 10' x 3") and Tiling Mats (26" x 17" x 3") for armoring and vegetating shorelines and embankments and a Breakwater Log (10" height x 6' long) to aid in dissipation of wave energy at earthen berms, terraces or containment dikes. More information can be found at www.shore-links.com.

SPECIFIC SOLUTIONS

1). Stabilize eroding containment dikes, earthen terraces or other existing project features. Poll OM&M personnel to identify project locations where wave or current induced scour coupled with small scale and poor access make maintenance projects infeasible. SHORE|LINKS® products will be deployed from shallow draft or amphibious equipment to stabilize scoured areas then revegetated.

2). Stabilize and vegetate scour areas behind sinking, overtopped rock structures. Poll OM&M personnel to identify project locations where settlement and overtopping has resulted in erosion behind existing rock structures. SHORE|LINKS® Revetment Mats and Tiling Mats will be used in conjunction with appropriate plantings to protect underlying substrate and establish stable vegetated marsh.

3). Create armored earthen berms or terraces to protect wetlands, stabilize channels or protect other project features from wind induced waves.

4). Stabilize cut banks by inserting SHORE|LINKS® Breakwater Logs into the under cut embankment below the hanging vegetative root mass.

PROJECT COSTS

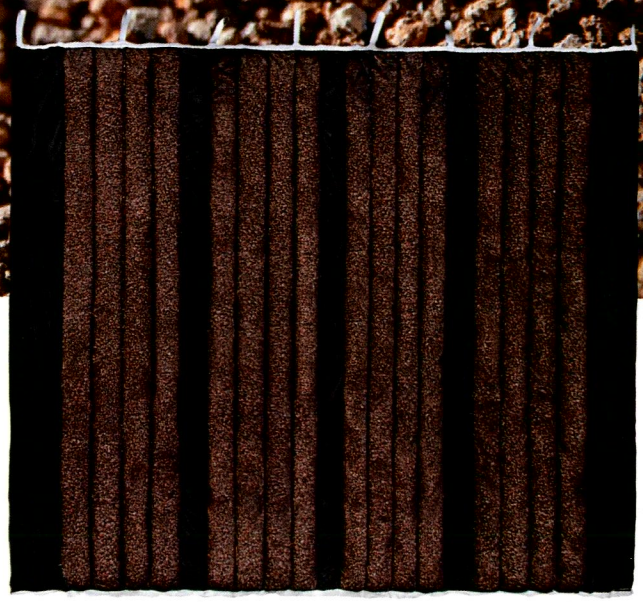
TBD

PREPARER OF FACT SHEET

TBD

1090 CINCLARE DRIVE • PORT ALLEN, LA 70767 • (OFFICE) 225.388.5197 • (FAX) 225.343.3200

SHORE | LINKS®



ARTICULATING REVETMENT MATS

ABOUT US

SHORE|LINKS® was created in 2010 through a collaboration with Delta Land Services, a turn-key mitigation and land restoration company, and the Louisiana State University AgCenter. Because of Delta Land Services' role in wetland restoration and continual work with coastal land loss issues, the company recognized the need to create an effective erosion control product. The SHORE|LINKS® system was born through Delta Land Services' and LSU AgCenter's joint efforts, which focused on stabilization of shorelines and a goal of creating a cost-effective living shoreline product.

BREAKWATER LOG

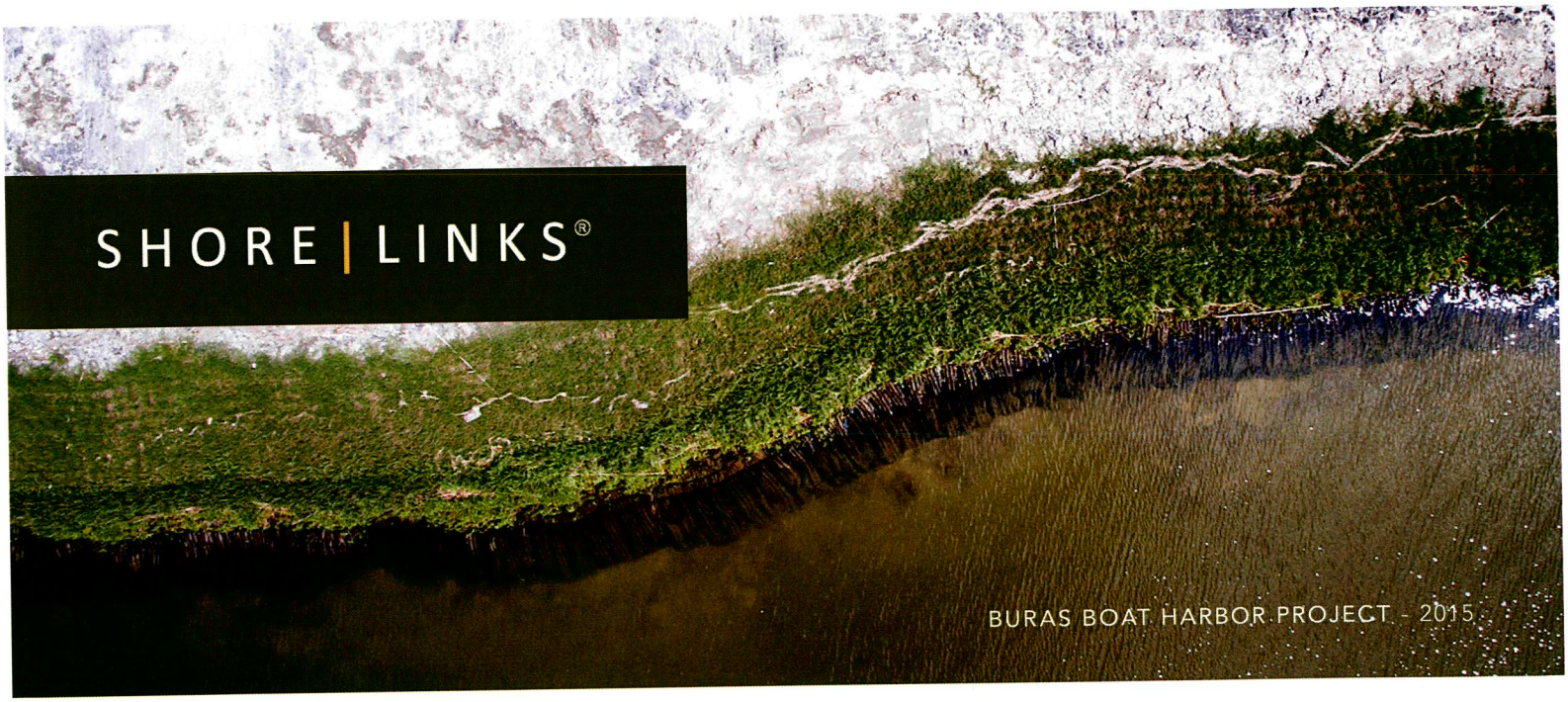
TILE MATS

Patented by the LSU AgCenter with exclusive license rights to Delta Land Services, the products comprise a lightweight, clay aggregate in a poly mesh fabric casing. The mesh material contains multiple, aggregate-filled lobes, which minimizes the weight of the units while maximizing unit height. These features allow for interlocking of the units and the entrapment of sediments to facilitate growth of vegetation. The SHORE|LINKS® system offers Articulating Revetments and Tiling Mats for armoring and re-vegetating shorelines and embankments and a Breakwater Log that aids in dissipation of wave energy at shorelines.

SHORE|LINKS® is a promising technology patented by the LSU AgCenter and exclusively licensed to Delta Land Services, L.L.C. with a shared goal of restoring and protecting our valuable wetland resources.

For More Information Please Contact:
BURT BRUMFIELD | CELL - 225.614.4110 | OFFICE - 225.388.5197 | BURT@DELTALAND-SERVICES.COM

SHORE-LINKS.COM



FEATURED PROJECTS

- **Buras Boat Harbor Project**
  In July 2014, the SHORE|LINKS® team participated in a terrace levee armament project, the Buras Boat Harbor Shoreline Protection Project, in Plaquemines Parish, Louisiana. The project consisted of placing 580 linear feet of SHORE|LINKS® Articulating Revetment and Tile Mats on a coastal levee built to protect the Buras Boat Harbor from volatile wave action and erosion.

  The levee was constructed with local dredged borrow material on a 5 to 1 slope and Articulating Revetment Mats fixed between – 1 foot and +1 foot NAVD88. Tiling Mats were installed between +1 foot NAVD88 and the crown of the berm.

  For further stabilization, marsh plant species were planted on the mats, creating a living shoreline. The mesh and aggregate components of SHORE|LINKS® products allow vegetation to grow throughout the mats and take root, providing habitat for flora and fauna and giving the stabilization project a more natural appearance. The SHORE|LINKS® products allowed for successful vegetation establishment in less than a year. The SHORE|LINKS® material will prevent the levee from erosion and increase its life by combating wave energy.

- **False River Project**
  The False River South Flats Phase I Ecosystem Restoration Project began in 2014 in an effort to use dredge material to create a 16-acre island at the southern end of False River. SHORE|LINKS® joined the project team to provide armament on the island's shoreline. The project consisted of placing 1870 linear feet of SHORE|LINKS® Articulating Revetment Mats (187 mats total) throughout the project area. The SHORE|LINKS® materials will protect the levee from wave damage and allow for natural vegetation to occur along the shoreline.

- **Black Lake Project**
  The Black Lake Coastal Shoreline Restoration project will begin in spring 2016 and consists of 3700 feet of shoreline stabilization utilizing 370 SHORE|LINKS® Articulating Revetment Mats and 3,500 SHORE|LINKS® Tile Mats. In addition to mat installation, Smooth cordgrass and Seashore paspalum will be planted. The project area, located in southwest Louisiana, is a collaborative effort among industry and consultant project managers and will allow for stabilization and vegetation of imperiled shoreline.

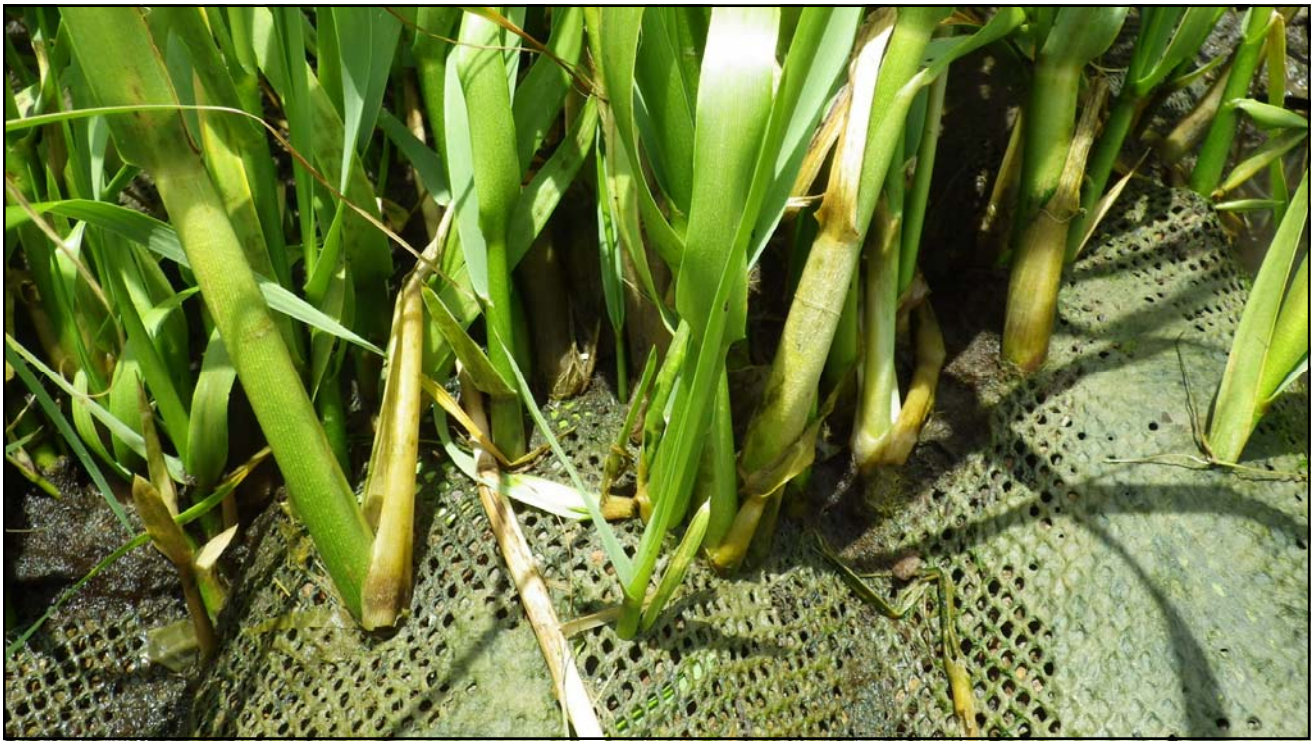
For More Information Please Contact:
BURT BRUMFIELD | CELL - 225.614.4110 | OFFICE - 225.388.5197 | BURT@DELTALAND-SERVICES.COM

SHORE | LINKS®

Erosion Control Solutions | www.shore-links.com

Presentation to CWPPRA RPT | January 2016

burt@deltaland-services.com



What is the SHORE|LINKS® System?

What is the SHORE|LINKS® System composed of?

Configurations Articulating Revetment Mats

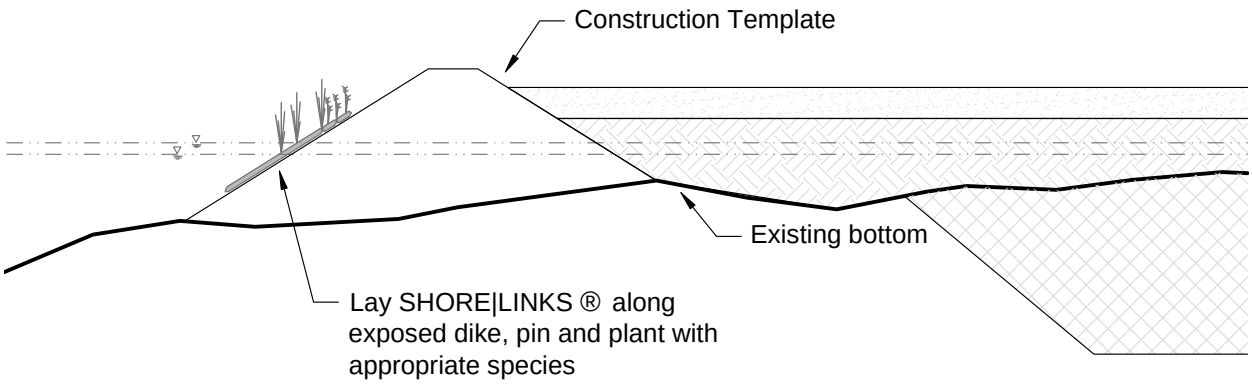
Configurations Submersible Breakwater Logs

Ideal Applications

Advantages / Strengths

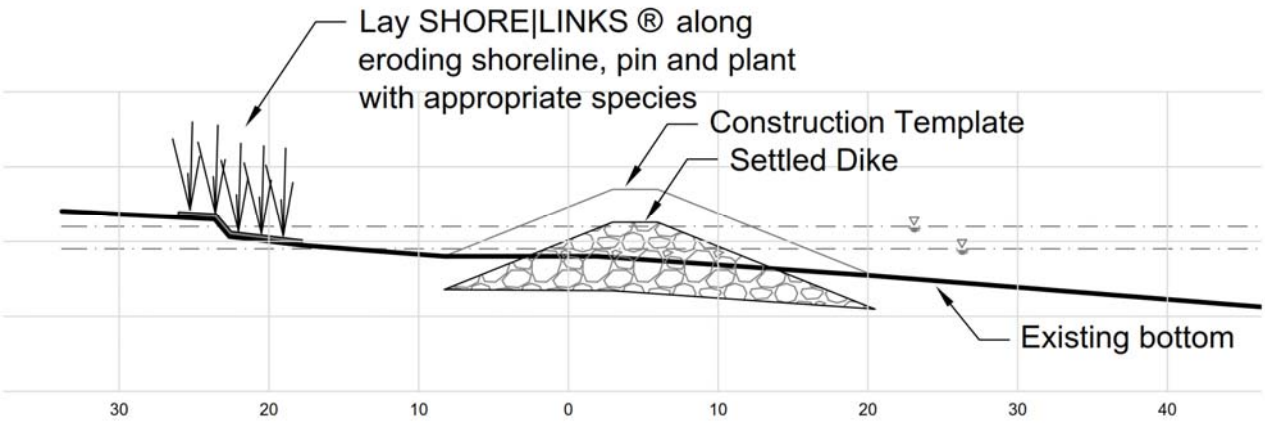
Proposed CWPPRA Demo

Concept 1: Stabilize Eroding Project Features



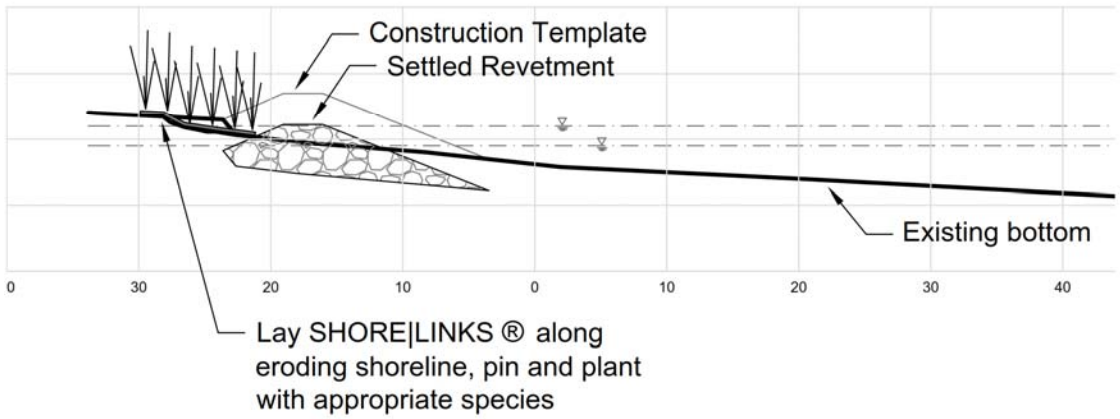
Proposed CWPPRA Demo

Concept 2: Stabilize Scour Behind Sinking Rock Features



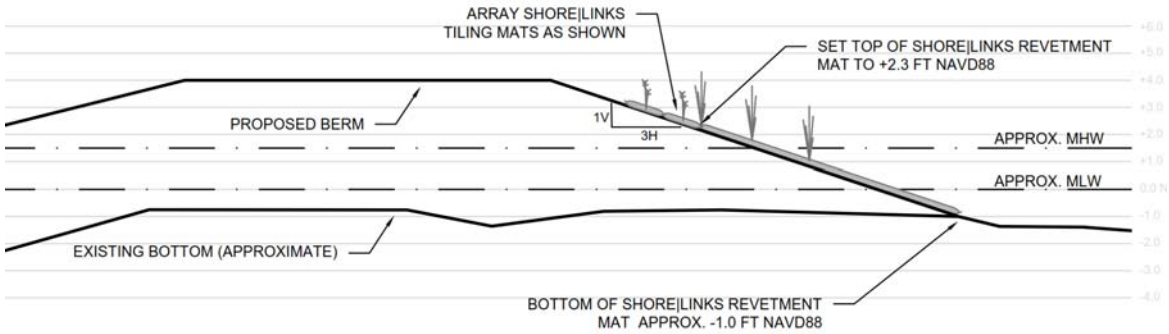
Proposed CWPPRA Demo

Concept 2: Stabilize Scour Behind Sinking Rock Features



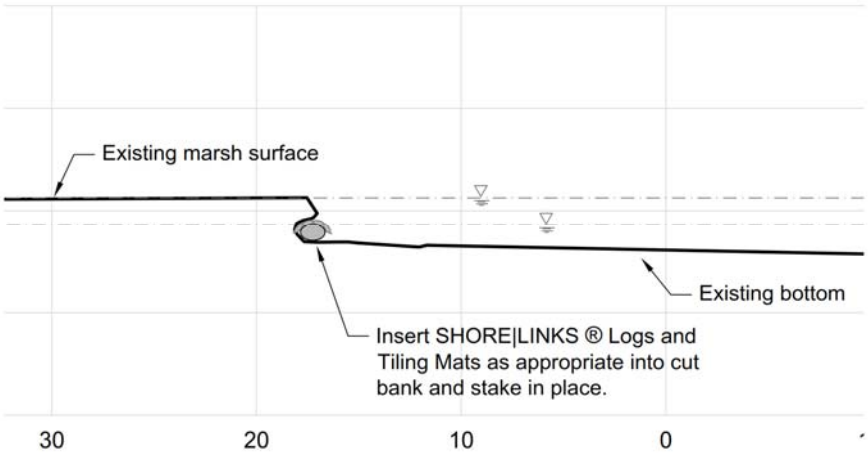
Proposed CWPPRA Demo

Concept 3: Create Armored Earthen Berms or Terraces



Proposed CWPPRA Demo

Concept 4: Stabilize Cut Banks



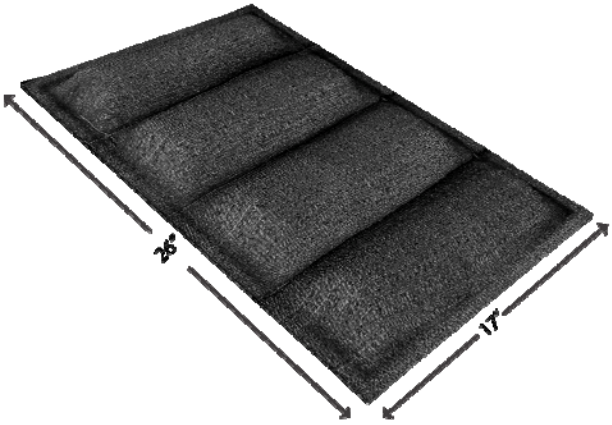
Additional information

What is the SHORE|LINKS® System?

SHORE|LINKS® is an ***erosion control*** modular system based on an articulating unit filled with lightweight manufactured aggregate.

Comprised of (2) components; lightweight aggregate or expanded clay & and UV rated mesh material.

Designed with (4) lobes for maximum height and minimum weight that easily forms to irregular surfaces.

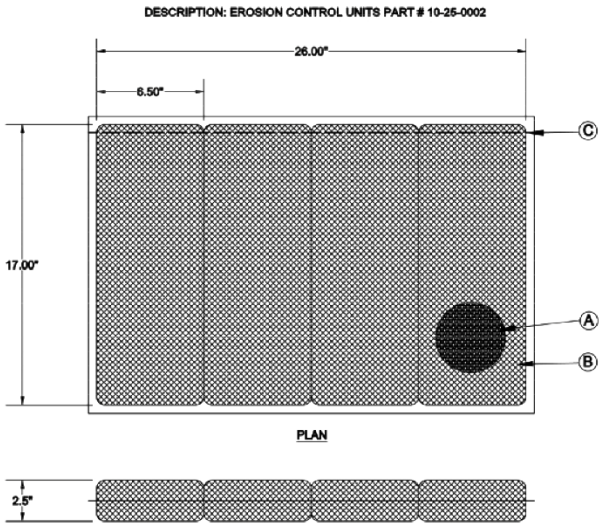


What is the SHORE|LINKS® System composed of?

This stable ceramic is ideal for construction of erosion control structures in the coastal marsh because:

- Low density prevents or greatly retards structure subsidence
- Porosity entraps sediment and supports aquatic vegetation

Drawings / Specs Individual SHORE|LINKS®



ELEVATION

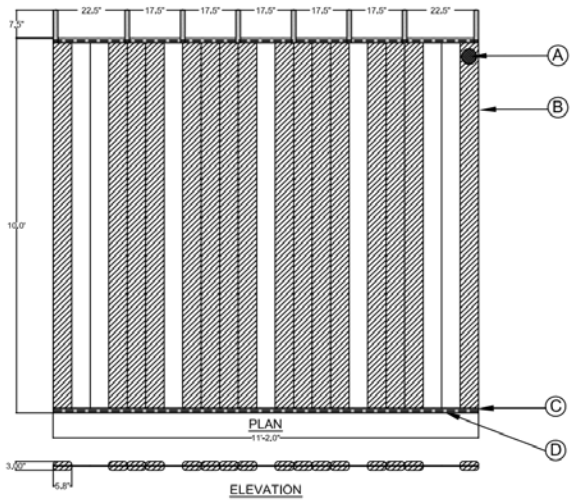
BILL OF MATERIALS

	ITEM	DESCRIPTION	QUANTITY
A	LWA .25"	.25" LIGHTWEIGHT AGGREGATE	.53 CUBIC FEET
B	10-60-0002	SEWN POLYETHYLENE 60% SHADE MESH	1
C	SEWING THREAD NYLON OR POLYESTER	POLYESTER OR NYLON SEWING THREAD	AS REQUIRED

NOTES:

1. FILL EACH TUBE WITH 1 GALLON OF .25" LWA.
2. FOLD MESH WITH 2" OVERLAP AND SEW WITH BAG SEALER.
3. PLACE 50 UNITS ON PALLET AND SHRINK-WRAP.
4. DRY WEIGHT: APPROXIMATELY 25 LBS.
5. DIMENSIONS: 26" L X 17" W X 2.5" H (+/- .25").

Drawings / Specs Articulating Revetment Mats



BILL OF MATERIALS			
	ITEM	DESCRIPTION	QUANTITY
A	LWA .375"	3/8" LIGHTWEIGHT AGGREGATE	.85 CUBIC YARDS
B	EK-1000PFBKD-23X6.125	23 POCKET POLYESTER MESH	12 LINEAR FEET
C	11454	SLATE GREY STRAP	50 LINEAR FEET
D	210 TEX207	POLY BONDED WHITE SEWING THREAD	AS REQUIRED

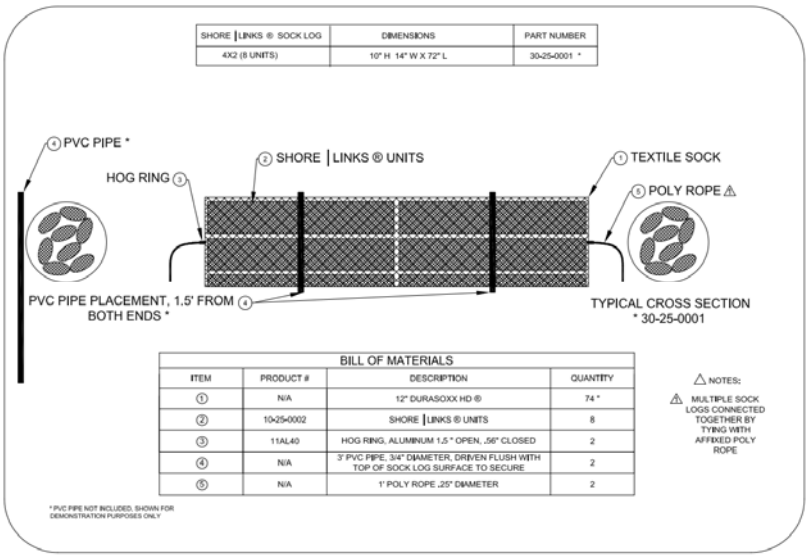
NOTES:

1) LOAD EMPTY MESH MAT ONTO CUSTOM EXCAVATOR BUCKET.
2) FILL EXCAVATOR BUCKET WITH LWA MATERIAL.
3) ELEVATE UNIT ALL BUCKET CELLS ARE EMPTY.
4) PLACE FILLED UNIT ON CUSTOM TABLE FOR STRAP PLACEMENT AND CLOSURE WITH UNION SPECIAL 2200 SEWING MACHINE.
5) ATTACH (8) LIFTING LOOPS ONTO HOOKS ON EXCAVATOR BUCKET AND TRANSPORT ONTO PALLET.

*WEIGHT: APPROXIMATELY 800 LBS.

TOLERANCES:
.0 - +/- 1"
.00 - +/- .5"

Drawings / Specs Submersible Breakwater Logs



SHORE | LINKS ® SOCK LOG	DIMENSIONS	PART NUMBER
4X2 (8 UNITS)	10" H 14" W X 72" L	30-25-0001 *

BILL OF MATERIALS

ITEM	PRODUCT #	DESCRIPTION	QUANTITY
①	N/A	12" DURASOXX HD ®	74 *
②	10-25-0002	SHORE | LINKS ® UNITS	8
③	11AL40	HOG RING, ALUMINUM 1.5 " OPEN, .56" CLOSED	2
④	N/A	3' PVC PIPE, 3/4" DIAMETER, DRIVEN FLUSH WITH TOP OF SOCK LOG SURFACE TO SECURE	2
⑤	N/A	1' POLY ROPE ,25" DIAMETER	2

* PVC PIPE NOT INCLUDED, SHOWN FOR DEMONSTRATION PURPOSES ONLY

△ NOTES:
⚠ MULTIPLE SOCK LOGS CONNECTED TOGETHER BY TYING WITH AFFIXED POLY ROPE

Configurations
Articulating Revetment Mats

Where waves or currents are more severe, SHORE | LINKS® articulating revetment mats can be anchored in position to stabilize the shoreline and allow vegetation to become established.

Configurations
Submersible Breakwater Logs

SHORE | LINKS® submersible breakwater logs can be deployed near shorelines to reduce the effects of currents and waves or to increase elevation.

Ideal Applications:

Armoring newly constructed shorelines such as levees, terraces, plugs to facilitate vegetative stabilization.

Protecting endangered shorelines by providing a stable base for restoring shoreline vegetation.

Creating marsh on mud flats that lack the elevation or sediment stability to allow successful planting

Repairing marsh buggy ruts and other damage from machinery in wetlands

Establishing vegetation on sloped surfaces where seeding is difficult to establish.

Controlling sediment loss on new construction such as pipeline, stream crossing and ponds.

Advantages / Strengths:

Creates a productive, living shoreline by offering a stable rooting medium for shoreline vegetation while protecting sediment from erosion.

Remain firmly anchored in place by entrapping sediment and by roots and stems growing from top-down & bottom–up.

Vegetation is readily established by seeding, planting or volunteer regeneration.

Over time, SHORE|LINKS® accumulate sediments and vegetation to form an erosion-resistant surface that appears natural.

It's low density prevents structure subsidence.

Coastal Applications:

Small Levee armored with SHORE | LINKS® and smooth cord grass planted between each unit.

After three months, shoreline vegetation has anchored SHORE | LINKS® to the sediment, protecting against erosion.

Coastal Applications:

Marsh buggies used during pipeline ROW maintenance activity create ruts and damage to the marsh. These ruts cause a loss of elevation and vegetated cover in various areas of the ROW.

SHORE | LINKS® are an ideal device for healing and repairing the damaged ROW. The mats are used to fill the ruts along with planting to bring the area back to its previous condition.

Upland Applications: …continued

Culvert repair completed in 1 hour by two installers.

Before

During

After

Buras Boat Harbor Shoreline Protection Project

Armoring newly construction berm with SHORE|LINKS® large and small units.

Buras Project:
…continued

Laying out SHORE|LINKS® on newly constructed berm and planting smooth cord-grass and seashore paspalum

Buras Project:
…continued

Laying out SHORE|LINKS® on newly constructed berm and planting smooth cord-grass and seashore paspalum

Logistics

SHORE | LINKS® weigh about 25 lbs. each and are easy to handle and transport to remote sites.

Individual units are available in pallets of 50 readily transferred to an appropriate vehicle or boat for delivery to the site.

DEMO-02

Enhancing Restoration Transplant Survival via Stress Acclimation

Demo -02

PPL26 Enhancing Restoration Transplant Survival via Stress Acclimation Demonstration Project

Potential Demonstration Project Location(s):
Coastwide (barrier islands)
Suggested locations: East Timbalier Island, Whiskey Island, or Raccoon Island

Problem:
The success and stability of barrier island/headland restoration projects (a $1B investment) depend on the successful re-establishment of vegetation. In 2010, a large scale barrier island planting effort on New Cut / Trinity Island was complicated due to a lack of rain, causing mass death of the transplanted individuals. Multiple restoration planting efforts have described mass death of transplanted individuals due to stressful abiotic conditions of the field site, specifically drought. Because large-scale planting projects cannot always schedule around weather events, ensuring that restoration plants survive transplanting conditions is essential for success of marsh and barrier island restoration projects.

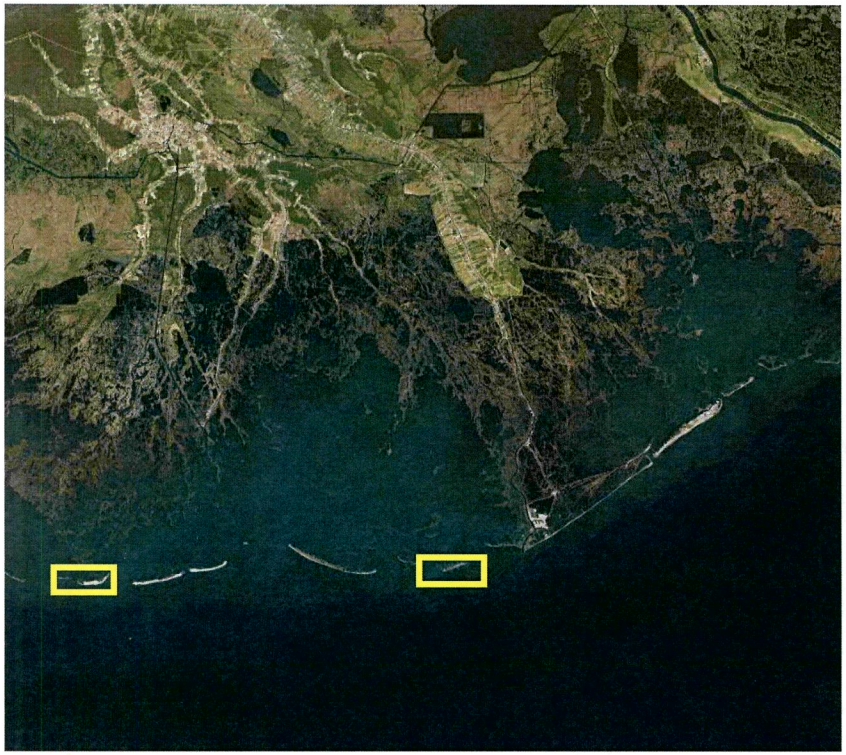
Goals:
The goal of this demonstration would be to 1) improve future survival success of restoration transplants through improving nursery stress conditioning research; and 2) establish 1800 experimental plants and 10,000 transplants on a barrier island restoration site.

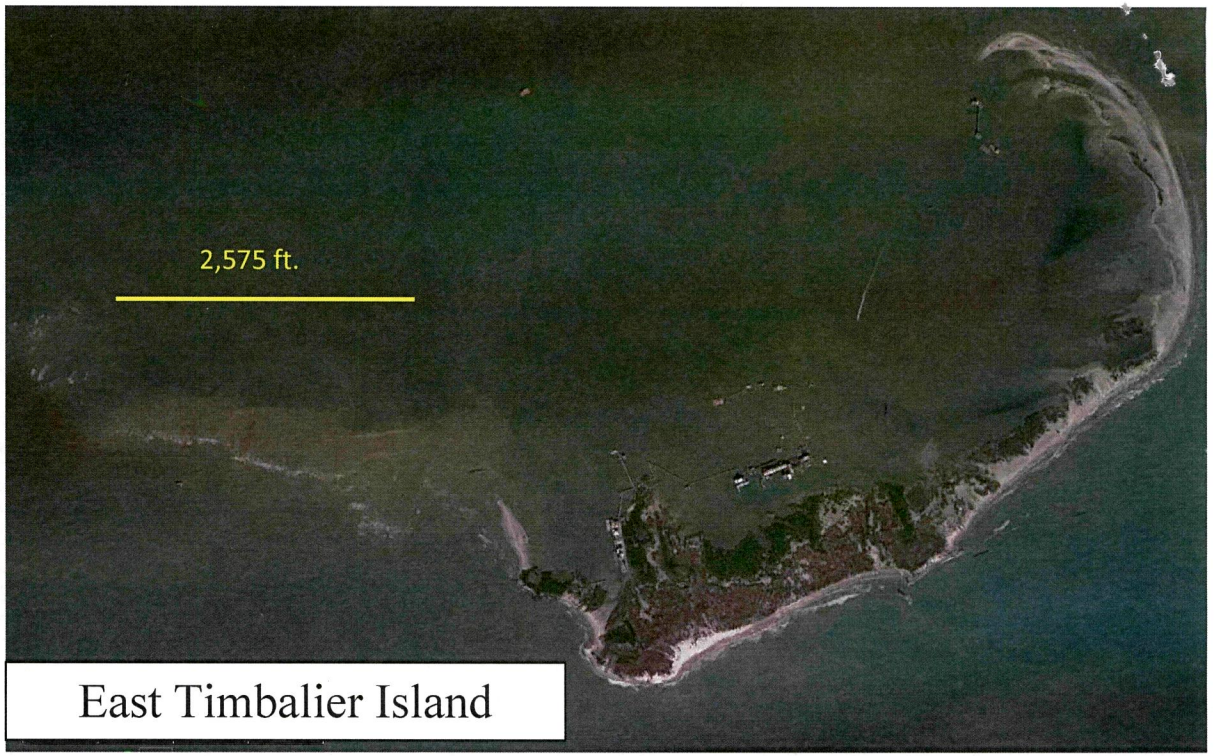
Proposed Solution:
Agricultural industries have long understood the benefits of using stress conditioning to increase stress tolerance in plant species. Although restoration nurseries do implement salt conditioning in certain species, practices should be investigated to increase salt and drought tolerance in barrier island wetland plant species. The proposed demonstration would implement a controlled scientific study with a field planting component to determine if transplant success can be increased through pre-transplant stress conditioning in species that are typically selected for restoration plantings (*Avicennia germinans, Panicum amarum, Paspalum vaginatum, Uniola paniculata, and Spartina alterniflora*). Species would be subjected to (3) salinity conditioning and (3) drought conditioning treatments prior to transplantation. Units would then be transplanted to one of three scenarios (controlled ambient conditions, controlled stressful conditions, and field conditions). This project would transplant individuals on two barrier island restoration sites and implement monitoring and assessment of transplant survival. This demonstration would improve nursery practice, advance restoration science and understanding of important species ecology while replanting coastal marsh and dune restoration sites.

Project Benefits:
The proposed project would 1) improve knowledge of stress physiology of common restoration species; 2) develop new practices for plant nursery industry; 3) establish vegetation on barrier island restoration site; 4) stabilize sediments at transplant location; 5) reduce mortality of future restoration transplants; 6) improve future success of restoration plantings; 7) provide approximately three years of restoration plant analysis; 8) communicate findings to pertinent audiences (including CWPPRA technical task force)

Project Costs:
The estimated cost including materials, transportation, salary, monitoring and dissemination of findings for four years is $1.3 M

Preparer(s) of Fact Sheet:
Taylor M. Sloey, PhD, Coastal Environments, Inc. (225) 383-7455 (ext. 148); tsloey@coastalenv.com




2,575 ft.
East Timbalier Island

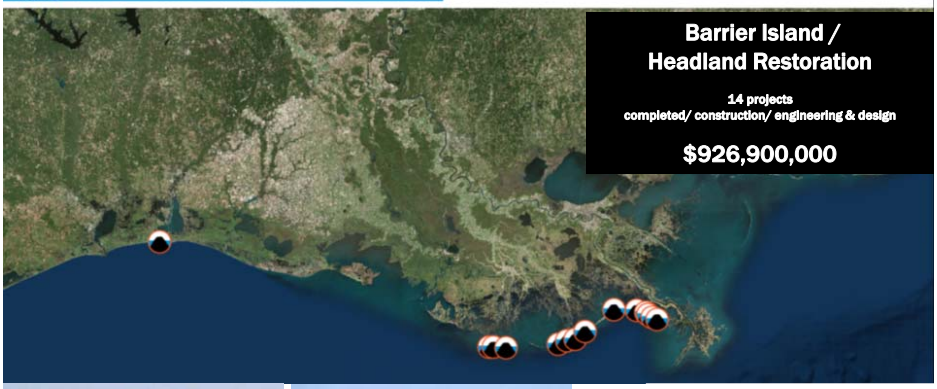
4,280 ft.
Image © 2016 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Whiskey Island
Imagery Date: 1/25/2015 29°04'16.24" N 90°50'21.15" W elev 1

ENHANCING RESTORATION TRANSPLANT SURVIVAL VIA STRESS ACCLIMATION

Dr. Taylor Sloey
Coastal Environments, Inc.

Coastal Protection and Restoration Authority

Source: CPRA



Barrier Island / Headland Restoration

14 projects
completed/ construction/ engineering & design

$926,900,000

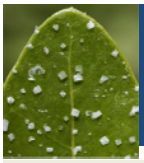
Photo: lpb.org

Dune Grasses
Bitter Panicum (*Panicum amarum*)
Sea Oats (*Uniola paniculata*)
Seashore Paspalum (*Paspalum vaginatum*)

Marsh Plants
Black Mangrove (*Avicennia germinans*)
Smooth Cordgrass (*Spartina alterniflora*)

Trinity / New Cut Barrier Island

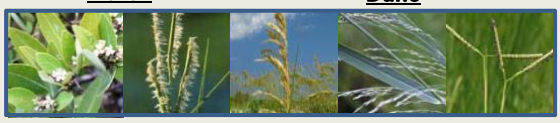
- Precipitation did not occur for at least four weeks following monitoring (Hester et al. 2012)
- Minimal precipitation (<5mm) following New Cut planting effort (Hester et al. 2012)
- Vegetative plantings had low transplant success due to drought (Khalil and Lee 2006)
- Restoration efforts should be planned for dates when local forecast calls for rain events (Hester et al. 2012)



The Proposed Demonstration Project

5 species

Marsh **Dune**



3 salt conditioning treatments
- Freshwater 36 weeks
- Freshwater 32 weeks, salt 4 weeks
- Freshwater 24 weeks, salt 12 weeks

3 hydrologic regimes

Marsh	Dune
Water above soil 10cm	2x Average rain
Water at soil level	Average rain
Water under soil 10cm	½ Average rain

4 transplant scenarios
- Controlled ambient
- Controlled stressful
  - Barrier Island A
  - Barrier Island B

10 replicates

BENEFITS FROM DEMO PROJECT

1. Improve knowledge of stress physiology of four common restoration plant species
2. Develop new practices for plant nurseries
3. Establish vegetation on barrier island restoration site
4. Stabilize sediments at transplant location
5. Reduce mortality of future restoration transplants
6. Improve future success of restoration plantings
7. Provide three years of restoration plant analysis
8. Communication of findings

COST

Materials, greenhouse, transportation, travel, salary, monitoring, analysis and reports: $1,250,000

DEMO-03

Sediment Accretion and Marsh Restoration Using Modified ReefBlk Design

Demo-03

PPL26 Sediment Accretion and Marsh Restoration Using Modified ReefBlk Design Demonstration Project

Demonstration Project Location(s):
Coastwide

Problem:
Louisiana's coastal communities are particularly vulnerable to the threats of sea level rise and storms. To mitigate the effects of these threats, living shorelines can be installed along coastlines to attenuate wave energy and promote shoreline progradation. Deployment of living shorelines as a means to accrete sediment is an area in need of research and development.

Goals:
The goals of this demonstration project would be to demonstrate the synergistic potential of deploying ReefBlk structures with vegetative plantings to promote sediment accretion and shoreline progradation in sediment-rich freshwater environments while simultaneously stabilizing the existing shoreline.

Proposed Solution:
ReefBlks are triangular breakwater structures constructed of rebar and steel caging and filled with oyster shell or limestone. When linked together and deployed along saline shorelines, ReefBlks have shown to successfully attenuate wave energy and recruit oyster growth. However, observations suggest the physical structures have potential to successfully accrete sediment and promote shoreline expansion in low salinity sediment-rich environments. *Schoenoplectus californicus* is a native fresh to brackish water macrophyte that is highly tolerant of flooding and often used in restoration plantings due to its ability to stabilize shorelines and accrete sediment. The project would introduce a modified methodology for sediment accretion by deploying ReefBlk breakwaters in combination with vegetative plantings in sediment-rich freshwater locations with a focus on maximizing sediment accretion to promote shoreline progradation. This project will deploy and compare three types of living shorelines:1) ReefBlks; 2) *Schoenoplectus californicus* plantings; and 3) ReefBlks combined with *Schoenoplectus californicus* plantings . Each living shoreline block will stretch 100 linear feet (20 consecutive ReefBlks) and be oriented parallel and 30' from the existing shoreline. A 20' open space will separate each shoreline block to allow water passage and estuarine animal ingress/egress. Living shoreline blocks will be replicated eight times and randomly distributed, creating 1,600 linear feet of ReefBlk shoreline, directly creating 8,000 ft^2 of *S. californicus* marsh, and providing shoreline protection and sediment accretion for 2,880 linear feet. Over time, the implemented project should aid in creating 86,400 ft^2 of marsh. This project could be implemented at diversion and river outlets throughout the state. The project would include a scientific monitoring component to assess change in elevation and shoreline retreat/progradation using this technique.

Project Benefits:
The proposed project would 1) promote sediment accretion and land building; 2) promote shoreline progradation and rapid marsh creation; 3) provide shoreline protection for 2,880 linear feet of existing marsh; 4) directly create 8,000 ft^2 of *S. californicus* marsh; 5) allow ingress and egress of aquatic species; 6) enhance restoration science and methodology; 7) communicate findings via peer reviewed literature and conference presentations

Project Costs:
The estimated cost of construction, installation, salary and monitoring is $1.5 M.

Preparer(s) of Fact Sheet:
Taylor M. Sloey, PhD, Coastal Environments, Inc. (225) 383-7455 (ext. 148); tsloey@coastalenv.com

The exact site for project implementation is negotiable.
Sites should be characterized by fresh to brackish water and adequate suspended sediment availability.
Possible sites in region III include: Freshwater Bayou Canal, Jaws Bay, Bayou Sale, Wax Lake, Atchafalaya Bay

SEDIMENT ACCRETION & MARSH RESTORATION USING MODIFIED REEFBLK DESIGN

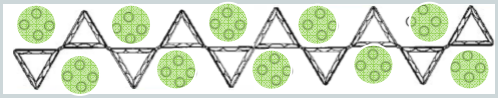
Dr. Taylor Sloey

Coastal Environments Inc.

LIVING SHORELINES

ReefBlk$_{SM}$ *S. californicus*

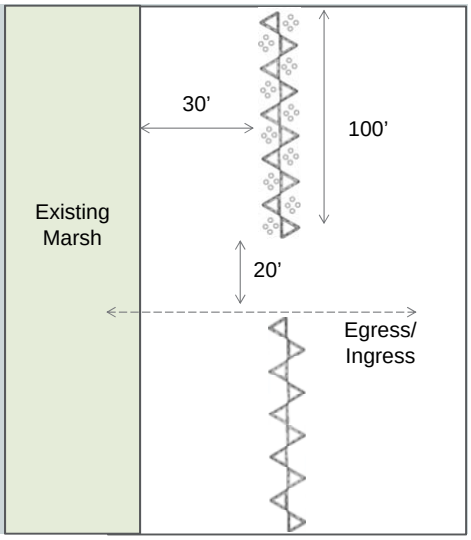
1.

2. 

3.

DESIGN

- 3 shoreline types
  - Placed 30’ from existing shoreline
  - 20’ spacing between blocks
  - Randomized placement order
- 8 replicates
- Scientific component
  - Monitor 6 mo., 1 yr, 2 yr, 3 yr, 4yr
  - Plant survival and growth
  - Elevation (transect)
  - Sediment accretion
  - Shoreline progradation/retreat



BENEFITS

- **Project Benefits:**

1. Promote sediment accretion and land building
2. Promote shoreline progradation and rapid marsh creation
3. Provide shoreline protection for 2,880 ft of existing marsh
4. Directly create 8,000 ft^2 *S. californicus* marsh
5. Allow ingress and egress of aquatic species
6. Enhance restoration science and methodology
7. Communication of findings
8. Promote creation of 86,400 ft^2 of marsh

Project Costs:

- Est. cost of construction, installation, and monitoring- $1.5 M.

DEMO-04

Ecobale Containment Barrier for Shoreline Protection and Marsh Creation

Demo 04

PPL 26 DEMONSTRATION NOMINEE FACT SHEET
JANUARY 27, 2016

Demonstration Project Name:
EcoBale Containment Barrier for Shoreline Protection and Marsh Creation

2012 Coastal Master Plan:
Shoreline Protection
Marsh Creation

Potential Demonstration Project Location(s):
Coastwide

Project examples:
Terrebonne Basin, Gibson, Louisiana, GIWW
Terrebonne Basin, Raccoon Point
Barataria Basin, East Bayou Lafourche Marsh Creation, Leeville, Louisiana

Problem:
What problem will the demonstration project try to solve?
The demonstration project would introduce an innovative solution for shoreline protection and marsh creation projects, especially where containment is needed in poor soil conditions. EcoBale is a lightweight containment barrier that will prevent (floatant marsh) from flowing out of shallow estuaries into nearby channels, ultimately allowing for new vegetation to establish. EcoBale would also serve as a more permanent barrier for marsh creation projects where dredge material is pumped into a particular area. It provides the benefit of containing and protecting the new dredge material, while also allowing for ingress and egress of aquatic species due to the small gaps between each bale.

What evidence is there for the nature and scope of the problem in the project area?
In Louisiana we are experiencing rapid land loss along the shorelines of lakes, bays, and channels. Historically, heavy materials such a rock and rip rap have been used for protection and containment. Yet, in many areas soils are poor and are not able to support the weight which leads to subsidence and loss of the protection or containment that was created.

Goals:
What does the demonstration project hope to accomplish?
The goal of an EcoBale demonstration project would be to provide shoreline protection and containment of floatant marsh and/or dredge material in order to reestablish the growth of existing marsh or assist in the creation of new marsh, especially where rip-rap and rock would sink. A demonstration project would also prove that EcoBale can reduce fetch and wave energies which would allow for floatant marsh to grow and spread while improving conditions for the growth of submerged aquatic vegetation.

Proposed Solution:
Describe demonstration project features in as much detail as possible.
EcoBale is a cylindrical shaped product made from recycled PET plastic matrix material. It is manufactured in standard sizes of four and a half feet (4 1/2') diameter and can either be five feet (5') or seven and a half feet (7 1/2') in length. The diameter can be customized to project site water depths. EcoBales are installed in twenty foot (20') sections. They are positioned onto

a 4'x 21' marine coated schedule 40 pipe with a pad eye welded on each end to serve as an anchor point. Each twenty foot (20') EcoBale section is anchored in place using a helical anchor system consisting of a seven foot (7') round rod anchor with an 8", 10", 12" flight. Five foot (5') extensions can be added according to geotechnical site data.

Matrix material characteristics are as follows:

- High melting point of 260℃
- Good insulating properties for cold weather conditions
- Tear strength of 20 pounds per square inch in both directions
- Saltwater tolerant
- Non toxic to fish.
- Pre-installed weight with the tubing is 40 pounds per foot

Project Benefits:

Describe demonstration project benefits in as much detail as possible.

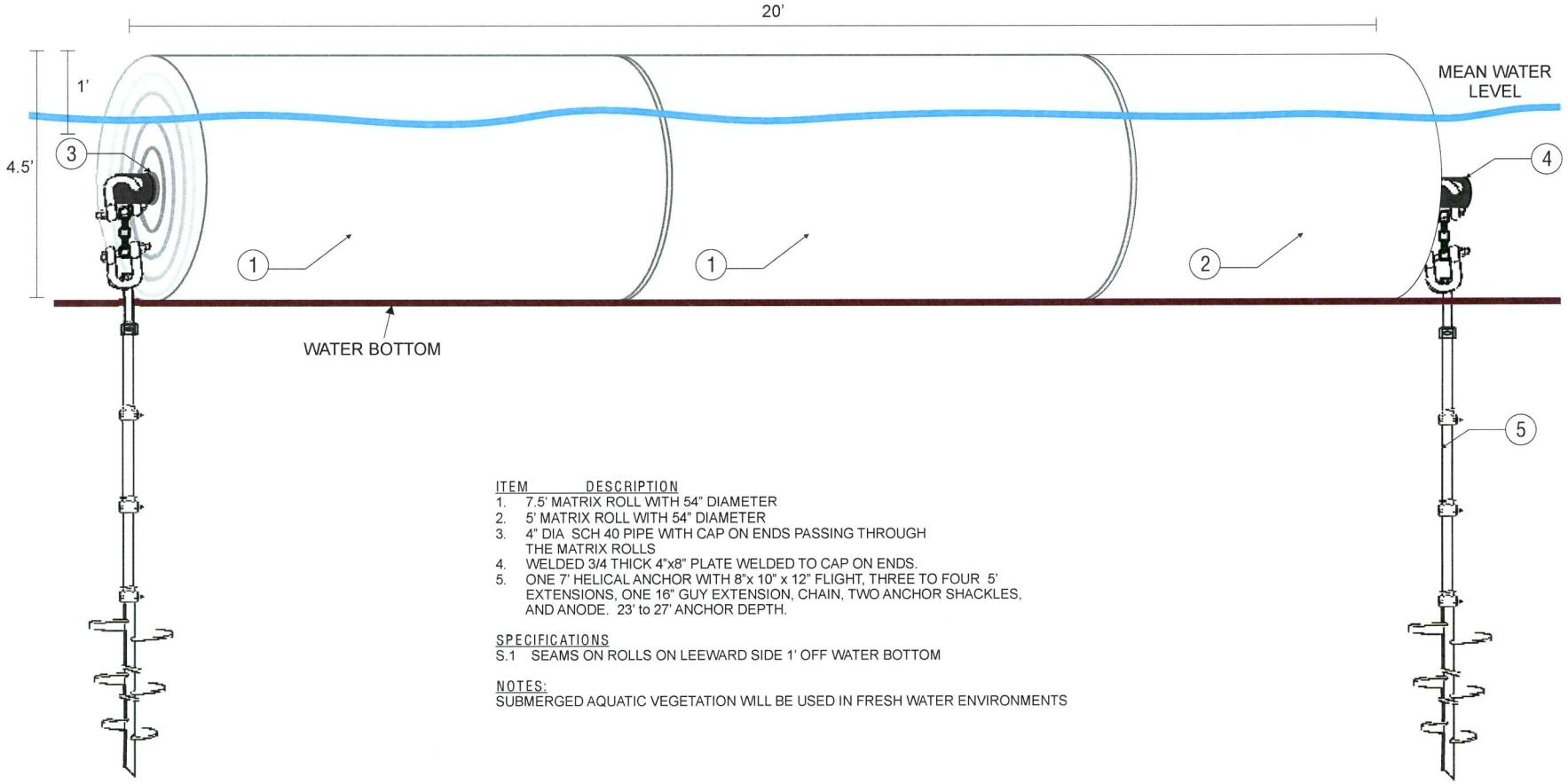
1. Product Benefits
   - Containment of floatant marsh and water movement allows marsh to proliferate and spread
   - Lightweight product is ideal for peat based soils
   - Reduction of wave fetch and energy allows for new vegetative growth along existing shorelines while also improving conditions for SAV growth
   - Provides cover and protection of aquatic species
2. Manufacturing Benefits
   - Manufacturing time is decreased because pre-casting is not required
3. Installation Benefits
   - Gaps between each bale (approximately 12") allow for ingress and egress of aquatic species
   - Minimal footprint on the marsh because dredging/digging is not required
   - Lightweight, easy to install
   - Cost Savings

Total Project Costs+25%:

The estimated cost including 25% contingency is $1M.

Preparer of Fact Sheet:

Ted Martin, Martin Ecosystems, (225) 292-6750, ted@martinecosystems.com



ITEM DESCRIPTION

1. 7.5' MATRIX ROLL WITH 54" DIAMETER
2. 5' MATRIX ROLL WITH 54" DIAMETER
3. 4" DIA SCH 40 PIPE WITH CAP ON ENDS PASSING THROUGH THE MATRIX ROLLS
4. WELDED 3/4 THICK 4"x8" PLATE WELDED TO CAP ON ENDS.
5. ONE 7' HELICAL ANCHOR WITH 8"x 10" x 12" FLIGHT, THREE TO FOUR 5' EXTENSIONS, ONE 16" GUY EXTENSION, CHAIN, TWO ANCHOR SHACKLES, AND ANODE. 23' to 27' ANCHOR DEPTH.

SPECIFICATIONS

S.1 SEAMS ON ROLLS ON LEEWARD SIDE 1' OFF WATER BOTTOM

NOTES:

SUBMERGED AQUATIC VEGETATION WILL BE USED IN FRESH WATER ENVIRONMENTS

MARTIN ecosystems
Baton Rouge, Louisiana
(225) 292-6750

CLIENT		PROJECT	EcoBale Product Spec
DRAWN BY	MEM	DATE	April 2015
CHECKED BY	TAM	DATE	April 2015
DRAWING TITLE	EcoBale 20' Cross Section (Typical Configuration)		
PROJECT No.		FIGURE No.	REVISION

Proprietary and Confidential
Copyright 2015 Martin Ecosystems LLC

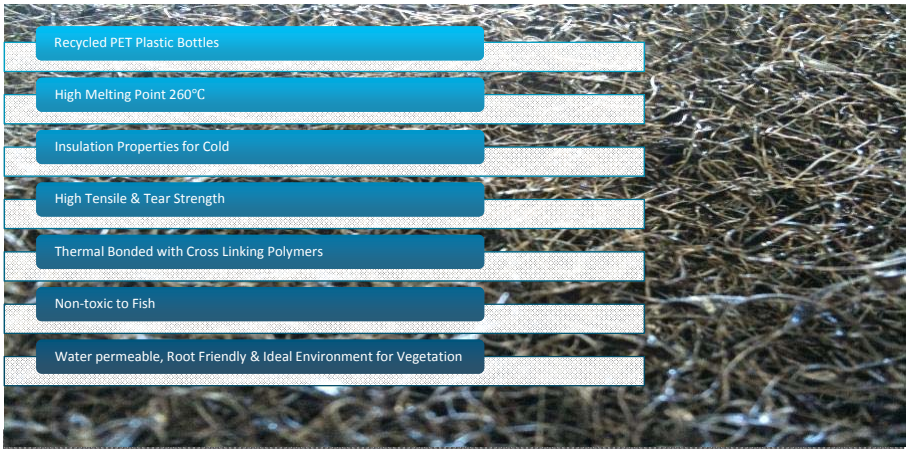
EcoBale

Containment Barrier for Shoreline Protection & Marsh Creation

Ted Martin

Matrix Advantage

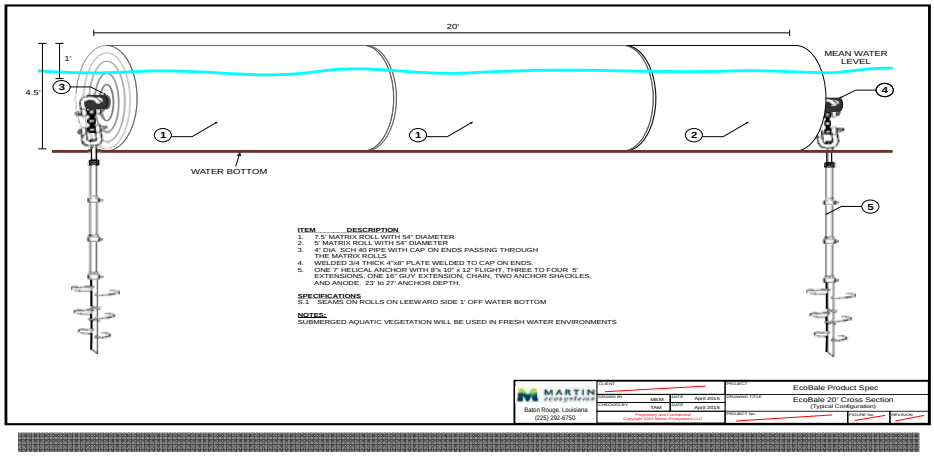
Polyester fibers from recycled PET



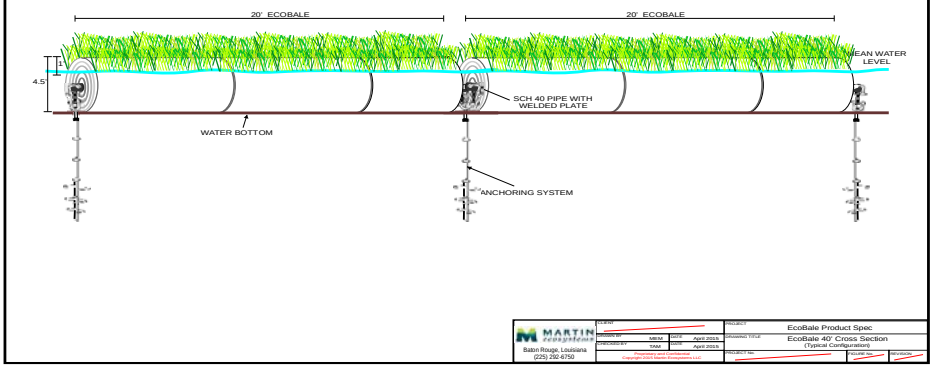
EcoBale-How does it work?

- EcoBale is a cylindrical shaped product made from recycled PET plastic matrix material.
- It provides shoreline protection and containment of floatant marsh and/or dredge material in order to reestablish the growth of existing marsh or assist in the creation of new marsh, especially where rip-rap and rock would sink.
- EcoBale also reduces fetch and wave energies which allow for floatant marsh to grow and spread while improving conditions for the growth of submerged aquatic vegetation.

1 EcoBale



2 Vegetated EcoBale



ECOBALE
Potential Site Examples

NAVIGATION CHANNELS

Gulf Intracoastal Waterway-Gibson, Louisiana

- Plug up holes along the channels
- Protect and contain vulnerable marsh

INLAND LAKES, BAYS & MARSHES

East Bayou Lafourche-Leeville, Louisiana

- Create a barrier for dredge material containment
- Enhance & protect marsh creation projects

FAILING BERMS AND LEVEES

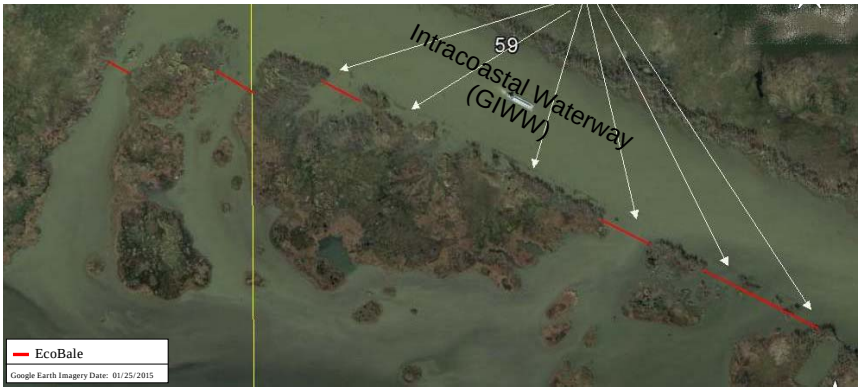
Raccoon Point-Terrebonne Parish, Louisiana

- Plug up berm breaks to prevent further erosion

GIWW Pre-rock

GIWW Post CIAP Rock Installation

GIWW Post CIAP Rock Subsidence



GIWW
Marsh containment; shoreline protection

Gibson, Louisiana

East Bayou Lafourche Marsh Creation
Dredge containment; marsh creation barrier

Leeville, Louisiana

Raccoon Point
Break protection; Plug

Terrebonne Parish, Louisiana

Raccoon Point Breaks Close Up

Terrebonne Parish, Louisiana

Raccoon Point Break

Raccoon Point Break Close Up

MARTIN ecosystems

6265 Benefit Drive
Baton Rouge, LA 70809
(225) 292-6750
(225) 292-6751 fax
www.martinecosystems.com

THE WATER INSTITUTE OF THE GULF

Gulf Guardian Award

Environmental Leadership Pollution Prevention

2014 & 2015 Endorsed by The Water Institute of the Gulf-Shoreline Protection & Bank Stabilization
2013 & 2015 Louisiana DEQ Environmental Leadership Recipient and 2013 EPA/Gulf Guardian Award Recipient

DEMO-05

Novel Techniques for the Efficient Use of Spoil Material in the Backfilling of Canals

Novel Techniques for the Efficient Use of Spoil Material in the Backfilling of Canals Demonstration Project

January 27, 2016

Project Location:

Region 2, brackish marsh areas; Region 3, brackish marsh areas

Problem:

Many areas of brackish marsh in Louisiana contain extensive lengths of abandoned access canals with intact spoil banks. The canals themselves are too deep for the establishment of either marsh or submersed aquatic vegetation (SAV) habitat; and the spoil banks of these canals limit hydrologic exchange between adjacent marshes and open water bodies, thereby reducing the health and vigor of adjacent marsh vegetation. Although the return of spoil material to canals (backfilling) has been previously investigated as a restoration technique, the resultant elevation of the backfilled canal is typically too low (too flooded) across much of the area to allow for the healthy establishment of emergent marsh vegetation in more than 25% -50% of the backfilled area. Therefore, there is a need to develop techniques to optimize utilization of existing sediment to reconfigure existing canals in a targeted manner that results in optimal elevations in the backfilled canal for the creation of both specific areas of high-quality emergent marsh and SAV habitat, as well as enhance health of bordering marsh.

Goals:

- Optimally reconfigure local sediments to create specific areas of high quality emergent marsh and SAV habitat (rather than attempt to create emergent marsh throughout site).
- Substantially improve the health of existing emergent marsh adjacent to the project area.
- Develop a suite of techniques as a flexible "tool kit" including,
    - informed sculpting of spoil banks into new emergent marsh and SAV habitat
    - innovative planting and seeding techniques
    - shoreline stabilization

Proposed Solution:

- Reallocation of current spoil bank sediments in a guided fashion, maximizing creation of
    - emergent marsh habitat
    - shallow SAV habitat
    - nekton habitat (marsh creek channels)
- Restore hydrologic connectivity of existing marshes
- Targeted hand planting of optimal emergent species to stabilize shorelines and mechanized dispersal of SAV propagules or plant fragments

Project Benefit:

Implementation of this project will enable the most effective use of existing sediments in a local area containing abandoned marsh canals with intact spoil banks to create high quality emergent marsh and SAV habitat, and channels enhancing nekton habitat. This project specifically entails

a suite of techniques that can be optimized in a site-specific manner to ensure the creation of the maximum area of desired habitats possible with available sediments. This project differs from existing backfilled canal strategies as it incorporates a high element of design to ensure that a number of different habitats (emergent marsh, SAV, marsh channels) are created in the ratio that maximizes benefit. Further, this project employs a number of innovative planting and seeding techniques to quickly establish vegetation and stabilize sediments.

Project Costs:
The preliminary cost of construction + 25% contingency and monitoring* is $2.3 million

Preparers of Fact sheet:
Adrian Chavarria, Environmental Protection Agency, Region 6 (6WQ-EC)
1445 Ross Ave. Dallas, TX 75052; (214) 665-3103; chavarria.adrian@epa.gov
Scientific guidance: Mark W. Hester (mhester@louisiana.edu) and J. M. Willis (jwillis@louisiana.edu) University of Louisiana at Lafayette; Charles Sasser, Louisiana State University (csasser@lsu.edu)

*Monitoring:

- Will utilize replicated experimental design suitable for statistical analysis
- Will include pre-construction and post-construction data collection/monitoring
    - Habitat elevations and hydrologic regime
    - Vegetation establishment success and plant community development
        - Emergent marsh
        - SAV
    - Faunal/nekton utilization

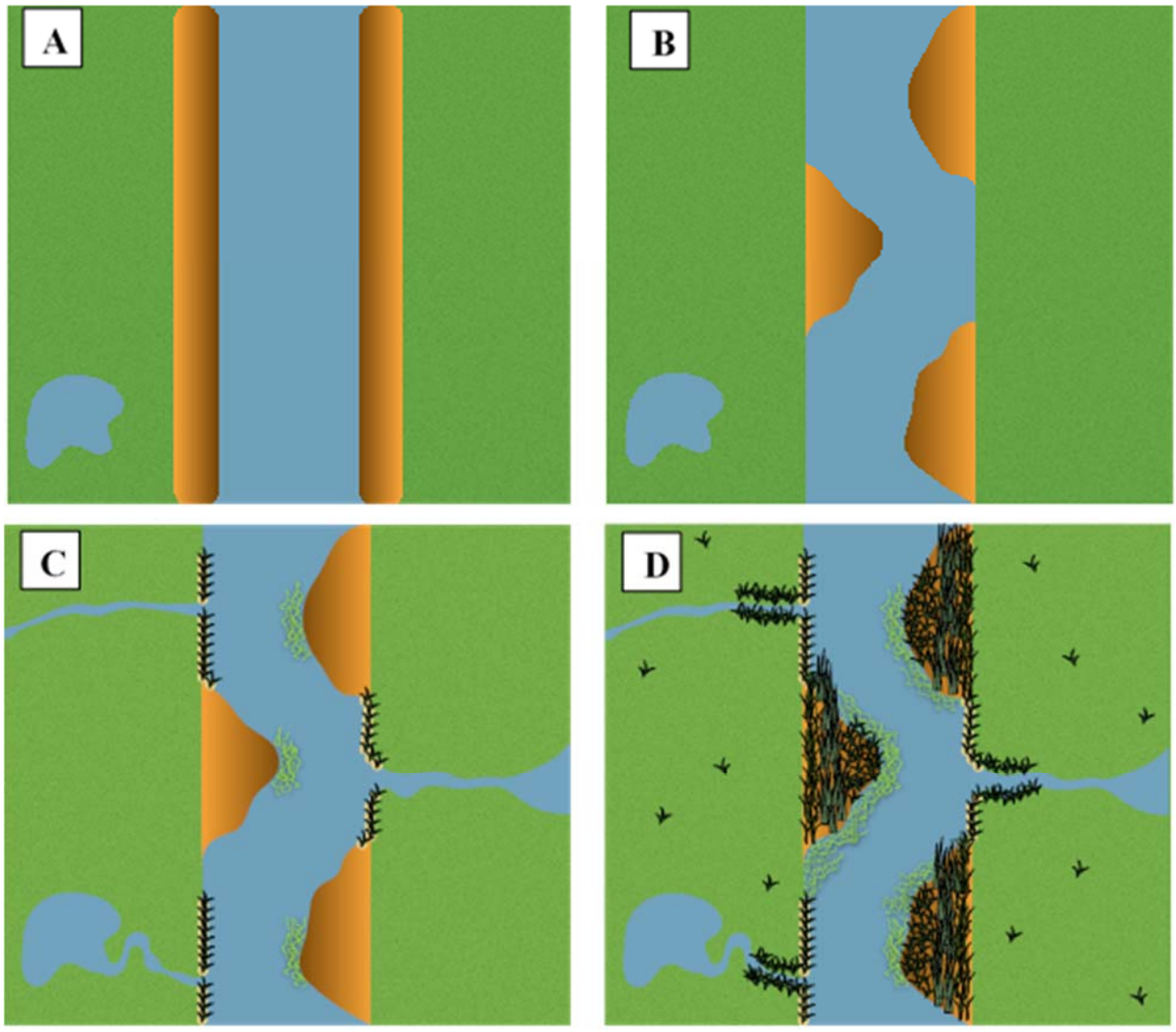


Fig. 1. Timeline for idealized project implementation showing (A) hypothetical project area with intact spoil banks prior to implementation, (B) sculpting of optimal emergent marsh area by targeted transfer of spoil bank sediments and enhanced nekton habitat through tidal creek construction, (C) creation of SAV habitat through plantings and stabilization of newly created emergent marsh shorelines with vegetation , and (D) final project area with newly created emergent marsh and SAV habitat, enhanced adjacent marsh, and tidal creeks for improved nekton support.

Novel Techniques for the Efficient Use of Spoil Material in the Backfilling of Canals

Adrian Chavarria, Environmental Protection Agency

Mark Hester & Jonathan Willis, University of Louisiana at Lafayette,
Charles Sasser, Louisiana State University

Region 3 Planning Meeting
January 27, 2016

Problem

- Canals and associated spoil banks account for 22% of the direct loss of wetlands in Louisiana (ca. 100,905 ha; Turner 1987)
  - Canals too deep for emergent marsh and SAV
  - Spoil banks hinder hydrologic exchange with adjacent marshes
- Numerous canals suitable for backfilling (10,775 ha; Pate 2014)
- Backfilling typically involves dragging or pushing spoil bank into canal
  - Spoil bank foot print graded to marsh level (5% to 95% conversion to marsh)
  - Not sufficient spoil to completely fill canal for emergent marsh (0% to 25%)
  - Shallow open water habitat most commonly results
- There is a need to develop techniques to more efficiently and effectively utilize spoil material to maximize the creation of quality emergent marsh and SAV habitat in backfilled canals

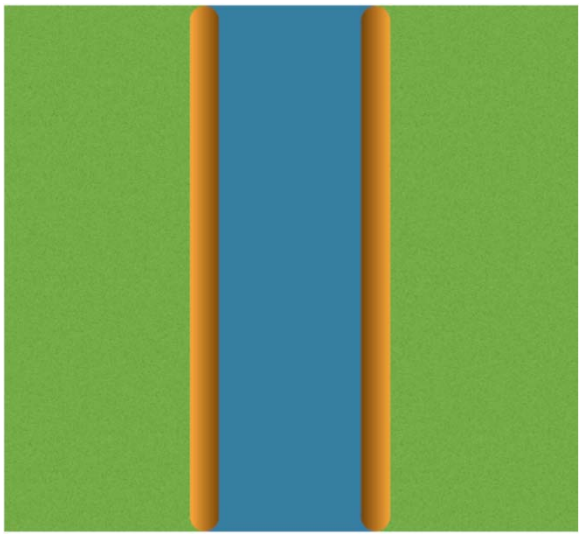
Goals

- Optimally reconfigure local sediments to create new areas of high quality emergent marsh and SAV habitat
- Substantially improve the health of existing emergent marsh adjacent to the project area.
- Develop a suite of techniques as a flexible “toolkit” including,
  - informed sculpting of spoil banks into new emergent marsh and SAV habitat
  - innovative planting and seeding techniques
  - shoreline stabilization

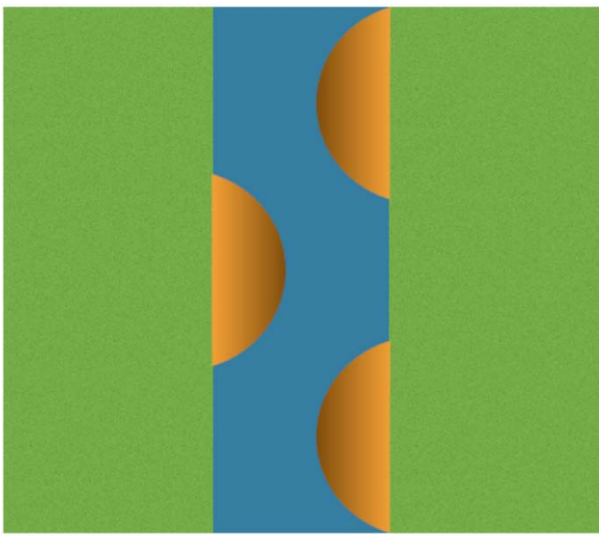
Proposed Solution:

- Reallocation of current spoil bank sediments in a guided fashion, maximizing
  - emergent marsh habitat
  - shallow SAV habitat
  - nekton habitat (marsh creek channels)
- Restore hydrologic connectivity of existing marshes
- Targeted hand planting of optimal species to stabilize shorelines and mechanized dispersal of SAV propagules

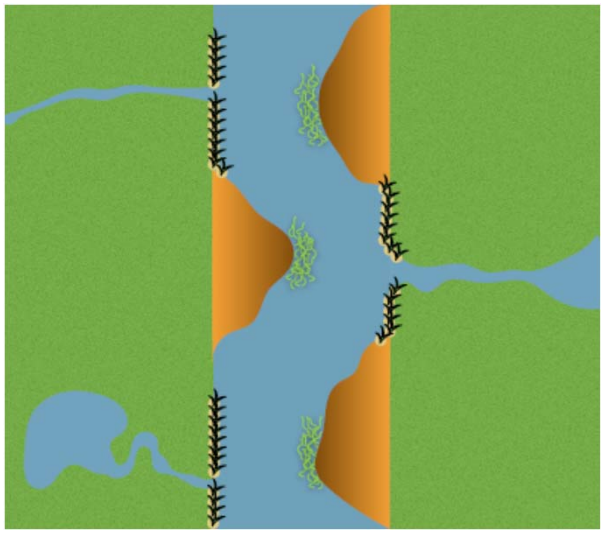
Example Canal Prior to Project



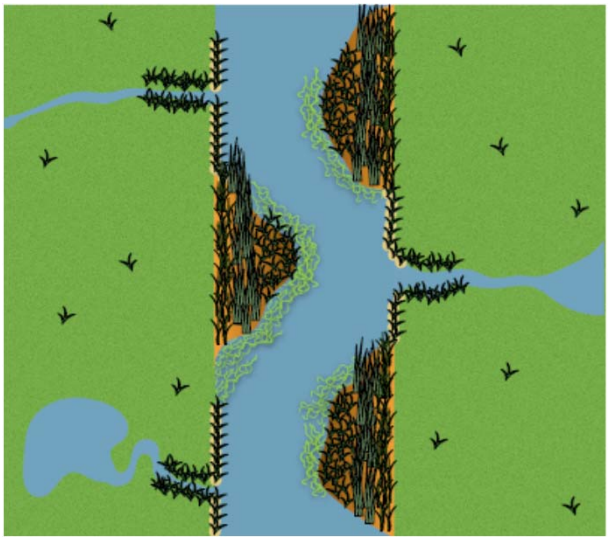
Initial Sculpting to Maximize Created Marsh



Targeted Planting of Marsh and SAV

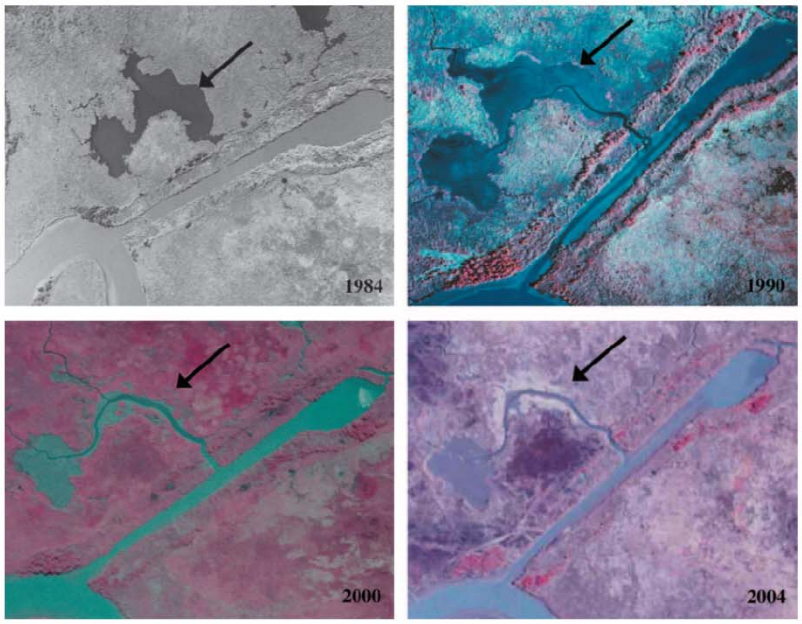


Enhanced Adjacent Marsh Health



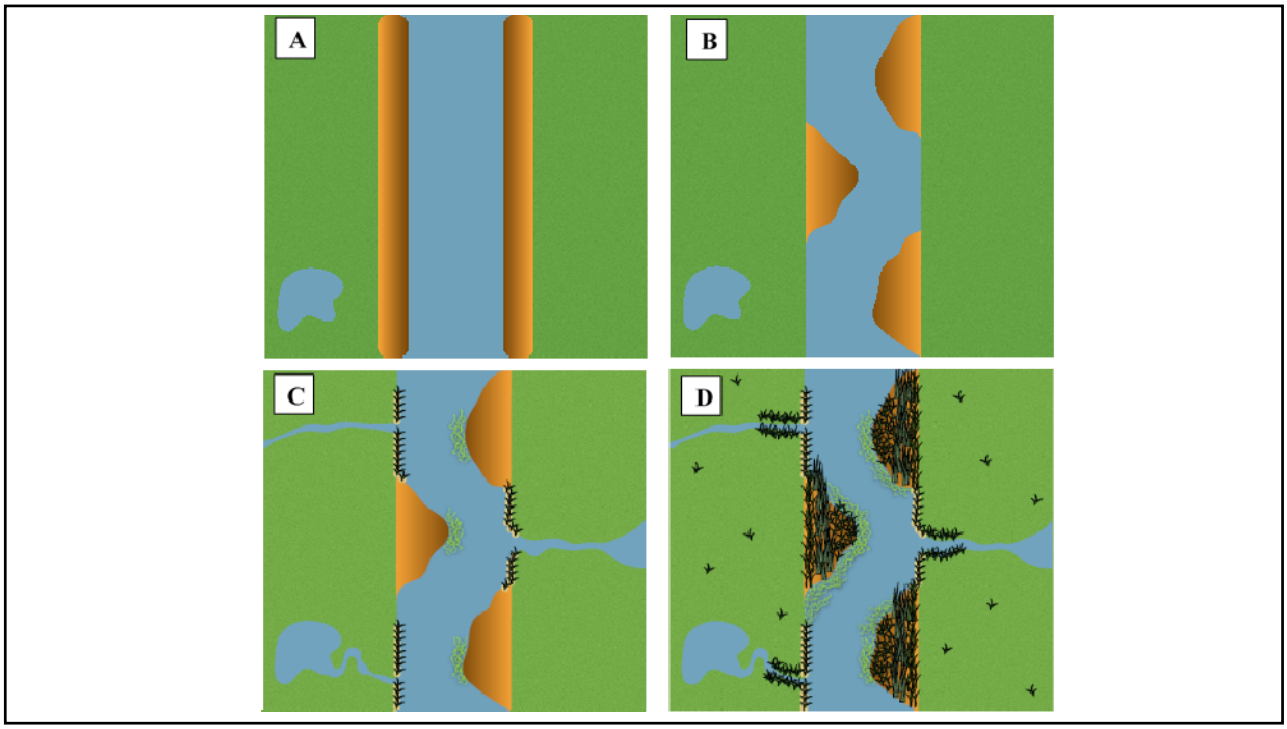
- Jean Lafitte Nat'l Park
- Used marsh buggy
- Assessed backfilling after 3 years
- Marsh restored:
  - 65% of spoil footprint
  - 20% - 25% of canal

From Baustian et al. 2009 Wetlands Ecology and Management



Baustian and Turner 2006. Restoration Ecology

Figure 8. A pond adjacent to the canal converts to marsh after the Vermilion River site was backfilled. The arrows point to the same area in all photos.


A
B
C
D

DEMO-06

Explosive Ditching

Demo - 06

CWPPRA PPL 26 Nomination Sign-Up Sheet

Complete a sign-up sheet for each project you nominate. Please print neatly!

Name of Project: Explosive Ditching

Is this a demonstration project? (Yes) No

If not, please provide the below information.

Region: *(Circle one)* 1 2 3 4 Coastwide

Basin: *(Circle one)* Pontchartrain, Barataria, Breton Sound, Terrebonne, Atchafalaya, Teche-Vermilion, Calcasieu-Sabine, Mermentau

Did you provide a factsheet? Yes No

Contact Information:

Name: Darin Lee, CPRA

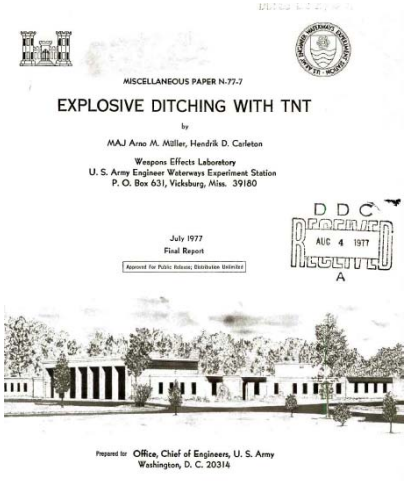
Phone Number: 985 447 0990

Email: Darin.Lee@la.gov

CWPPRA PPL26 – DEMO
Explosive Ditching

Explosive Ditching

- Highly Engineered Technique



MISCELLANEOUS PAPER N-77-7

EXPLOSIVE DITCHING WITH TNT

by

MAJ Arno M. Müller, Hendrik D. Carleton

Weapons Effects Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

July 1977
Final Report

Approved for Public Release; Distribution Unlimited

DDC
AUG 4 1977
A

Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

In other words, spacings S that correspond to values under this curve will yield smooth ditches, i.e., ditches within which widths and depths at the saddles are at least 95 percent as large as those at the charge locations. The shaded area just above this curve is a zone within which the ditches produced will maintain saddle widths of at least 95 percent of widths at charges, but which may have saddle depths as small as 60 percent of depths at charges.

23. From Table 3, scaled optimum burial depth c_b for dry sandy clay is 0.45. The ratio of the values of the scaled spacing between row charges c_s and the scaled apparent radius c_r at abscissa value $c_b = 0.45$ will give the spacing between row charges S in terms of the apparent radius R expected from a single charge emplaced at optimum burial depth in dry sandy clay:

$$\frac{S}{R} = \frac{c_s}{c_r} = \frac{0.90}{0.72} = 1.25$$

or

$$S = 1.25R \qquad (12)$$

In the absence of comprehensive experimental data from other media, it is assumed that a smooth row crater from charges buried at optimum burial depth in any soil will require a spacing between row charges S of 1.25 times the apparent crater radius R that would be expected from a single charge emplaced at optimum burial depth for that medium. In actual practice with a variety of explosives in a variety of media, this relationship works well.

Ditching Design Example

24. Problem. A drainage ditch is to be excavated in wet clay on flat terrain. A minimum width of 8.0 m and a minimum depth of 1.5 m are required. Ditch length is to be 2000 m. Determine the amount of TNT required to produce the ditch with a single row of charges, and give the

charge size, burial depth, and spacing between charges to produce the ditch.

Given:

Required ditch width $2R_r \geq 8.0$ m
Required ditch depth $D_r \geq 1.5$ m
Required ditch length $L = 2000$ m

From Table 3:

$a = 3.0$
$c_b = 0.57$
$c_r = 1.03$
$c_s = 0.51$

The corresponding single crater will have:

$R = R_r = 4.0$ m

$D = D_r = 1.5$ m

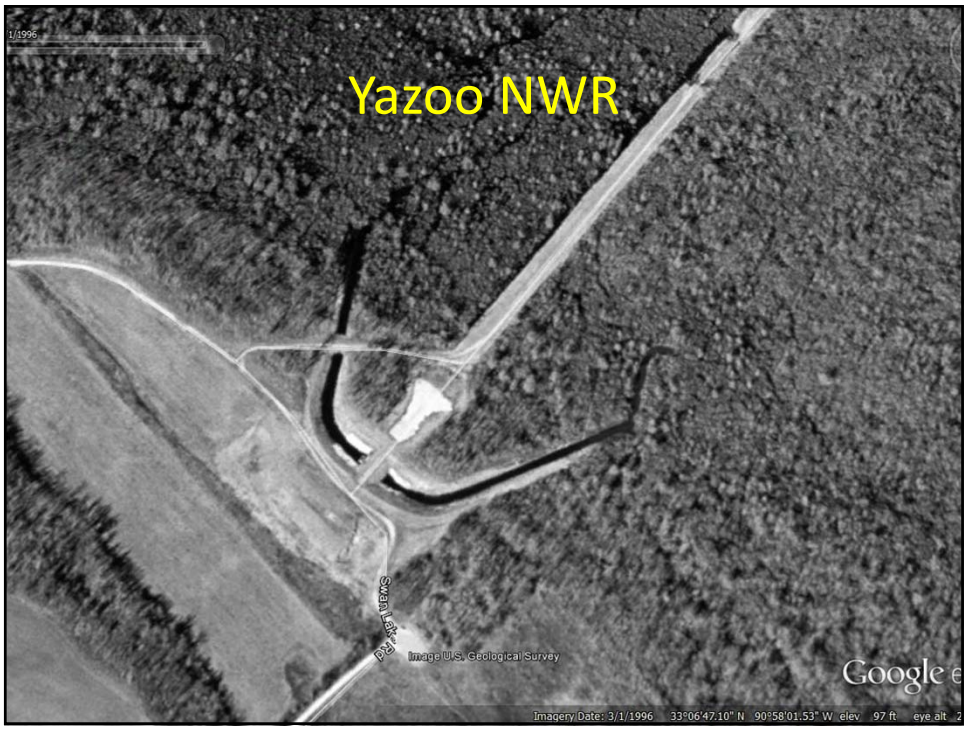
Using Equation 5a the single charge may be calculated:

$$w = \left(\frac{R}{c_r}\right)^a = \left(\frac{4.0}{1.03}\right)^{3.0} = 58.57 \text{ kg}$$

and

$$w = \left(\frac{D}{c_s}\right)^a = \left(\frac{4.5}{0.51}\right)^{3.0} = 25.44 \text{ kg}$$

A charge of at least 58.57 kg of TNT will be necessary for each individual charge in the row shot to achieve the required ditch width $2R_r = 8.0$ m (the required ditch depth D_r could be achieved with 25.44-kg charges). To determine the apparent depth that will actually be achieved using 58.57 kg of TNT, use Equation 5:

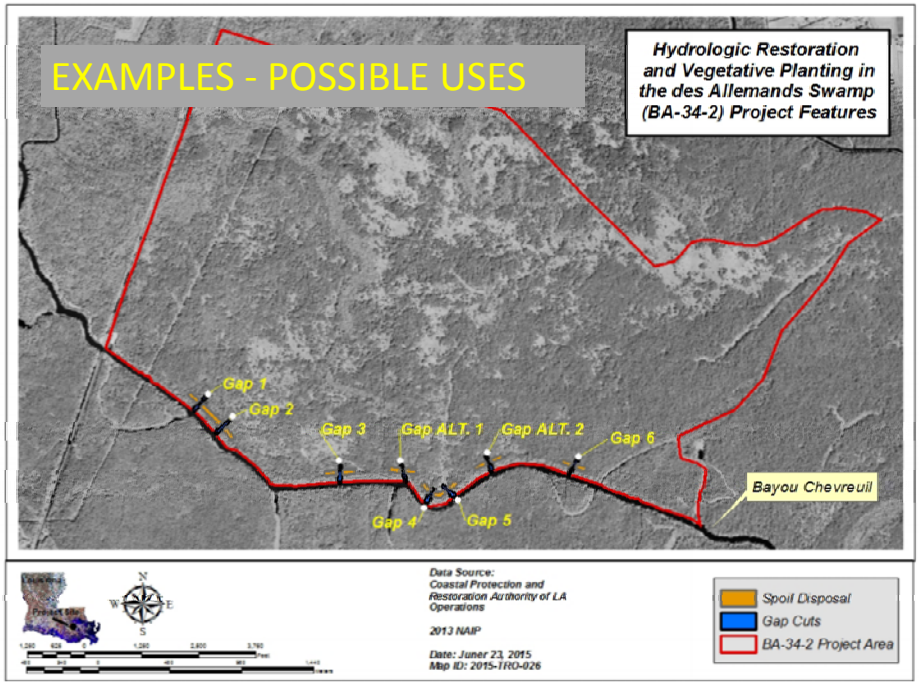


Yazoo NWR - Example

- A preliminary site visit revealed that very boggy conditions existed even during the dry summer months. This made the use of mechanical equipment difficult and costly. In addition, the large stands of cypress trees needed to be protected from damage.
- Swan Lake was a Mississippi River channel thousands of years ago and the entire area is interlaced with a series of natural drainage patterns. The refuge management, together with Vicksburg District and WES personnel, determined that explosive excavation could effectively connect the natural drainage and the two weirs, and could do so with less disturbance to the environment than mechanical equipment might inflict.
- The targeted ditch dimensions were 40 inches deep and 10 to 14 feet wide.
- The blasts sent mud and debris over 100 feet into the air and created ditches approximately 15 feet wide and 40 inches deep
- Tim Wilkens, Yazoo Refuge manager, stated, "It (the blasting) is more sensitive to the environment, and it looks very natural."
- Additional benefits of minimized environmental impact, time, and cost were realized.

- http://el.erdc.usace.army.mil/elpubs/pdf/v4n4/article2/v4n4a2.html

- **Mr. Henry S. McDevitt, Jr.**
  Deputy to the Commander
  U.S. Army Engineer Research and Development Center



BA-34-2

- Construction Estimate
  - Approx. $1.7M
    - Excavation (9,500 cy)
    - Clear & Grub
    - Tree Removal
    - Tree Disposal
    - Tree Planting
- O&M Estimate
  - Approx. $1.1M
    - Gap Maintenance
    - Plantings
    - Tallow Control

PO-142

- Construction Estimate
  - Approx. $800 - $900K
    - Excavation (9,500 cy)
    - Clear & Grub
    - Tree Removal
    - Tree Disposal
    - Tree Planting
- O&M Estimate
  - 3 Gaps + 13,000 ft of channels

Explosive Ditching

- Lower Costs
- No excavated material placement
  - No plantings
  - No Tallow control

Other Potential Uses –

Containment Dike breaching

Tidal Channel Development

DEMO -

- Minimum 5-6 locations
- Coordinate with existing projects or develop new projects
  - BA-34-2
  - LCA Amite River
  - Maurepas Swamp Diversion Outfall Mgmt.
- As-builts vs Design and monitor channel development with surrounding Veg changes impacts.
- Compare costs and environmental impacts with existing projects (no need for references?)

Figure 6. Drainage ditch at Pond 293 (cratering charges).

Figure 8. Drainage ditch at Pond 285 (Bangalores).

DEMO-07

Marine Gardens LLC Geopolymer Composites

Demo-0

CWPPRA PPL 26 Nomination Sign-Up Sheet

Complete a sign-up sheet for each project you nominate. Please print neatly!

Name of Project: Marine GARDens LLC CoCo Polymer Composite

Is this a demonstration project? (Yes) No

If not, please provide the below information.

Region: *(Circle one)* (1) 2 3 4 Coastwide

Basin: *(Circle one)* (Pontchartrain) Barataria Terrebonne Calcasieu-Sabine

Breton Sound Atchafalaya Mermentau

Teche-Vermilion

Did you provide a factsheet? Yes (No)

Contact Information:

Name: Michael Beatright

Phone Number: 504 430 8900

Email: MeBeatright@yAhoo.com

Marine Gardens LLC

Michael Boatright

- Marine Gardens - 2003 R&D reef habitat/ reef systems/ oil impact /farming of corals, fish and sea life

Demonstration Project

- Marine - GeoPolymer Stone, Casting and Composites
- Introduction to low cost “customized macromolecular stone structures” for coastal erosion

What are Geopolymers? Are they proven?

- Geopolymerisation is a “proven science of well-defined macromolecular structures” Dr. Davidovits GeoPolymer Institute -founder
- GPC does not use clinker lime or Portland cement reducing greenhouse emissions 90%
- Made of silica, kaolin and other earthen materials that through a reaction form covalent bonds speeding up natural processes.
- History – Steles Of Memnon in Egypt – documents the methodology of constructing the colossi of Memnon
- Modern Times 80 ‘s – Lone Star Industries, “Pyrament” -Texas – construction projects throughout the state, L A airport, Brisbane Airport in Australia, many projects throughout India and Asia

Abundant Qualities and Flexibility

- Works with traditional concrete methods but it is easier to work and finish.
- Sets in 2 hours, can be driven on in 6 hours
- Can be prefabricated or done on most sites with local materials
- Can be poured, pumped, shotcrete, as a mortar, or molded with ancient methods.
- Performs excellent in highly corrosive and most acidic environments.
- Protects reinforcement by forming a protective bond, impermeable to chloride, sulfates and corrosives, forces water out after cured
- Works well with bio materials, wood and fibrous matting, metal mesh
- Adsorbent, binds heavy metals and hydrocarbons in the water column.
- Customizable macromolecular design ie (accreting structure attracts aragonite and calcite from the water column. Mole factor and weights are customizable.

Sensible Solutions

Best uses for a wide range of coastal erosion projects.

Armor- any hard structures in seawater requiring durability in a corrosive environment

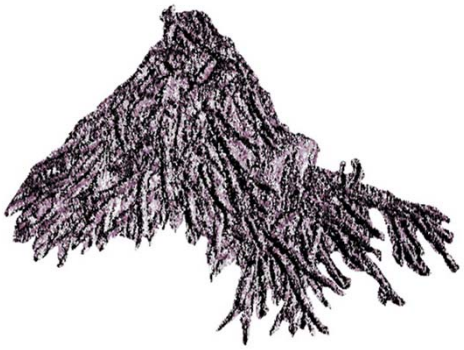
Breakwater structures

Bio enriched structures
mineralized biological structures

Foundation stabilization

Heavy metal sequestration
Bioremediation

Sediment trapping structures



Large Pre fab Marine Blocks and large post and beam structures

Comparison

Material	Corrosion Res	Comp strength	Mod of Rupture	Stability/settle	pH buffer	environmental	Cost
P. Concrete	Poor	Good	Good	?	buffers after 30 days	large producer of greenhouse gas, good reef base, non accreting material	Base cost portand cement 120-160 per ton,
GPC	Excellent	Meets or exceeds P.Concrete	Meets P. Concrete	?	buffers after 30 days	known as green cement, nonclinkered 90% less greenhouse gas compared to portland, accreting material with negative charge , abundant reef colonizer	Base cost of GPC cement 35-45 per ton
Limestone	N/A	N/A	N/A	?	remains high for long periods	Is not a rapid reef colonizer, ph stays high for long periods. High transportation costs associated with large amounts of material	55 - 65 per ton , plus more to build a similar structure.

DEMO-08

Earthen Berms

CWPPRA PPL 26 Nomination Sign-Up Sheet

Complete a sign-up sheet for each project you nominate. Please print neatly!

Name of Project: _Earthen Berm Bankline Stabilization Demo_____

Is this a demonstration project? (Yes) No

If not, please provide the below information.

Region: *(Circle one)*	1	2	3	(4)	**Coastwide**
Basin: *(Circle one)*	Pontchartrain	Barataria	Terrebonne	Calcasieu-Sabine	
		Breton Sound	Atchafalaya	Mermentau	
			Teche-Vermilion		

Did you provide a factsheet? Yes (No)

Contact Information:

Name: __Chad Courville_____

Phone Number: __337.264.1695_____

Email: ___ccourville@maimi-corp.com_____

The 2012 State Master Plan includes in the Types of Projects Bank Stabilization defined as the onshore placement of earthen fill and vegetation plantings designed to reduce wave energies and maintain shorelines in open bays, lakes, and bayous … include(ing) work on navigation channels.

It is difficult to determine which predictive Model Group would evaluate the effectiveness of an Earthen Berm as a means of Bank Stabilization based on the definitions provided.

On Page 120 of the 2012 State Master Plan the Southwest Coast is identified with Project Types, one being Bank Stabilization.

I would suggest that test sections of those areas have Earthen Berms constructed on them to determine their applicability, cost effectiveness, and ability to achieve bankline stabilization objectives in those environments. In accordance with the State Master Plan, I would suggest test sections be implemented along the Calcasieu Ship Channel, Sabine Lake, West Cove, GIWW, and Grand Lake. The Master Plan calls for approximately $186 Million dollars of Bank Stabilization with the use of Earthen Berms in those areas without the benefit of an evaluated technique that would include construction design, effectiveness, or sustainability of those features. There is a need for this information as we are unsure of how effective this technique is when compared to the proven alternatives.

Interestingly, the Southwest Coast appears to be the only region where this approach is proposed. However, it is my understanding Earthen Berms are being considered in the Central and Southeast Coast.

The CWPPRA guidelines for demonstration projects calls for small-scale projects necessary to demonstrate the use of new techniques or materials for coastal wetlands restoration. The guidelines go further to say demonstration projects contain technology that has not been fully developed for routine application which Earthen Berms qualify. I would hope a State or Federal Agency would recognize this Demonstration Project as a data gap and explore the applicability of this technique that has been proposed across such a vast region of the State.