

# Shore-land Restoration Techniques, Bio-engineered and Structural

## Lakeshore Habitat Restoration Training 2015

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# Talking Points

Techniques

Possibilities

Materials Discussion

Project Examples - Before / After

Project Monitoring & Observations

# Various Techniques or Combinations of Techniques

- ▶ Natural Shoreline
- ▶ Native Plantings
- ▶ Biolog w/ Plantings
- ▶ Branch Box Breakwater
- ▶ Brush Mattress
- ▶ Live Fascine
- ▶ Branch Packing
- ▶ Vegetated Geogrid
- ▶ Rock Riprap
- ▶ Rock Riprap w/ Live Stakes; “vegetated riprap”
- ▶ Demo/Experimental

# Techniques

## Natural Shoreline

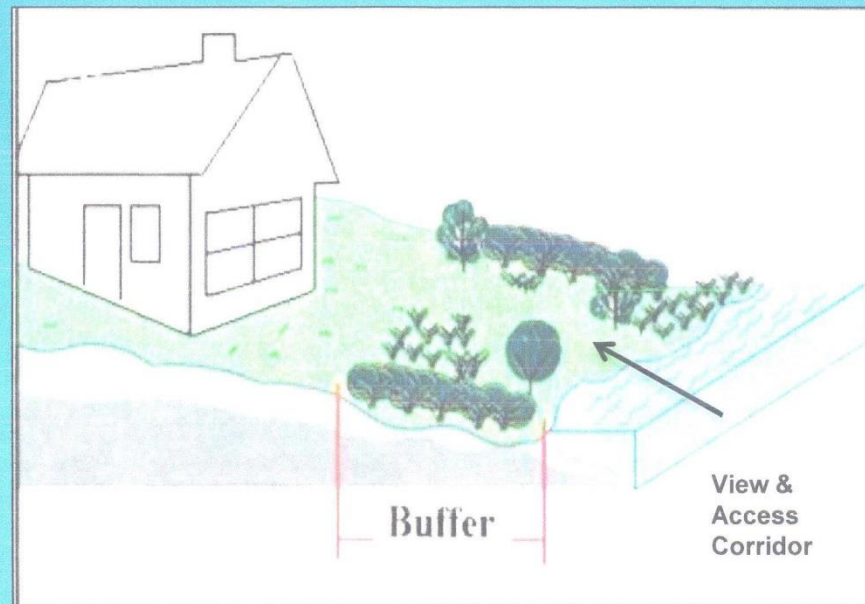
- ▶ Left natural
- ▶ Buffer of vegetation left intact, i.e. no mow
- ▶ May have access to water, i.e. path, dock, stairway, etc.
- ▶ Removal of invasive species
- ▶ Easiest to maintain





# What is a Shoreland Buffer?

Area of protected vegetation along the water





# What is the Importance of maintaining a Shoreland Buffer?

- Erosion Prevention
- Fish & Wildlife Habitat Preservation
  - Protects spawning grounds
- Water Quality Protection & Improvement
  - Limits sedimentation and provides filtering of stormwater
- Natural Scenic Beauty
- Screening & Privacy from Boaters and Neighbors
- Increased Property Values



## Undeveloped Apr - Oct Phosphorus/Sediment Runoff Model

- maple-beech forest
- 6% slope to lake
- sandy loam soil



### IMPACT ON LAKE (April - Oct.)

- 1,000 ft<sup>3</sup> runoff to lake
- 0.03 lbs. phos. to lake
- 5 lbs. sediment to lake

## Developed with Shoreland Buffer – 1940s

### Apr - Oct Phosphorus/Sediment Runoff Model

- maple-beech forest
- 6% slope to lake
- grass corridor 20'-wide
- cottage 700 ft<sup>2</sup> perimeter
- gravel drive 800 ft<sup>2</sup>
- 35'-wide buffer strip



#### IMPACT ON LAKE (April - Oct.)

- 1,000 ft<sup>3</sup> runoff to lake
- 0.03 lbs. phos. to lake
- 20 lbs. sediment to lake

## Developed – 1990s

### Apr - Oct Phosphorus/Sediment Runoff Model

- maintained lawn, soil graded
- 6% slope to lake
- home 3,350 ft<sup>2</sup> perimeter
- paved drive 770 ft<sup>2</sup>



#### IMPACT ON LAKE (April - Oct.)

- 5,000 ft<sup>3</sup> runoff to lake
- 0.20 lbs. phos. to lake
- 90 lbs. sediment to lake



# Passive Restoration

**Effective only when the shoreline hasn't been altered to a great extent and the native ground covers and plants can regenerate on their own**





# Active Restoration Needed



**Natural shoreline vegetation has been removed and replaced with sod. More difficult to establish native seed bank.**



# Why Plant Native Plants?

- ~ Adapted to Fluctuations in Wisconsin Weather
- ~ Disease and Pest Resistant
- ~ Less Maintenance (no fertilizers)
- ~ Provide Food and Habitat for Native Wildlife -  
Birds, Insects, Fish, Amphibians

# Techniques

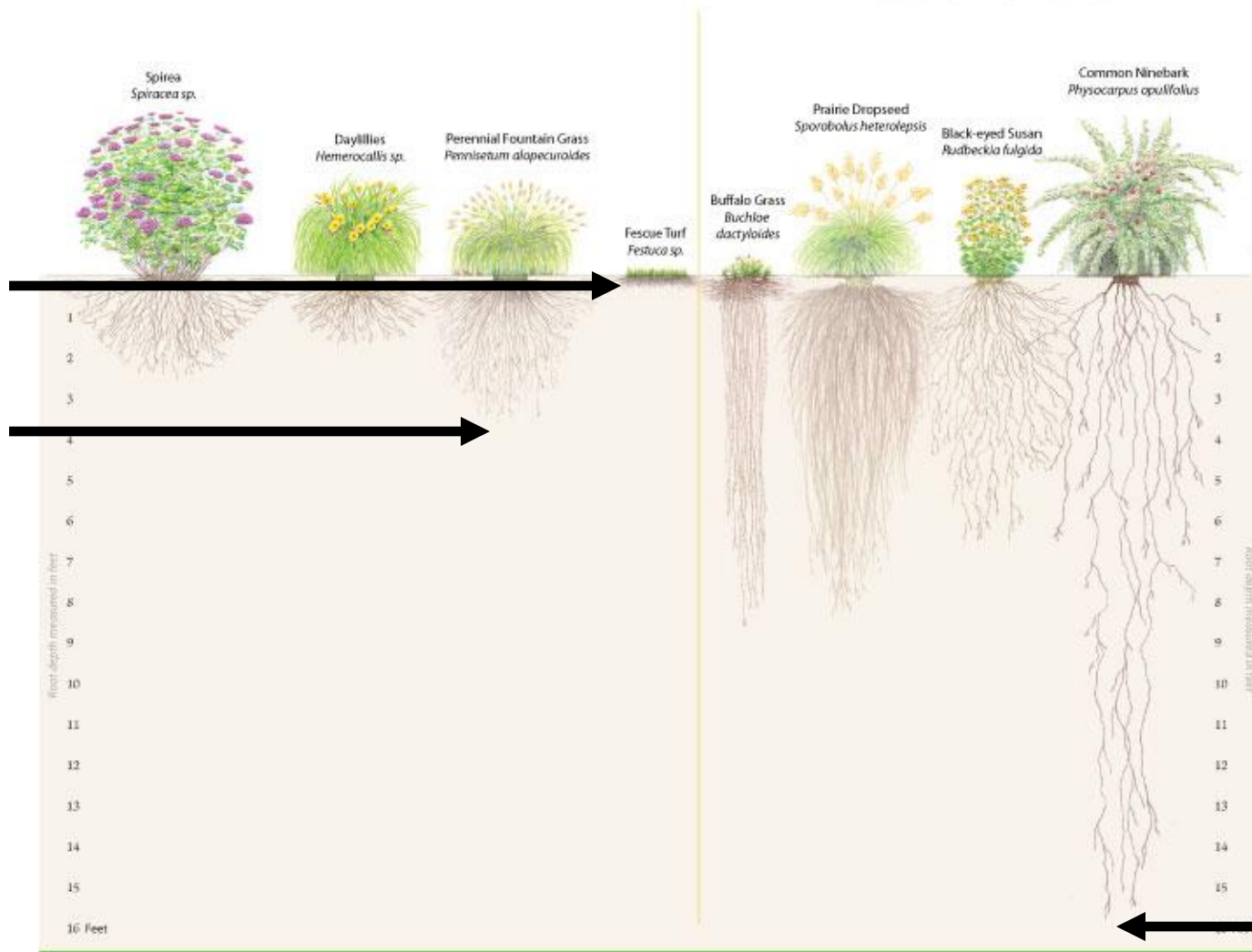
## Vegetation Holds Soil

### Non-Natives

### Natives

Turf  
Grass

4.0 Ft



16 Ft



# Techniques

## Rip Rap with Shrubs and Trees





# Techniques: Biolog



3 YEAR OLD BIOLOG



# Techniques

## Brush Mattress





# Techniques

## Live Fascine





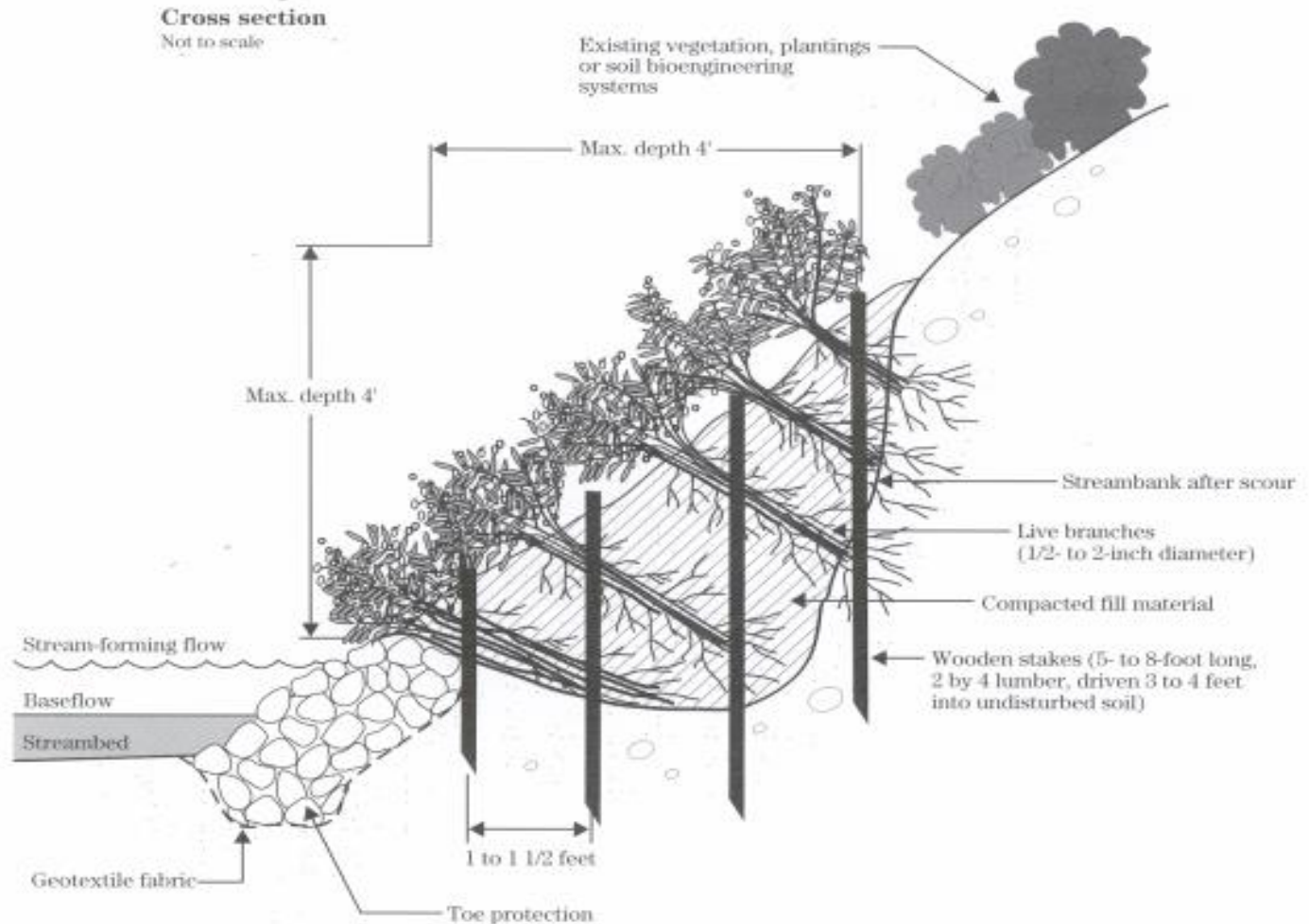
# Techniques

## Branchbox Breakwater



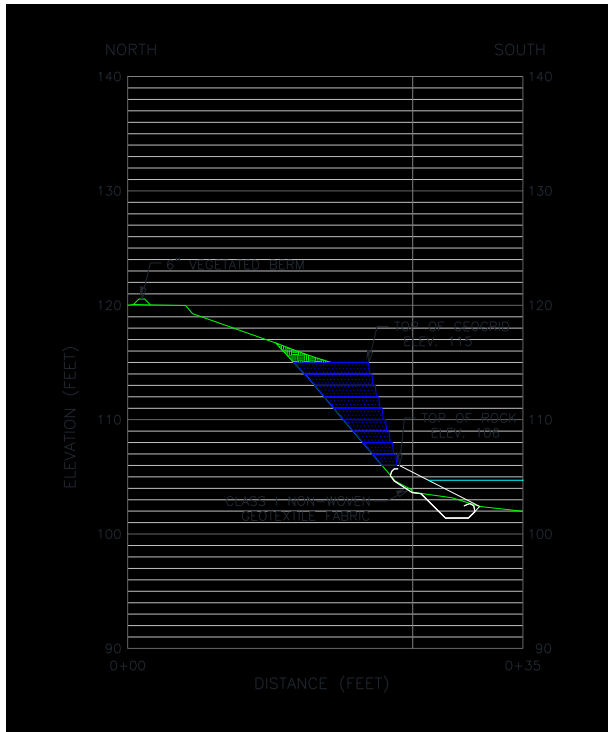
## Branch Packing

Figure 16-10 Branchpacking details

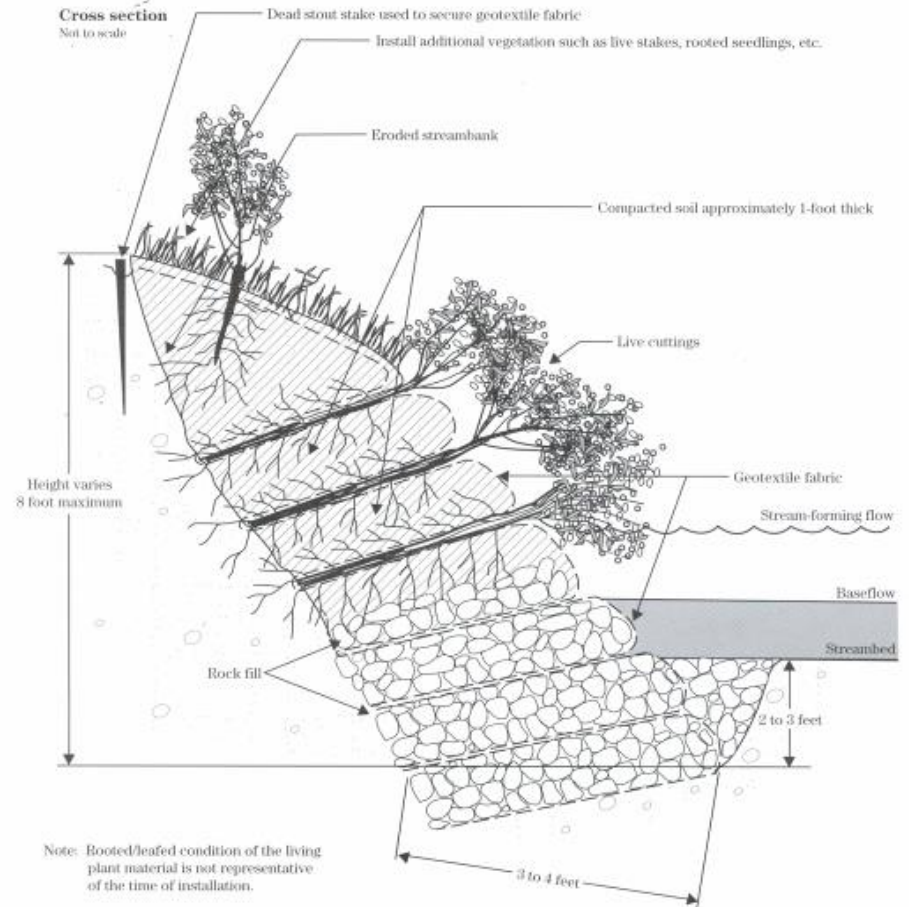


# Techniques

# Vegetated Geogrid

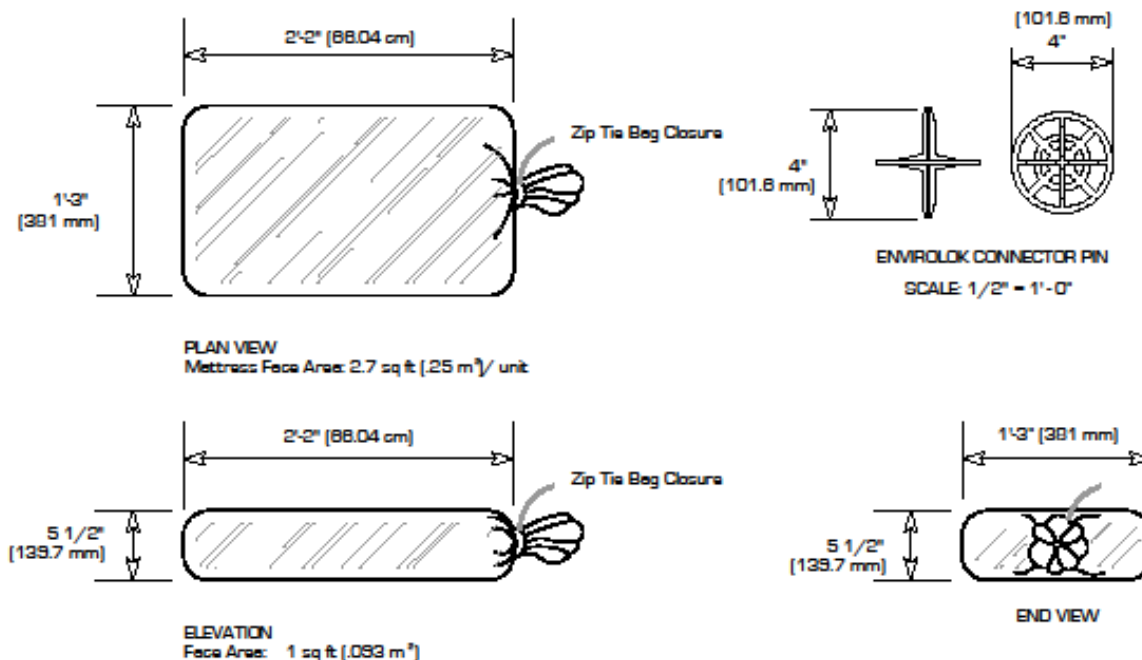


**Figure 16-12** Vegetated geogrid details





# Geotextile Bag Wall



**ENVIROLOK SPECIFICATION:**  
 Calculated Unit Fill: 1.25 cu ft (.0354 m<sup>3</sup>) / unit  
 Face Area: 1 sq ft (.093 m<sup>2</sup>)  
 Mattress Face Area: 2.7 sq ft (.25 m<sup>2</sup>) / unit

**NOTE:**  
 \* Quantities required vary based on unit filling  
 \* One Envirolok Unit consists of:  
 One Envirolok Bag  
 Two Connector Pins  
 One Zip Tie Bag Closure

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## PROJECT ENVIROLOK INSTALLATION STANDARD UNIT

DATE: JANUARY 2012  
 SCALE: 1" = 1'-0"  
 SHEET: 5-455T-1

**Envirolok**<sup>TM</sup>  
 Vegetated Environmental Solutions

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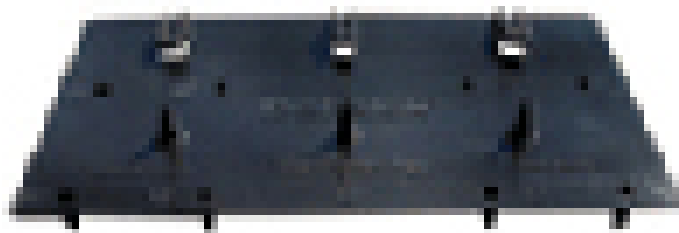
REVISIONS




Deltalok GTX Bag



Deltalok  
Standard Connector

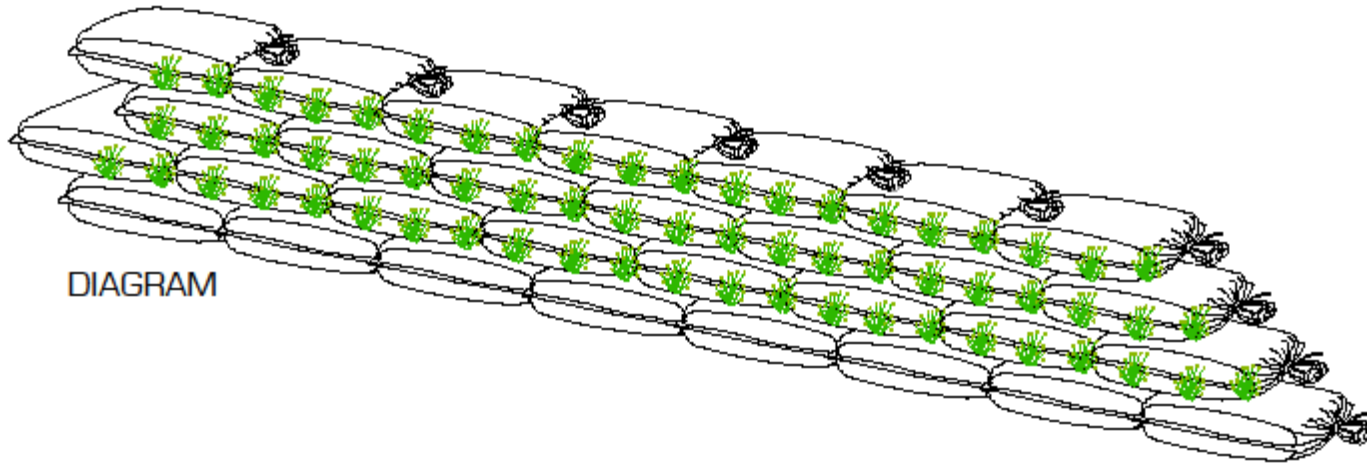


Deltalok  
Engineered Connector

placed  
Deltalok GTX  
use the shear  
e. The result  
that promotes



# Geotextile Bag Wall



DIAGRAM

## NOTE:

Live Plant Material Planted Between Envirolok Courses  
Do Not Rupture Envirolok Units  
Recommended Density; Three Plants per Envirolok Unit

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## PROJECT

### ENVIROLOK INSTALLATION LIVE PLANTING DIAGRAM

## DATE

JANUARY 2012

## BY

SH-657-27

## SCALE

1/2" = 1'-0"

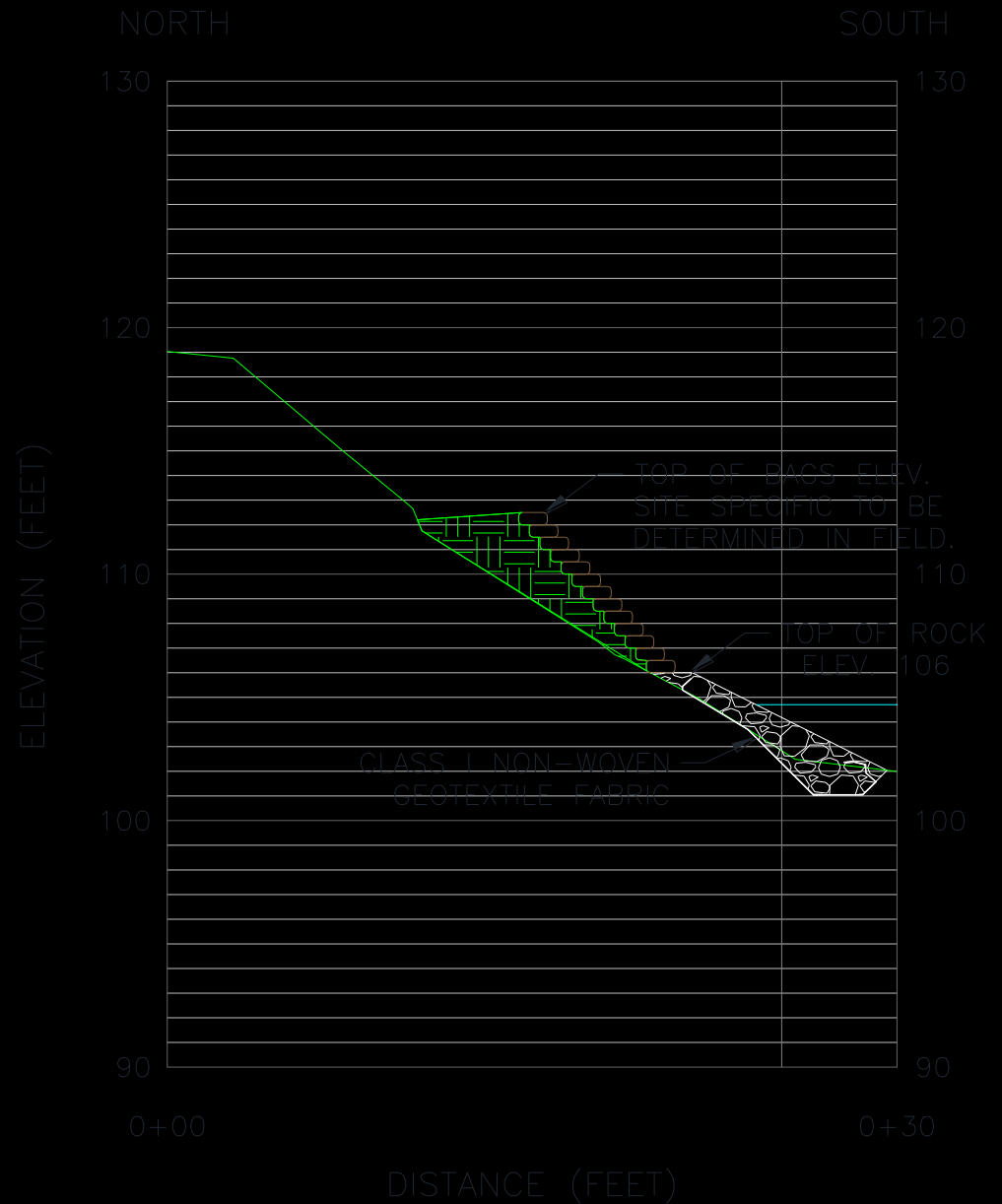
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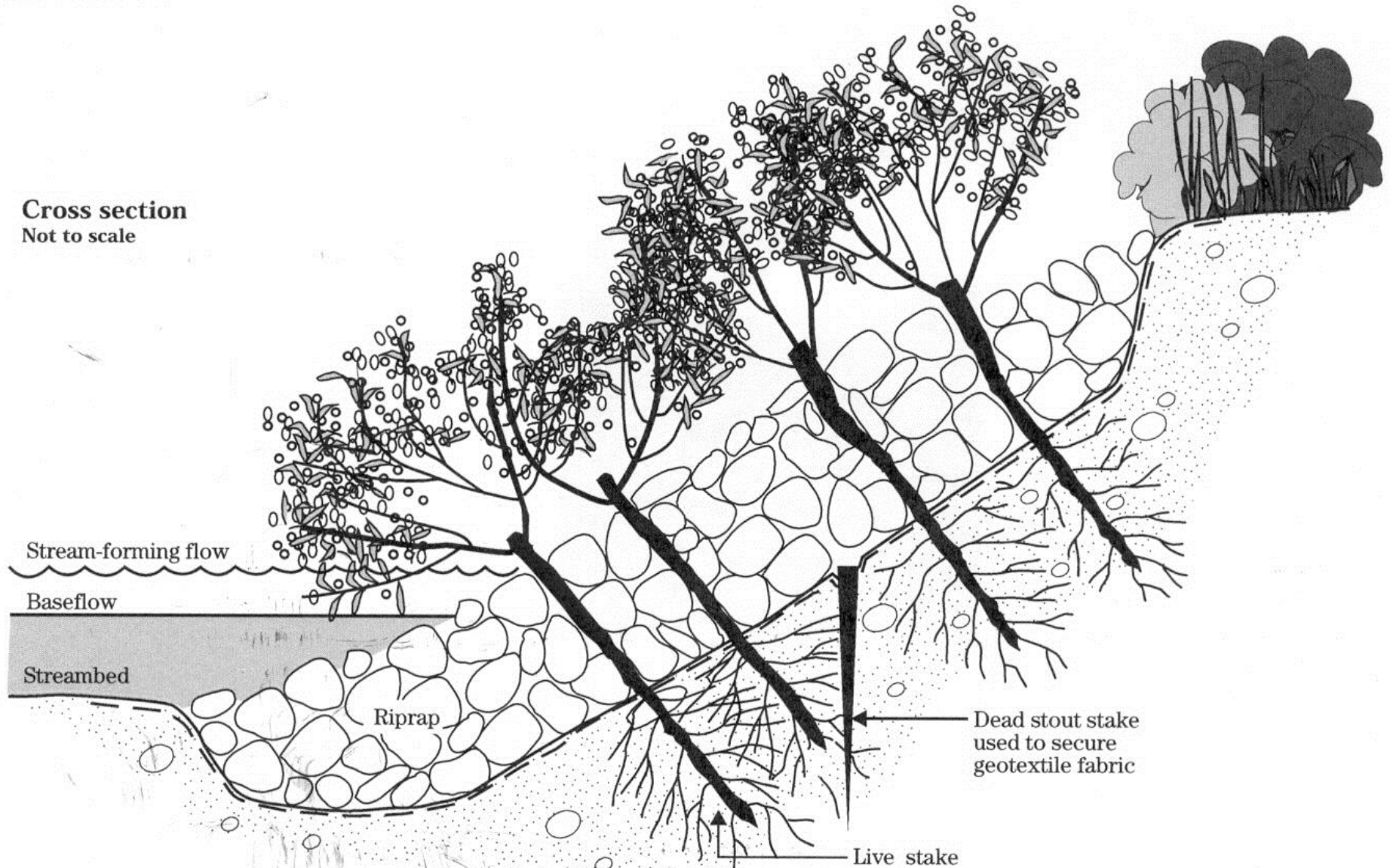
## REVISIONS


# Geotextile Bag Wall

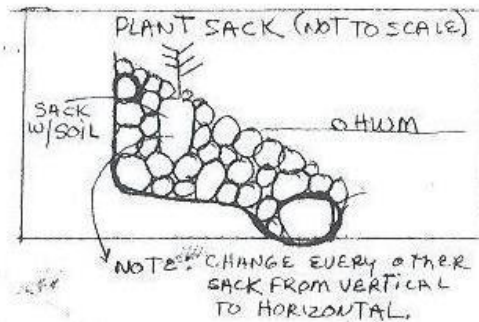


# Techniques

## Vegetated Riprap



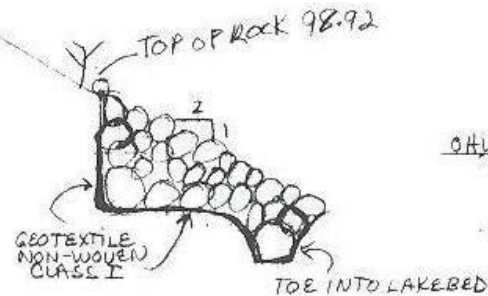
# NOESGES PHASE II TYPICAL CROSS SECTION STATIONS 0+80 — 2+00



ROCK GRADATION	
% PASSING	SIZE OF STONE (IN.)
100	10-12.5
85	8-10
50	5-7.5
15	1.5-2.5

## NOTES

1. TOE INTO LAKE BED 1' X 1'
2. NON-WOVEN CLASS I GEOTEXTILE PLACED UNDER ROCK
3. WRAP GEOTEXTILE ONE FOOT ON ENDS
4. ROCK - d 50 5 inch
5. ROCK RIPRAP TO HAVE A FINISHED SLOPE OF 2:1
6. TBM - LAST PERMANENT STEP OF WOOD DECKING - NE CORNER - ELEVATION 100.00



## Shrubs for sacks

Meadowsweet	<i>Spirea alba</i>
Sweet Gale	<i>Myrica gale</i>
Speckled alder	<i>Alnus incana</i>



## Vertical Geotextile Bag Photo









Rock rip rap with boulder  
toe with shoreland buffer





White Potato Lake Oconto  
County-Shoreline  
Buffer/rock rip  
rap/walleye spawning  
habitat





Lake Poygan off shore break  
Water structure and in shore  
Wetland restoration and  
protection





Sunrise Lake Portage  
County buffer with  
envirolock bags





## Waushara County Lake Alpine Biolog Installation







Waushara County:  
Mt. Morris Lake historical  
Ice heave and geotextile  
Reinforced chute





## Geotextile Reinforced Chute with bio log at the toe





# ShoreMax Product



## ShoreMax™

Soft Revetment Scour Protection Mat

### What is ShoreMax?

ShoreMax™ is a patent-pending soft revetment scour protection mat designed as mechanical protection over highly erosive areas. ShoreMax provides protection against much higher shear stresses and velocities than turf reinforcement mats (TRMs) alone. The ShoreMax system is comparable to hard armor products such as rock rip rap and articulated concrete blocks in turbulent flow and wave attack applications.

ShoreMax is a unique, highly flexible UV stabilized rubber mat designed with voids to allow vegetation establishment through the mat, or natural infilling of sediment. ShoreMax is a versatile product that should be used in conjunction with other erosion control products such as turf reinforcement mats above water lines and geotextiles below normal water lines.

### Typical Applications and Uses for ShoreMax

- Shoreline protection along rivers, streams, and lakes
- Boat docking areas
- High flow channel bottoms and bends
- Stormwater pipe inlets and outlets
- Curb outfalls and downspouts
- Over-flow structures like levees and spillways
- Bridge abutments
- Anywhere extra scour protection is needed!

For more information contact North American Green or your authorized distributor today by calling (800) 772-2040, emailing [customerservice@nagreen.com](mailto:customerservice@nagreen.com) or visiting [www.nagreen.com](http://www.nagreen.com).



Tensar

NORTH AMERICAN GREEN

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The flexible interlock system of the ShoreMax allows for easy installation in adverse conditions. ShoreMax can be installed with different fasteners including percussion earth anchors, standard wire staples, or rebar stakes.



















# Project Examples Before / After



15 foot Building  
Envelope Around  
Home

Before Buffer  
Plantings





**After Buffer Plantings**



# AMNICON LAKE



BEFORE



AFTER



BEFORE



Seawall Re









# BEFORE





AFTER







































NOV 2 200



Before – Oct 2009





After - Oct 2012













After 5 months of growth (May 2010 to Oct 2010)







**Vegetated Retaining Walls - Geotextile Bags (Install)**





**Vegetated Retaining Walls - Geotextile Bags (After)**





**One growing season  
later – Summer 2012**

**(left side of stairs)**

- Native plants are growing successfully
- Bags are camouflaged and will break down in time (biodegradable)



June 2010 Before





June 2011





June 2012

06/27/2012 13:44





# Delevan Lake Walworth County Shoreline Buffer Bio-Log Installation



After one year





Rock Lake-Jefferson  
County Biolog and  
Buffer installed in  
2001



Biolog and buffer in 2004





Questions?