Natural Shoreline Landscapes on Michigan Inland Lakes

Workshop for Property Owners

Chapter 4 (Part 2)
Designing for Shoreline Stability

MICHIGAN NATURAL SHORELINE PARTNERSHIP
Promoting Natural Shoreline Landscaping to Protect Michigan’s Inland Lakes

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Chapter Discussion

- Wave Energy Estimation
- Soft-shoreline erosion control – designs for low energy properties
- Products and techniques used in natural shoreline erosion control
- Examples of soft-shoreline erosion control on Michigan inland lakes
Natural Shoreline Erosion Control Continuum

- Plantings: aquatic, wetland and/or upland.

- No-mow (allow native shoreline plants to restore root structure)
- Plantings to restore root structure
- Plantings with wave-breaks
- Bioengineered erosion control technique(s)
- Bioengineering with light riprap
- Vegetated new or existing riprap

Increasing erosion problems and/or energy potential
What is the wave energy at my property?

- Wisconsin On-line Erosion Calculator
- Three factors used to estimate wave energy:
  - Maximum lake fetch
  - Average depth along the fetch line (lake bathymetry)
  - Standard storm wind speed

[www.dnr.wi.gov](http://www.dnr.wi.gov)
Search on ‘Erosion energy calculator’
Soft (Bio)engineering...

...uses plants, plant products and special techniques to protect soil surface and create structure within the soil to withstand erosive forces.

Overarching concept:

• Reintroduction of deep-rooted native plants to create a system that mimics naturally stable shorelines.
Erosion Control Blanket (ECB)

Biodegradable linear shoreline protection

Wetland plants
- seeded plants
- live stakes
- wattles
- bare root shrubs
- plant plugs
- containerized plants
- erosion control blanket

Toe protection
- erosion control blanket
- brush bundle
- coir fiber log
- predrilled coir fiber log
- prevegetated coir fiber log
- encapsulated soil lift
- rock riprap

Emergent aquatic plants
- containerized plants
- planted coir mats
- prevegetated coir mats
- coir pillows
- in-lake transplants

Wave break
- brush bundle
- coir fiber log

Wildlife exclusion
- posts/fence/string, etc.
Erosion control blankets (ECBs)

- Product line extensive for variety of applications
- Recommended on 2H:1V (or less) slopes
- Treat existing turf grass with wetland formula glyphosate prior to project installation
- Blankets containing straw or wood fibers should NOT be used at the water’s edge
- Avoid impacts to shoreline wildlife with fully biodegradable netting

Image courtesy of North American Green
www.nagreen.com
Note: Layering appropriately
Biodegradable linear shoreline protection

Imported coir (coconut) fiber logs (industry accepted)

- Netting – natural or synthetic
- Length – usually 10 or 20 feet
- Diameter – usually 12, 16 or 20 inches
- Density – usually 7 or 9 pounds (stuffing/cubic foot of log)
- Pre-drilled to accept plant plugs
- Pre-vegetated to specification (grown in greenhouses)
Biodegradable linear shoreline protection

**Brush bundles** – *linear shoreline protection made from on-site brush and/or tree branches*

- Low cost alternative to coir fiber logs
- May wrapped using coir matting or unwrapped
- Live brush bundles
  - Dormant cuttings from native shrubs
  - Intended to grow and colonize the shoreline
- Inert brush bundles
  - Cuttings from native shrubs or trees
  - Provide physical protection with NO expectation of growth
  - Wattles -- used upslope to secure ECBs or slow erosion
What about cost?

The construction of soft engineered erosion control is typically less expensive than seawalls or rock riprap.

Actual costs may vary considerably depending on local prices of plants, materials and on local labor costs.

See cost comparison table in the Guidebook.

For a list of MNSP Certified Natural Shoreline Professionals go to www.mishorelinepartnership.org
Soft Shoreline Erosion Control

Basic design #1

BIOLOG PLACEMENT AT BANK TOE

Or... brush bundle made from native plant material.
Coir log or a brush bundle made from native plant material.
Aquatic plantings behind brush bundle wave break. Also included a pre-vegetated mat.

Same site: Year 2
Install biolog completely within the undercutting of the bank and stake.
A low tech, low cost, minimal disturbance solution to undercut bank problem.

Inert wrapped brush bundle, ECB and plantings

Year 3

Drought tolerant

Wetland

Aquatic

OHWM
Note: Rooted, leafed condition of plant material is not representative of the time of installation.

Mature live stakes

Existing grade

OHWM

Lakebed

Riprap to protect toe of bank

LIVE STAKE JOINT PLANTING
One year after planting

Plant herbaceous plugs into unlined, gently-sloped rock riprap
Softening existing hard-scape

Photos: Jane Herbert
What’s missing in this design?

- Coir logs not secured tightly.
- No plantings behind coir logs. Lawn doesn't hold the shoreline!
- Needs monitoring and control of invasive species.
Case Study
Armes Property
Paw Paw Lake

May 2005
Moderate Energy Site

Maximum fetch = 1.2 miles
Average fetch approx. 1 mile
Solution

- Soft Shoreline Protection w/ riprap
- Wide buffer w/ 2000 native plants
- Open pile dock in lake w/ boardwalk over buffer
July 2006

Lessons Learned:

• Rich Soils susceptible to weedy plants
• Maintenance necessary to keep desired species
• Desired lake access achieved
Bioengineering on High Energy Lakes

Available for download at: www.watershedcouncil.org
Chapter 4: Design Ideas part 2

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DIAGRAM: Design idea for a natural shoreline landscape featuring:
- Vegetation
- Sand & Topsoil
- Filter Layer
- Fieldstone
- Keystone
- Shoreline

Legend: 0, 1, 2 ft.
Designing Rock Revetment

- In order to determine rock size, first must know:
  - Fetch
  - Wind Speed
- Use table to determine significant wave heights (in feet)

*In Northern Michigan, we have determined that significant wave heights generated by wind speed of 35 MPH is an appropriate estimate*
Little rocks work....but how little is little?

- Rock sizes: should vary...not all being close to the median size
  - Multiply median size by 1.5 to determine max.
  - Multiply median size by .5 to determine min.

- Thickness: about 2-2.5x thickness of the ave. rock size

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*Table 2: Recommended median rock sizes for various significant wave heights.*
Fetch = 6.6 Miles

Average significant wave height = 2.64’

Average rock diameter = Just over 11”

Smallest rock diameter = About 5.5”

Largest rock diameter = About 16.5”
NO-MOW ZONE
Check out the video at www.watershedcouncil.org
Coming to a Shoreline Near You!

- Shoreline Demonstration Projects at Camp Pet-o-Se-ga on Pickerel Lake, Emmet County
  - Part of the Michigan Natural Shoreline Partnership’s Certified Natural Shoreline Professional training
  - June 11

Questions?