SHORELINE & STREAMBANK EROSION CONTROL

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Lakeshore vs. Streambank

• Different Standards & Eligibility Criteria
  - NR 328 Subch. I – *Inland Lakes & Impoundments*
  - NR 328 Subch. III – *Rivers & Streams*

• Different Application Packets

[NR 328 Subchapters I, II and III](#)
Types of Permits

• General Permits
  – Must meet specific design, location & Construction standards (Eligibility Criteria)

• Individual Permits
  – Required for projects that exceed the General Permit Eligibility Criteria

Waterway Permits
Lakeshore Erosion Control

Available General Permits

- Biological
- Riprap/Vegetated Armoring
- Riprap Repair
- Riprap Replacement
- Replace Seawall w/ Riprap
- Seawall Replacement (Very Limited)
Biological Erosion Control

A structure that relies solely on biological materials

Constructed of living or organic materials that are biodegradable such as native plants, live stakes, branches, jute netting, fiber/coir logs and mats, etc…. 

http://dnr.wi.gov/topic/Waterways/shoreline/erosioncontrol-biological.html
The Roots of the solution

Native vegetation forms a deep network of roots that hold soil particles, binding the bank together to protect it from erosion.
Minocqua Town Park Biological Shoreline Restoration

Before

AFTER 8 Years later
Minocqua Town Park Biological Shoreline Restoration
Riprap

Layers of rock including filter material placed on the bed & bank of a navigable waterway.
Riprap/Vegetated Armoring

Highlights of Standard

• 200 linear feet or less

• Moderate or High Energy site

• Must be re-vegetated above the OHWM

Riprap/Vegetated Armoring Checklist
Riprap Repair & Replacement

Definitions

Riprap Repair = Involves the placement of additional rock or redistribution of existing rock within the footprint of the existing riprap.

Replacement = Means a degree of structural changes to the shore erosion control structure by which some or all of the structure is being removed and recreated. Replacement of filter fabric or replacement of the base substrate is considered replacement.
Riprap Repair or Replacement

**Highlights of Standard**

- **Replacement** limited to 100 linear feet or less
- **Repair** limited to 300 linear feet or less
- The applicant must demonstrate both:
  - The previous placement of riprap
  - That the replacement structure is within the footprint of the previous structure
- Must be re-vegetated above the ordinary high water mark (OHWM)
Replacement of a Seawall w/ Riprap/Vegetated Armoring

Highlights of Standard

• Limited to 500 linear feet or less
• Rock cannot be placed higher than the OHWM plus the Storm-Wave Height or for waters subject to subch.II, rock cannot be placed higher than the OHWM plus 1.5 times the Storm-Wave Height*
• Must be re-vegetated above the ordinary high water mark (OHWM)

*NOTE: The waters listed in subch. II are typified by the following conditions- Impounded; 2500 acres or more, extensive water level fluctuations, high shoreline recession rates and historic loss of shoreline vegetation.
Replacement of a Seawall

Highlights of Standard

Seawall replacement may only be permitted at the following locations:

• Municipal or commercial marinas where vertical docking facilities are a practical alternative considering the public interest

• Navigational channels where slopes are steeper than 1.5’V:1’H, showing evidence of erosion, where alternative methods would impede navigation

• Slopes steeper than 1.5’V:1’H where the applicants demonstrates alternative measures are not practicable

Replacement may not exceed 100 linear feet on an inland lake or flowage of 300 acres or more.
Application Information Requirements

• **Application form.** A complete, signed application form “Water Resources Application for Project Permits (WRAPP)” (Form# 3500-53) http://dnr.wi.gov/files/PDF/forms/3500/3500-053.pdf.

• **Site maps** which clearly illustrate the location and perimeter of the project site, and its relationship to nearby water resources (e.g. lakes, rivers, streams, wetlands), major landmarks and roads.

• **Photographs** that clearly show the existing project area. Remember that too much snow cover or vegetation may obscure important details. If possible, have another person stand near the project area for size reference.

• **Project plans** and specifications reflecting the General Permit Eligibility Standards as listed in the project-specific checklists.

• **Project Narrative** description of work that is proposed, from initial site preparation to installation and final site stabilization, detailing equipment used, erosion control measures, timing, etc.

• **Permit fee**

  Application Materials may either be submitted electronically or sent in by mail

**Mailing Addresses & County Contacts**
## Energy Category

Classifies shoreline sites bases on erosion severity

<table>
<thead>
<tr>
<th>Method</th>
<th>Low Energy</th>
<th>Moderate Energy</th>
<th>High Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm-wave</td>
<td>&lt; 1 foot</td>
<td>1 foot to &lt; 2.3 feet</td>
<td>&gt;2.3 feet</td>
</tr>
<tr>
<td>Erosion Intensity</td>
<td>47 or less</td>
<td>48-67</td>
<td>68 &amp; above</td>
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</tbody>
</table>
Fetch = Longest unobstructed straight line originating from the applicants site to the opposite intersect w/ the shore.

Mean Depth is determined by averaging the depths along 5 equally placed intervals across the fetch line.

Mean depth $\frac{100}{5} = 20'$

$2112 \times 9 = 19,008$ ft

$19,008 \div 5280$ (1 mile) = 3.6 miles

$1'' = 2112$ ft
Waterway and wetland permits: calculating energy along a shoreline

NOTE: For best results, use Microsoft Internet Explorer browser version 7 or higher

Follow these steps to obtain an accurate calculation of energy along your shoreline:

1. Print out the map for your lakeshore site (include the scale).
2. Figure out the correct feet-per-inch value using the map scale and your ruler, and enter
   the number below:

   1 inch = 2112 feet

3. Mark your shoreline site on the lake map.
4. Draw the longest unobstructed straight line originating from your site across the water to
   any other point on the shore; this is the fetch at your site. Use this example for reference.

5. Using a ruler, measure the length of the fetch line and record this value:

   9 inches

6. To convert the ruler measurement of fetch to actual distance, multiply feet per inch
   (found in step 2) by the measured fetch line (found in step 5):

   Lake Fetch = 2112 feet/inch x 9 inches = 19000 feet

7. Use the value (in feet) obtained from step 6 and divide by 5280 to convert Lake Fetch in
   feet to miles.

For example Lake Fetch (ft)/5280

8. Measure the mean depth along your fetch line:
   1. Locate and mark at least 5 equally-spaced points along your fetch line.
   2. Estimate and record the depths at these equally spaced points (for example: 45 ft, 105 ft, 75 ft, 55 ft and 25 ft).
   3. Add these depth values together and then divide by the number of sample points
      taken and record the result. For example, (45 ft + 105 ft + 75 ft + 55 ft + 25 ft)/5
      = 61 feet.) Use this example for reference.

9. Using the two values obtained in steps seven and eight, fetch from your site and mean
   depth on your fetch line, use the wind wave model below to calculate the storm wave
   height at your site. The storm wave height is used to determine the energy category at
   your site.

Mean Water Depth Along
My Fetch

Lake Fetch From My Site

Storm Wind Speed

51.33 ft/sec

Storm Wave Height

1.86 feet

Energy Category

Moderate Energy

http://dnr.wi.gov/topic/Waterways/shoreline/erosioncalculator.html
## Erosion Intensity Worksheet

### Section V: Erosion Intensity (EI) Score Worksheet

Applicants and department staff shall use this worksheet to calculate erosion intensity pursuant to s. NR 328.08(2). Where an applicant or the department believes that, as a result of site conditions, storm-wave height as calculated in sub. (1) may inaccurately predict the degree of erosion, the erosion intensity score may be calculated to determine erosion. When the department or applicants assess erosion intensity (EI) at the shore protection site they shall apply methods outlined in this worksheet. Wherever EI and storm-wave height result in different energy categories, the site shall be placed in the category as determined by EI.

### SHORELINE VARIABLES

<table>
<thead>
<tr>
<th>AVERAGE FETCH ^\textsuperscript{1}</th>
<th>(0) 0/10</th>
<th>(2) 1/10 – 1/3</th>
<th>(4) 1/3-1</th>
<th>(7) 1-3</th>
<th>(10) 3-10</th>
<th>(13) 10-30</th>
<th>(16) &gt;30</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPTH AT 20 FEET ^\textsuperscript{2}</td>
<td>(1) &lt;1</td>
<td>(2) 1-3</td>
<td>(3) 3-6</td>
<td>(4) 6-12</td>
<td>(5) &gt;12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEPTH AT 100 FEET ^\textsuperscript{3}</td>
<td>(1) &lt;1</td>
<td>(2) 1-3</td>
<td>(3) 3-6</td>
<td>(4) 6-12</td>
<td>(5) &gt;12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BANK HEIGHT ^\textsuperscript{4}</td>
<td>(1) &lt;1</td>
<td>(2) 1-5</td>
<td>(3) 5-10</td>
<td>(4) 10-20</td>
<td>(5) &gt;20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BANK COMPOSITION</td>
<td>(0) rock, marl, tight clay, well cemented sand (dig with a pick)</td>
<td>(7) soft clay, clayey sand, moderately cemented (easily dug with a knife)</td>
<td>(15) uncemented sands or peat (easily dug with your hand)</td>
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<tr>
<td>INFLUENCE OF ADJACENT STRUCTURES</td>
<td>(0) no hard armoring on either adjacent property</td>
<td>(1) hard armoring on one adjacent property</td>
<td>(2) hard armoring on both adjacent properties</td>
<td>(3) hard armoring on one adjacent property with measurable recession</td>
<td>(4) hard armoring on both adjacent properties with measurable recession adjacent to both structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AQUATIC VEGETATION ^\textsuperscript{5}</td>
<td>(0) rocky substrates unable to support vegetation</td>
<td>(1) dense or abundant emergent, floating or submerged vegetation</td>
<td>(4) scattered or patchy emergent, floating or submerged vegetation</td>
<td>(7) lack of emergent, floating or submerged vegetation</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BANK VEGETATION</td>
<td>(0) bank compose of rocky outcropping unable to support vegetation</td>
<td>(1) dense vegetation, upland trees, shrubs and grasses, including lawns</td>
<td>(4) clumps of vegetation alternating with areas lacking vegetation</td>
<td>(7) lack of vegetation (cleared), crop or agricultural land</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BANK STABILITY ^\textsuperscript{6}</td>
<td>(0) established lawn with few canopy trees</td>
<td>(1) established lawn with moderate to dense canopy trees</td>
<td>(4) moderate to dense natural ground vegetation and canopy trees with shrub layer substantially reduced; or few canopy trees with moderate to dense natural shrub layer.</td>
<td>(7) moderate to dense canopy trees with moderate to dense natural shrub layer; or other natural features prevents establishment of vegetation.</td>
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</tr>
<tr>
<td>SHORELINE GEOMETRY</td>
<td>(0) &lt; 1/3 mile fetch</td>
<td>(1) north to east-southeast (349°-360°, 1°-168°)</td>
<td>(4) south to west-southwest (169°-258°)</td>
<td>(8) headland, point, or island</td>
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<tr>
<td>SHORE ORIENTATION ^\textsuperscript{7}</td>
<td>(0) coves or bays</td>
<td>(3) irregular shoreline or straight shoreline</td>
<td>(7) moderate to dense canopy trees with moderate to dense natural shrub layer; or other natural features prevents establishment of vegetation.</td>
<td></td>
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<tr>
<td>BOAT WAKES ^\textsuperscript{8}</td>
<td>(1) no channels within 100 yards, broad open water body, or constricted shallow water body; or channels within no-wake zones</td>
<td>(6) thoroughfare within 100 yards carrying limited traffic, or thoroughfare 100 yards to 1/4 mile offshore carrying intensive traffic</td>
<td>(12) thoroughfare within 100 yards carrying intensive traffic (unregulated boating activity)</td>
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</tbody>
</table>

### EROSION INTENSITY SCORE (EI)

## Additional Notes

1. AVERAGE FETCH: Measure the average distance (miles) of the open water to the opposite shore at the point of interest.
2. DEPTH AT 20 FEET: Measure the depth at 20 feet below the low water level.
3. DEPTH AT 100 FEET: Measure the depth at 100 feet below the low water level.
4. BANK HEIGHT: Measure the height of the bank at the top of the bank.
5. AQUATIC VEGETATION: Type and abundance of vegetation occurring in the water off the shoreline.
6. BANK VEGETATION: Type and abundance of vegetation occurring on the bank face and immediately on top of the bank.
7. BANK STABILITY: Degree to which erosion and adjacent area (up to 10 feet of the bank face) is stabilized by natural ground, shrub, and canopy vegetation (outside a 10 ft access control).
8. SHORELINE ORIENTATION: Geographic direction the shoreline faces.
9. BOAT WAKES: Proximity to and use of boat channels.
Whenever the EI and the Storm/Wave Height result in different energy categories, the site shall be placed in the category as determined by the EI.

The EROSION INTENSITY WORKSHEET score “Trumps” the Storm/Wave Height calculation.
Streambank Erosion Control

Available General Permits

- Biostabilization
- Integrated Bank Treatment
- Replacement of Structure w/ Biological
- Replacement of Structure w/ Integrated Bank Treatment
- Repair of Riprap placed prior to Aug. 2007

http://dnr.wi.gov/permits/water/
Biostabilization

A structure that relies solely on biological materials

Includes native vegetation, fiber rolls & mats, live stakes, brush mattresses, branch packing, encapsulated soil lifts etc. . .
Integrated Bank Treatment

A structure that combines 2 separate treatments: structural treatment w/ inert materials for toe protection at the base of the bank, and biostabilization on the upper portion of the bank.
NEW Biostabilization or Integrated Bank Treatment

Must be located in the Driftless Area or Southeastern Till Plains, or be located in an urban watershed or within village or city limits.

- Must have BEPI of =>20

Instructions on how to determine the site location category

Surface Water Data Viewer
Bank Erosion Potential Index (BEPI)

Uses site specific characteristics to calculate and assess erosion at the site (counterpart to the Lakeshore EI Worksheet)
Replacement of a Seawall or Riprap with Integrated Bank Treatment or Biostabilization

Highlights of Standard

- Can only be replaced w/ biostabilization or Integrated bank treatment
- No location restrictions
- Cannot exceed the length of the existing structure or 300 linear feet (whichever is less)
- Must show that seawall or riprap was placed prior to August 1, 2007
Repair of existing Riprap

**Highlights of Standard**

- Repair of unpermitted riprap placed prior to August 2007
- Only within city/village limits
- Cannot exceed the length of the existing structure or 300 linear feet (whichever is less)
- Toe protection cannot exceed 1 or 2 feet above OHWM based on eco-region
- Redistribution or placement of stone limited to the horizontal footprint if the existing structure