TECHNIQUES FOR CONTROLLING SHORELAND EROSION PART 2

PLANNING, DESIGNING, AND CONSTRUCTING A SHORELAND RESTORATION

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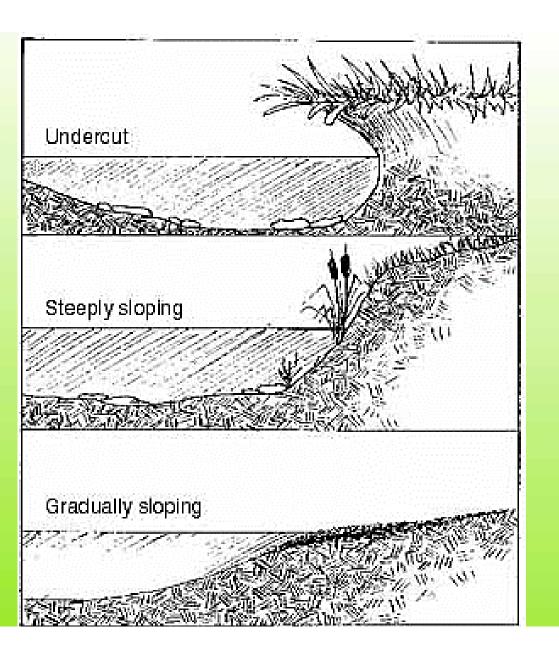
- Planning: What problems do you need to address? What are the causes of erosion?
- Design Tools & Techniques: Calculations, Spreadsheets, Standard Drawings, Specifications, and Materials
- Construction and Installation



Causes of Erosion - Passive

Passive = physical features

- Bank or Shoreline Characteristics
 - soil types & properties
 - ► geology
 - ► geometry
 - natural vegetative cover
- Currents
- ► Wind (fetch)
- Wave action



Shoreline and lakebed shape, soils, and vegetation

Causes of Erosion - Passive

Passive = physical features

- Groundwater (seeps)
- Frost/thaw
- ► Ice heave
- Adjacent Features/Character
 - watershed patterns
 - Iong shore currents
 - tributary areas / flowing water



Slump in Bank due to over-saturation - Passive

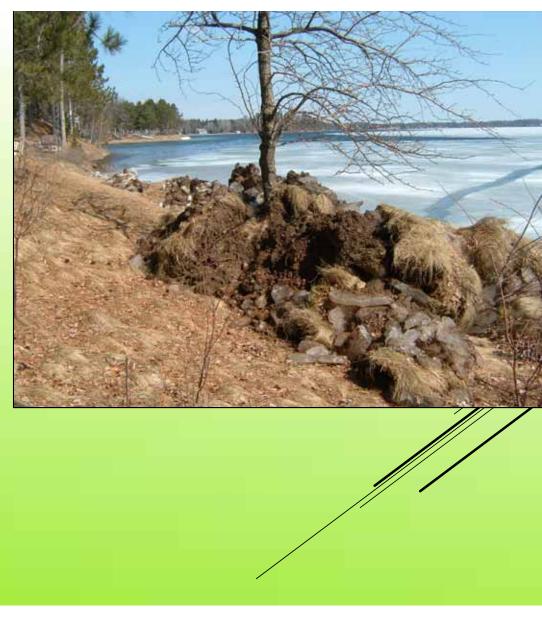


Seepage



lce Heave Action







Natural Wave Action

Causes of Erosion – Active

Active – due to human factors

- Waves caused by boat wakes
- Exposed soil/Loss of Vegetation
 - Lawns, landscaping, logging
 - Equipment storage
 - Animal damage (trampling or over-grazing)
- Impervious surfaces
- Inappropriate engineering
- Ineffective Drainage
- Water level fluctuations
 - Seasonal
 - Damming of flowages creating new banks
- Land use/development beyond the immediate shoreline
 - Road placement

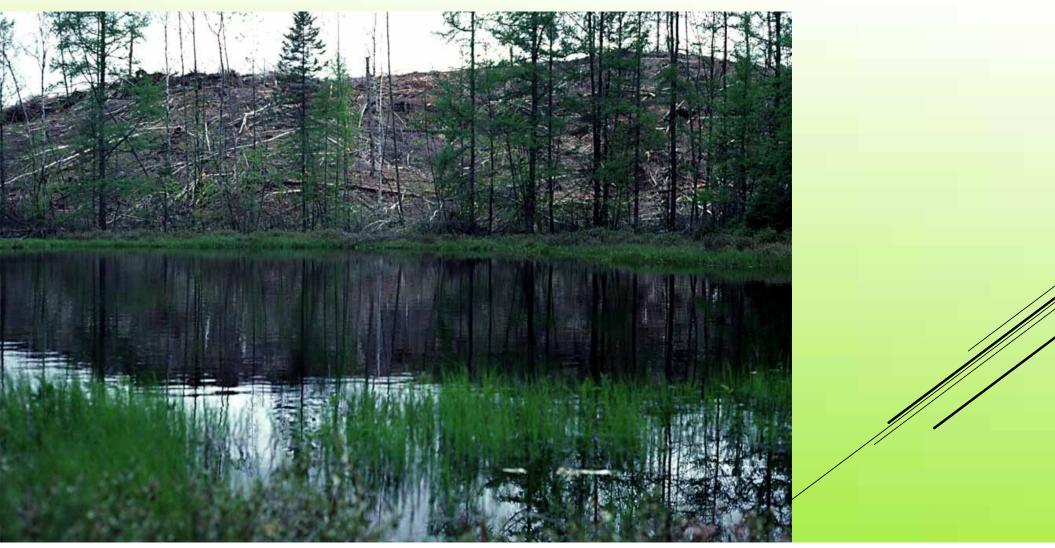
Wake Created Wave Action





Removal of Vegetation

Removal of Vegetation



Ineffective Drainage & Loss of Vegetation





Loss of Vegetation due to Equipment Storage Impervious Surface, Ineffective Drainage, and Exposed Soils







Removal of Vegetation, Ineffective Drainage and Erosion Control Methods



Upland Runoff Issues and Channelized Flow Water Level Fluctuations, Seawall Overtopping, and Splash Impacts



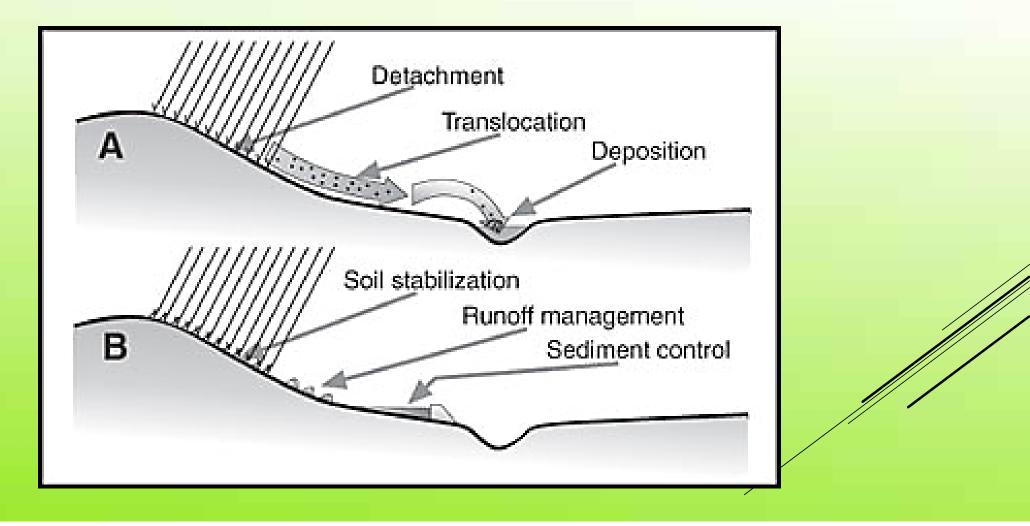


New Shoreline

Unstable Soils on a steep bank



Slow - Stop - Soak



The Objective of Erosion Control

Slow the water down

Stop the soil movement

Soak the water in

Erosion Control Planning– Site Evaluation

Define the cause(s) of erosion:

- Upland runoff? Impervious areas? Velocities?
- Wave energies? Boat or wind generated?
- Ice action? Prevailing wind direction?
- Water level fluctuations? Floods or Droughts?
- Groundwater seeps?
- Slope gradient (steepness) and bank height?
- Stability of native soils? Fill soils?

Planning Concepts – Incorporating Landowner Preferences

- Existing Structures to be Removed or Remain?
- Walking Paths or Travel Areas?
- Equipment Storage and/or Fire Pit Areas?
- Existing and Proposed Vegetation?
- Current Level of Maintenance/Mowing?
- Access to Lake and Docks/Piers?
- Well and Septic Area Locations?

Planning Concepts – Site Evaluation

Other Considerations:

- Soil type conducive to slope stability at given angle without toe protection?
- Parcel development is limiting a stable slope (i.e. home too close to slope break or existing vertical walls, driveway placement and angle of slope)
- Impervious surfaces (i.e. roofs, patios, garage roofs, driveways)
- Managed runoff (i.e. rain gutters, runoff directed away from the lake or infiltrated)

Planning Concepts – Site Evaluation

Other Considerations:

- Lake channel (narrow areas) or controlled wake areas create constant waves so vegetation can not establish
- Extreme ice action continuously removes or stresses soil/plants
- Erosion intensities are too high for existing vegetation

Technical Planning Assistance:

County Land & Water Conservation Departments

USDA Natural Resource Conservation Service

Wisconsin Department of Natural Resources

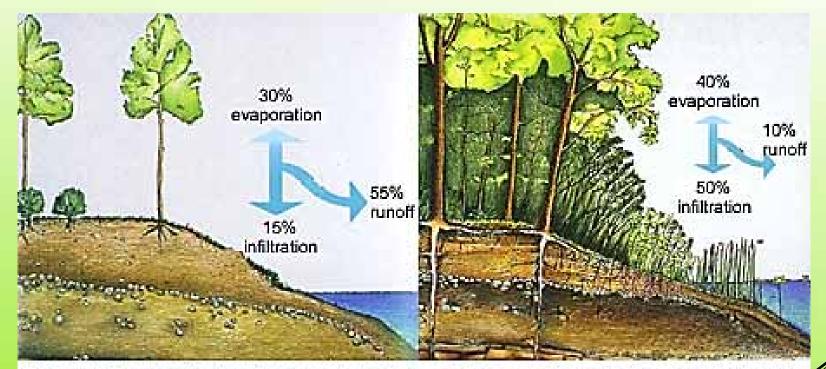
WI Dept. of Agriculture, Trade, & Consumer Protection

Private Consultants & Businesses

Design - Vegetative Treatment Only:

- Minimal fetch distance (<0.5 1 mile)</p>
- Protected cove or bay (not point or island)
- Shoreline does not face prevailing winds (i.e. faces east and rarely gets a westerly wind)
- When boat traffic waves are not common or constant (i.e. no motorized traffic allowed, no public landing, SLOW NO WAKE zone = decrease in the wave intensity)
- When water level fluctuations do not harm vegetation survival rates and/or success (dam management)

VEGETATIVE TREATMENT



Water quickly runs off a shoreline cleared of natural vegetation, washing nutrients and pesticides into the water. A natural shoreline holds rainfall, which soaks into the soil; less water, soil and chemicals run into the lake or river. Shoreline and equatic plants anchor shoreline areas, helping to protect them from erosion due to runoff and waves.

Design – Rock Riprap, Geobags, and Sediment Logs

Issues are:

- Water level fluctuation
- Unstable Soils on a Steep Bank
- ► Wake Induced Wave Action
- Removal of Vegetation
- ► Not the Original bank











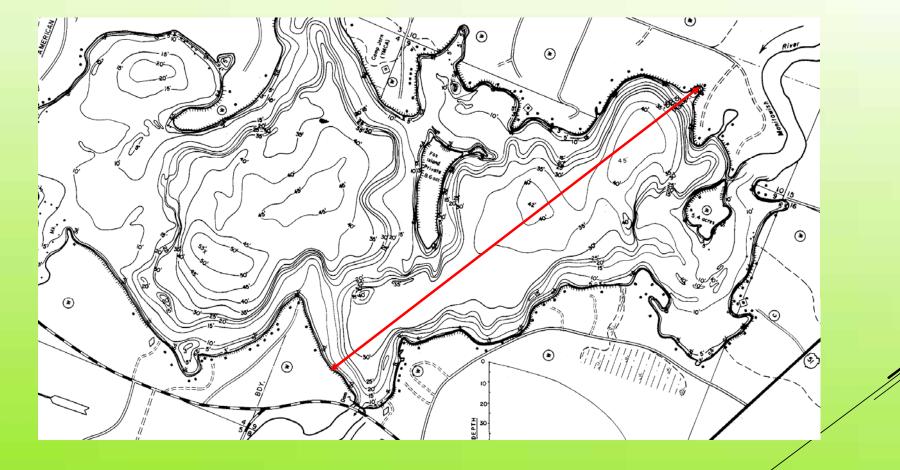
SOILS

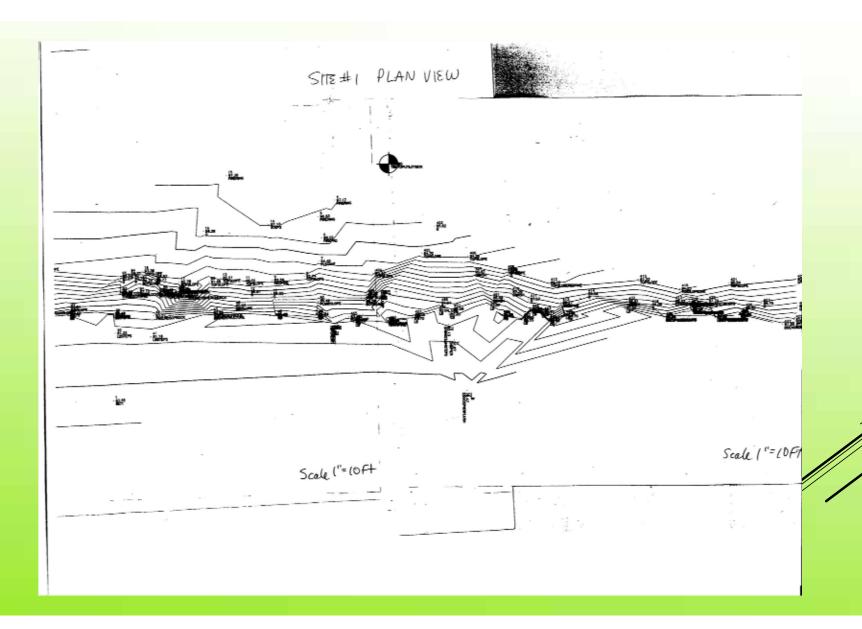


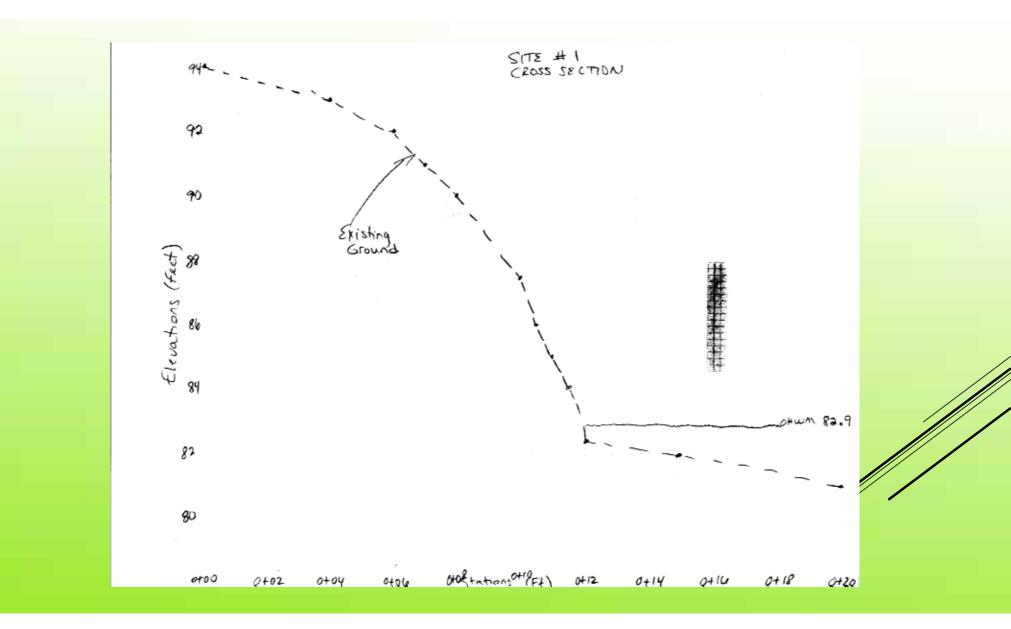
- ► Fetch
- Erosion intensity *
- Federal Permits*
- DNR permits*
- County permits
- Local permits

PLANNING FOR PERMITTING

Fetch distance = 1.12m, Average Depth = 22.5ft





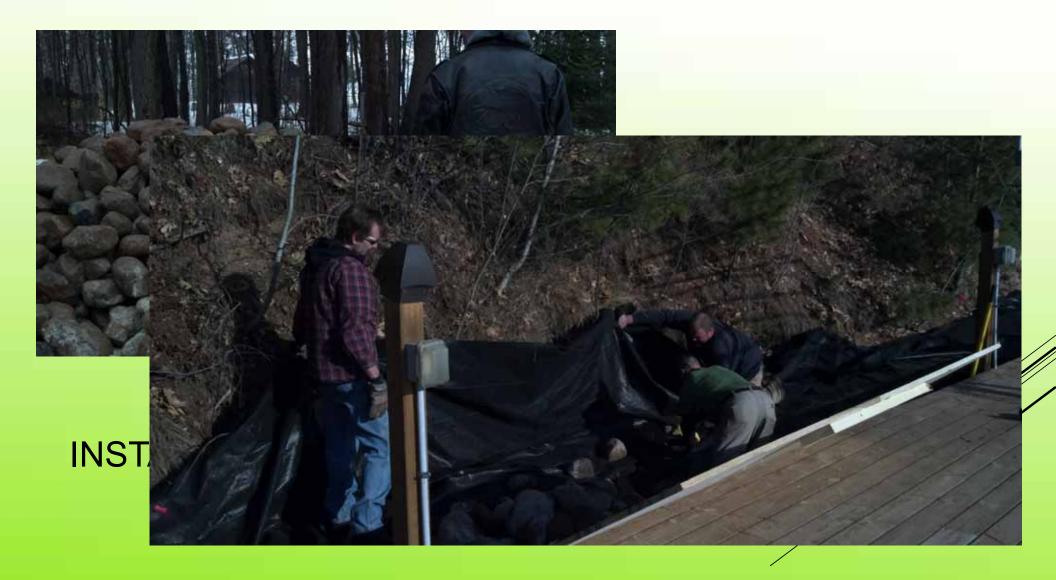


SPREADSHEET:

HTTPS://WWW.NRCS.USDA.GOV/WPS/PORTAL/NRCS/DETAIL/WI/TECHNICAL/ENGINEERING/?

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Lakeshore Riprap Design Computations (2017-03) (Compatibility Mode) - Excel	7 00 - 0 ×
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S COMMENTS	
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11 3 Revelment Skope Ratio (z) = (i.e. 2.1)	
12 4 Ordinary High Water Elex. =	
13 5 Normal Yearly Low Water Elev # See sketch 14 6 Average Top of Bark Elev # on "desc" tab.	
14 6 Average Top of Bank Elex = on "desc" tab. 15 7 Proposed Toe Lake Bottom Elex = Image: Top of Bank Elex =	
16 8. Length of Shoreline= ft	
17 9 Observed Boat Wave Height(B ₄)= (if applicable) t	
16 10 12 Weighted Average = 0.0 feet	
20 Numerical Average = #DIV/01	
21 Wave Height Design	
22 Storm Wind Speed (U ₄) = 35 mph = 51.45 ft/sec 23 Wave Period (T) = 0.559(U ₄ F) ^{1/2} (U ₄ mph, Fmile) = 0.00 sec	
24 Wave Length (L) = 5.127 ² = 0.00 ft	
$25 \qquad \text{Non-dimensional fetch } (y) = gF/(U_y)^2 2 = 0.00$	1/
26 Non-dimensional water depth (δ) = gd(U, y'2 = 0.0000 27 A1 = 0.4938 ⁸⁷⁸ = 0.0000	
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INSTALLATION OF GEOBAGS, SEDIN LOGS AND PLANTS





INSTALLATION OF GEOBAGS, SEDIMENT LOGS AND PLANTS



