Vanishing shorelines and riprap

Welcome to the DNR-LGU Forum!

DNR-LGU Forum Goals:

- Strengthen our relationship
- Share challenges and ideas
- Safe space to learn from each other
- Seek solutions together
- Improve SL & FP administration and resource protection

Agenda

- Vanishing Shorelines – Dan Petrik, DNR Shoreland Program Manager
- Assessment of shoreline erosion situations – Jake Frie, DNR Area Hydrologist
- Overview of shoreland riprap regulations – Dan Petrik & Ceil Strauss, DNR Floodplain Program Manager
- Overview of public water riprap regulations – Tom Hovey, DNR Water Regulations Supervisor
- Next steps for DNR

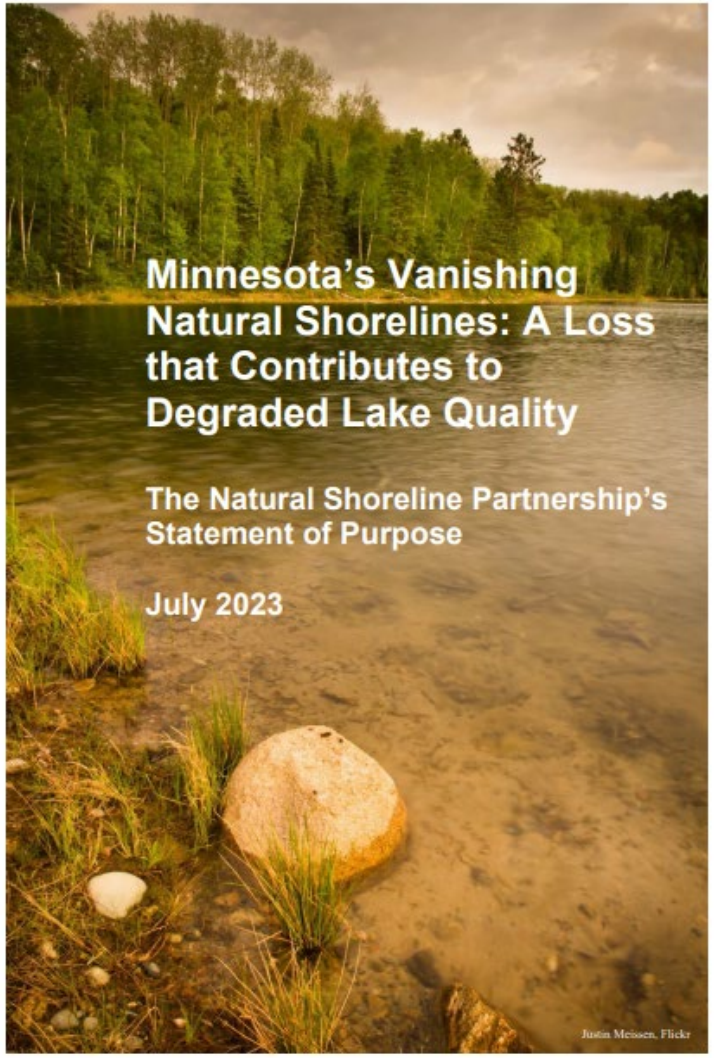
Objectives for today

- Understand the loss of natural shorelines – role of riprap
- Summarize the LGU shoreland and DNR public water regulations for riprap
- Feedback from you – to help us with our DNR riprap project
  - How important is this problem?
  - Assessment of erosion situations in need of riprap
  - Understanding shoreland and floodplain permit standards related to riprap

What organization do you work for?

Vanishing Shorelines

Public Concern / Media Attention



Trouble by the water: Minnesota's vanishing natural lakeshores

August 14, 2024 4:00 AM

Unchecked development, lax regulation push Minnesota lakeshores to the edge

Development has destroyed nearly half the natural shorelines that help protect Minnesota lakes from erosion and pollution. Reversing that means convincing people that their vision of beauty is killing the thing they love.

by Kirsti Marohn

Listen [6:55] Save

August 15, 2024 4:00 AM

'Quit mowing': Turning Minnesota lake homeowners into shoreline stewards, one lawn at a time

A program born in the Brainerd Lakes Area to protect natural shorelines and curb pollution also wants to reset Minnesota's lake culture. It's led by property owners, including some who helped create the current...

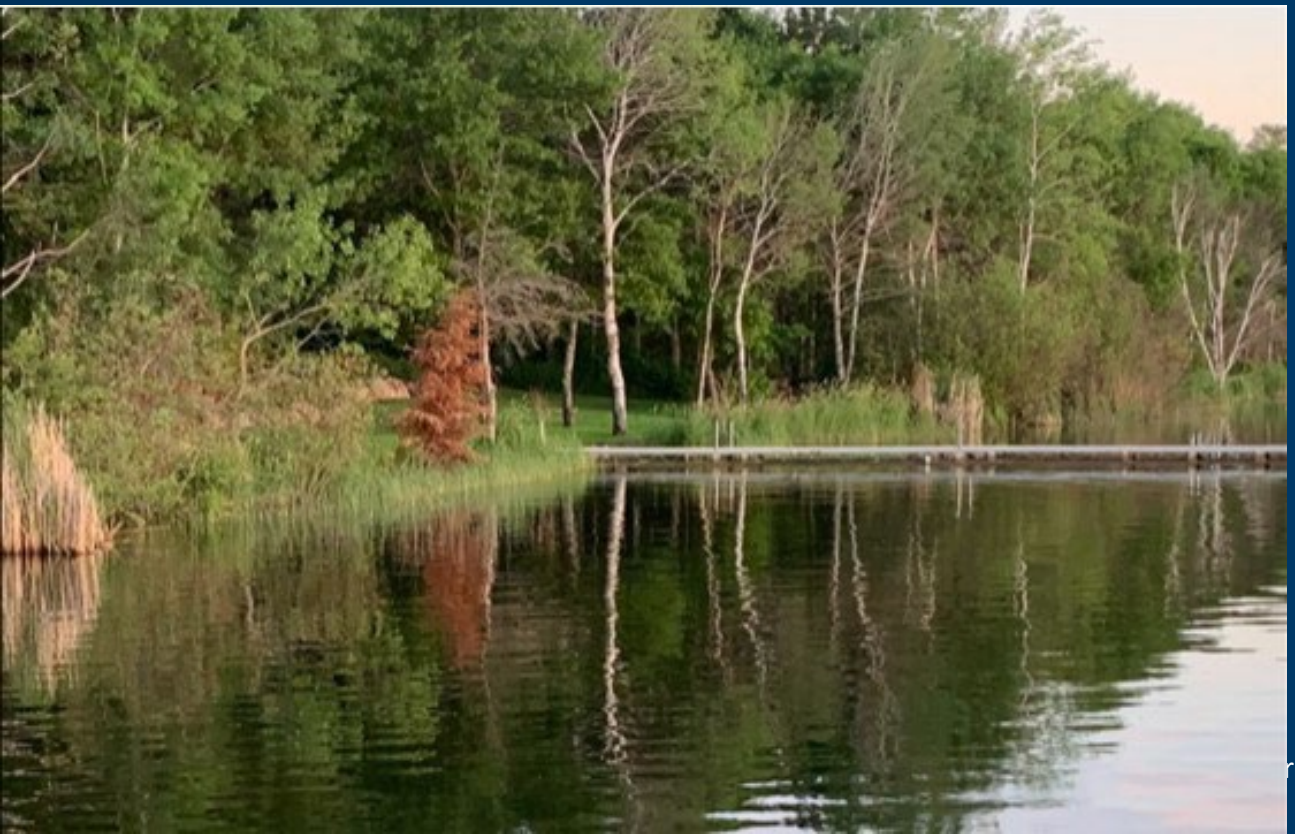
by Kirsti Marohn

Listen [3:58] Save

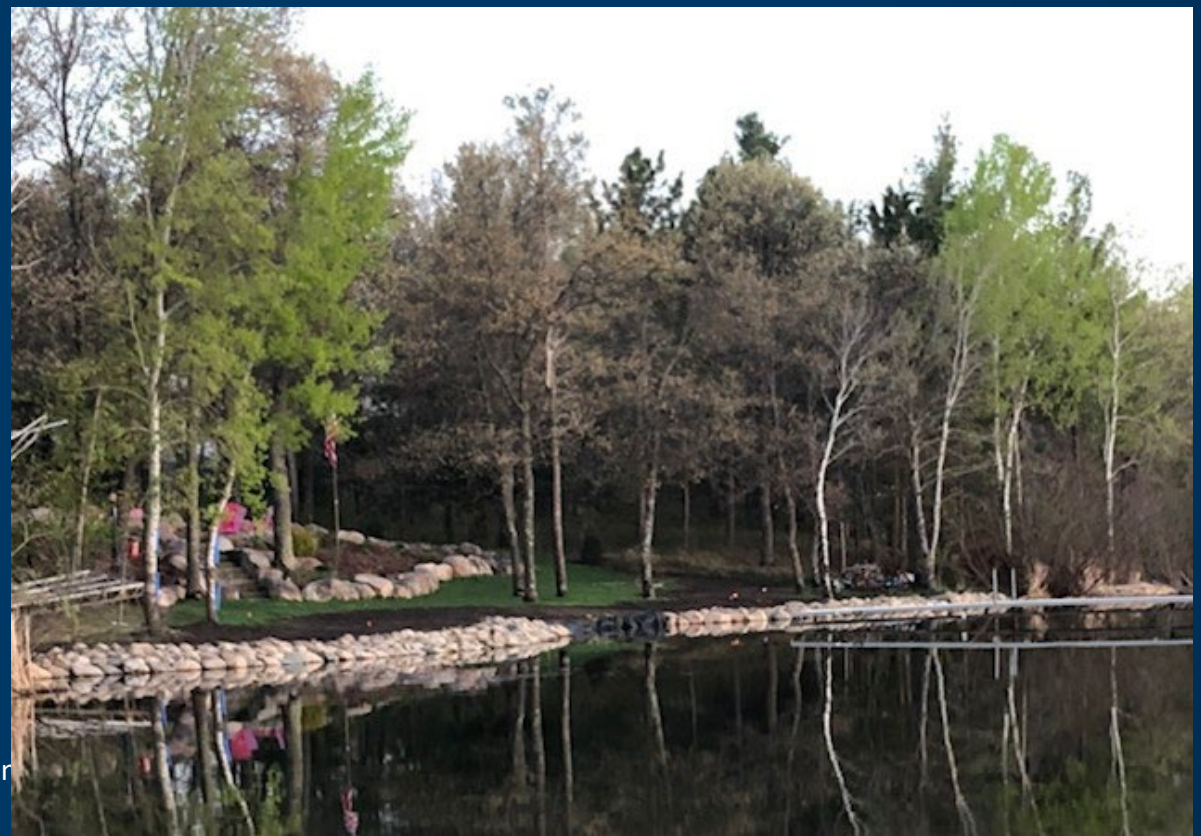
Vanishing Natural Shorelines

- 40% - 50% of natural shorelines have been lost
- Losing 1 – 2% per decade

Before



After



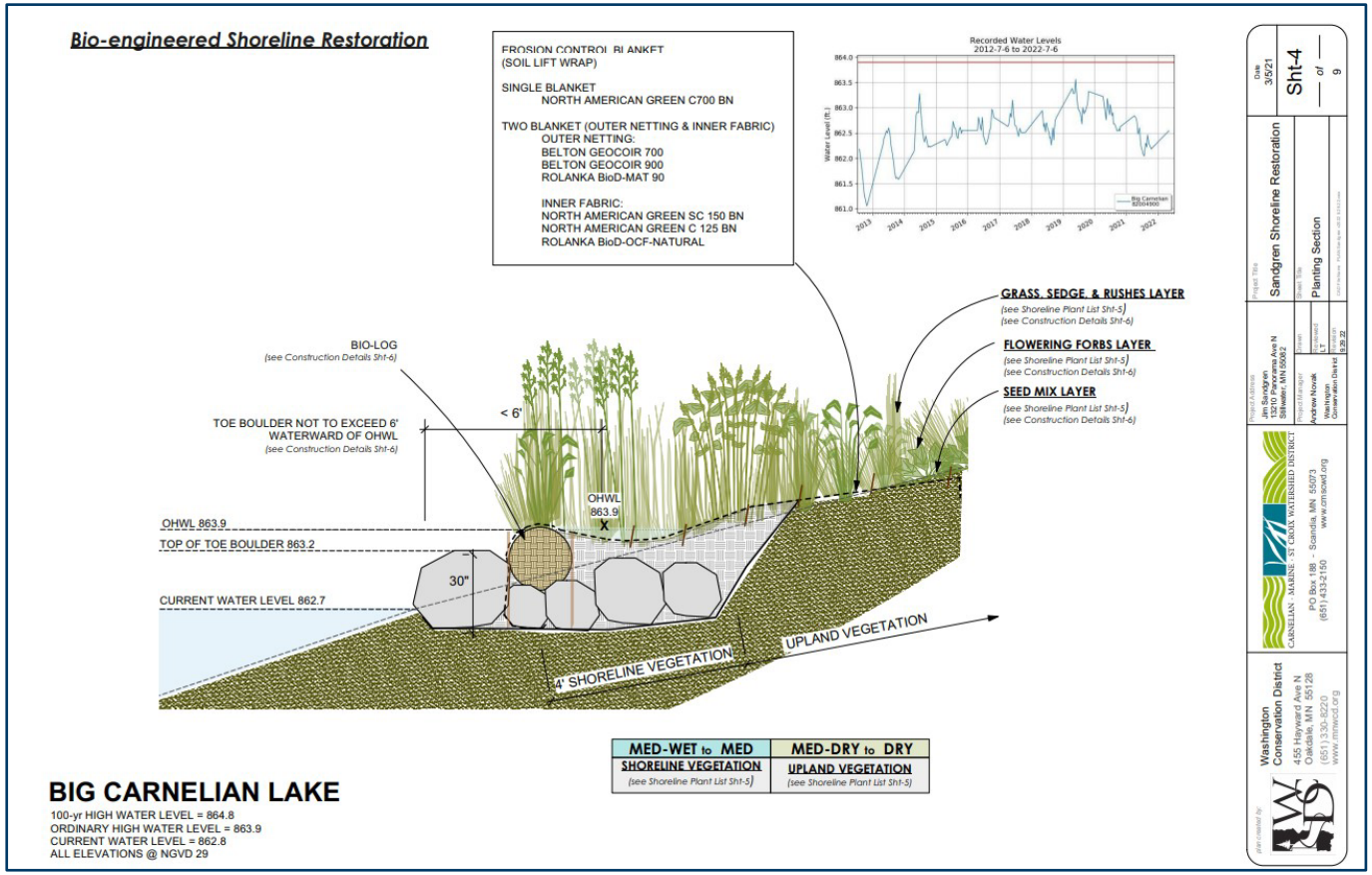
Why?

Unnecessary Riprap

Unnecessary Riprap

- 31% of counties say that riprap is <u>often or very often</u> installed when there ISN'T significant erosion.
- Aesthetics – most common reason
  - Tidy, neat, uniform, views to lake
  - Easier to maintain vs. vegetation

- Contributing Factors
  - Not aware of alternative solutions (63)
  - Natural shorelines not valued (58)
  - Capacity to administer/enforce (36)
  - Insufficient DNR requirements (31)
  - Insufficient local requirements (21)



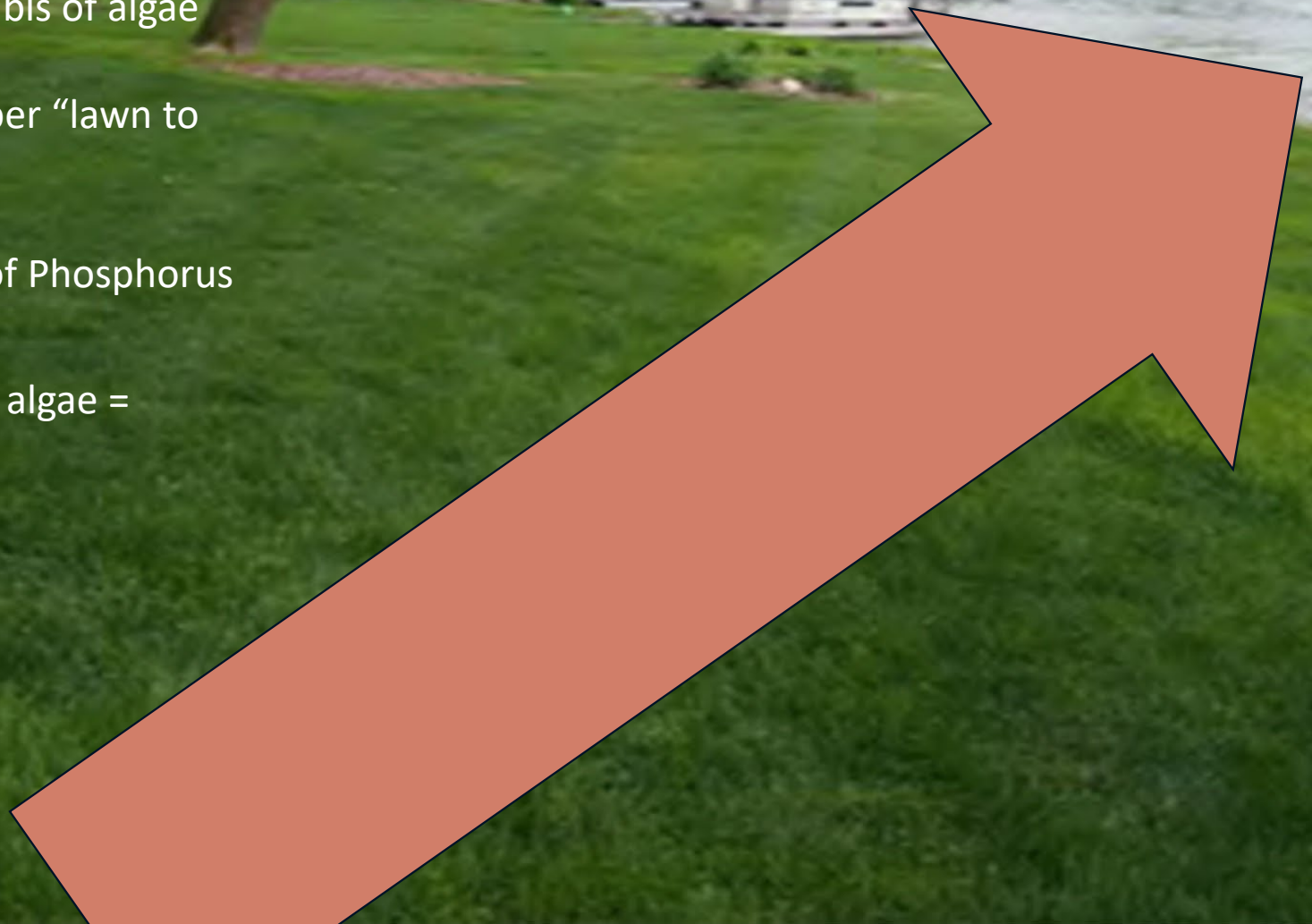
Reduced Water Quality

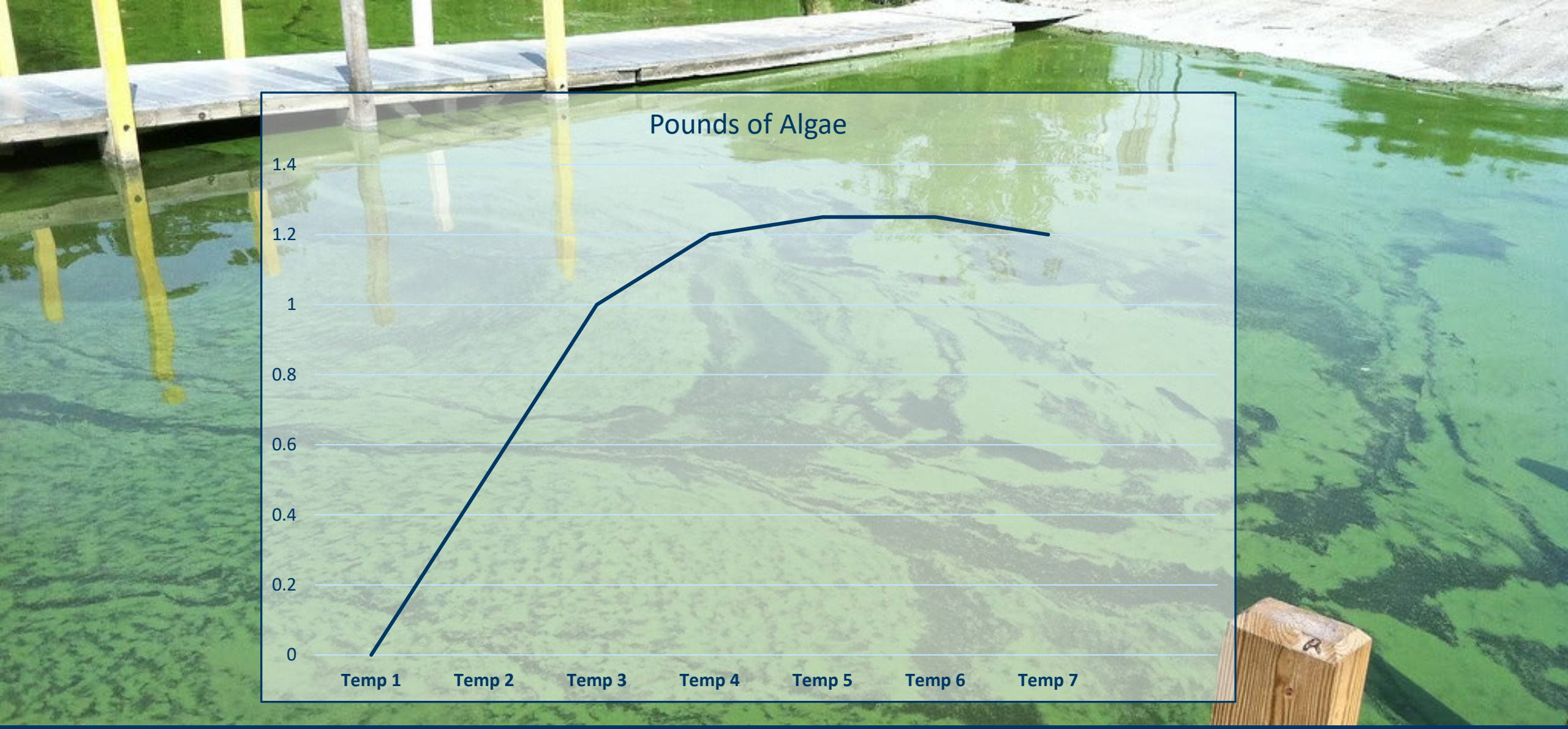
1 lb of Phosphorus produces 500 bls of algae

0.2 lbs of Phosphorus produced per “lawn to lake” lot per summer

0.2 lbs TP/lot X 100 lots = 20 lbs of Phosphorus

20 lbs of Phosphorus X 500 lbs of algae = 10,000 lbs of algae





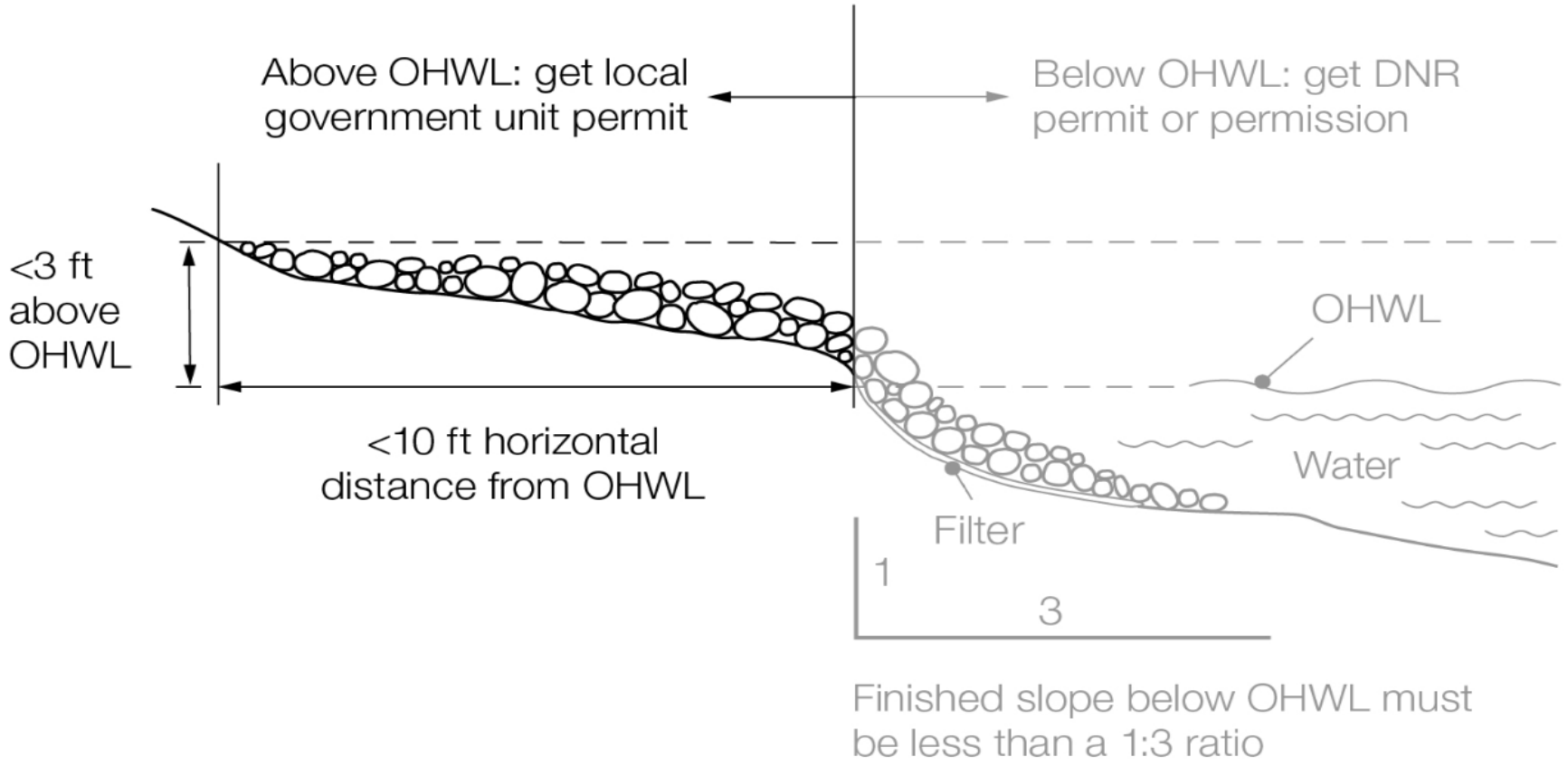
Algae Growth

Erosion

Loss of Habitat

- Loss of nesting habitat is a substantial threat to loons
- Loons prefer vegetated, marshy habitat with good protective cover

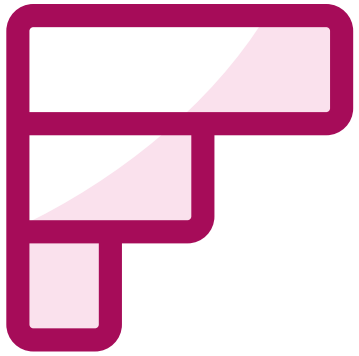
Riprap Guidelines



Shoreland & Floodplain Regulations: Riprap

How has the amount of natural shorelines changed in your LGU over the past 5 years?

We've discussed these benefits of natural shorelines. Which ONE would resonate most with your shoreline property owners?



Why are we losing natural shorelines in your community?

What is a significant erosion problem?

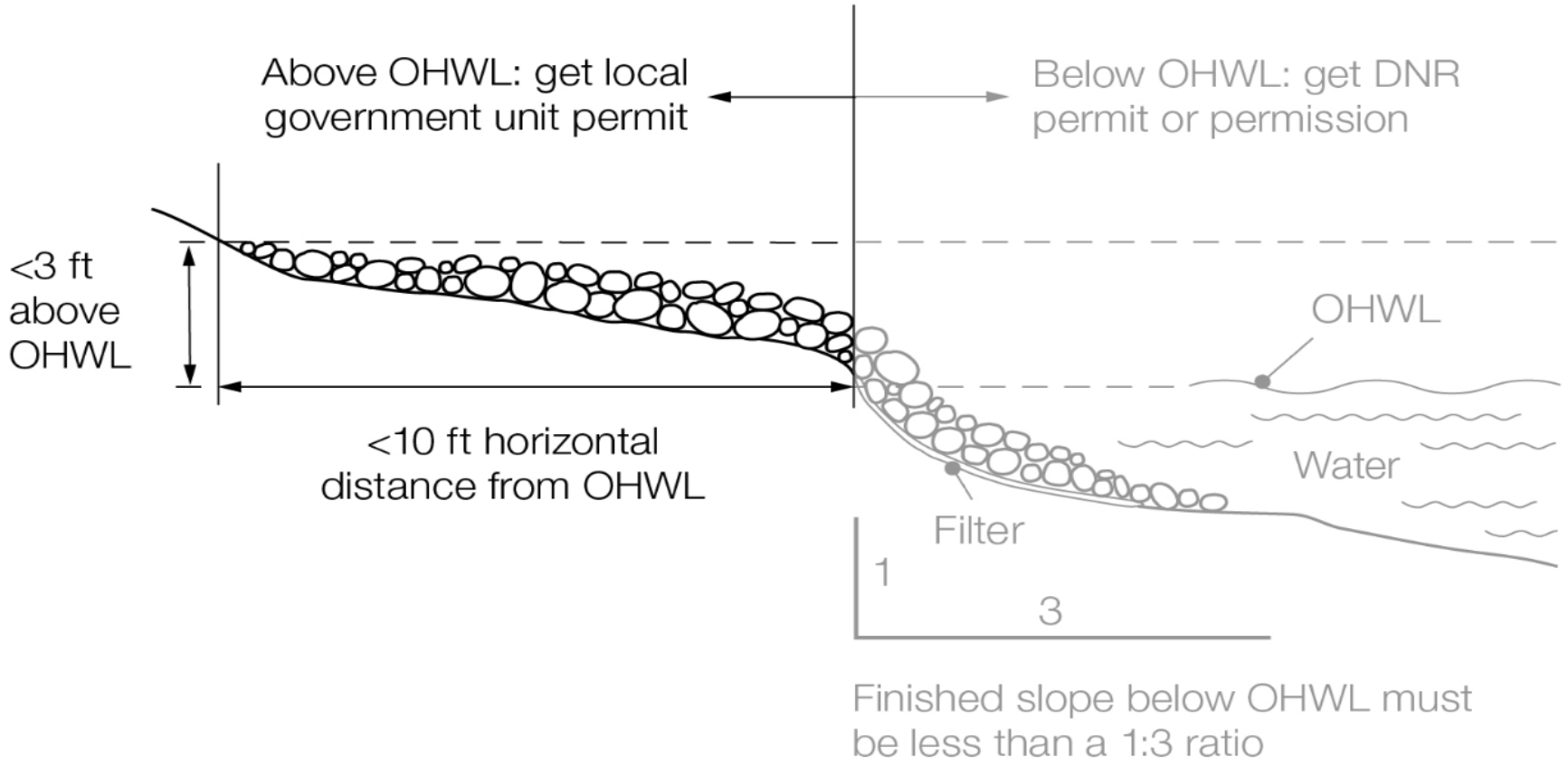
Does this situation show "demonstrated need" for rip rap?

“Does this situation show “demonstrated need” for rip rap?”

“Does this situation show “demonstrated need” for rip rap?”

Does this situation show “demonstrated need” for rip rap?”

Riprap Guidelines



Shoreland & Floodplain Regulations: Riprap

What is level of understanding of the land alteration permit requirements?

For riprap projects without a DNR permit, does your LGU require a permit?

What do you consider as "movement of material" in the shore impact zone as meeting the 10 CY threshold?

What AREA do you include for determining if the 10 CY threshold is met?

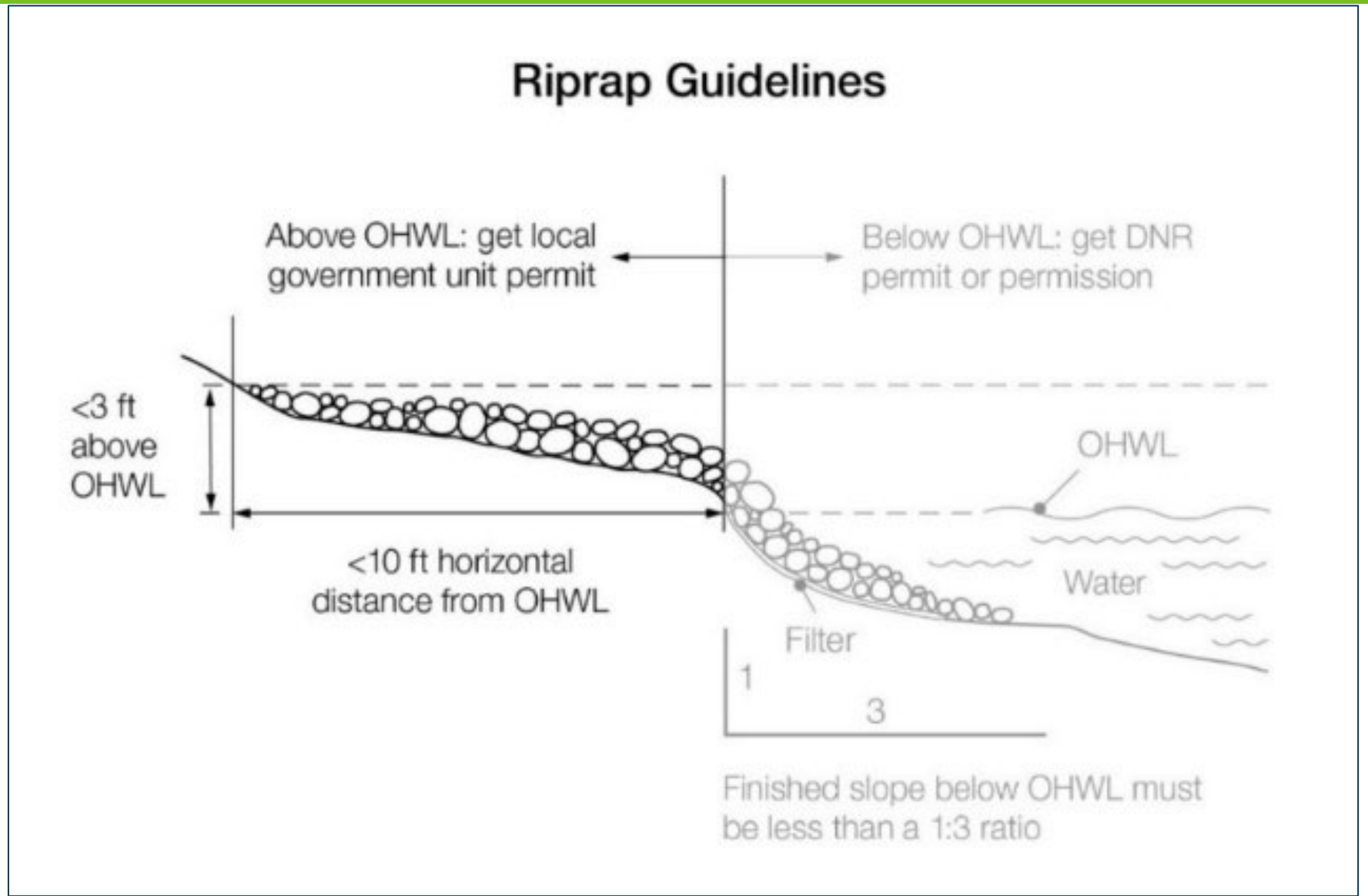
If you require a permit for riprap, do you require any of these BMPs to minimize impact on fish & wildlife?

If you require a permit for riprap, do you verify if the DNR has authorized work below the OHWL before you approve the permit?

LGU Land Alteration Permit Required for

- Movement of more than 10 cubic yards of material in the shore impact zone
- This includes riprap and associated grading, and placement of filter material.

Dimensional Standards



Permit Requirements

- Prior DNR approval/authorization for project work below the OHWL
- BMPs to minimize impact to fish and wildlife
  - Using sediment traps, buffer strips or other methods to limit sediment movement
  - Limiting amount/time of bare ground exposure
  - Use of temporary ground covers
  - Establishing permanent vegetative cover ASAP
  - No unstable slopes from placement of fill and excavated material

Floodplain Permits

Rip-rap is considered <u>development</u> per the floodplain ordinance.

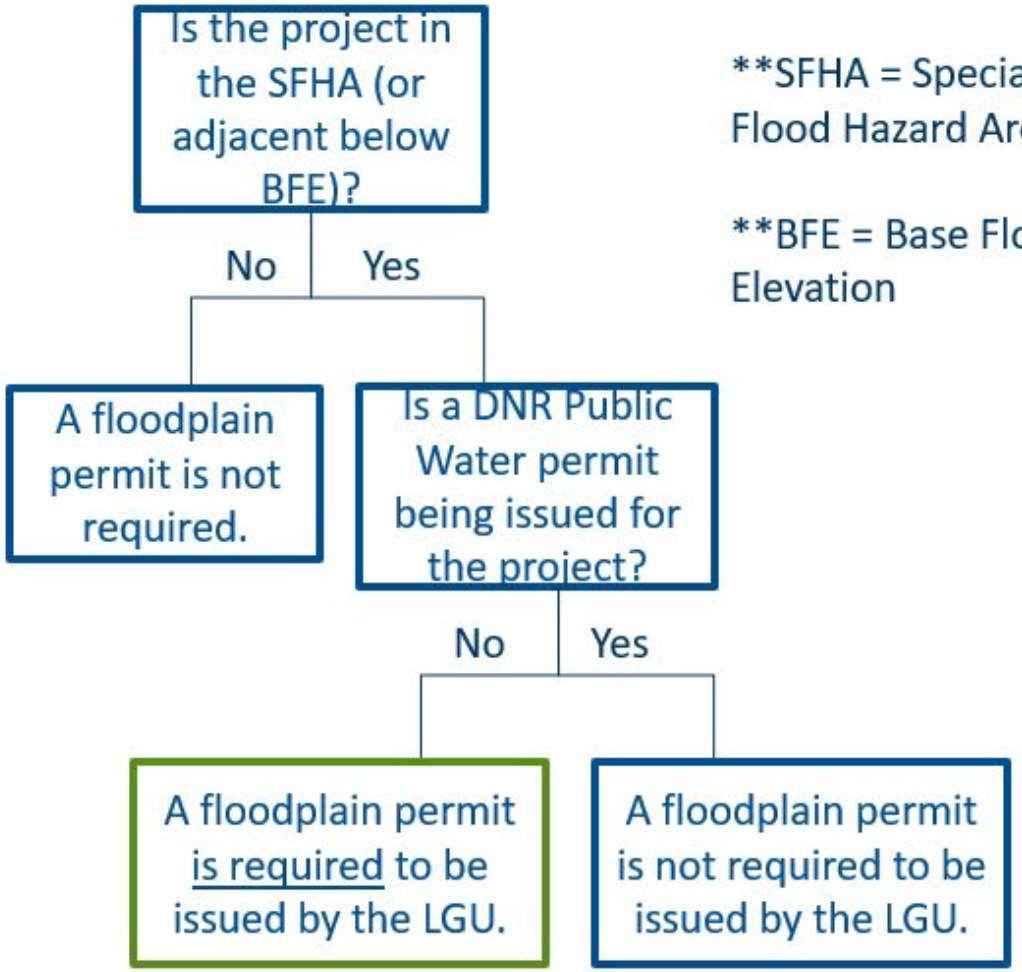
"Development. Any man-made change to improved or unimproved real estate, including, but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, or storage of equipment or materials."

Permit considerations for floodway development:

- If in AE zone – development within mapped floodway, must submit "No Rise" certification.
- If in A Zone – Watercourses & basins in areas of flowage must submit "Allowable Rise" documentation.

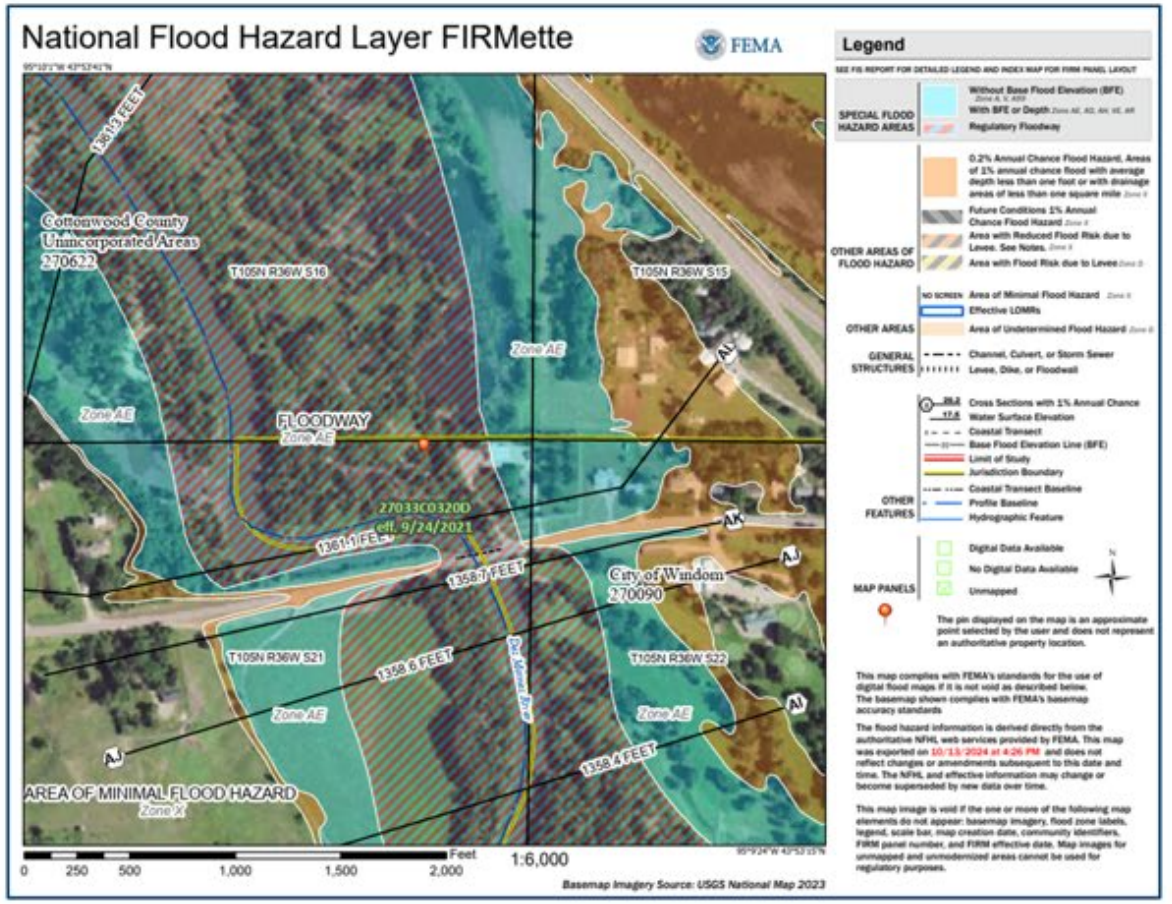
Other typical projects with overlap: "temporary" bridges & low-water ford crossings & permanent docks

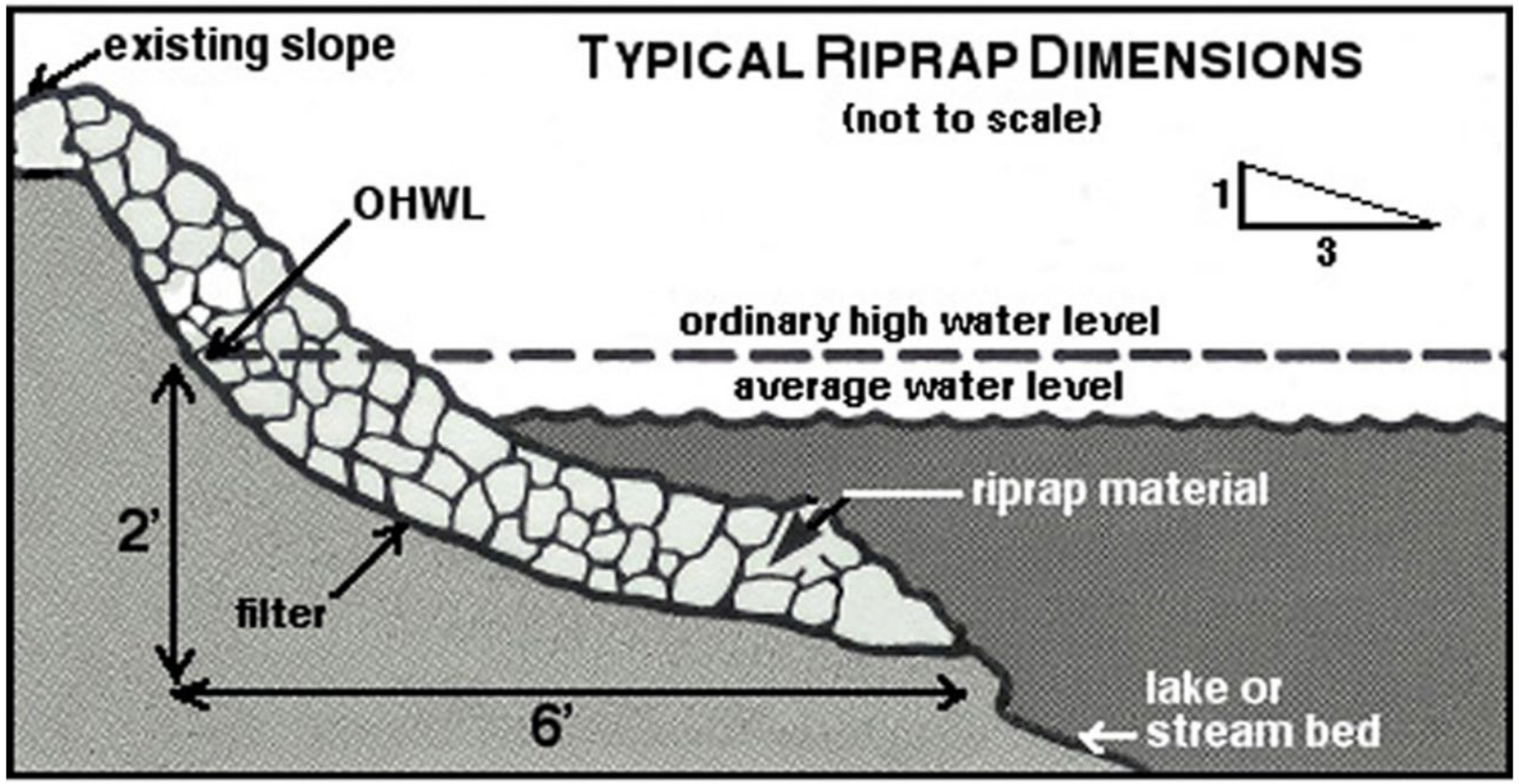
When should LGU's issue floodplain permits for rip-rap?



**SFHA = Special Flood Hazard Area.

**BFE = Base Flood Elevation





DNR Public Water Regulations: Riprap

The Actual Rule…

- MN Rules, 6115.0215, Subp. 4. **No permit required.** No permit is required for the following activities, unless prohibited elsewhere in parts 6115.0150 to 6115.0280:
- A. Bioengineering; B. Ice Ridges; C. Water Level Control Structures in water courses w/ less than 300 acre watersheds; D. Excavate or Fill for planting or collecting if in APM permit; and…
- E. to install natural rock riprap and associated filter materials where there is a demonstrated need to prevent erosion or to restore eroded shoreline, when there is a demonstrated need for such work, except along the shores of Lake Superior and officially designated trout streams, if:
- (1) the rock is sized appropriately with the erosion potential of the wave or current action of the particular water body, but in no case shall the rock average less than six inches in diameter or more than 30 inches in diameter;
- (2) the rock is placed so that it conforms to the natural alignment of the shoreline zone;

Examples

- Notice the “bump out”
- Does not conform to the natural alignment of shoreline
- Likely also fill was placed in violation of rules to create bump out

Examples

Not natural rock

- Not allowed without permit

Not Sized correctly

- Too small

The Actual Rule continued…

- (3) the finished slope, as measured on top of the rocks, is not steeper than three to one (horizontal to vertical);
- (4) no materials are placed more than six feet waterward of the ordinary high water level, unless the commissioner determines that this dimension may be measured from another point due to the particular nature of water levels of the public water;
- (5) the total length of shoreline to be affected does not exceed 200 feet for public waterbasins or public water wetlands or five times the width of the public watercourse measured at bank full conditions;

Examples

Riprap

(Minn. Rule 6115.0170, Subpart 35):

Coarse stones, boulders, cobbles, artificially broken rock or concrete, or brick materials ***laid loosely*** or within gabion baskets against the slope of the existing bank of a public water.

Restoration

(Minn. Rule 6115.0215, Subpart 2):

The repair, construction, or re-creation of ***essentially natural or native conditions*** of a public water and its shoreline or banks.

(emphasis added)

The Actual Rule continued again…

- (6) the riprap does not cover emergent vegetation, unless authorized by an aquatic plant management permit;
- (7) the riprap does not obstruct navigation or the flow of water;
- (8) a filter, consisting of crushed rock, gravel, or suitable filter fabric material is placed underneath the rock; and
- (9) the rock and any filter material are free from organic material, soil, clay, debris, trash, or any material that may cause siltation or pollute the waterbody.

If not eligible for “No-permit-needed” riprap…

- They can still do riprap but will need a permit;
- choose another method of shoreline protection;
- change plans;
- Etc.

DNR Next Steps

- “No Permit Required” option – DNR project Team:
  - Clarify DNR interpretation and administration of “demonstrated need.”
  - Update public guidance documents
  - Area Hydro training
  - LGU and contractor training
- Shoreland Program
  - Develop training module on the land alteration permit requirements
  - Explore potential rule update to focus on better near shore protections

Thank you

DEPARTMENT OF NATURAL RESOURCES

Some challenges:

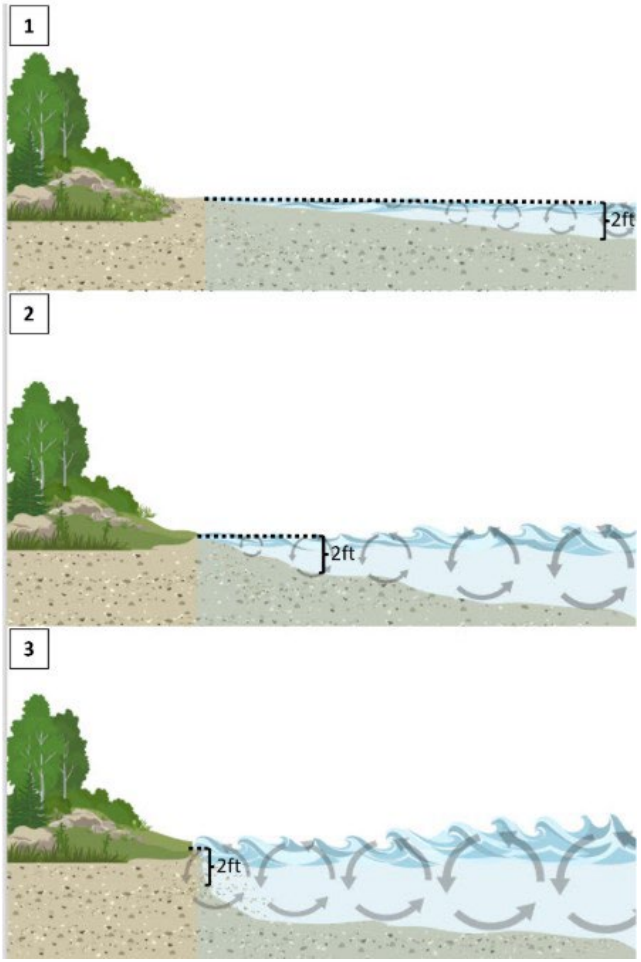
- Uncertainty regarding success, landowner maintenance, animal damage
- High cost
- Distrust of expert or government advice*
- Existing retaining walls or extensive riprap already in area
- Stubborn landowners
- The RipRap Bros. with very large advertising presence
- Vegetation takes time
- Anything other than no permit riprap will likely take more Hydro time
- Boats, high water, etc.

A few words about demonstrated need…

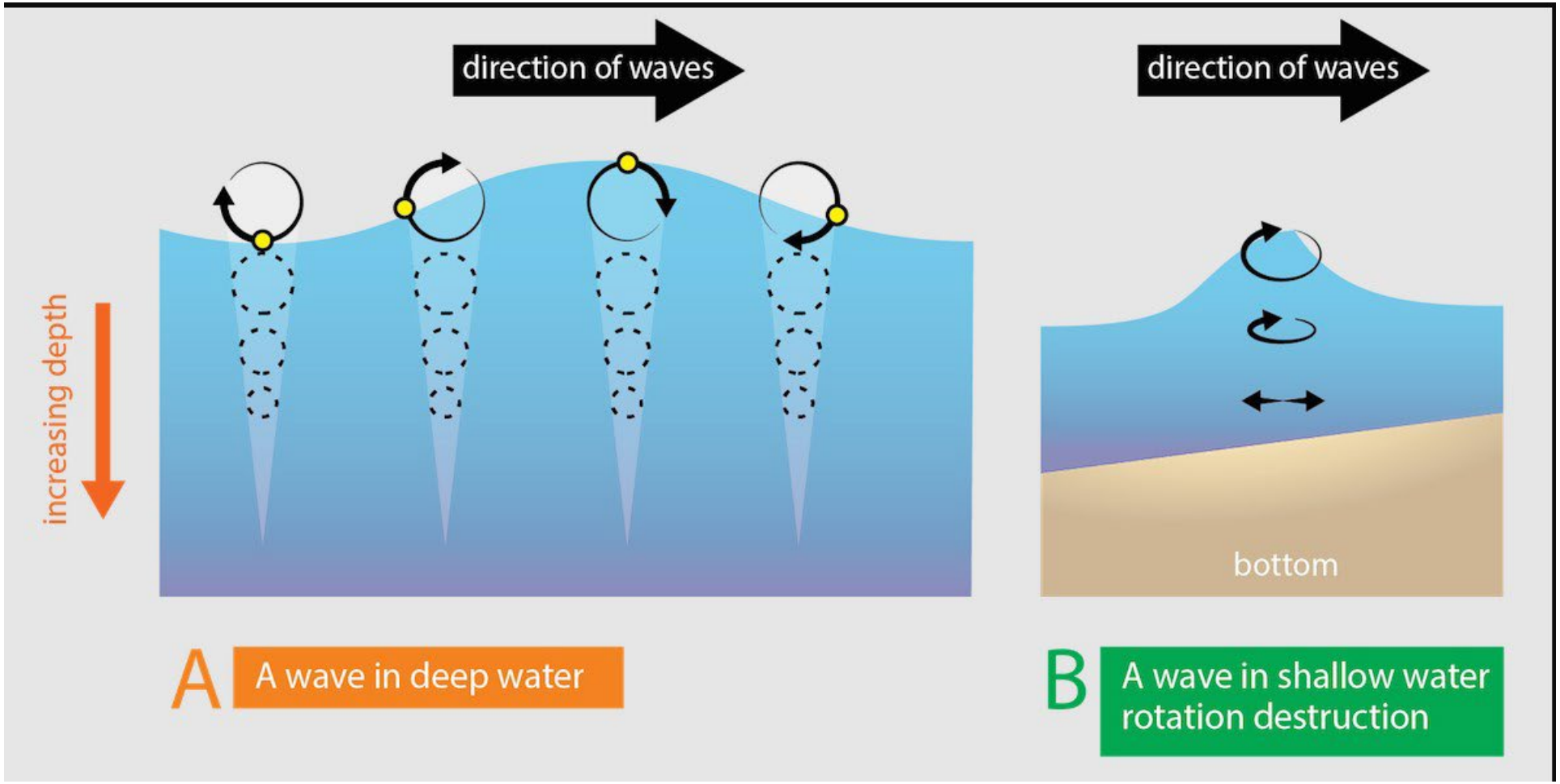
- See next few slides…

Assessing Erosion Potential of Waves

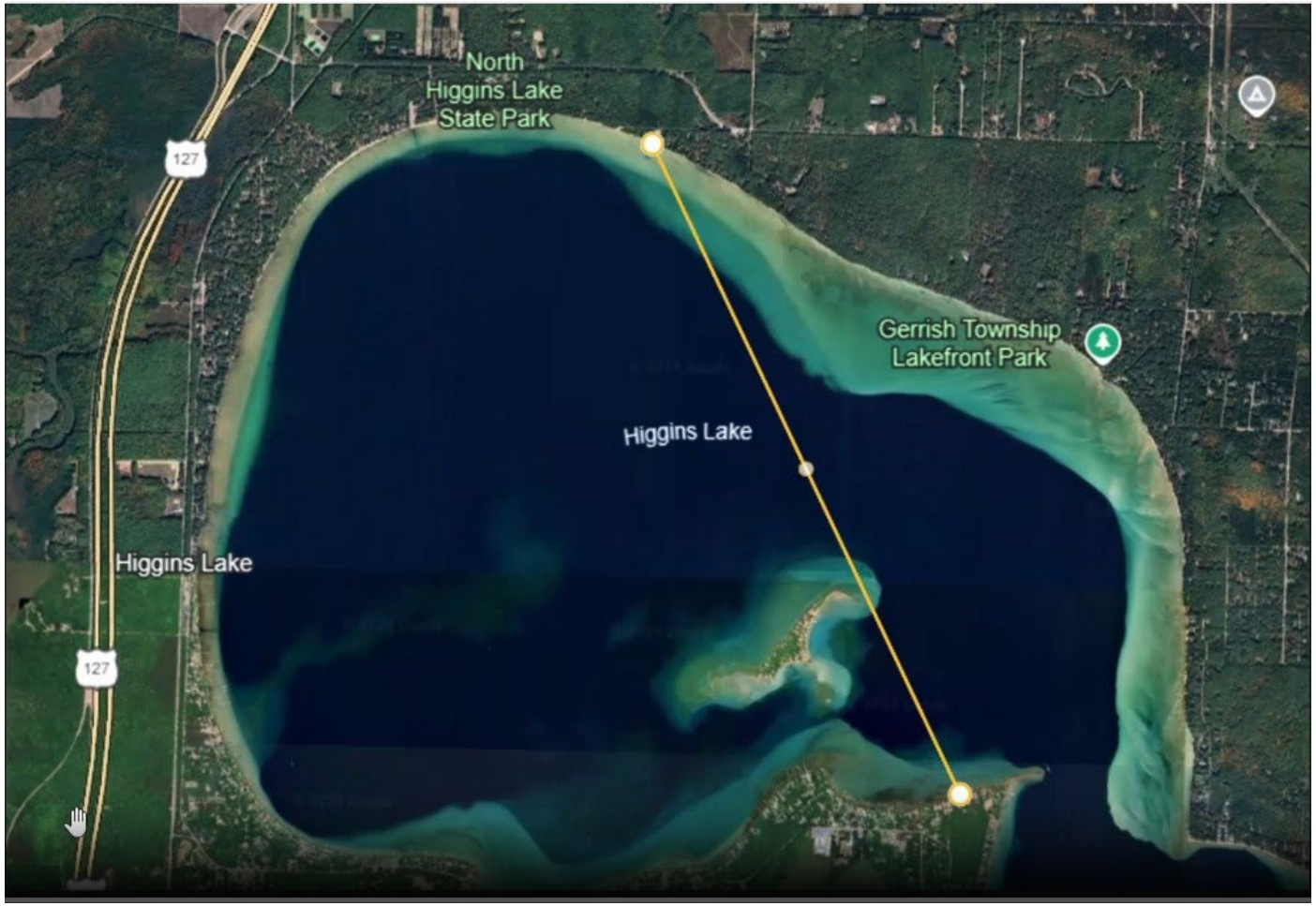
- **Significant wave height**: This is crucial. Energy is directly proportional to the square of the wave height.
- **Fetch Length**: Distance over which wind can blow freely to generate waves, significantly impacting wave height and therefore wave energy.
- **Water depth**: As waves approach the shoreline, water depth decreases, affecting wave height and energy at shoreline.



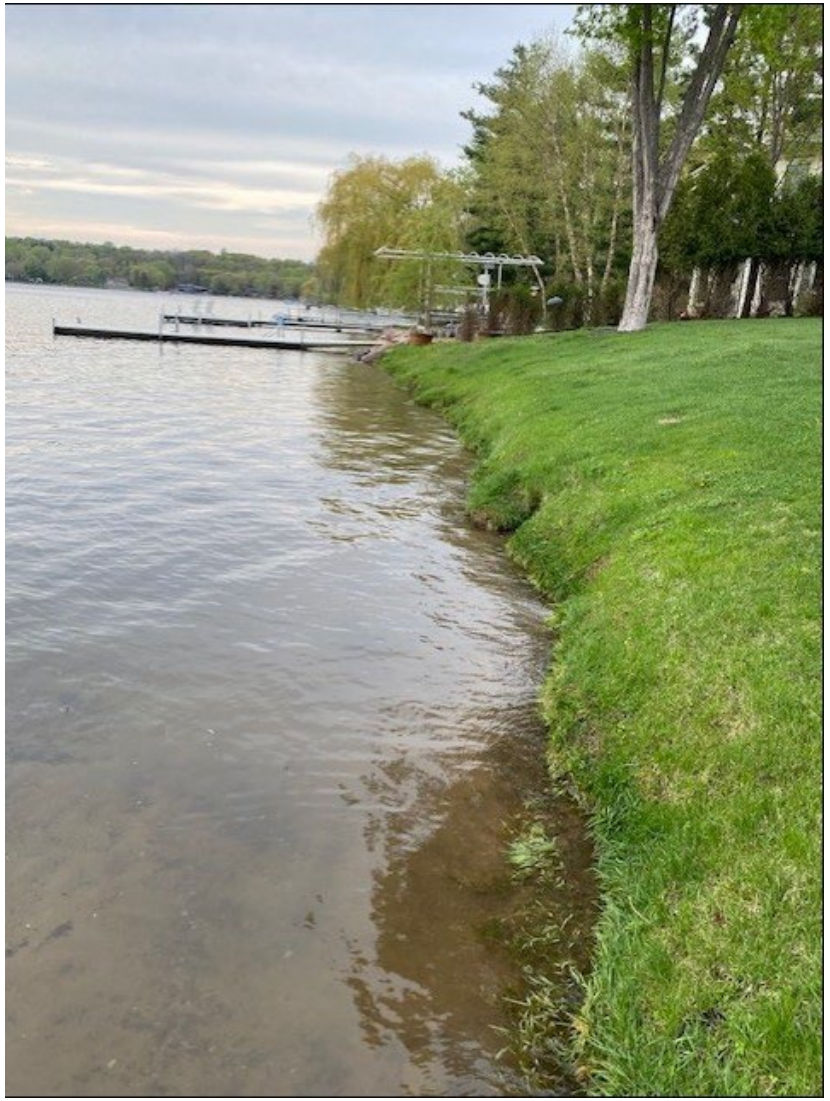
Rotation destruction in shallow water

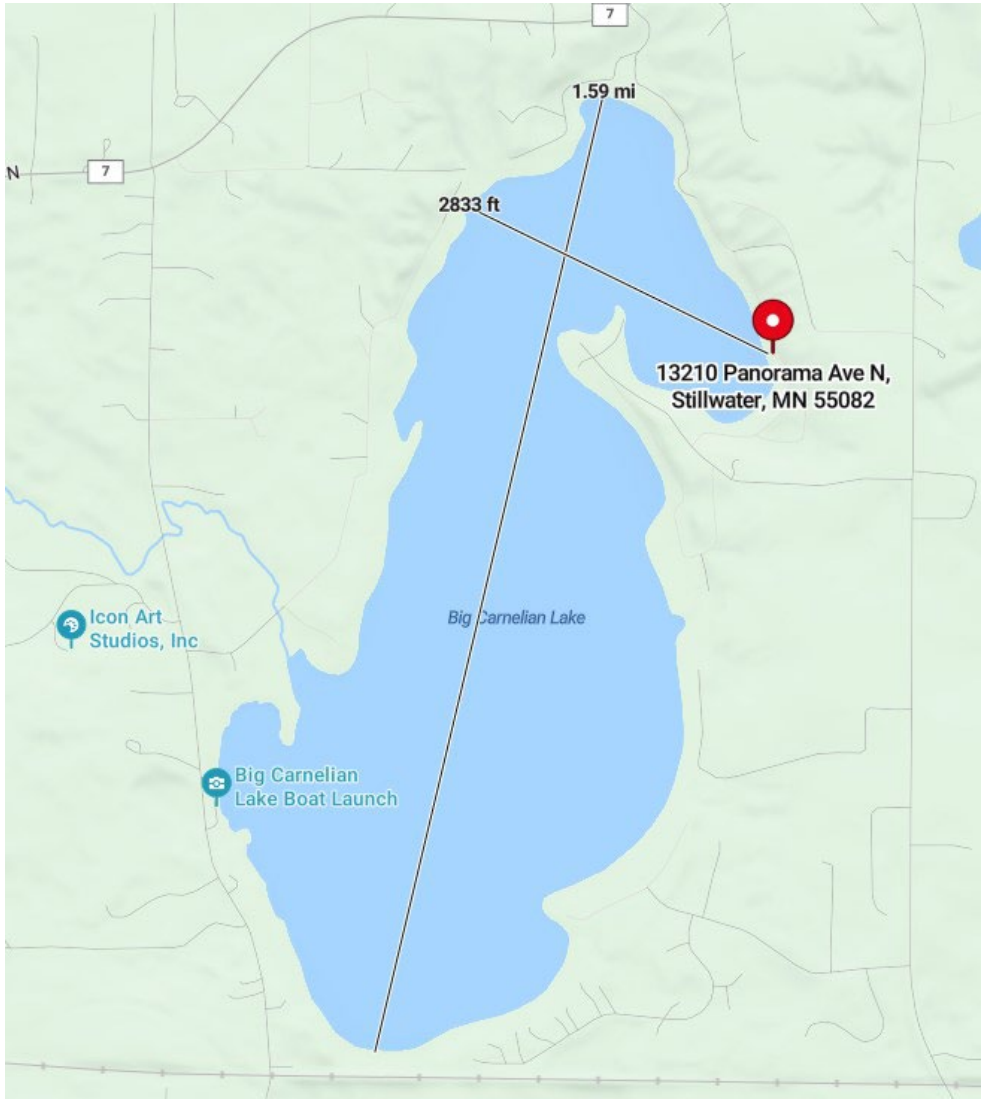


Measuring fetch



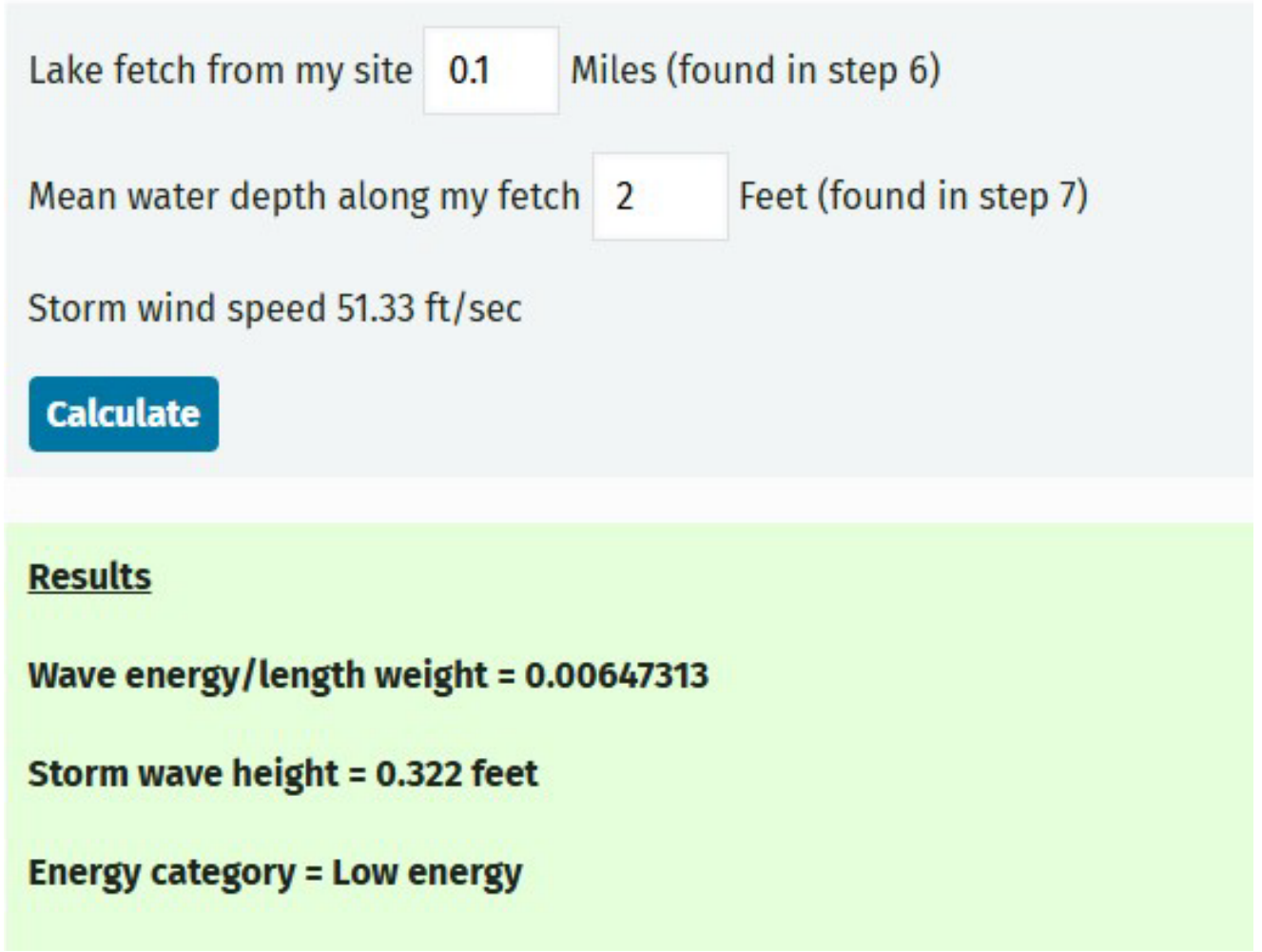
Big Carnelian, WA Co. example





Calculate wave energy on shoreline…

From Wisconsin Shoreline Energy Calculator:



Wakeboats and high water

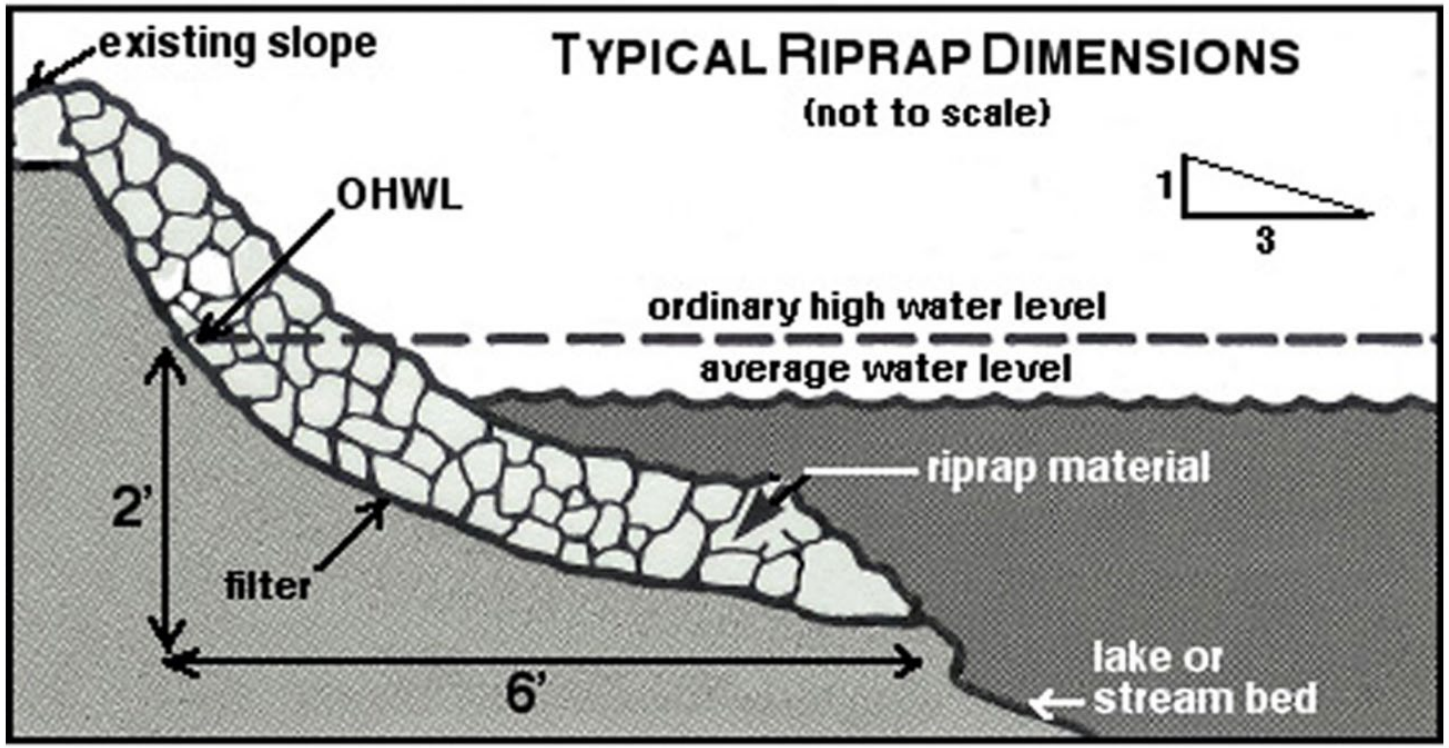
If demonstrated need, then…….

Rock is sized…….

- No less than 6 inches or more than 30 inches, in diameter
- Appropriately with the erosion potential of the wave or current action (MN Rule 6115.0215)

Design to Dimensional Requirements

- Conforms to the natural shoreline alignment of
- Finished slope is no steeper than 3:1
- No more than six feet waterward of the ordinary high-water level



Other Design Requirements…

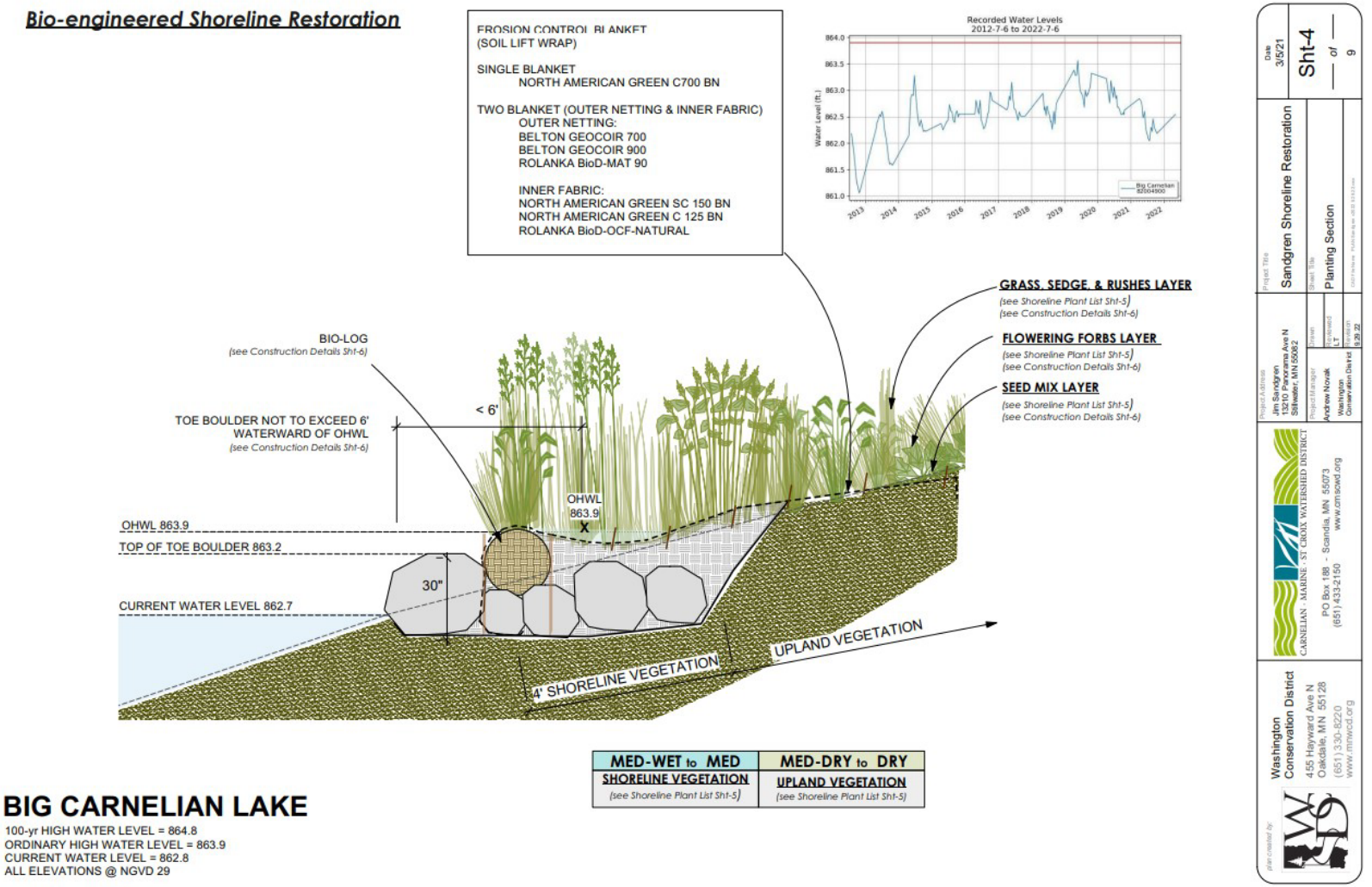
- No longer than 200 feet for basins or five times the width of the public watercourse measured at bank full conditions;
- Cannot cover emergent vegetation, unless authorized by an aquatic plant management permit;
- cannot obstruct navigation or the flow of water;
- rock and filter material are free from organic material or material that may cause siltation or pollute the waterbody.

Prohibited Work…

- Detrimental to significant fish and wildlife habitat
- Takes threatened or endangered species
- Obstructs navigation or creates a water safety hazard
- Violates the regulations of any local zoning authority or water management agency;

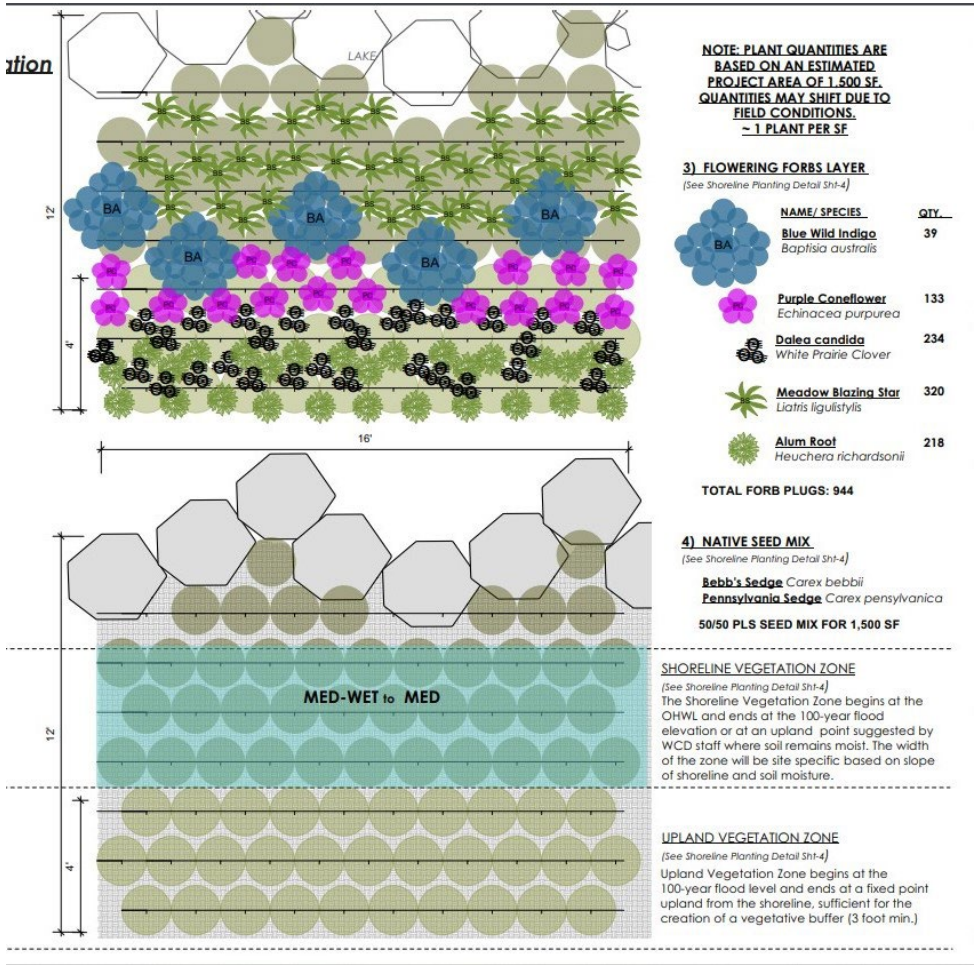
If Need for Riprap not Demonstrated, what next…

If Need for Riprap not Demonstrated, what next?

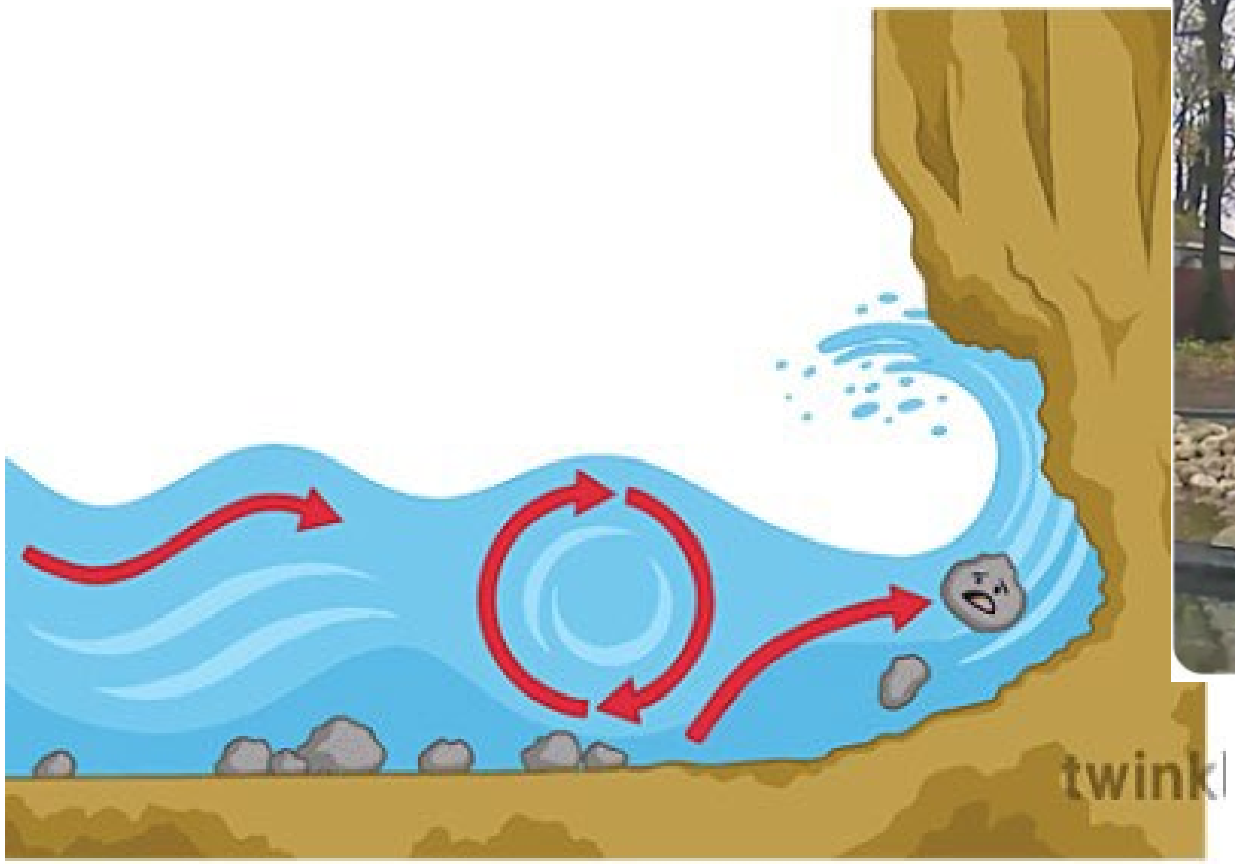


Steep riprap

Big Carnelian structural/bioengineering



The erosion process at shorelines



Not Riprap, or permit needed

Definitions:

Riprap shore protection

(Minn. Rule 6115.0170, Subpart 35):

Coarse stones, boulders, cobbles, artificially broken rock or concrete, or brick materials *laid loosely* or within gabion baskets against the slope of the existing bank of a public water.

Note: only some of the above-described “riprap” is authorized without a permit. All others need a permit and may qualify for a permit.

Two examples of rock work that that do not meet the definition of riprap – not laid loosely

The Riprap brochure…

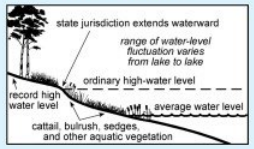
The brochure that people love to hate…

Shoreline Alterations: Riprap

Is an individual permit required?

For most projects constructed *below* the ordinary high-water level* (OHWL) of public waters, an individual Public Waters Work Permit is required by the Minnesota Department of Natural Resources (DNR) .

Riprap exception: An individual permit from the DNR is not required for riprap placement if the conditions outlined in this information sheet are followed.



Shoreline cross section.

If you have questions concerning the contents of this information sheet, contact your local DNR Area Hydrologist. See contact information on reverse side.

Please note that local units of government and other agencies may require a permit for this project.

*For lakes and wetlands, the OHWL is the highest elevation that has been maintained as to leave evidence on the landscape. It is commonly that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. For watercourses, the OHWL is the top of the bank of the channel. For reservoirs and flowages, the OHWL is the operating elevation of the normal summer pool.

What can I do to keep my shoreline from washing away?

If your shoreline is eroding, any of the following events may be destabilizing your soil, resulting in erosion: fluctuating water levels, increased wave or wake action, ice pushes, loss of natural vegetation, and human activity. Protecting your shoreline from erosion may not require you to replace natural shoreline with a high-cost, highly engineered retaining wall or riprap. There are affordable, low-impact methods to stabilize your shoreline and still protect property values, water quality, and habitat. The Minnesota Department of Natural Resources (DNR) encourages you to consider planting native vegetation to control shoreline erosion, enhance aesthetic values, and contribute to better water quality in your lake (see Lakescaping information sheet).

Shoreline stabilized with riprap and enhanced with a vegetative buffer.

Both riprap and retaining walls can reduce erosion, but they can be expensive and negatively affect lakes by creating a barrier between upland areas and the shoreline environment. Riprap should only be used where necessary and never to replace a stable, naturally vegetated shoreline. Additionally, installing riprap on a stream or river bank is a special condition that may require professional advice to ensure that the structure will stand up to the fluctuations in water levels and flowing conditions.

Natural rock riprap consists of coarse stones randomly and loosely placed along the shoreline. You should consult your DNR Area Hydrologist to determine whether your shoreline needs riprap to stop erosion. If there is a demonstrated need, such as on steep slopes, you may want to consider placing riprap or a combination of riprap and vegetation. In most cases, vegetation planted in the rocks will stabilize the riprap and improve the appearance of your shoreline. Naturalizing your shoreline is the most important contribution you can make to enhance water quality, maintain fishery resources, and provide wildlife habitat.

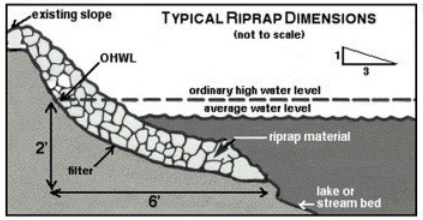
Shoreline Alterations: Riprap

…ed only where there is a demonstrated need to stop existing erosion or to restore an eroded …t Public Waters Work Permit is *not* required if the installation meets all of the following

…r emergent aquatic vegetation, unless authorized by an aquatic plant management permit …of Fisheries.

…average less than 6 inches or more than 30 inches in diameter) may be used that is free of …lution or siltation. Concrete is not allowed.

…ravel, or filter …laced underneath



…re than 6 feet …high-water level …age 1).

…to the natural align- …ot obstruct naviga-

…ope waterward of …eeper than 3 to 1

…e no more than …e along lakes and …nes of streams, must be less than five times the average width of the affected watercourse. …sted fish spawning area, designated trout stream, or along the shore of Lake Superior.

What are some other issues to consider?

…r's edge is not considered natural rock riprap. Rows of stacked boulders function as a …n would *require* an individual permit from the DNR. Retaining walls are very damaging to …Retaining walls cause wave action that scours the lakebed, displacing bottom sediment and …environment. The cumulative effect of numerous wall structures on a lake reduces criti- …fe resources and much of the food chain they depend on. Retaining walls require structural …ly damaged by ice action and undermined by wave action.

…e and does not eliminate ice heaving, but it is easier to return the rocks to their original posi- …nsider planting within the riprap to add color, interest, and diversity. Live cuttings and plant …iprap to provide additional slope stability and give your shoreline a more natural appearance.

…nt of Natural Resources. Prepared by DNR Ecological and Water Resources. Based on Minnesota Statutes 103G, …Rules Chapter 6115.

…and Water Resources …ting of Area Hydrologists: …waters

…and Water Resources …ad, Box 32 St. Paul, MN 55155 (651) 259-5100

DNR Information Center

This information is available in an alternative format on request.

Twin Cities: (651) 296-6157
Minnesota toll free: 1-888-646-6367
Telecommunication device for the deaf (TDD): (651) 296-5484
TDD toll free: 1-800-657-3929

Equal opportunity to participate in and benefit from programs of the Minnesota Department of Natural Resources is available regardless of race, color, national origin, sex, sexual orientation, marital status, status with regard to public assistance, age, or disability. Discrimination inquiries should be sent to Minnesota DNR, 500 Lafayette Road, St. Paul, MN 55155-4049; or the Equal Opportunity Office, Department of the Interior, Washington, DC 20240.

Riprap Standards

Stone Type

- Hard, angular
- Won’t disintegrate from water, weathering
- Chemically stable
- Withstand freeze/thaw
- Clean from debris
- Natural (not concrete)

Underlayment

- Non-woven geotextile
- Granular filter blanket

- Necessary to prevent water from removing soil through the voids in the riprap

Riprap Standards

Size, Weight, and Gradation

- D50 = 50% larger, 50% smaller
- Important so voids are filled and mixture forms an interlocking matrix

Thickness

- Equals 1.5 x D100
- Important so that riprap is greater than one rock thick

MnDOT standard riprap gradations

Link to this table

Weight		Size		Approximate Percent of Total Weight Smaller than Given Weight				
				Riprap Class				
lb	kg	in	mm	I	II	III	IV	V
2,000	900	30	750	-	-	-	-	100
1,000	450	24	600	-	-	-	100	-
650	300	21	525	-	-	-	-	75
400	180	18	450	-	-	100	-	-
250	113	15	375	-	-	-	75	50
120	55	12	300	-	100	75	50	-
50	22	9	225	-	75	50	-	-
15	7	6	150	100	50	-	-	10
5	2	4	100	-	-	-	10	-
2	1	3	75	50	-	10	-	-
-	-	2	50	-	10	-	-	-
-	-	1	25	10	-	-	-	-

New/Revised Regulations

- Stronger riprap standards/permitting requirements
- Quantified standards for vegetation clearing for views and access
- Requiring a buffer with specifications for depth, width, and plant material
- Requiring buffer restoration as condition of variance or expansion of nonconforming structure
- Requiring training/certification of landscape contractors for work in shoreland
- Administrative penalties for violations

Technical Assistance

- Training for landscape contractors on regulations and best practices for protecting/restoring natural shorelines
- Shoreline evaluation tools to evaluate shorelines and identify opportunities
- Property owner assistance to design/implement restoration
- Do-it-yourself restoration guides
- Financial incentives to property owners
- On-demand training videos for designing/implementing restorations

Communications & Outreach

- Advertising campaign targeting riparian property owners about value of natural shorelines
- Recognition programs identifying property owners for good stewardship
- Outreach to local elected officials about value of natural shorelines

NSP Shoreline Protection Subcommittee

Identification of Issues

The following issues were identified during the subcommittee's discussion. Some attendees voted on the issues that resonated with them the most. Vote tallies are indicated with the corresponding number of asterisks (***) behind each of the categories listed below.

1. **Lack of Enforcement (or Inconsistent Enforcement) *****
2. **Disjointed Regulatory Authorities ****
3. **Contractors Decide if Need is Demonstrated / No Field Assessment Required ****
4. **Few Incentives for Bioengineering / No Permit Needed for Riprap Promotes Use ***
5. **General Permit for LGUs is Underused, Not Promoted, Complicated ****
6. **Variances are too easily granted ***
7. **Need greater DNR Area Hydrologist Capacity ***
8. **Rules Confusion / Misinterpretation of "No Permit Needed" ***
9. **Lack of Landowner Connection / Understanding of Actions on the Resources ***

Score the Shore Survey

- Objectives:
  - Determine a lakewide lakeshore habitat score
  - Monitor trends in lakeshore habitat
- Survey:
  - Boat-based by DNR biologists
  - 1 day per lake
  - Systematical random site selection
  - 100 ft of shore assessed at each site