



Shoreline Erosion

Fact Sheet

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INTRODUCTION

Shoreline erosion was identified as a medium or high concern for 64 percent of Bone Lake residents in the 2025 Bone Lake Property Owner Survey. In addition, several focus group participants identified shoreline erosion as a severe problem that has gotten worse in recent years.

RESULTS OF SHORELINE SURVEY

The 2025 Bone Lake Shoreline Survey measured active bank erosion where there was visible bare soil. Bank erosion was identified on 5% of the shoreline of Bone Lake (4% less than 1 foot vertically and 1% greater than 1 foot vertically). However, lake residents report bank undercutting and loss of shoreline on additional parcels which may not be evident in the shoreline survey because they were currently vegetated.

CAUSES OF SHORELINE EROSION

Shoreline erosion is caused by forces such as waves and moving ice. Headlands (points) usually have relatively high erosion rates because the waves, currents, and ice push from all sides. Bays are usually the most erosion-resistant areas.

Ice damage

The ice of frozen lakes can expand shoreward with a force of many tons per square foot, moving most obstacles in its path (including shoreline soil). High winds increase the force of ice push. Grading to remove seasonal ice damage can leave exposed shorelines prone to further erosion. Left in place, a vegetated ice ridge creates a barrier between the lake and runoff from impervious surfaces.

High waves

The potential for erosion from high waves can be predicted using WDNR's wave energy calculator which uses distance (fetch) to the furthest shoreline and average depth across that distance. WDNR general permits may be obtained for installation of rock rip rap (a common form of shoreline erosion control) for sites with moderate to high wave energy if requirements are followed. [Waterway Permits: Storm-Wave Height Calculator | Wisconsin DNR](#). Moderate energy sites generate waves from 1 to <2.3 feet and high energy sites generate waves of at least 2.3 feet

This calculator does not consider wave energy from boat traffic such as wake boats. Waves produced by wake surf boats during wake surfing are higher and require greater distance to decrease to the same height as waves from typical recreational boats. The waves are also of higher energy and power. Wake surf boats require distances **greater than 500 feet** from the shoreline, docks, and other boats to decrease their wake wave characteristics to levels similar to non-wake surf boats.

PROTECTING AGAINST SHORELINE EROSION

A variety of shoreline stabilization techniques are available ranging from encouraging natural vegetation, to using logs or trees in the water, to rock reinforcement with vegetation. Choosing the right shoreline stabilization technique for each property requires a thorough site assessment. A proper site assessment helps determine the factors that affect rates of erosion. Factors to consider include impacts of waves and ice, steepness of slope, runoff from impervious surfaces, soil type, and recreation use. The [Shoreline Stabilization a Guide for Homeowners and Conservationists on Inland Lakes and Flowages](#) provides excellent guidance for site assessment and choosing an appropriate shoreline stabilization technique.



Areas of bare sand have eroded while vegetated shoreline remains stable and protected from erosion on this Burnett County, WI property.

WDNR permits may be required when installing shoreline stabilization techniques. [Shoreline Erosion Control Structures Permitting | Wisconsin DNR](#). A permit is required for rock rip rap installation adjacent to sensitive areas. There may be exemptions from permits if certain requirements are followed: <https://dnr.wisconsin.gov/sites/default/files/topic/Waterways/checklist/ExemptionChecklist-Riprap.pdf>. In each case, establishing native vegetation above the rock is required.

BONE LAKE SHORELINE STABILIZATION PROJECT

The Bone Lake Management District completed a shoreline stabilization design project with technical assistance from the Polk County Land and Water Resources Department and grant funding from the WDNR in 2021.

Objectives of the project were as follows:

- ❖ Stabilize shorelines experiencing erosion which results from high water, wind and wave action, and ice push.
- ❖ Promote new aesthetics for erosion control designed with rock, plants, and trees that hold the shoreline together while supporting wildlife and creating a pleasing natural space on the shore.
- ❖ Develop shovel-ready designs for six properties.

The project provided designs to stabilize shorelines of five Bone Lake properties. Final designs suggested a variety of techniques to control erosion based on site conditions. They included native vegetation – especially shrubs, tree drops, establishing emergent aquatic vegetation, vegetated geotextile erosion blocks, vegetated concrete mats, and rock. To qualify for WDNR grant funding when structural techniques such as blocks, mats, and rocks are used, a 35-deep vegetative buffer must be installed and maintained on the property. None of the owners were interested in pursuing installation largely because of this grant requirement. Others wanted to maintain lawn at the shoreline. One of the projects was completed without grant funding. However, it was not installed according to project design; rock rip rap was installed without a native planting above it.

REGULATING BOAT WAKES

The Wisconsin Department of Natural Resources regulates boating in the state:

Slow, no wake speed is required for a vessel operating within 100 feet of the shoreline, a swimmer, dock, raft, or pier. *Slow-no wake speed means a speed at which a vessel moves as slowly as possible while still maintaining steering control.* In addition, personal watercraft may not be operated at faster than slow, no wake speed within:

- ❖ 100 feet of any vessel on any waterbody
- ❖ 200 feet of shore on any lake.

Towns have the authority to enact ordinances covering the use and operation of boats on waters within their jurisdiction (WI Stat 30.77). Where the lake is at least 60% within a first town and all remaining shoreline is in a second town, the first town may pass an ordinance covering the entire lake, but it must conduct notification and public hearing (30.77)(3)(aw)(1 and 2).

As of July 2025, 75 local Wisconsin jurisdictions had implemented ordinances regulating the wakes produced by wake boats. Local ordinance enforcement can be a challenge. The WDNR does not enforce local ordinances. And while county sheriff's departments have the ability to enforce town ordinances, they may not be willing given other priorities. If the town has a constable, the constable may issue a citation. Some towns appoint and empower a water safety patrol officer. Per Wisconsin Statute 66.0113, a town board may authorize town board members and other town officials to issue citations. These enforcement officers may issue a verbal or written warning before writing a citation. For towns with a municipal judge, the matter would come before the municipal court. For towns without a municipal judge, the town, upon paying a small fee to the clerk of the County Court, can get a court date and the matter will be heard in the Circuit Court of the County (Wisconsin Statute 814.63(2)). This is the same process used to enforce any town ordinance. Town boating ordinances must be posted at public access points and, in the absence of enforcement, may still deter violations and educate lake users.

Ideas from Focus Group Participants

- ❖ Install breakwaters to prevent damage from high impact waves.
- ❖ Develop more natural shoreline options to hold the ground in place.
- ❖ Create a test pilot project that shows what happens with half lawn and half natural area.
- ❖ Measure the results from native garden plantings and natural shorelines.
- ❖ Natural lake shore is important: provide ways to support this including changing the narrative, sweeten the incentive, promote via informal social channels.
- ❖ Do a large project and invite people to watch—like a group demonstration.
- ❖ Teach folks how to do things on their own.

SOURCES

Boat Ed – a Division of Kalkomey Enterprises, LLC. *The Handbook of Boating Laws and Responsibilities*. Approved by the Wisconsin Department of Natural Resources. 2020.

Last Wilderness Alliance: <https://lastwildernessalliance.org/updates>

Sorenson, Colton and Katelin Anderson. Polk County Land and Water Resources Department. *Bone Lake Shoreline Inventory Report, 2025*. https://bonelakewi.com/docs/BLMD_ShorelineInventory2026.pdf

Shoreline Stabilization a Guide for Homeowners and Conservations on Inland Lakes and Flowages. 2021. https://wisconsinlandwater.org/assets/documents/Shoreline-Stabilization-Guide-for-Homeowners_Print-Version.pdf

Shoreline Erosion: Causes, Prevention, and Control Options | Waterway protection | Wisconsin DNR. <https://dnr.wisconsin.gov/topic/Waterways/shoreline/info-erosion.html>

University of Minnesota. St Anothony Falls Laboratory. *A Field Study of Maximum Wave Height, Total Wave Energy, and Maximum Wave Power Produced by Four Recreational Boats on a Freshwater Lake*. 2022.

Wisconsin Statutes 30.77. <https://docs.legis.wisconsin.gov/statutes/statutes/30/v/77>

WI DNR Shoreline Erosion Control Structures Permitting: <https://dnr.wisconsin.gov/topic/Waterways/shoreline/shoreline.html>

WI DNR Waterway Permits: Storm-Wave Height Calculator: <https://dnr.wisconsin.gov/topic/Waterways/shoreline/erosioncalculator.html>