

Wake Enhancement Impacts: Lake Tahkodah
Prepared by the Tahkodah Lake District Board, January 2022

The Lake: Lake Tahkodah is a small, quiet lake shared by those with an interest in its solitude, wildlife, and recreational activities. Users of both motorized and non motorized boats have enjoyed the lake for decades. Lake Tahkodah is 148 acres with an average depth of 12 feet and a maximum depth of just 18 feet. It is a seepage lake with no flow through of water from other bodies. Lake Tahkodah is part of the Wisconsin DNR citizen lake monitoring program. After more than two decades of lake secchi disk transparency measuring 9 to 12 feet, in the fall of 2021 monitors measured transparencies of only 3.5 to 4.5 feet. Previously unheard of fall algal blooms were observed by lake residents.

Wake Surf Boats: When operating to create an enhanced wake, wake surfing boats travel at 10 miles per hour and not on-plane. The goal is for the boat to make as big a wave as possible or an enhanced wake to surf behind. Boat manufacturers are making larger wake surfing boats that can weigh about 6000 pounds and load another 4000 pounds of water ballast in the stern. They can generate waves over 4 feet high. The angle of the hull is around 20-25 degrees while operating and the prop shaft is another 15 degrees. These boats draft 24 to 36 inches standing still. While under power, the stern is pushed down another foot or so which means the prop can be up to 4 feet below the surface of the water. One study found wake surf boats impact the water column to a depth of 16 feet, remobilizing bottom sediments. Due to the differences in the design and operation of these boats compared to water skiing boats, pontoons and other recreational boats, they can significantly alter a lake - especially smaller, shallow lakes like Tahkodah. In the summer of 2021, the first wake surf boat regularly operated on the lake.



Water sport boat comparison at operating speed

Safety of Small Boaters and Swimmers: The creation of large, sustained wakes creates a safety concern by increasing the danger of capsizing for small watercraft such as fishing boats, paddleboards, canoes and kayaks, along with interference to water skiing and fishing activities. Swimmers are also impacted.

Effect on Fish and Wildlife: Lake Tahkodah's shoreline harbors loons and other wildlife. Birds, particularly waterfowl, nest close to shorelines and are especially vulnerable when molting to shoreline disturbances. When boats create large wakes on a small lake, the following impacts can occur to shoreline nesting areas: relocation of nesting sites, abandonment of nests and loss of young. There can also be long term impacts as many species of birds normally would return year after year to the same nesting area. This disturbance and dislocation are often associated with narrow or small bodies of water. Disturbance of aquatic vegetation near the shoreline can reduce vegetation, impacting fish habitat.

Effects on Shoreline and Water Quality: Wake surf boats have the potential to generate much larger waves with more energy than watercraft of similar size and shape resulting in removal of sediments from the shoreline. Shoreline erosion results in two primary negative impacts: loss of land or property destruction and an increase of sediment mobility. Increased sedimentation which can reduce light penetration and inhibit primary production, abrade and clog fish gills, and prevent feeding by sight feeders, can negatively alter fish populations. When erosion occurs, sediment particles are mobilized in the water column resulting in turbid (cloudy) water. Additionally, suspended sediment particles mobilize nutrients such as phosphorus, leading to algal blooms.

While shoreline erosion can be reversed with much effort within years, changes to water quality from disturbance of the lake bed can be even more difficult to remedy. Disturbance of the lake bed can release nutrients such as phosphorus that took decades to accumulate. Once released and resuspended, it can take decades for a lake to return to its former status. Without adequate protections, erosion and sedimentation can accelerate lake eutrophication with a negative impact on all who use these water resources.

Spread of aquatic invasive species is another concern when Lake Tahkodah boats go to neighboring lakes such as Lake Namakagon where eurasian milfoil exists. Wake boats are of particular concern, because it can be difficult to clean and completely drain the ballast water compartments as they are currently designed. Incomplete draining can lead to the harboring of viable aquatic invasive plants or animals and can remain viable for several days.

Partial list of references used to create this document:

Condition Reports for: Town of Hayward, Sawyer County Motorboat Wake Protection Area Ordinance No. 07-2021, Town of Bass Lake, Sawyer County Motorboat Wake Protection Area Ordinance No. 2018-10-08, Town of Hunter, Sawyer County Motorboat Wake Protection Area Ordinance No. 2021-01

St Anthony Falls Laboratory, U of Minnesota, February 2022, A Field Study of Maximum Wave Height, Total Wave Energy, and Maximum Wave Power Produced by Four Recreational Boats on a Freshwater Lake
https://conservancy.umn.edu/bitstream/handle/11299/226190/BoatGeneratedWakeWaveReport_Feb12022_Final.pdf?sequence=1&isAllowed=y

Raymond S. and Galvez R., Impact of Lake Navigation - Sediment Suspension Study: Lake Masson and Sand Lake Cases - 2015. Laval University
<https://www.documentcloud.org/documents/6801170-5%C3%A9Bastien-2015-English-U-of-Laval-1.html>

March 9, 2021 Wisconsin Lakes Association Presentation
https://www.youtube.com/watch?v=_nlHa9XrAE0&list=PL6aVQYpBMBW-c22Mcg79oqEwKZGeWKZfq&index=20

Boat Wake Impact Analysis, Lake Rabun and Lake Burton, Georgia Prepared by Water Environment Consultants. January 20, 2021
<https://img1.wsimg.com/blobby/go/cf65b112-4ce9-4da9-a066-f09ac53fad63/Boat%20Wake%20Impact%20Analysis%20-%20Final%20Report%20-%2020202.pdf>

WI Lakes Association 2021 "Thursday's @ 4:00 talk" Mike Engleson gave on carrying capacity that goes into more depth than the Six County talk: https://youtu.be/5WcA5u_rBg0