



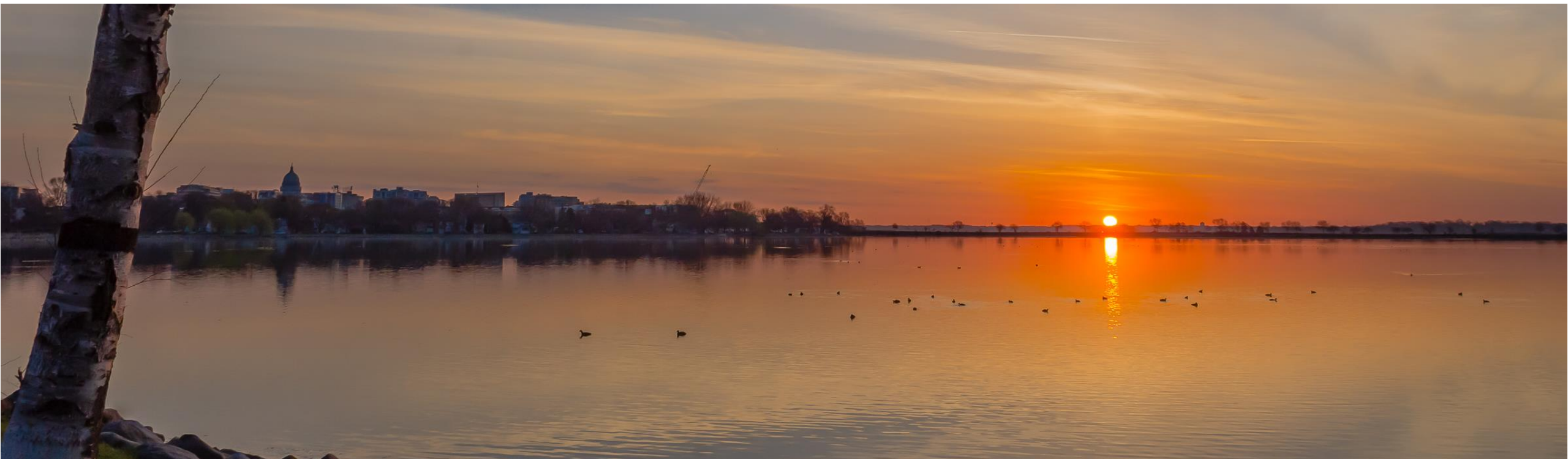
LAND&WATER
RESOURCES
DEPARTMENT

The Influence of Boat-Generated Waves on Lake Shorelines and Aquatic Habitat

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Kyle Minks – Watershed Manager

Dec 3, 2025



Overview

 **Wave Impacts**

 **Recent Studies**

 **Municipal & State Actions**



Wake Boat Concerns



Shoreline Erosion



Water Recreation



Lakebed & Water Column



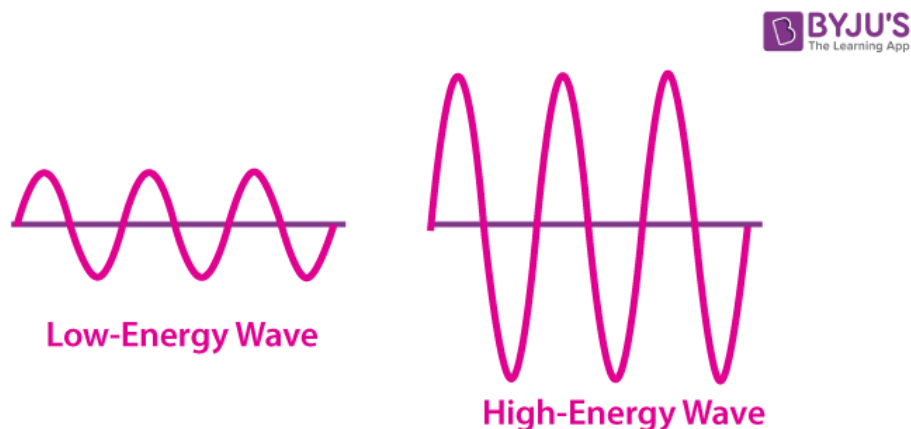
Aquatic Invasive Species

Wave Energy

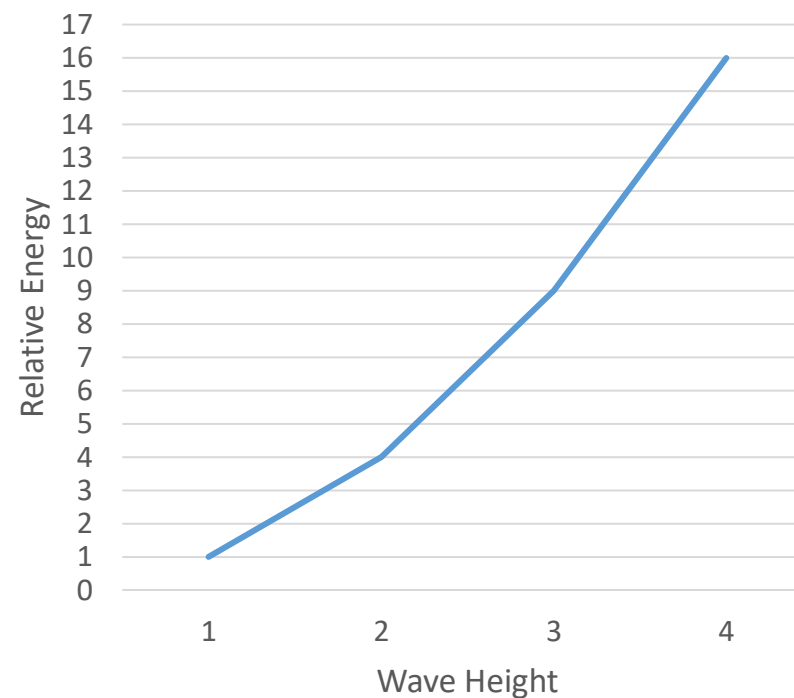
The energy carried by a wave is proportional to its amplitude squared.

A 2- foot wave is 4 times more powerful than a 1-foot wave

A 3- foot wave is 9 times more powerful than a 1 foot wave



The amplitude of a wave is related to the energy which it transports



Boat Waves

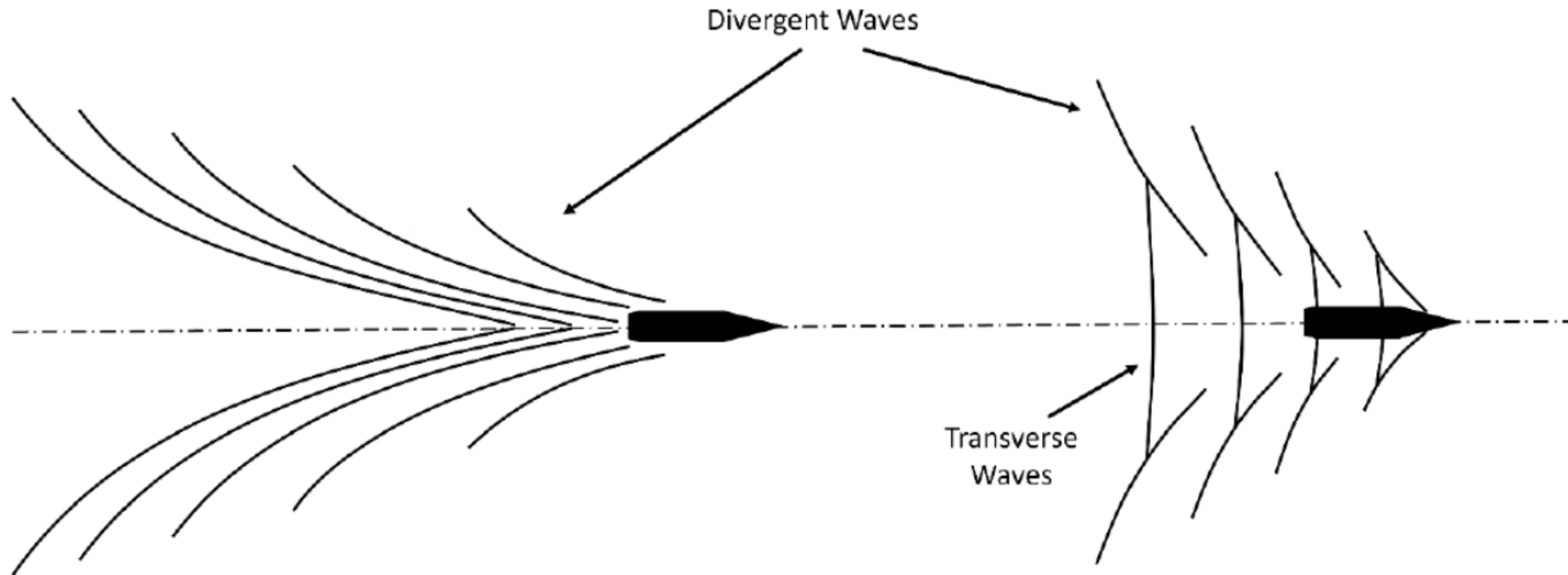


Figure 2. Wake wave patterns of a powerboat traveling at fast planing speeds (left) and slower displacement and semi-displacement speeds (right).

Boat Waves

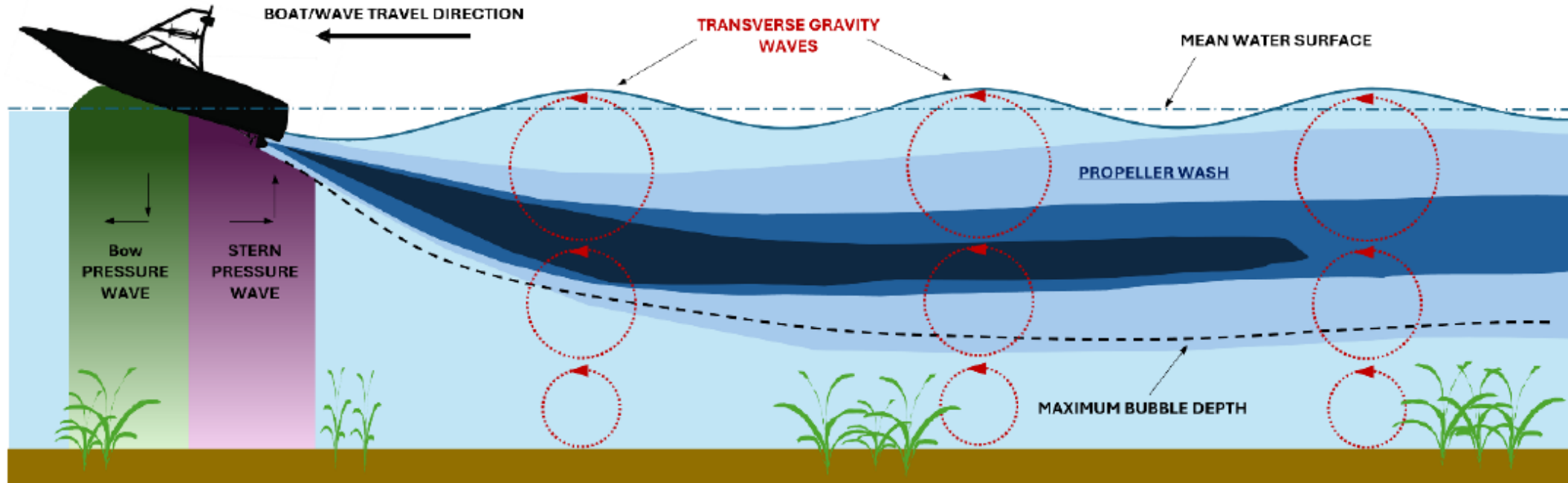


Figure 3. Conceptual illustration of the three hydrodynamic phenomena formed during displacement and semi-displacement modes of operation when transverse waves are present, that produce orbital movement in the water column. The figure represents the first ~10 seconds of time following a boat in forward motion. The arrows in the green bow and purple stern regions represent the direction that the water is moving as it is being displaced by the boat's hull.

University of Minnesota – SAFL 600

Field study looking at Wave Height and Energy (2022)

Conclusion:

- Semi-displacement operation generates larger more powerful waves than planning.
- Wake boats create larger more powerful wake waves than non-wake boats.
- Aftermarket devices on regular ski boats can generate larger maximum wave height, energy and power.
- Wake boats would need to operate at 500 feet from shore to have same amount of wave height and energy as non-wake boat at 200 feet from shore.

Field study looking at impacts to water column and lakebed of recreational boats (2025)

Conclusion:

- Bow and stern pressure waves initiate the movement of lakebed sediments.
- Transverse waves and propeller wash lift and entrain sediment into the water column

University of Minnesota – SAFL 611

Recommendations to limit environmental impacts:

- Boats operate in 10 ft of water or greater when planing to minimize impacts
- Non-wakeboats in displacement (slow cruising) mode should operate in > 10 feet of water
- Wakeboats operate in 20 ft of water or greater when in semi-displacement mode to minimize impacts
- In general boats should avoid areas of the lake with aquatic vegetation to minimize damage

Lake Beulah Wave Impact Study

Field study using remote sensors and video to identify disturbed areas of the Lake including prop downwash and wave impacts (2025)

Conclusion:

- Wake boats are impacting Lake Beulah aquatic plants and lake bottom
- Wave height and energy are 3-4x greater than a ski boat operating 200 feet from shore
- Impacts to Lake bottom observed at 15 and 21 foot depths

Boat Operating on Plane



Boat Operating in Displacement Mode



Municipal Actions



Wis. Stat. 30.77 Local Regulation of Boating



DNR guidance

<https://dnr.wisconsin.gov/Topic/Boat/ordinances>



71 Local ordinances in WI regulating wake surfing and enhanced wakes

The screenshot shows the Wisconsin Department of Natural Resources (DNR) website. The header includes social media icons (Facebook, YouTube, Instagram, LinkedIn) and a search icon. The main navigation bar lists: HUNTING, FISHING, PARKS, CLIMATE, ENVIRONMENT, FORESTRY, LICENSES, NEWS, ABOUT, CONTACT. The breadcrumb trail reads: » TOPIC » BOAT. The page title is **ORDINANCES AND WATERWAY MARKERS**. A blue button labeled "Boating in Wisconsin" is on the right. The text states: "Before boating on unfamiliar Wisconsin waterways, check for a sign at the public boat landing to determine if there are local regulations (more restrictive than state law) that may apply on that water body." The section **BOATING ORDINANCES** explains that Wisconsin law allows local municipalities to enact regulations for public health, safety, or welfare, including preserving natural resources. It notes that while state law provides a general framework, local municipalities tailor regulations to local conditions, with authority found in Chapter 30.77 of the Wisconsin Statutes. It concludes by stating that municipalities seeking assistance in drafting local regulations should contact their local Recreation Warden.

State Actions - Legislation

LAB656/SB680

- Prohibited wake sports within 200 ft of shore and in lakes 50 acres or less
- Prohibited more restrictive local ordinances

SB1016

- Prohibited enhanced wakes on any lake smaller than 1500 acres with a max depth less than 20 feet and within 700 feet of shore.



State Actions – 2024 WCC Advisory Questions

Environmental committee

Q32. Would you support the WCC and legislature creating a new statute that prohibits the use of wake boat ballast systems on Wisconsin's lakes and rivers?

All participants			Wisconsin Resident			Dane County*		
Yes	No	No opinion	Yes	No	No opinion	Yes	No	No opinion
10,608	4,193	1,370	10,002	3,715	1,272	930	511	96

* Respondents that attended in person or indicated they reside in the county

State Actions – 2024 WCC Advisory Questions

Motorized recreation committee

Q42. Would you support regulations by DNR to require that all ballast systems used in boats shall have a reasonable practical means of inspecting the system to confirm that no water is retained in the system (tanks, piping, valves, etc.)?

All participants			Wisconsin Resident			Dane County*		
Yes	No	No opinion	Yes	No	No opinion	Yes	No	No opinion
10,016	4,228	1,771	9,448	3,777	1,630	908	492	121

* Respondents that attended in person or indicated they reside in the county

State Actions – 2024 WCC Advisory Questions

Motorized recreation committee

Q43. Would you support the WCC and legislature modifying exiting statutes to prohibit generation of intentionally magnified wakes for wake surfing through the use of ballast, design features, operational procedures or any other means on lakes smaller than 1500 acres and less than 20 feet deep and maintain a distance from shore and other lake users of 700 feet?

All Participants			Wisconsin Resident			Dane County*		
Yes	No	No opinion	Yes	No	No opinion	Yes	No	No opinion
10,895	3,804	1,288	10,274	3,363	1,194	939	476	101

* Respondents that attended in person or indicated they reside in the county

Additional Resources



Wisconsin Watersports Coalition

<https://www.wwcoalition.org/>



Wisconsin Lakes

<https://wisconsinlakes.org/category/lake-policy/wakesports/>



Last Wilderness Alliance

<https://lastwildernessalliance.org/>



Wisconsin's Green Fire

<https://wigreenfire.org/?s=Wake+Boats>



THANK YOU

Courtesy Shan Bartus



LAND & WATER
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Join us!

