Wakesurfing

Fact: All relevant studies have concluded that a) wind produced wave related energy transfer is the primary determinate of shoreline erosion and b) dissipation of enhanced wakes at 200ft is sufficient to prevent any threat of shore erosion

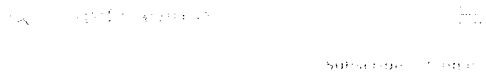
- In a 2022 Peer Reviewed study, Fay et al find that "*if a wake surf boat is operated at least 200ft from shore and in at least 10ft of water, the environmental impact is limited*". That study can be found here: https://www.scirp.org/journal/paperinforcitation.aspx?paperid=116094 or through a google search for "Numerical Study on the Impact of Wake Surfing on Inland Bodies of Water"
- In a 2015 study, Goudey and Girod show that, "*A 10 mph wind blowing over a mile of open water is a common occurrence and our results suggest boat wakes are not likely to be the most significant source of energy along the shores of all but the smallest bodies of water. The persistence of wind waves can belie their importance. While a boat wake coming ashore can seem like a significant event, in the larger scheme of things it can be of little consequence if that shore also experiences wind-driven waves.*
- The myth that wake boats erode shorelines primarily comes from a 2022 crowdfunded (non-peer-reviewed) study from the St. Anthony Falls Laboratory that compares wake surfing waves to those of other boats - primarily an old Lund fishing boat. This study finds that a brand new Malibu creates a bigger wave than an old Lund. The study concludes that the Malibu wave needs about 700ft to dissipate to the level of the Lund wave at 200ft (this is where the 500ft talking point comes from) but this is only a comparison of waves, not a commentary on their effect on the shoreline in the broader context of all forces experienced by that shoreline. In fact, the study directly states that, "**.....(this study) does not address potential environmental impacts such as shoreline/riparian erosion, water quality degradation, or alteration of aquatic habitats".**

JOUNAL OF WATER RESOURCES & PROTECTION

LASW = LAND AIR SEA WELLNESS

Myth: Opponents of Wakesurfing claim that recent changes in lake environments corresponds with the arrival of wake boats

- Opponents of wake boats have been claiming that recent changes in lake environments are due to the recent introduction of wake boats to these lakes. This claim is simply non-factual, as wake boats have been on Wisconsin lakes since the late 1990's and have thus been on Wisconsin lakes for nearly 30 years.
- Besides the fact that these claims are often based on anecdotal evidence and never seem to consider the thousands of alternative variables that could cause changes to lake environments (ie. higher fishing traffic post covid or differences in year over year weather patterns), they demonstrate a lack of historical understanding, as wake boats were introduced in 1997.
- When pressed, promoters of the specious narrative are unable to point to specific changes or data, and will even admit that they do not know what is causing the unspecified perceived changes. See excerpt below in which Scott Rolfs, a director of LASW, admits in a Journal Sentinel article that he cannot prove that wake boats are causing perceived changes in lake environments:



Myth: Opponents of wake boats claim to have videos depicting a decline in aquatic vegetation

- The aforementioned video published by LASW does not provide any corroborating evidence that the two video clips were a) taken at the same time of year b) were taken at the same spot on the lake c) were taken during at the same time of week either prior to or post-weed harvesting or d) were even taken in Wisconsin!
- The video appears to be taken in separate areas of the lake that are less than 10 ft deep, meaning that it is unlikely that any wakesurfing has even occurred in either of the locations shown.
- **The conclusions that LASW draws from these two allegedly related video clips is directly contradicted by publicly available official data from the WI DNR, the US geological service, and the PRD from the lake in question.**

Myth: Wakesurfing Is Operationally Dangerous

- Wake boats, even in surfing mode have full visibility while operating
- Wakesurfing is done at ~10mph, significantly slower than other recreational activities such as tubing (~20mph), slalom skiing (~30mph), or fishing tournament shotgun starts (~40mph).
- As of 4/10/24, the DNR's incident tracking system doesn't have a single recorded accident or fatality in the last 5 years involving a wake boat in surf mode.

teresting observation factor is that the sea state only takes ten minutes to become fully developed at a wind speed of 35 miles per hour. Figure 37 shows a photograph of the wave spectra on a lake with a fetch of about one mile in 15 - 20 mph (24 - 32 kph) of wind.

Figure 38 shows the results of the CFD analysis of the wave train over the 800-foot fetch. The CFD model uses 32 million cells and a long eddy simulation to model the wind to water interface. The elevation shows a wave height of 0.32 meters which corelates to the wind-wave model shown above.

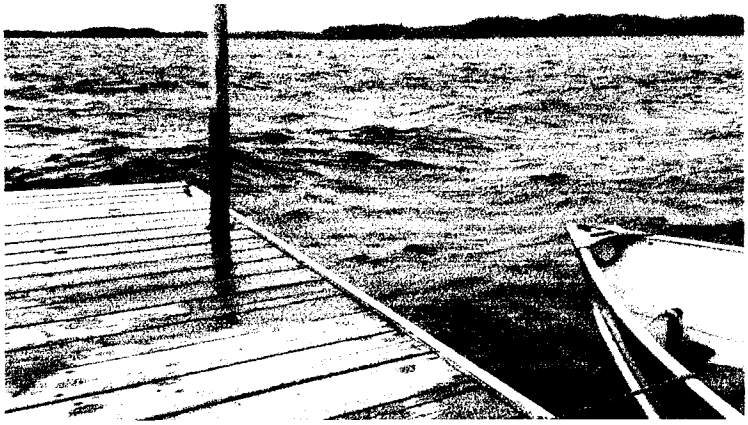


Figure 37. Image of wind driven waves at 25 - 35 mph.

Table 4. Wave height estimate.

FETCH YARDS	FETCH FEET	WIND FT/SEC	DEPTH FEET	WAVE HEIGHT	WAVE PERIOD	WAVELENGTH FEET	TIME MINUTES	WAVESPEED FT/SEC
100	300	51.4	16	0.267	0.941	4.82	2.71	2.13
200	600	30	16	0.357	1.101	5.64	4.59	2.49
300	900	30	16	0.422	1.205	6.17	6.23	2.73
400	1200	30	16	0.475	1.282	6.57	7.75	2.90
500	1500	30	16	0.521	1.344	6.89	9.18	3.04
600	1800	30	16	0.561	1.396	7.15	10.54	3.16
700	2100	30	16	0.598	1.440	7.38	11.85	3.26
800	2400	30	16	0.631	1.480	7.58	13.12	3.35
900	2700	30	16	0.662	1.515	7.76	14.34	3.43
1000	3000	30	16	0.691	1.547	7.93	15.54	3.50
1200	3600	30	16	0.743	1.602	8.21	17.85	3.63
1400	4200	30	16	0.791	1.649	8.45	20.06	3.73
1600	4800	30	16	0.834	1.691	8.67	22.21	3.83
1800	5400	30	16	0.873	1.728	8.85	24.29	3.91
2000	6000	30	16	0.910	1.761	9.02	26.31	3.99

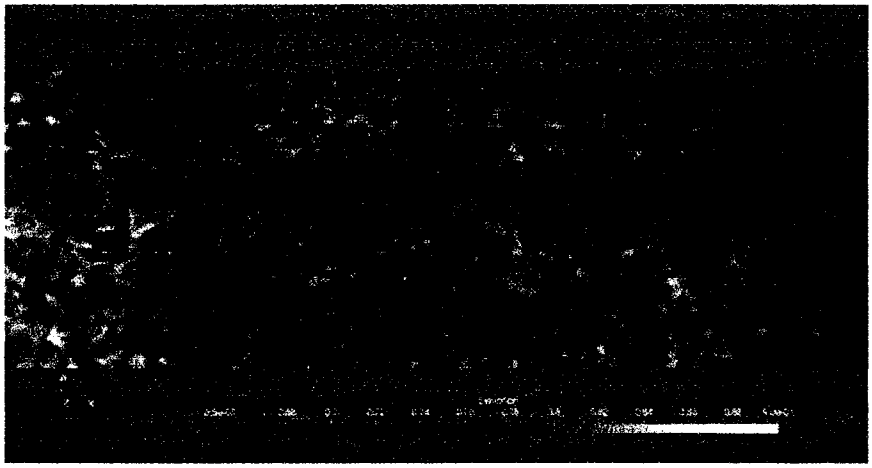


Figure 38. Wave height elevation at 35 mph over a fetch of 800 yards.

Figure 39 shows the wind velocity profile over the water surface. The wind speed is set at the top of the domain at an elevation of 30 meters which is defined as the standard for the measurement of wind velocity overland. The level of turbulence over the water is an indication of the wind and water interaction as the sea state develops.

8. Conclusions

The report has shown that the operation of wake boats on a lake has a minor impact on the environmental health of the body of water.

In an Australian study [8], the goal was to develop a decision support tool (DST) to objectively access the vulnerability of a particular shoreline to erosion. The study references a range of papers that describe the wave energy threshold for erosion. The range of wave heights noted by the author does not include any reference to wind waves and the author states, "Importantly, the previously proposed wave management criteria do not take into account the natural background wave energy, nor the condition of the bank." The quote from the author is true, but the studies cited were all done for a specific body of water. The wave heights noted generally agree on a maximum wave height of 28 cm (11 inches) as it approaches the shore. A broader definition [9] uses the following equation to define a maximum wave height.

$$H_h \le 0.5\sqrt{\frac{4.5}{T_h}} \tag{19}$$

where:

H_h: Maximum wave height (meters);

T_h: Mean Wave period (seconds).

The higher speed wake at 20 mph will cause turbidity through bottom friction while producing a smaller series of waves at the shoreline. The impact of rain events and modest wind events also tend to raise the level of turbidity and are the primary cause of erosion on shorelines and the introduction of sediment into the lake.

erating a boat that far off a shoreline may not be possible due to the size of the lake. The testing [4] [8] suggests a distance of 200 feet allows the wave train to dissipate enough to cause little or no impact on the shoreline. The commonsense approach includes a few operating guidelines for wake surfing. Always operate the boat at least 200 feet from shore and in a water depth greater than ten feet. If possible, run parallel to shore and make only lateral runs without turning at speed to reduce the large wake produced during a turn. If the lake is large enough, relocate within the lake to reduce the time in a particular area.

9. Epilogue

While operating any motorboat on a small body of water, the depth of water and the proximity to shore should be considered for the people on shore as well as the health of the lake. On large lakes in Ontario, a speed limit is imposed within 100 m (330 ft) from shore of 10 kph (6.3 mph) and 70 kph (44 mph) over the remainder of the lake. In New Hampshire there is a no-wake zone within 150 feet of the shore. Many states' focuses are on enforcement of existing laws on the books which state that the boat operator is responsible for their wake and any damage it may cause. The price of a ticket for a wake that causes damage or injury can be as high as $720. The law in Oregon reads if a skipper operates a boat in a way that damages or is likely to damage private property or cause injury, ORS 830.305 clearly states it as a citable offense. At this time many states are opting for the Play Away approach that everyone has a right to be on the water, but anyone that endangers others will be cited.

In some states, they are looking at imposing restrictions on lakes with an average water depth under fifteen feet. Wake surf boats should operate 200 feet offshore to minimize the wave impact on shore to allow the wave to break into their group components to an average height lower than the suggested limit of 11 inches in height. The rules going forward will include all power boats, but the wake surfing community needs to embrace their responsibility as operators to minimize the confrontations with other boats and people on shore. The conspicuous nature of wake surfing by generating a larger wake at a slower speed and staying in the area tends to draw attention to the activity. Sometimes the effected shoreline needs a break from the action, and they could move to a new location. The wake-surfers need to be sensitive to people on shore as everyone has a right to enjoy the water.

Acknowledgements

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.