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Low-Speed Boating . . . Managing the Wave

Doug Keller

Remember the old days when the “cool” boats were the ones that glided across the water at such high speeds that they seemed to barely touch the surface of the water? A low wake was what slalom skiers desired as they skipped from side to side behind the boat. Oh, how times have changed. Now boats that plod along at a low rate of speed, deeply plowing through the water, throwing a large wake for wakeboarding and surfing are all the rage. I like to term this type of boating as “low-speed boating” and it comes with its own set of concerns regarding the health of a body of water.

Today’s “wake boats” are designed to increase wave height. To accomplish this, the hull is shaped to achieve maximum wake and many have a hydrofoil device that lowers the stern when the boat is under power. Most wake boats also have built-in ballast tanks that can be filled with lake water to increase the weight in the back of the boat, causing more water to be displaced and larger waves created (Figure 1).

Problems with Increased Wake Height

As wave height increases, so do adverse effects that go along with waves. The larger the wave, the deeper it can churn sediment in the shallows of a lake. Larger waves also deliver more energy against the shoreline, exacerbating erosion of natural shorelines and islands. If the shoreline is a hard regular face like a concrete or sheet-pile seawall then the energy from waves is deflected back toward the center of the lake, which, again, disturbs sediment in the shallow areas of the lake.

Because of the shape of the boat and the means of lowering the stern of the boat through ballast placement or mechanical means, ultimately the



Figure 1. A typical, stern-heavy wake boat creates a large surfable wake. Photo from Pinsdaddy.

propeller is deeper in the water. This can result in direct contact of the propeller with the lake bottom. However, even if the prop does not contact the bottom directly, the turbulence from the propeller can reach as deep as 10 feet. In either scenario, the end result is disturbance to the bed of the lake.

Whether it is propeller-induced or the result of boat-induced wave action, sediment and nutrients can become re-suspended due to low-speed boating. After a weekend of heavy boating, lake residents have surely noticed that the lake is not as clear as it was right before the weekend because of the disturbance of the sediment. Depending on how fine the bottom sediments are, it can take 24 hours or more to return to the clarity it was prior to an intense boating period. Sediment

in suspension means nutrients like nitrogen and phosphorus have also been kicked-up. These nutrients in suspension are now available to interact with the biotic community in the water column. Often times these available nutrients fuel a planktonic algae bloom, which can contribute to additional water clarity problems. In the worst-case scenario, a harmful algae bloom can lead to water safety issues.

The deeper the propeller, the more chance there is to uproot or fragment aquatic vegetation. This can lead to the destruction of desirable native species, many of which do not reproduce via fragmentation. Invasive plant species, however, commonly use fragmentation as a means of propagation. Therefore, boats chopping up plants can facilitate the

proliferation of aquatic invasive plants, which can lead to their spread and crowd out native species.

Speaking of invasive species, the ballast tanks that assist in creating the large waves for surfing behind wake boats can facilitate the spread of detrimental species. Zebra mussel larvae, fish pathogens, or invasive plant fragments could be pumped into the ballast tanks. While the tanks would typically be de-watered when the boat is loaded on the trailer to go home, the tanks are never able to completely dry. Unwanted “hitchhikers” could remain viable in the tanks and could be expelled into the next lake that is visited.

Wake Boat BMPs

There are a number of best management practices (BMPs) that could be employed by low-speed boaters and lake residents to lessen the impacts from this style of boating. No one action can save a lake; rather, improved lake management could involve adopting many different practices.

The suspension of sediment and nutrients is arguably the greatest concern with wake boats because it can speed eutrophication of lakes. Boaters should consciously seek water 10 feet or deeper to operate wake boats since by design the propeller is much deeper underwater than boats that are not intentionally trying to create a large wake. While few if any wake boats are fitted with depth finders, there is other information available to guide recreational boaters toward deeper water. With today’s technology, it is much easier than before for state agencies or other entities to gather lake depth data and produce maps showing depth contours. Check with your state’s Natural Resources agency to see what lake maps may be available.

Another reason for wake boat operators to avoid shallow water is to minimize contact with aquatic vegetation. This will protect native vegetation from damage and will lessen the fragmentation and spread of invasive plant species. Vegetation fouling the propeller is certainly a nuisance to boaters and should cause wake boat operators to want to avoid these areas anyhow. For the sake of the health of the lake, the answer is not to perform more weed control in shallow

water; the solution is for boaters to move to deeper water to avoid plants.

When wake boat owners move from one body of water to another, the greatest risk is the movement of aquatic invasive species. All boaters, not just wake boaters, should adopt practices to stop the movement of aquatic hitchhikers. Simple steps such as draining water from all parts of the boat, removing aquatic vegetation from the boat and trailer, and drying or decontaminating all parts of the boat that came in contact with the water are reasonable procedures to reduce the likelihood of transporting unwanted organisms. Unfortunately, the drying and decontaminating step can be problematic when dealing with the enclosed ballast tanks of wake boats. Check with the boat manufacturer to determine a method to treat the ballast tanks before visiting a different body of water.

It is not simply incumbent on wake boat operators to lessen the negative impacts of higher waves created; lake residents also play a key role. Flat-faced, vertical, bulkhead seawalls deflect most of the wave and its energy back toward the center of the lake causing additional lakebed erosion and suspension of sediment and nutrients. Irregular or natural surfaces actually dissipate wave energy. Lakefront owners can greatly improve the health of a lake by installing

living, bioengineered shorelines that utilize native plant materials to protect shorelines. Other options providing some improvement over concrete or sheet-pile seawalls would include the installation of glacial stone seawalls or placing glacial stone on the face of a vertical seawall.

Another action shoreline owners can take is to maintain some submergent and emergent vegetation in the shallows of the lake. Aquatic vegetation does a remarkable job at dissipating waves, protecting shorelines, stabilizing sediment, and locking up nutrients. Low-speed, high-wake boating is the rage and certainly will continue. We just need to learn how to manage the wave all the way from the wake boat driver to the shoreline property owner in order to reduce the negative impacts of this boating style to protect our lakes.

Doug Keller is the Aquatic Habitat Program Manager with Indiana DNR – Division of Fish and Wildlife. In his 28-year career with the Division he has also had roles as a district fisheries biologist and the Aquatic Invasive Species Coordinator. 🐟



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Protecting Water Quality & Resuspension Caused by Wakeboard Boats

Heather Harwood

A Conservancy's View

As a lake area conservancy charged with protecting and maintaining good water quality, the Wawasee Area Conservancy Foundation (WACF) has installed pollution and erosion control projects for over 20 years. Projects include streambank stabilization, wetland restoration, sediment basins (allowing sediment to settle out), and agricultural projects keeping topsoil on the fields. With the help of willing landowners and many partners including the IDNR Lake and River Enhancement, the Elkhart River Restoration Association, and the Great Lakes Commission, we have kept over 40,000 tons of sediment out of lakes and streams in our watershed.

But with all that effort, sediment still gets into our lakes and streams, and over the years has accumulated. This bottom sediment is now our biggest challenge. These days, instead of thinking about projects upstream, we are thinking about the sediment already in the lake, thus the current focus: keeping sediment out of the water COLUMN. Stirring up sediment clouds turbidity and releases phosphorus from the lake bed. Our goal: to leave that sediment alone as much as possible.

Responsible Boating Campaigns

The first line of defense on stirring: *responsible boating*. Being aware of the shallow areas, and staying in deep areas while wake boarding and surfing. This has a huge impact on slowing resuspension in the lake, helping turbidity, and keeping algae blooms down. Included in Figure 1 are examples of our efforts to spread the word at local marinas and public launch ramps.

Wawasee, Indiana's largest natural lake (3,060 acres) has large shallow areas

Effortless Steps to a Clean, Clear Lake



Lake Wawasee

■ 0-10 Feet

PHOSPHORUS

- **DON'T USE IT!**
- Seaweed uses phosphorus to grow.
- Tell your local supplier or lawn care provider that you only want zero phosphorus fertilizer.
- Once released into the lake it stays in the sediment.

PRESERVE OUR LAKE BOTTOM

- Stirring lake bottom suspends the phosphorus.
- Accelerating in shallow water creates sediment plumes.
- Shallow water is highlighted above in blue.
- Wakeboard and surf in deeper water (you will have a larger wake anyway).
- Begin pulling skiers and tubers in deep water.

DIMINISH WAVE ACTION

- Consider Glacial Rock in front of your seawall.



PLEASE RESPECT BUOYS AND PROTECTED AREAS

Figure 1. WACF's signs and refrigerator magnets stressing the importance of avoiding stirring the lake bottom (and including a bathymetric on the magnet).

susceptible to stirring. Up to half of the lake's surface area is less than 10 feet deep. We encourage deep draft boats to stay in the deep areas for wake boarding and surfing (Figure 2). Our campaign: "Be Wake Cool" (Figure 3).

Under Indiana law, a person may not operate a motorboat at a speed greater than 10 mph on a lake having less than 300 surface acres. This law is intended to provide safe boating speeds on small lakes and to protect small lakes from excessive boat wakes. However, since wakeboats operate at less than 10 mph, these small lakes will not be protected from excessive wakes or the lake bottom scouring and shoreline erosion that can occur.

We absolutely do not discourage boating on Lake Wawasee – but we do encourage *smart boating*. By publishing the bathymetric maps regularly (Figure 4) and providing these maps as reminders, we hope to continue to have an impact on boating awareness. Our long-term goal is to add a boating education center on site at our Lake & Watershed Education Center.

Deep drafting ballast boats are more and more common on Lake Wawasee and



Figure 3. "Be Wake Cool" campaign sign.

other Indiana lakes. Directing boats to the best places to wake board and surf in the lake will be key to protection of the bottom. Damage has already occurred. Prop scarring of the lake bottom is visible in aerial images (Figure 5).

Regulated Ecozones

Another tool WACF has used to encourage smart boating is the establishment of ecozones. Ecozones were established by the State of Indiana in 2000 to protect significant ecological areas within lakes where the use of



Figure 2. Typical surfing wave.

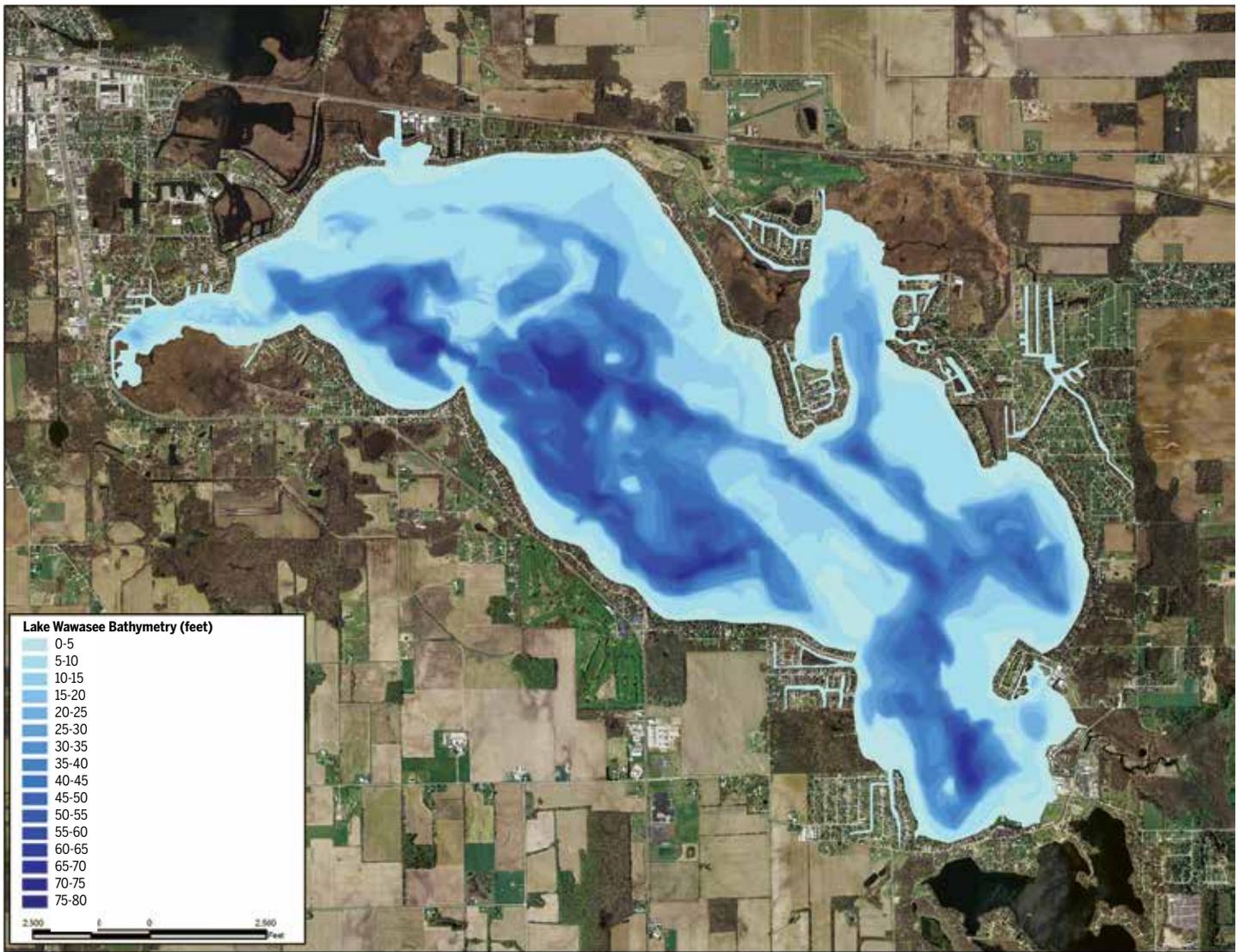


Figure 4. Wawasee's bathymetric map.

watercraft may be limited or prohibited for fish, wildlife, or botanical resource management, or for the protection of users. Wawasee was the first lake in Indiana to establish ecozones. In four areas where perimeter wetlands are contiguous, WACF has special designated and regulated ecozones defined by white "Idle Only" buoys (Figure 6). These wetlands are vital to the health of our lake and a healthy sustainable fishery. These buoys are installed and removed by volunteers in the spring and the fall of each year.

As we gain more experience with wake boats, we will continue to examine and identify more options to relieve the pressure from deep drafting ballast boats and the waves they create. The WACF is committed to working together with recreational lake users and encouraging

good lake stewardship. WACF completed a Carrying Capacity Study in 2004 to measure the magnitude of effect from motor boating activity. Dudiack (2004) suggested that a conservative estimate of a lakes' motor boat carrying capacity is around 15-20 acres of usable lake area per boat. On most given days, that is easy to meet. But on a busy weekend, Lake Wawasee can become over-crowded, resulting in some of these wave action and bottom scarring stresses on the lake.

Healthy Shorelines

Wake boarding and surfing create larger waves that, as a result, create a greater demand for shoreline protection and seawalls. WACF encourages natural shorelines and glacial stone seawalls to help break up the wave action. With every permit application for concrete

seawalls around the lake, WACF contacts the applicant and explains advantages of stone seawalls and sends out our "Stop the Chop" brochure on the advantages of glacial stone to absorb the wave action. Glacial stone can absorb wave action better than concrete seawalls, improving swimming areas and back wash that scrubs the bottom of the lake.

So – "Stop the Chop" and "Be Wake Cool"!

Heather Harwood,

ASLA, is a landscape architect and has been executive director of the Wawasee Area Conservation Foundation for 20 years. 🌿



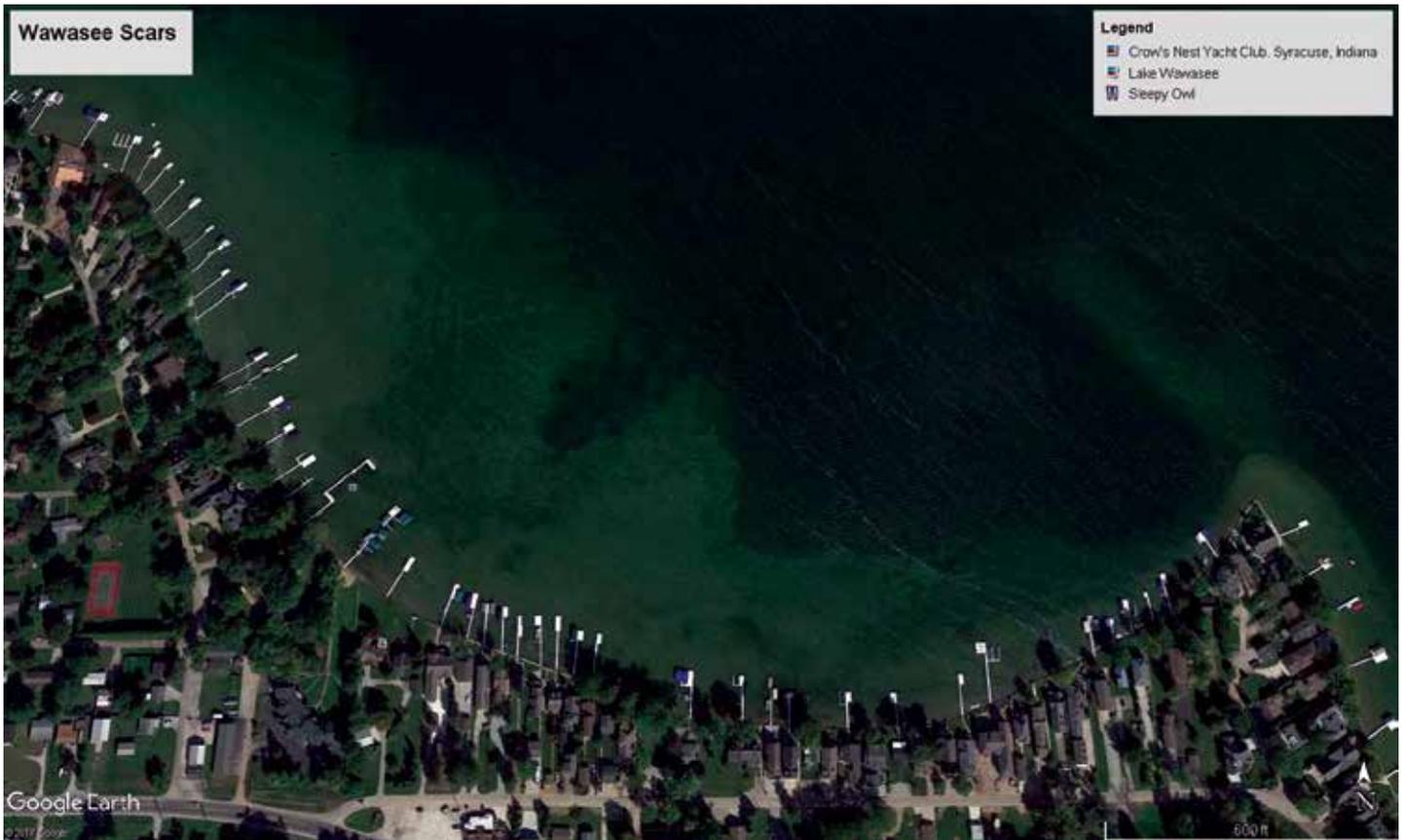


Figure 5. Propeller scarring on the bottom of Lake Wawasee are seen as thin, straight lines.



Figure 6. Eco-Zone buoy.