



The Lake CONNECTION

Going bottomsides”: boating impacts in lakes

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In Wisconsin, boating is one of the most popular summer recreational activities. Many thousands of hours are spent each year fishing, skiing, or just enjoying the water from boats. On many lakes, increased boating pressure and larger boats and motors are leading many to ask the question “what impacts are all these watercraft having on Wisconsin’s water bodies?”

Operating boats can have an impact upon lake ecology and water quality. One obvious impact is when a propeller or jet cuts plant shoots or uproots entire plants. In shallow areas with high boat use, research has shown vegetation decreases due to contact with boat propellers and bottoms.

Another impact is when boat-generated waves erode the shoreline. This problem can be larger in areas already altered by development and lacking natural stabilization, such as aquatic vegetation, that can provide a natural buffer against wave and wind turbulence. Higher rates of shoreline erosion have been documented and conclude from field investigations that boating was responsible.

One of the more difficult impacts to understand is how boating mixes bottom sedi-



ments. In part, this is hard to understand because it can be difficult to see from the helm. Unfortunately, resuspended sediment can alter the lake by decreasing water clarity, increasing nutrient levels, redistributing sediment in the lake, and altering plant, invertebrate and fish habitat. This summary was prepared to take us under and behind the watercraft to examine some of the research on the impact of boating on sediment in lakes

The Physics of Boating

A simplified way to look at motorized watercraft is that push against the water behind the boat as they move forward. Because the water is a fluid, it

moves backward as the boat is pushed forward. If this backward movement extends to the lake bottom, it can disturb or resuspend sediment. Predicting how much sediment will be disturbed is complicated because it depends on the angle of the boat, motor size, and the size and type of sediment.

Although more research is needed on this topic, one interesting observation made by several researchers is that the water movement at the lake bottom, and therefore the likelihood of resuspension, can be lower at both fast and slow boating speeds than it is at intermediate speeds. That occurs because the angle and amount of water movement is great-

est when the boat is pushing harder, but moving slower and is tilted upwards. Under those conditions, there can be more backward water movement directed towards the lake bottom.

As anticipated, there will also be more disturbances in shallower water because the water movement will be greater closer to the motor. As a result, sediment resuspension can be greatest when boats are starting or accelerating in shallow water because this combines relatively large amounts of backward water movement with a bottom relatively close to the motor.

Stirring up the Bottom

Clear water is an important visual attribute for all lake users and is essential for healthy aquatic life. Stirred up sediments affect aquatic organisms ability to find shelter, forage, and reproduce. Disturbed lake sediments may also release nutrients that are stored in the sediments and support undesirable algal blooms.

Not surprisingly, there is research demonstrating that boating can lead to elevated sediment in the water, but it also shows how difficult it is to generalize the impact of a specific boat on resuspension. Researchers have shown that a larger boat and engine size are more likely to disturb bottom sediment. They have

also shown that stirring up the bottom depends on characteristics of the lake bottom. For example, smaller particles and less dense sediment is easier to resuspend. They have also shown how resuspension is more likely in shallow water because the water movement from the watercraft is more easily transmitted to the lake bottom.

Therefore, on a particular lake, understanding resuspension requires an understanding of boat size, boat operation, and how sediment characteristics vary with water depth or location. On many lakes, bottom characteristics are not uniform and smaller sediment particles are found in deeper or protected areas of the lake that are not as frequently mixed by the wind.

Once sediment is resuspended in the lake, it can also settle in a different location. Deeper or protected parts of the lake, for example, are usually areas of finer sediment accumulation. If fine sediment from these areas is resuspended, it may remain suspended for hours or days before finally settling in areas more likely to be impacted by wind resuspension. It can then be resuspended many times before finally settling again in more stable areas. As a result, the sediment suspended in the lake at any time reflects not only the char-

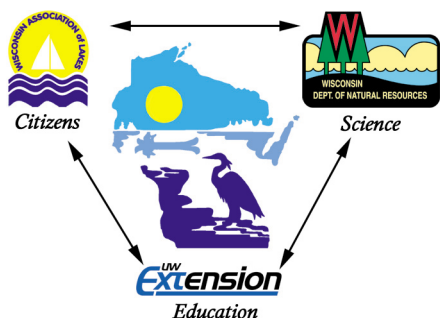
acteristics of that resuspension event, but also the pattern of sediment redistribution resulting from previous boating or wind resuspended sediment.

Controlling Resuspension

Some bottom sediment resuspension is inevitable on all lakes as wind and waves naturally move sediment particles around, but accelerated resuspension linked to watercraft activity can be controlled. The available research on sediment resuspension provides some ideas that we can begin to incorporate into our boating and our lake management.

First, remember that even relatively low boating speeds can have an impact on bottom resuspension. That suggests that in no-wake areas, boaters should strive to remain no-wake. Second, the research suggests that both lake and boat characteristics should be included when establishing no-wake areas. Resuspension will vary with water depth, sediment properties, motor size and boat operation, so management strategies may need to be more specific and may also need to vary from lake to lake. Hopefully, with an increased understanding of sediment resuspension, we can improve our lakes and protect them into the future.

Wisconsin Lakes Partnership



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