



Wake Boats – An Overview

Presentation to the BCL PRD
January 18, 2022

*Note this is presentation for the BCL PRD, and has not been produced by, nor endorsed by the BCL PRD

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What is a Wake Boat?

Wake Boats are specifically designed to create large wake, with said wake being used by riders for a more intense experience

Wake Boarding – Similar to water skiing, using a tow rope



Wake Surfing – No tow rope use. Wake propels rider forward



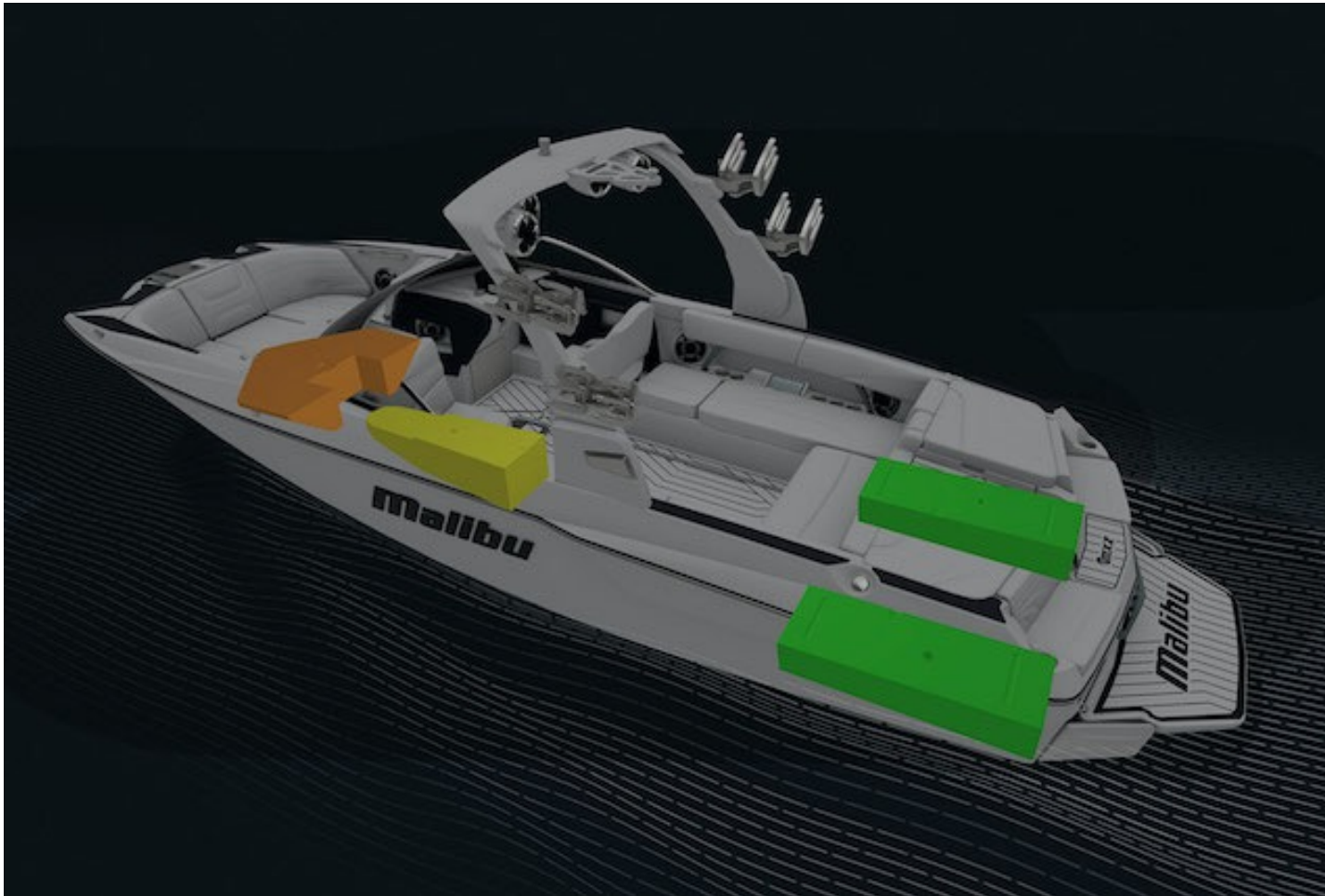
How are the Boats designed?

Wake Boat hulls are specifically designed to create large wake, with said wake being used by riders to allow a surfboard to be propelled forward. Some boats use fins attached to the outside (as shown below)



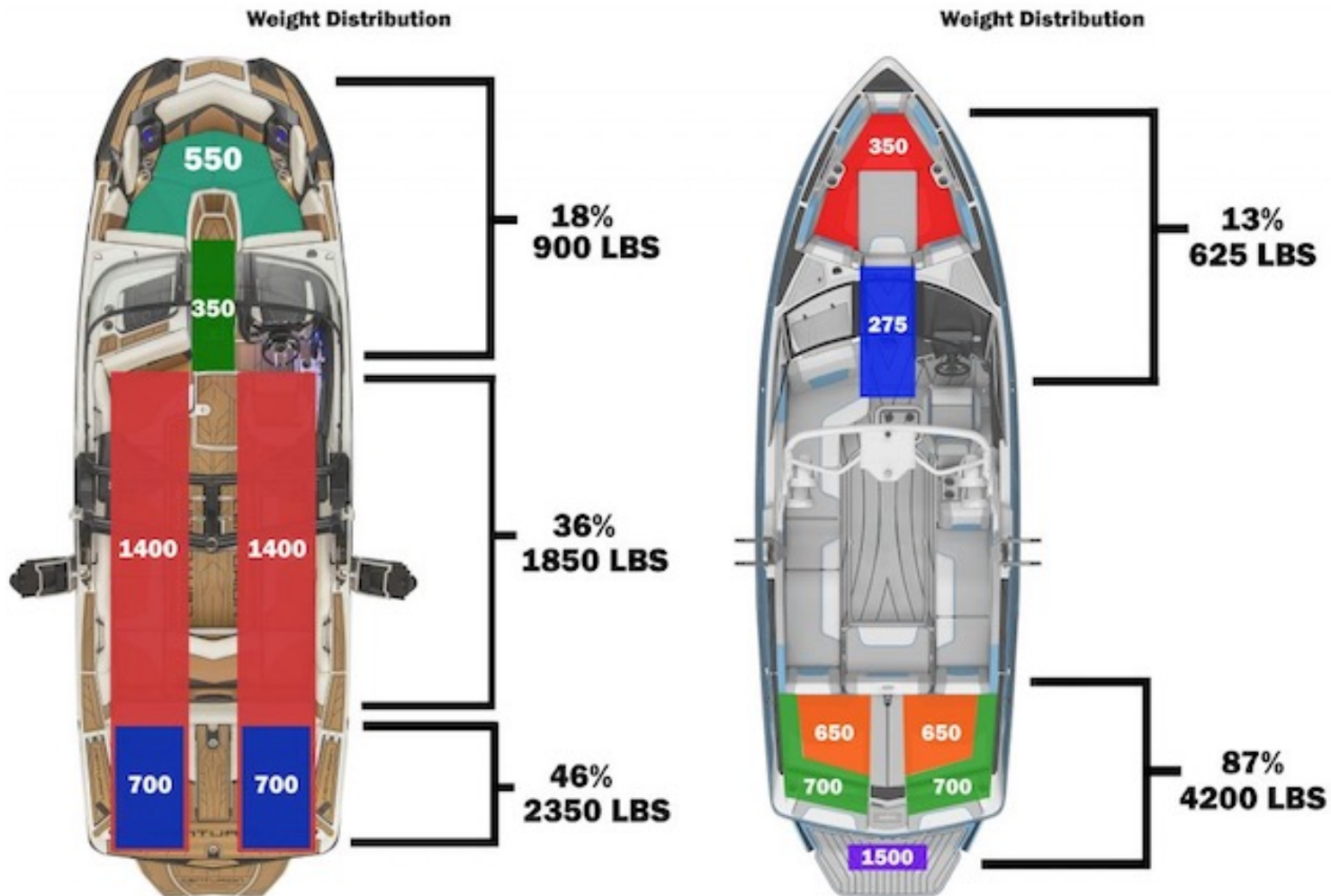
The Role of Ballast Tanks

The Ballast tanks (shown below) are able to be filled and discharged with water, to enable certain performance characteristics. Typical boats will have 200-500 gallons of ballast tank capacity



Ballast Tank Weight Distribution

Fi25 vs. 25 LSV Weight Distribution



*BoardCo Boats sales brochure showing impact of ballast tanks

Wave pressure directed downward

Previous studies of powerboats show that the most damage to the lake bottom occurs when a boat is trying to reach a plane. Wake surfing is made possible by keeping the boat in a perpetual plane state

WAKE SURFING
10 mph

WAKEBOARDING
20 mph

WATER SKIING
32 mph



The Power of the Wake - Height

Boat Wake Impact Analysis – Lake Rabun and Lake Burton, Georgia

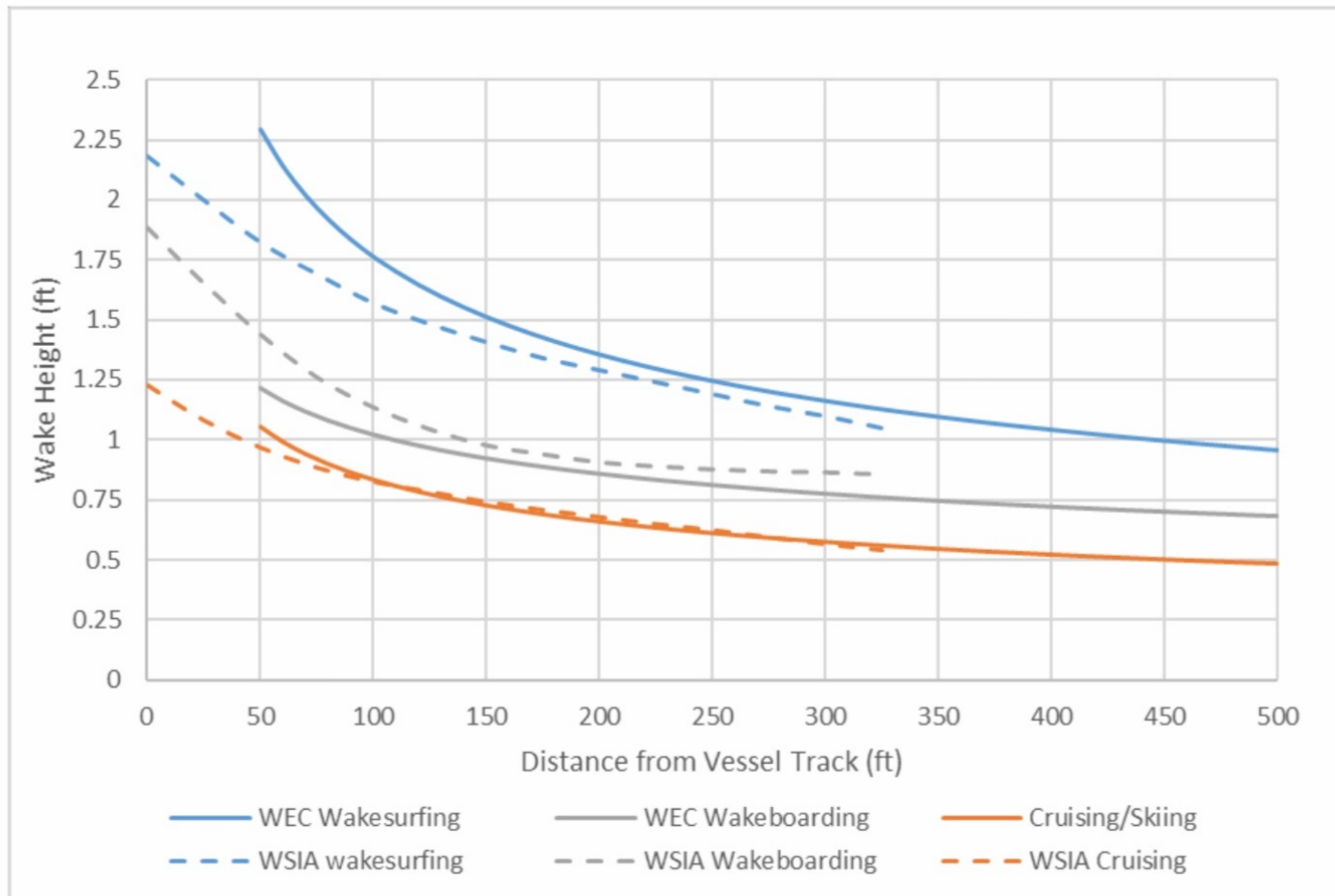


Figure ES-1. WEC measured wake heights and wake attenuation compared to WSIA study (digitized deep water curves from Goudey and Girod 2015)

The Power of the Wake - Force

Boat Wake Impact Analysis – Lake Rabun and Lake Burton, Georgia

Table ES-2. Wave energy at the shoreline and percent increase compared to cruising vessels

| Vessel Distance from Shore (ft) | Energy (ft·lb) | | | Percent Increase | |
|------------------------------------|----------------|-----------|----------|------------------|----------|
| | Cruising | Wakeboard | Wakesurf | Wakeboard | Wakesurf |
| 100 | 2587 | 4346 | 17621 | 68% | 581% |
| 150 | 1964 | 3549 | 12948 | 81% | 559% |
| 200 | 1615 | 3073 | 10405 | 90% | 544% |
| 250 | 1387 | 2749 | 8782 | 98% | 533% |
| 300 | 1226 | 2509 | 7646 | 105% | 524% |
| 400 | 1008 | 2173 | 6144 | 116% | 510% |
| 500 | 866 | 1944 | 5186 | 124% | 499% |

- ✓ Note 2,587 energy (ft-lb) at cruising versus 17,621 Wakesurfing at 100 feet from shore
- ✓ Going further from shore only marginally helps, since force is still 5x a normal wave at 500 feet
- ✓ Most studies show you need at least 700+ feet of distance to bring wave to "normal". University of Quebec study showed 1,000 feet.

Wakesurfing Impact Video



*Boat approximately 400 feet from shoreline. Video taken on October 1, 2022

Normal Boat Waves Video



*Boat approximately 250 feet from shoreline. Video taken on October 1, 2022

Wakeboat waves – Collateral Damage

- ✓ Shoreline Erosion
- ✓ Pier Damage
- ✓ Difficulties for pleasure boaters, traditional water skiers, fisherman, kayakers, swimmers and sailors
- ✓ Ecological Damage not seen by boaters
 - ✓ Numerous recent studies showing aquatic vegetation uprooted as deep as 17 feet below the surface.
 - ✓ Studies showing sediment stirred up causing bad algae, and dormant chemical layers such as arsenic may be re-released. Water turbidity can impact vegetation as well
 - ✓ Fish nests upended by wake
 - ✓ Shore nesting birds and other species upended (Minnesota Loons)

Collateral Damage – UW Vegetation



Weed bed on southeast shore of BCL on 6-1-2014

Collateral Damage – UW Vegetation



Same exact area on southeast shore of BCL on 7-1-2022

Fisherman noticing loss of vegetation

WISCONSIN (change)

LAKES REPORTS FORUMS CLASSIFIEDS

Displaying 1 to 10 of 6,388 posts

ALL POSTS ▾ SORT DESC ▾ ALL DATES ▾

12/27/22 @ 1:51 PM ↑

FISHING REPORT

MCC1364 ●
User since 7/2/22

● **Waxing Crescent**

Was here Monday no bites. This lake like others in area has glass ice, or whatever it's called. It is really cool because it's like looking through a window. You can see everything in shallow water. There are no standing weeds on North end. Won't fish here again this winter. Ice is 8+ inches.

LIKE

Report Abuse

*Lake Link Fisherman message board for BCL – 12/27 to 1/1/2023

Fishing Discussion (Cont.)

12/29/22 @ 7:02 PM



FISHING REPORT



Mickel

User since 6/10/18



☾ Waxing Crescent

☁ Cloudy

Ice: 6"

Gil, I too would like an explanation for the weed loss. I ice fish this lake ALOT and I noticed this for the first time last winter. Went to all my normal GPS marked spots from previous years and the thick weeds that were always there were gone. Was on the lake yesterday and same thing, nothing but dirt or sand grass below me...

👍 LIKE 2

Report Abuse

12/30/22 @ 10:22 AM



CedarLakeSlobber

User since 7/7/18



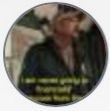
Gil, I have noticed an incredible loss of weed growth in the last few years. I used my camera yesterday scouting for weeds around the lake and it's strictly sand/sand grass. I have no answers as to why, but all I can say is what I saw, which was nothing (except a juvenile 13" pike destroying perch).

👍 LIKE 3

Report Abuse

Fishing Discussion Cont.

1/1/23 @ 1:36 AM



fish-sl@yer

User since 12/21/07



Gil - As others have pointed out, and as someone who fishes this lake regularly (and has for 20+ years): the lack of weeds over the past 1-2 years, especially, has been noticeable.

Regular spots for ice fishing I've had marked on my GPS for years, are dead zones now. Last winter I spent more time just drilling holes and dropping the camera down to find weeds. When I would, the number, the size, and the diversity of the fish around just isn't what it used to be.

Based on nothing other than my experience, and the word of other fisherman, I can only speculate what's happening. The DNR is an unreliable source, as they'll say the population of fish is "healthy", but empty livewells and undersized fish tell another story. It seems more and more like the residents of the lake want to keep the traffic of fisherman off the water so they can have the lake to themselves for non-fishing enjoyment, and killing the weeds off is less noticeable than killing the fish. ????? just my 2 cents.

LIKE 2

Report Abuse

Invasive Species and Ballast Tanks

Wakeboats regularly intake and discharge hundreds of gallons of water from the ballast tanks. BCL may become a lake of choice for wake boats in SE Wisconsin

BCL known invasive species*

- ✓ Zebra Mussels – first appeared in 2000 (prefer depths < 30 feet)
- ✓ Banded Snail – 2016 seen at Gonring Boat launch
- ✓ Chinese Mystery Snail – 2018 seen at Gonring boat launch

Potentially coming to BCL

- ✓ Quagga mussels (In Lake Michigan now, not in BCL. Can thrive at 100ft+ depths)
- ✓ Spiny Water Fleas (In Lake Michigan now, not BCL. They destroy beneficial zooplankton)
- ✓ Starry Stonewort (present at Little Cedar Lake boat launch)

*2018 study (Doll – University of MN) showed wakeboat ballast tanks contained **247 Zebra mussel veligers** (larvae) per sample versus only **13 veligers per sample** of standard boat bilges*

*Same study showed 95% of veliger dies **within 5-hours** in livewells, compared to **48 hours** for >95% mortality in ballast tanks*

*Source – Wisconsin DNR

The First Ordinance - 2009

City of Mequon and Village of Thiensville both adopted these:

Sec. 90-5. - Prohibited equipment.

(b) Any device, including water sacks, ballast or submersible wing, which is being used to cause a boat to operate in a bow-high manner, or to increase or enhance a boat's wake. (Code 1957, § 11.01(11)3.(c) ; Ord. No. 2009-1281, § I, 8-11-2009)

Sec. 90-17. - Prohibited operation to enhance wake.

No person may operate a boat in an artificially bow-high manner, in order to increase or enhance the boat's wake. Such prohibited operation shall include wake enhancement by use of ballast, mechanical hydrofoils, uneven loading or operation at transition speed. Transition speed means the speed at which the boat is operating at greater than slow-no-wake speed, but not fast enough so that the boat is planing. (Ord. No. 2009-1281, § I, 8-11-2009)

Milwaukee Journal Sentinel article - May 31, 2010

Education Campaign didn't work

"Efforts to talk with offenders and get them to limit their hours or location weren't very successful.

'They pretty much told us, 'We can do what we want,' " Knuth said, and so research began on the ordinance.

*Rob Flunker, 21, said he used the river several times a week to wakeboard, with ballast in his specialized boat. He said he lives two minutes from the river, **but now has to travel 30 minutes** or more to a lake without restrictions on wake enhancement"*

What are other lakes doing?

Town of Hayward – 2021 Ordinance – Applies to all lakes in the Town

Wake Protection Ordinance adopted 7-13-2021

“No person shall operate a motorboat, as defined in s.30.50(6), Wis. Stats. On the waters within the town of Hayward, Sawyer County in a manner to enhance an elevated wake for over 50 feet in length closer than 700 feet from any shoreline, dock, pier, raft or other restricted area(s) within the Town of Hayward, Sawyer County. An elevated wake is a trail of disturbed water left by the passage of a watercraft in excess of 24 inches. Such prohibited operation shall apply to wake enhancement watercraft by the use of ballast, mechanical hydrofoil(s), uneven loading or operation at transition speed. Transition speed means the speed at which the boat is operating at greater than slow-no-wake speed, but not fast enough so the boat is planning.”

What are other lakes doing?

Crystal Lake – Sheboygan County – Town of Rhine

Wake Protection Ordinance adopted 4-13-2021

Sec 5.13 ARTIFICIAL WAKE ENHANCEMENT PROHIBITED ON CRYSTAL LAKE

(1) Prohibited Equipment. No person may use or employ on Crystal Lake water sacks, ballast tanks, submersible wings or any other device which causes a boat to operate in a bow-high manner, or which increases or enhances a boat's wake

(2) Prohibited Operation. No Person may operate a boat on Crystal Lake in an artificially high bow-high manner in order to increase or enhance the boat's wake. Such prohibited operation shall include wake enhancement by the use of ballast, mechanical hydrofoils, uneven loading or operation at transition speed (the speed at which the boat is operating at greater than slow-no-wake speed, but not fast enough so that the boat is planning).

What are other States doing?

State of Michigan DNR – Fisheries Division – Report dated September 1, 2022

Fisheries division requesting legislative action for wakeboats to operate at least 500 feet from shore and in waters at least 15 feet deep. They also want strict ballast tank cleaning regimens implemented to protect against invasive species.

The MI report cited studies noting that:

- Wakeboat waves can be 1.7x higher than normal boat waves
- Wave energy 5x to 17x greater than normal boat waves
- Wakeboats can cause sediment resuspension in waters as deep as 33 feet
- Most previous wakeboat studies indicate powerboats disturb aquatic vegetation, by implication wakeboats compound this

What does the WI DNR say?

State of Wisconsin Natural Resources Board Meeting

December 14, 2022

Agenda Item #5c – Regulation of Wake Surf Boat operation

Presenter: Lt. Darren Kuhn, Boating Law Administrator, Division of Public Safety and Resource Protection

State has three laws on books relevant:

- ✓ Can't go faster than 'slow no wake' within 100 feet of shore
- ✓ Hazardous wake and wash statute – prohibits motorboats from creating hazardous wake and wash while passing other vessels. Can bring civil suit for damages
- ✓ AIS – All boats must drain all water, including ballast tanks.

Per testimony, problem is that WI DNR does not have the resources to enforce these laws. Not enough personnel, and in the case of ballast tanks, impossible to prove that a particular tank was fully drained

What does the WI DNR say? (cont)

Local Municipalities and Lake Associations:

- ✓ Municipalities may enact local boating ordinances in the interest of public health, safety or welfare, including the public's interest in preserving the state's natural resources
- ✓ Examples include areas of waters with reduced speed zones, distances from shorelines and limiting boating activities by time of day, among others
- ✓ A municipality could also enact an ordinance effectively banning wake boats
- ✓ DNR can help with drafting of any local ordinances
- ✓ DNR provides grants for local boat patrols for enforcement of their local ordinances. DNR can not enforce local ordinances, must be local enforcement
- ✓ Commissioner Frederick Prehm very concerned about AIS and ballast tanks since some can't be drained completely dry. DNR says they have no resources to enforce the ballast drain law. Impossible to enforce. Prehm says this type of environmental damage is a bipartisan issue that is not going away. Damage to bottom of lakes will take years to reverse
- ✓ Bill Smith – NRB Secretary: The Public Trust Doctrine arguably could be used to regulate wake surf activities statewide. Responsibility to address threats and protect resources

Distance requirements problematic

The BCL PRD could require wakeboating to be at least 700-1000 feet from shore and in at least 20-foot water depth, as some other governmental bodies have enacted or recommended

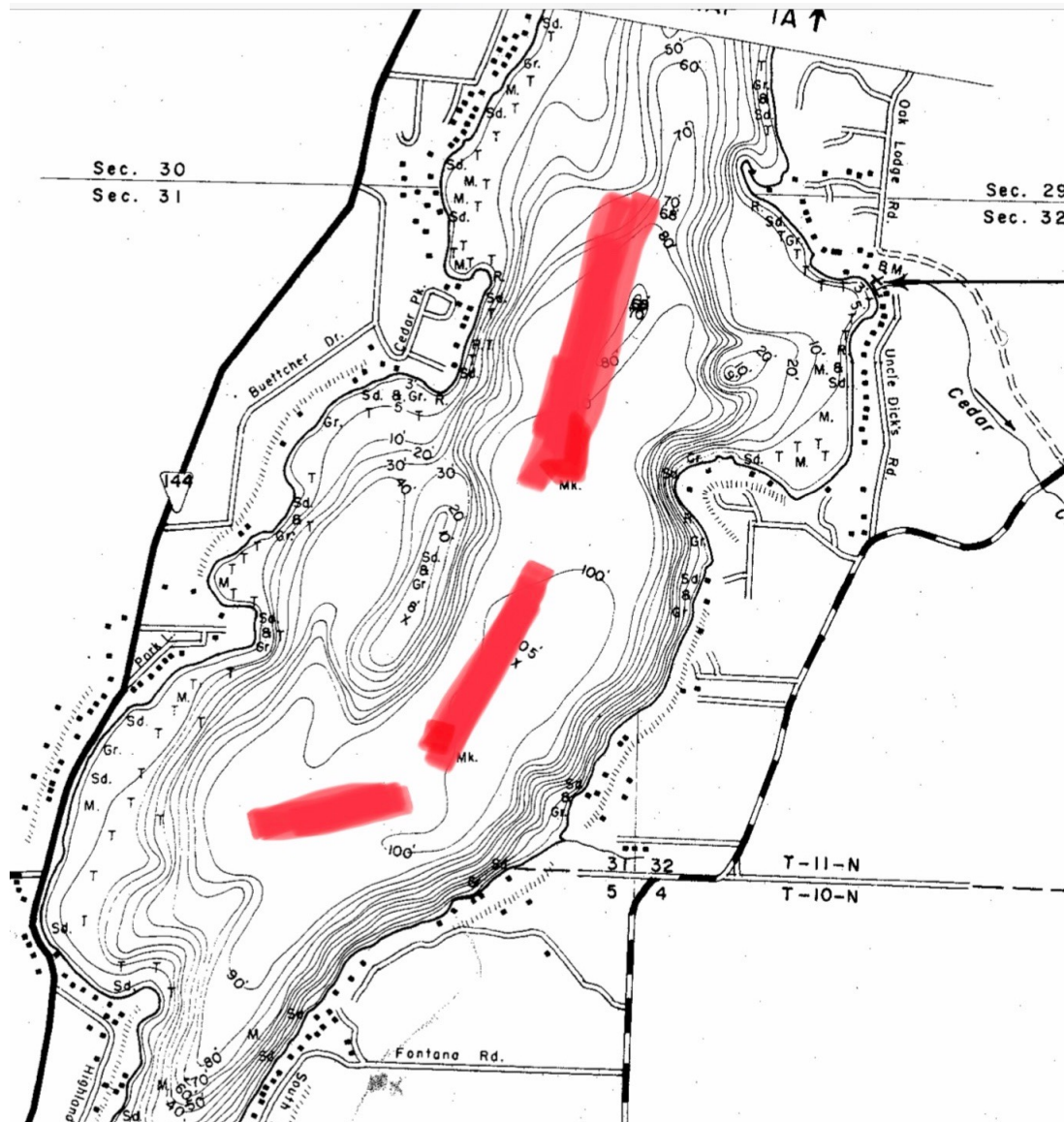
The challenge with this approach is that BCL is extremely narrow. The North End appears to be both too narrow and too shallow for any wake boat activity. The widest shore to shore point on South End is approximately 3,200 feet

Complicating this analysis, is that BCL has a large sandbar or sunken island feature in center where water depth comes up to four feet in places. Critical habitat for the fishery. In years past, this bar did have extensive weed growth.

The outer edge of this sunken island is approximately 1,700 feet from East shore. Inner edge is only 900 feet from West Shore

If you want to protect this area, it means there are only a couple very narrow slots on BCL for wakeboating (see next slide)

BCL Specific challenges



Red zones are only potential wake boat slots that have proper distance from shore, shallow zones, and sunken island. However, those zones complicate main navigational channel for most boats on South end

Summary & Solutions

- ✓ BCL is a unique spring-fed lake, that provides recreational activities for thousands in SE Wisconsin
- ✓ Municipalities and PRD's are allowed to regulate water activities
- ✓ Wake boat regulations to date do not prohibit the boats, nor their use on a given body of water. They only regulate specific activities – i.e. use of ballast and/or wakesurfing
- ✓ Municipalities and PRD's that have implemented said regulations have not faced any legal challenges to date
- ✓ Regulations appear to be extremely popular with residents and lake users based on surveys done in other jurisdictions

Summary & Solutions

- ✓ BCL being narrow and with unique depth contours makes enacting of shore and depth regulations problematic
- ✓ Recommend PRD adopt an ordinance similar to those enacted by other lakes, that place prohibition on use of wake surfing equipment and wake surfing
- ✓ Wake surfers do have many other good alternatives, Lake Michigan and larger acreage inland lakes such as Pewaukee, Winnebago, Big Green, Mendota, etc.
- ✓ As smaller lakes move to prohibit the activity, it will push the boats to Big Cedar Lake

Summary & Solutions

- ✓ While more studies will continue to come out, there are already a plethora of studies currently available. While they differ slightly on the impacts, all agree there is sustained environmental damage occurring
- ✓ BCL does not have a current comprehensive lake plan, nor current vegetation or DNR fish studies at this time.
- ✓ Time if of the essence. Zebra mussels made it to many Wisconsin lakes because authorities didn't move fast enough. Wisconsin spent ten years talking about the situation. Preventative measures only enacted after AIS made it to inland waters
- ✓ Ecological damage to shorelines, wildlife, water quality and the fisheries could take years to reverse

Primary References

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Water Environmental Consultants, Boat Wake Impact Analysis – Lake Rabun and Lake Burton, Georgia, Water Environmental Consultants, Mount Pleasant, SC, January 20, 2021

Cities and Municipalities of Mequon, Thiensville, Town of Rhine, and Sawyer County, current municipal codes

Wisconsin DNR – Board of Natural Resources meeting, December 14, 2022

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