6 COUNTY CONFERENCE 2025, NICOLET COLLEGE

AQUATIC INVASIVE SPECIES AND THE WAKE BOAT VECTOR

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Wisconsin Lake leadership Institute, Crew 11

WAKE SURFING

- They surf, like in the ocean, without a tow rope, 5 to 15 feet behind the boat
- Maintains transition speed, operates at about 10 to12 mph
- Bow up stern down
- Plowing, not on plane
- Propeller is angled downward, over 30 degrees below horizontal
- Causes excessive propeller wash to more than 25 feet below the surface
- Creates large waves to 4.5 ft. that damage the environment and property, and create a safety hazard

SAFETY

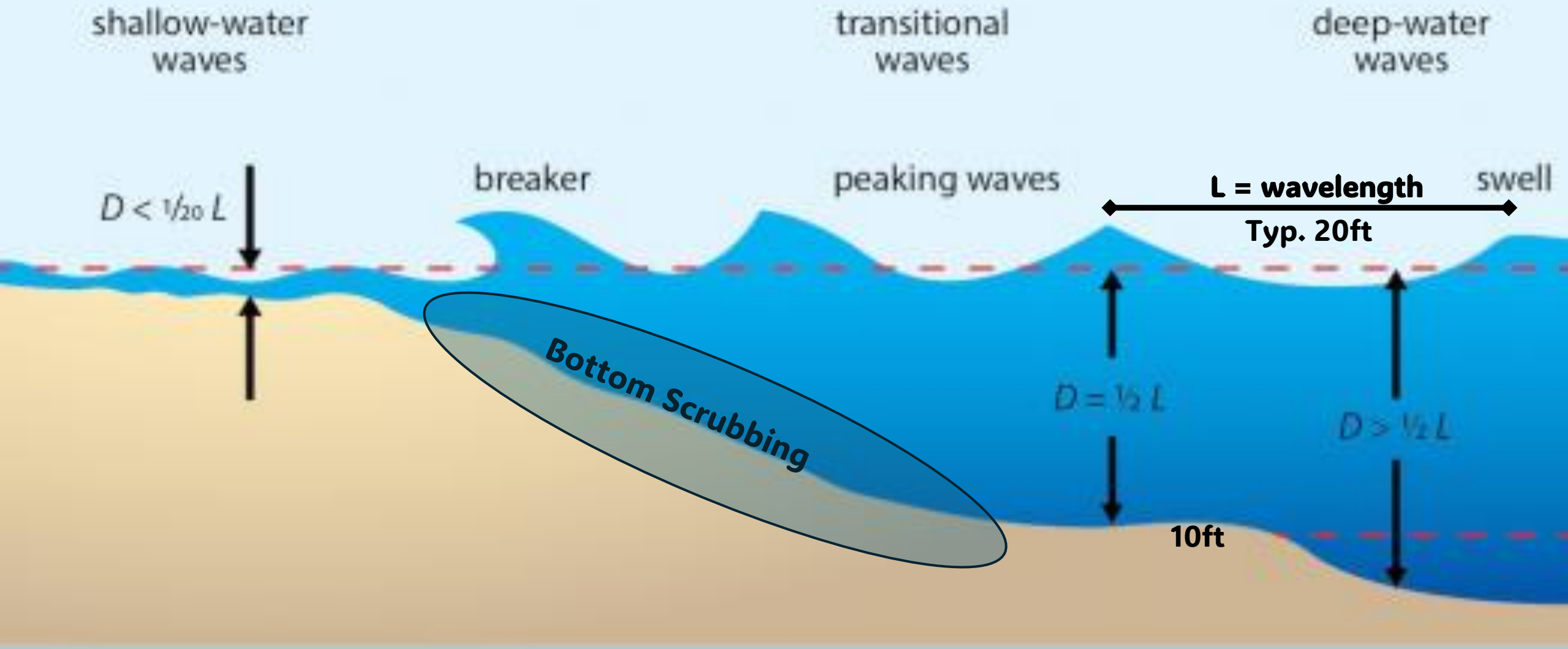
VISABILITY


INJURIES

LARGE WAVES CAPSIZE BOATS

SHORELINE EROSION

Large Displacement Wave Physics



SHORELINE DAMAGE

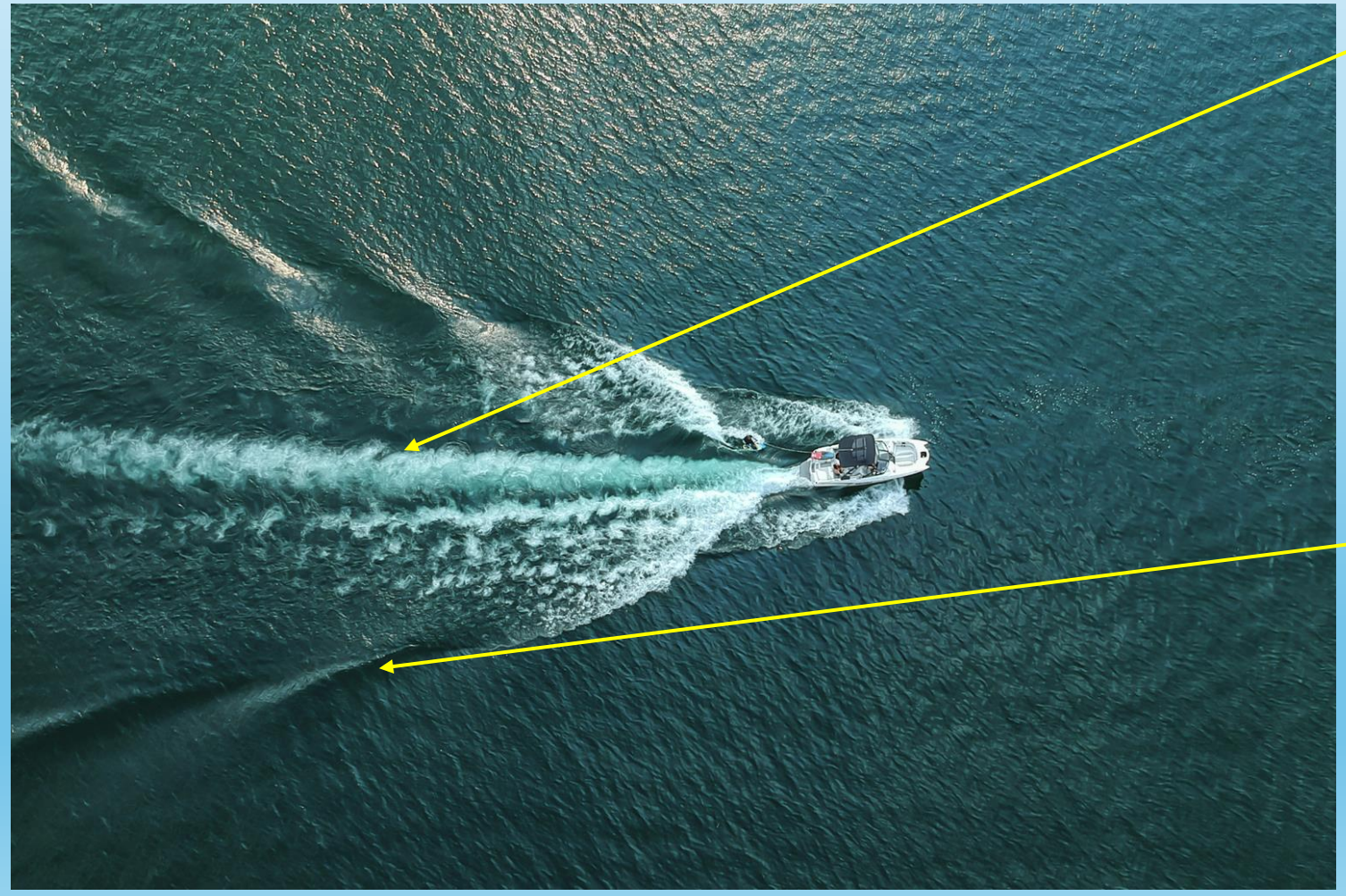
DESTROYED HABITAT


SILTATION KILLS PLANTS

FISH SPAWNING SITES ARE DESTROYED BY BIG WAKES MOVING INTO SHALLOWER WATER

WHAT'S HAPPENING UNDERWATER?

IT'S A ONE-TWO PUNCH!

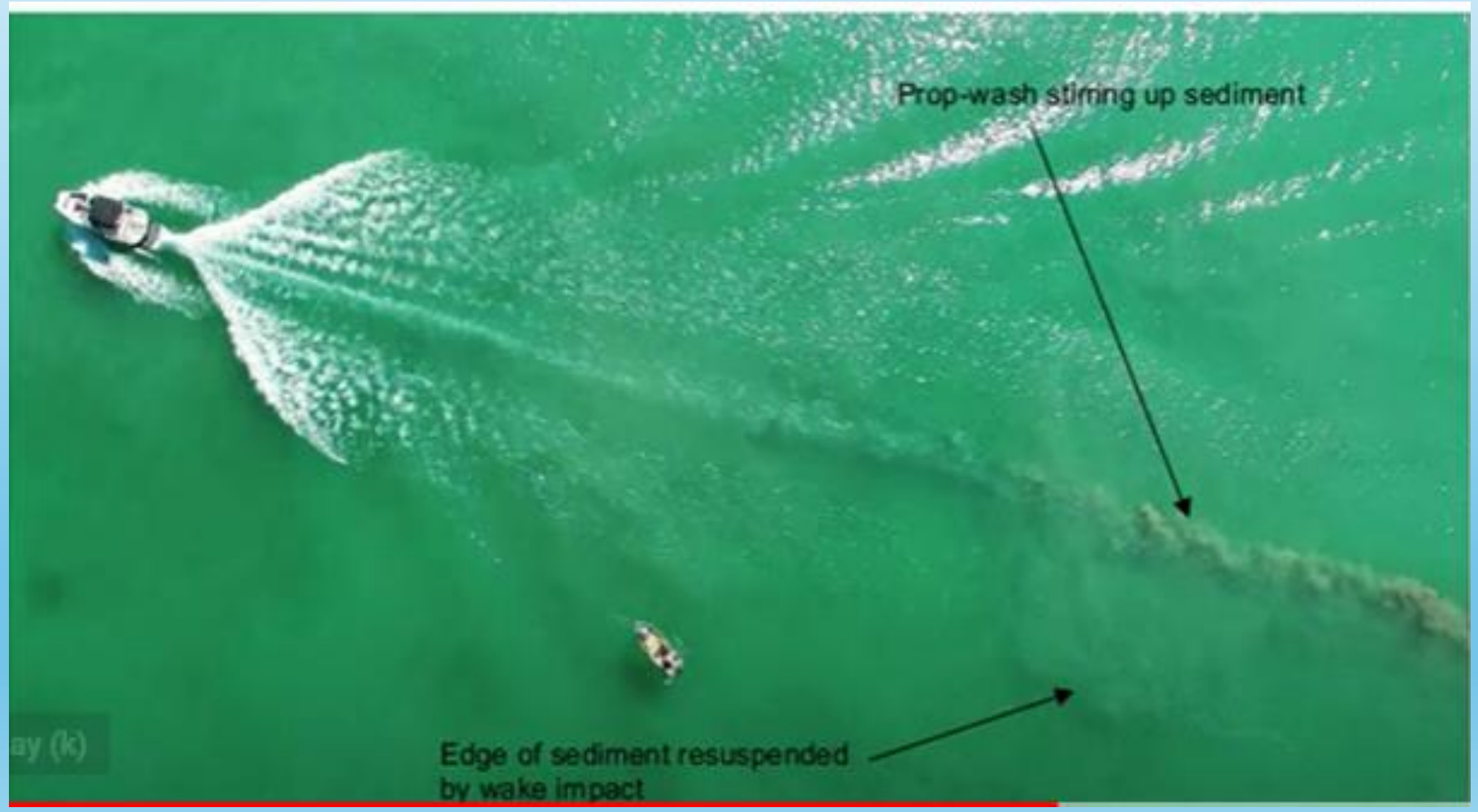


Damage is caused two very different ways:

First, propeller wash directly under the boat's path can scour the lakebed down to 30 feet deep

Second, the waves have underwater energy. Lakebed is disturbed as waves move toward shore and reach water between 8' and 10' deep.

FIRST PUNCH:
THE PROPELLER WASH FROM THE POWERFUL MOTOR AND DEEP DOWNWARD ANGLED PROPELLER



Sediment is disturbed

Plants damaged or uprooted

Fish and wildlife habitat are destroyed

Phosphorus, mercury, and other pollutants are freed

This photo shows what just 20 seconds of surfing can do.

WITH THIS MUCH DAMAGE IN JUST 20 SECONDS, IMAGINE THE HARM BY THE TIME THEY ARE DONE FOR THE DAY!

There is no minimum depth requirement for surfing in Wisconsin.

Studies show a depth of at least 25 feet is needed to avoid propeller wash damage from wakesurfing. Some studies suggest 33’.

A new study ordered by Connecticut shows lake bed severe damage at 26 ft.

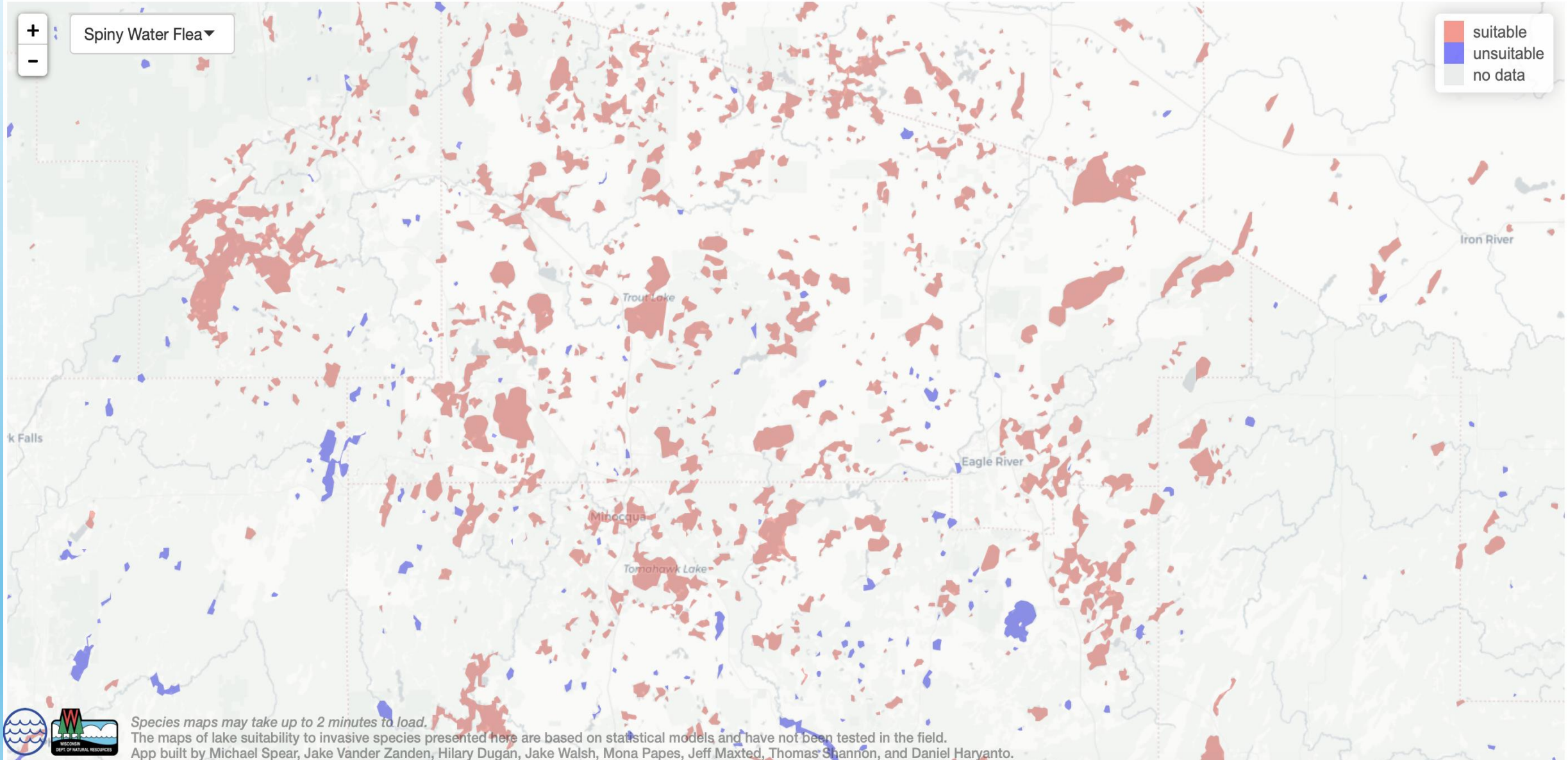
AQUATIC INVASIVE SPECIES

and BALLAST

SPINY WATERFLEA --THEY CAN UPSET THE ENTIRE ECOSYSTEM AND MAKE THE WATER MURKY

- They compete with juvenile fish since daphnia (native zooplankton) are their primary food source.
- As Spiny reduces algae-eating daphnia, phytoplankton (algae) increases and water clarity decreases.
- Tail spines make it hard for small fish to eat spiny waterflea. They are a dead-end in the food web and will eventually lead to fewer big game fish.
- There is no way to eliminate them.
- They are in Trout, Star, Plum, Ike Walton and Stormy Lakes, the Gile Flowage and Butternut I.
- Spiny waterflea has infested more than 20 inland lakes in Wisconsin, 5 in Vilas County.

AIS Smart Prevention Tool 2.0 | Interactive map | About this tool | Species and Model Information



Species maps may take up to 2 minutes to load.

The maps of lake suitability to invasive species presented here are based on statistical models and have not been tested in the field.

App built by Michael Spear, Jake Vander Zanden, Hilary Dugan, Jake Walsh, Mona Papes, Jeff Maxted, Thomas Shannon, and Daniel Haryanto.


Quagga Mussel


Zebra Mussel

This information sheet is no longer being updated. For current information on GLERL projects and programs, visit: www.glerl.noaa.gov/res

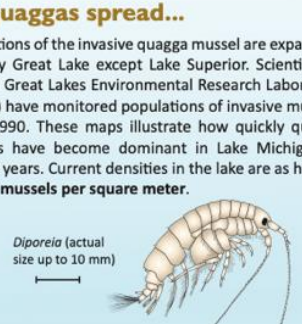
Invasive Mussels

Dramatically Changing the Great Lakes Ecosystem

Many people think of zebra mussels as the most destructive invasive species in the Great Lakes, when in fact they have been "out-musseled" by the closely related quagga. Both are native to Eastern Europe and were introduced to the Great Lakes via ballast water discharged from ships. Zebra mussels arrived in the 1980s and caused widespread ecological and economic damage. Quagga mussels arrived in the 1990s and have since outcompeted zebra mussels. Unlike zebra mussels, quaggas have the ability to adapt to cold temperatures and live in soft sediments like mud instead of requiring hard surfaces. Quaggas also have a longer siphon, the body part that sucks in water to filter out food. Because of these differences, quagga mussels are able to colonize deeper areas of the Great Lakes and have almost entirely replaced zebra mussels in many places. The dominant quagga mussel has become so widespread that the species has completely changed the Great Lakes ecosystem - with harmful impacts to native organisms.

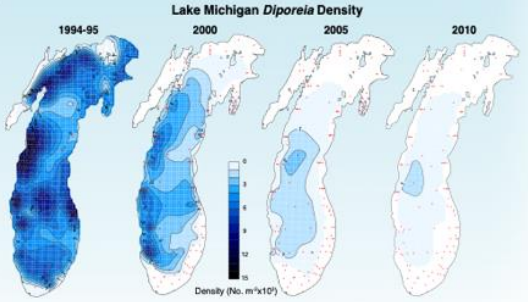
As quaggas spread...

Populations of the invasive quagga mussel are expanding in every Great Lake except Lake Superior. Scientists at NOAA's Great Lakes Environmental Research Laboratory (GLERL) have monitored populations of invasive mussels since 1990. These maps illustrate how quickly quagga mussels have become dominant in Lake Michigan in only 10 years. Current densities in the lake are as high as **35,000 mussels per square meter**.



...*Diporeia* disappears

Diporeia is a native shrimp-like organism about the size of your pinky nail that Great Lakes fish once relied on for food. Researchers at GLERL documented a dramatic decline in *Diporeia* populations in Lake Michigan at the same time invasive quagga mussel populations were expanding. In just 15 years, *Diporeia* densities declined from an average of 5,200 per square meter to only **82 per square meter**. Although exact reasons are unclear, scientists believe it is related to the introduction and expansion of invasive mussels.



NOAA Great Lakes Environmental Research Laboratory • 4840 S. State Rd. • Ann Arbor MI 48108 • 734-741-2235

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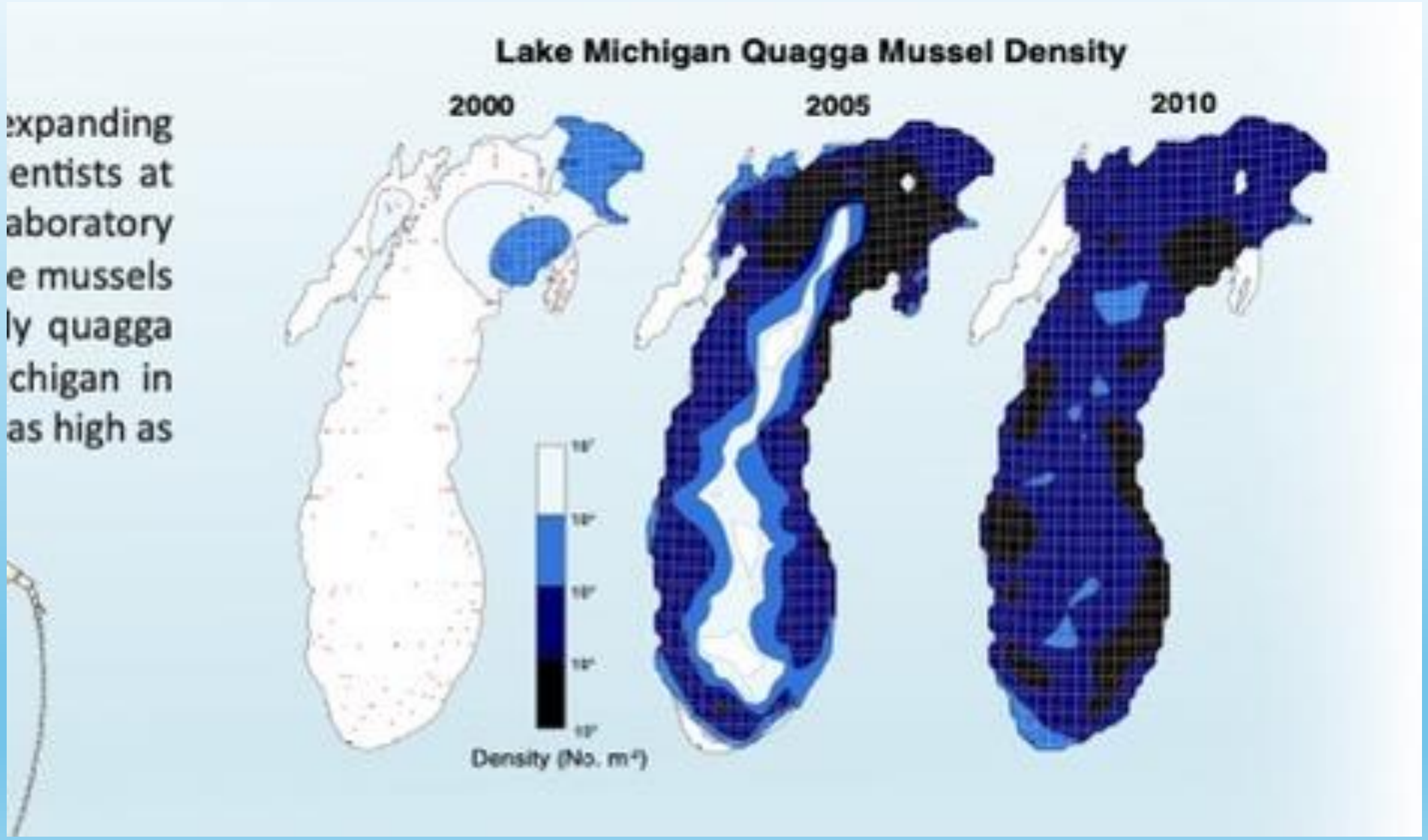

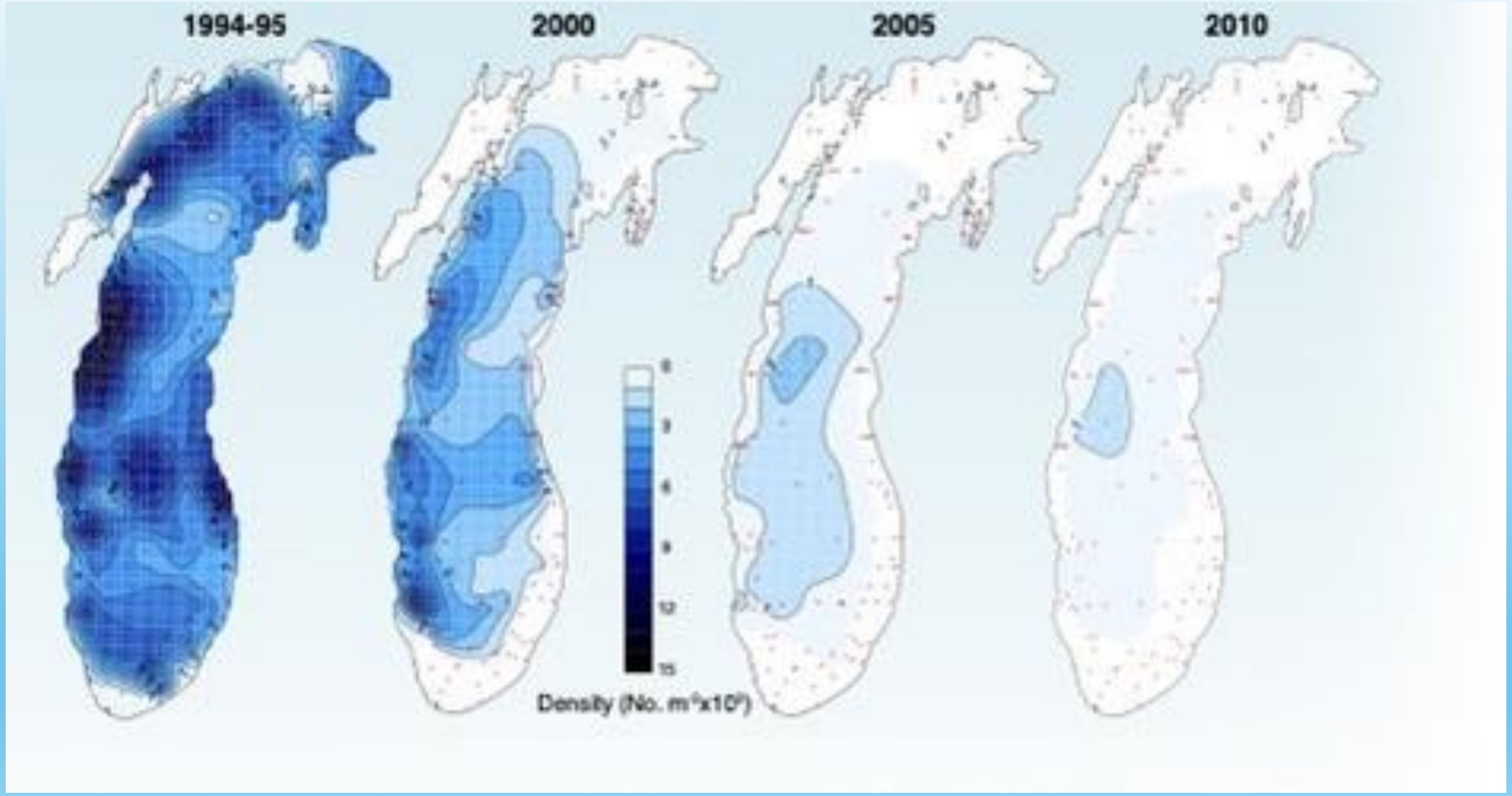
1994-95
2000
2005
2010
0
3
6
9
12
15
Density (No. m⁻³x10³)

- Walleye infected with VHS


THE ORIGINAL
FATSAC
BALLAST BAG CO.


SWELL
FATSAC
SWELL WAKESURF

U of W STUDY "VOLUME AND CONTENTS OF RESIDUAL WATER IN RECREATIONAL WATERCRAFT BALLAST SYSTEMS"

- The study measured water left in aftermarket ballast systems in 13 boats.
- The average was 8 gallons. Two boats retained over 20 gallons each.
- Nine of the 13 sampled boats contained live invertebrates including zebra mussel veligers after more than a week.

UNIVERSITY OF MINNESOTA TEST ON BALLAST CONTENT

- 10 WAKE SURF BOATS TESTED
- BOATS LAUNCHED IN LAKE MINNETONKA
- MINNETONKA HAS ZEBRA MUSSELS
- BALLAST WAS PUMPED FULL AND THEN PURGED
- REMAINING WATER IN BILGE WAS TESTED FOR MICROORGANISMS
- 7 OF THE 10 BOATS CONTAINED LIVE ZEBRA MUSSEL VELIGERS.
- THE DALL STUDY ALSO TESTED RESIDUAL WATER IN STERN DRIVE MOTORS.
- THE VELIGERS FOUND IN THE TWO QUARTS OF WATER WERE ALL DEAD DUE TO THE HIGH TEMPERATURE OF THE WATER, WHICH IS USED FOR COOLING THE MOTOR

FROM MALIBU 2024 WAKE BOAT MANUAL

Refer to pages 121-122 in the manual

Flushing the Ballast Tank System

“These procedures have been developed to help prevent the spread of aquatic invasive species, especially quagga and zebra mussels that attach and infest inside ski/wakeboard boat ballast tank systems.”

Flushing the system with hot water (120°F or greater) kill quagga and zebra mussel juveniles and larvae in seconds and protects water bodies from the many destructive invasive species that hitchhike on trailered watercraft.

But….

How many hot water cleaning systems are readily available in Wisconsin?

NONE

How would we know if the ballasts that can’t be inspected are clean?

WE DON’T.

Malibu and Axis Wakeboat Owners Manuals Say Not to Drain Ballast Completely to Avoid Pump Damage.

This Directly Violates Wisconsin Law!

"Ballast pumps will continue working as long as the controller is on. Therefore, operators must ensure that the pumping is turned off when the outlets show only a minute amount of water is coming out. Leaving the pumps on will result in pump damage."

"Allowing the ballast pumps to continue operating when there is no water to be pumped will result in the internal components being permanently damaged, which is not covered under warranty"

Quote is from page 121 at https://cdn.malibuboats.com/docs/owner-manuals/2024%20Malibu%20Owner%27s%20Manual.pdf?_ga=2.136996405.482784965.1713270232-1686420796.1713270232
The Axis Boats manual is similar, see p 86 at https://cdn.malibuboats.com/docs/owner-manuals/2024%20Axis%20Owner%27s%20Manual.pdf

From the Mastercraft Wakeboat Owner's Manual

Two gallons antifreeze is added to each of multiple ballast tanks to protect residual water from freezing.

This shows they know their ballast systems can't be completely emptied, violating Wisconsin law.

Winterization

Ballast tanks, pumps, hoses and fittings must be properly winterized to prevent freezing damage during winter storage. Because of the complexity of preparing a ballast system for winter storage, as well as the possibility of extreme damage to the ballast system if a preparation error is made, MasterCraft recommends scheduling an appointment with an authorized dealer's service department to have a certified technician to perform all winterization procedures, including ballast winterization. MasterCraft uses a -50 F RV type, nontoxic, propylene glycol based antifreeze to winterize every boat built at the factory. Any antifreeze meeting these requirements is acceptable for MasterCraft engine, ballast, and freshwater system winterization. Be aware that colder climates may require antifreeze with a -100 F temperature rating.

Winterization Process

1. Completely empty all ballast tanks and bags of any water that may be in the ballast system.
2. With all bags still hooked up to the system, identify the ballast thru-hull vents (see guide to each model in this Owner's Manual).
3. **Add two gallons of -50 F RV type nontoxic propylene glycol based antifreeze to each of the thru-hull vents.** Colder climates may require antifreeze with a -100 F temperature rating.
4. Once the antifreeze is in all ballast zones, use the manual ballast switches in the helm area to drain the antifreeze through the system. This will push antifreeze through the ballast system, across all pumps, hoses, fittings and intake valves.
5. Be cautious while using the ballast switches as antifreeze will be pumped out of the intakes mounted to the bottom of the boat. Once antifreeze begins to pump out of the boat through the 4 ballast intakes (three aft, one forward), turn the pumps off.

From p 245 at https://www.mastercraft.com/media/ywxbltjn/mastercraft_my2022_ownersmanual.pdf

FROM MASTERCRAFT WAKE BOAT MANUAL

Refer to pages 386 thru 389 in the manual

To winterize NXT series boats:

Add one gallon of -50 F RV type nontoxic propylene glycol based antifreeze to each of the three thru hull vents. Colder climates may require this same type of antifreeze with a -100 F temperature rating.

Upon reactivating the boat the first time after storage, run the ballast system to pump out the antifreeze (the engine must be on and the boat must be in the water).

Also, About the Manufacturer's Antifreeze Instructions:

It Not Only Proves Ballast Can't be Fully Drained, but it Also Shows a Problem in the Spring, when Ballast is First Used Again, and Antifreeze in the Tanks is Discharged into the Lake!

From Handbook of Wisconsin Boating Laws and Responsibilities PUB-LE-301 2022:

Discharge of Waste

- It is unlawful to place, leave, or discharge waste or waste containers into or near any Wisconsin waters.
- **This includes anti-freeze used in winterizing your vessel.**
- Anti-freeze, **both ethylene glycol and propylene glycol**, is now classified as a **hazardous waste (just like used motor oil)** and it has specific disposal requirements.

Major Ski Brands No More: Summary 2024 Line Ups

Boat Brand	Ballasted Boats	Traditional Ski Boats
MasterCraft	17	1
Malibu	11	2
Ski Nautique	12	1
Total	**40**	**4**

Whose Job Is It to Solve the Wakeboat Ballast AIS Problem?

Root Cause: Manufacturers designed ballast systems that don't drain completely

(Evidenced by the fact that manufacturers warn of pump damage if run dry and say to add gallons of antifreeze to ballast system in winter)

Secondary Cause: Wisconsin doesn't enforce existing laws requiring draining completely

Result: AIS will spread via ballast systems. Some options include:

Currently: Ignore AIS threat. After AIS occur, remediate. There is no way to eliminate some like spiny waterflea.

Local and state taxpayers pay.

Option 1: Towns try to solve manufacturers' mistake, trying to decontaminate complicated ballast systems and trying to make all ballasted boats visit decon stations.

Local and state taxpayers pay.

Option 2: Towns adopt ordinances prohibiting use of ballast until manufacturers solve their own problem and the State has a way to confirm boats comply.

LOCAL CONTROL ORDINANCES PROTECT OUR LAKES

Wisconsin Statute 30.77: Local units of government have the right to enact ordinances more restrictive than State minimum standards when necessary to fully protect the waters under their jurisdiction.

KEY LANGUAGE

Section 2. Certain Artificial Wake Enhancement Prohibited

1) **Prohibited Equipment**. No person may use or employ ballast tanks, ballast bags or fins to cause 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 in an artificially bow-high manner having the effect of increasing the boat's wake. Such prohibited operation shall include wake enhancement by use of ballast tanks, or ballast bags, or fins, or continuous operation at transition speed (the speed below planing speed in which a boat is operating in plowing mode).

3) **Certain Operations Excluded.** In no event shall any of the following operations be deemed a violation of this Ordinance, provided such operations do not use or employ ballast tanks, ballast bags or wake enhancing fins: i) water skiing, ii) tubing, iii) wake boarding employing a tow rope; iv) brief transition operation to empty a boat of bilge water, or v) brief transition operation of a boat accelerating into a planing condition.


LOCAL ORDINANCE
Town of Plum Lake Ordinance #2024-004
August 27,2024
Wake Enhancement is Prohibited
USE OF BALLAST TANKS/BAGS OR FINS OR CONTINUOUS OPERATION AT TRANSITION SPEED CAUSING WAKE ENHANCEMENT OR OPERATING A MOTORBOAT IN AN ARTIFICIAL BOW-HIGH MANNER CAUSING WAKE ENHANCEMENT IS PROHIBITED
Report Violations to
Plum Lake Town Clerk 715-542-4531

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