

Zebra Mussel Discussion

Eleventh Crow Wing Lake, Akeley MN

Sunday Oct 4th, 2026

10th / 11th Crow Wing Lakes Association

Website: Crowwing11.org

Private Facebook Page: 10th and 11th Crow Wing Lakes Association

Agenda

- Background / Discovery
- DNR Press Release
- What are Zebra Mussels; Article by Dr Bruce Carlson
- Treatment Options
- Containment Priorities
- 10th Crow Wing Impact; Other Downstream Crow Wing Lakes
- Area Lakes with Zebra Mussels
 - Water quality changes, impacts, property values
- Resources
- Questions & Group Discussion

19 slides

Background & Discovery

- Since early 2010's, our lake association has funded additional paid inspection hours at the boat ramp. We have great partners in City of Akeley and Akeley Township in funding these hours. More paid hours (\$3000+/yr and COLA Hours) than most lakes of our size. We have additionally funded voluntary zebra mussel sampling for veligers (the tiny offspring) for 5-8 years on Eleventh Crow Wing
- Through a connection with downstream Crow Wing Lake Associations, we heard of likely Zebra Mussel issue in Eleventh Crow Wing (9/28). A call was placed to Gina Kemper, our DNR area AIS (aquatic invasive specialist) contact. She confirmed approximately 2 dozen zebra mussels were on a resident pontoon boat near the access. And additional zebra mussels were found at two properties on the north shore including one dock

DNR Press Release – Oct 1st, 2026

Zebra mussels confirmed in Sauer Lake in Becker County, Eleventh Crow Wing Lake in Hubbard County

The Minnesota Department of Natural Resources has confirmed the presence of zebra mussels in Sauer Lake, near Detroit Lakes in Becker County, and **Eleventh Crow Wing Lake, near Akeley in Hubbard County.**

At Saurer Lake, a lake property owner contacted the DNR after finding zebra mussels attached to a boat being removed from the lake for the season. A DNR invasive species specialist found zebra mussels at the Sauer Lake public water access, about 300 feet from the location of the initial report.

At Eleventh Crow Wing Lake, it was Hubbard County staff that contacted the DNR after a county watercraft inspector found zebra mussels on a boat being removed from the lake for the season. DNR invasive species staff found additional zebra mussels at the public water access.

Several new zebra mussel populations in Minnesota lakes in recent years were first reported by property owners and lake service providers as they removed docks, boats and boat lifts at the end of the season. It is a good reminder to carefully check boats and trailers, docks and lifts, and all other water-related equipment for invasive species when removing them for seasonal storage.

Whether or not a lake has any invasive species, **Minnesota law requires people to:**

- **Clean** watercraft, trailers and equipment to remove aquatic plants and prohibited invasive species.
- **Drain** all water and leave drain plugs out during transport.
- **Dispose** of unwanted bait in the trash.
- **Never release** bait, plants or aquarium pets into Minnesota waters.
- **Dry docks, lifts and rafts for 21 days** before moving them from one water body to another.

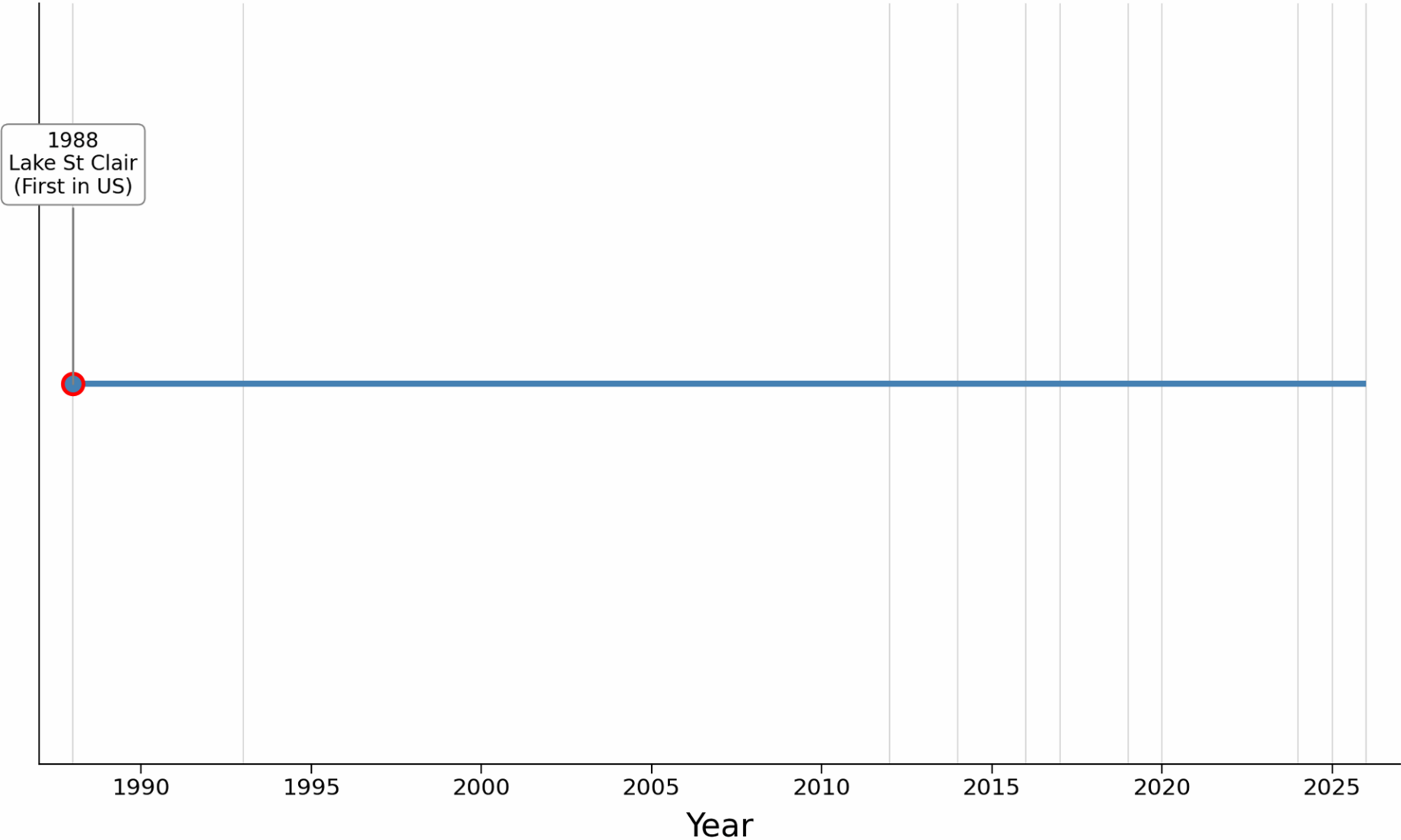
What are Zebra Mussels?

- How did they get here?
 - Native in freshwater basins in Eastern Europe/Western Russia (Black and Caspian Seas), they were introduced to the United States via ballast from transoceanic cargo ships. First found in Lake St Clair in MI, connected to Lake Huron and Lake Erie. After infesting all 5 Great Lakes it quickly spread to rivers and other lakes
- How do they impact our lake?
 - Filter out plankton which changes food chain; increased water clarity; can increase phosphorus with excrement
 - Can cause plant growth in deeper water due to improved clarity
 - Attaches to rocks and hard surfaces such as boats, propellers, ladders, swim platforms, lifts, and docks
 - Can be a nuisance as dead mussel shells are sharp; harder to walk on beach areas





Zebra Mussel Infestations Timeline (1988-2026)



Dr Bruce Carlson Article

- You can find and read his article by searching for “zebra mussel Dr Bruce Carlson”
 - Academic who studied in Minnesota, earning various degrees including a PhD-MD from Univ of Minnesota studying limb regeneration in salamanders
 - Summer home on nearby Ten Mile Lake in Hackensack
 - Since retirement in 2006, Bruce has reverted to his scientific childhood and has again taken up work on fish and lake biology. In addition to weekly collections of data about the lake by his cabin, he has directed a ten-year study on the growth of northern pike on a nearby lake and has spent hundreds of hours taking underwater videos in northern lakes. This activity has led to his writing two popular books on lake biology and one on aquatic invasive species.

Excerpts from his Article

Zebra won't bore your body per day out and consume pyramid. This almost all of t

currents, most veligers begin water must cover shell growth. and look for a

Within a in the water. If already a reproductive spread present slow, but at some were not found until four years after veligers were detected in the water, but two years later, adults were found everywhere.

All lakes aren't affected in the same way by zebra mussels. Their impact depends upon many characteristics of the lake. Zebra mussels prefer hard substrates, so lakes with rocky bottoms are ideal for them. They also need sufficient calcium in the water in order to form shells. The very infertile water of Lake Superior is a major factor that limits their spread in that lake. Another factor is temperature. As mentioned above, their ideal temperature is 68-77 degrees. This is another factor that limits their spread in Lake Superior, which is much colder. Ideal depths for zebra mussels are between 6 and 45 feet, but they have been found as deep as 100 feet in some lakes.

One of the most noticeable effects of zebra mussels on a lake is an increase in water clarity. This is due to the filtering out of much of the phytoplankton, which is a major factor that limits water clarity. The increase in water clarity itself can have a major impact on a lake. Increased clarity allows greater penetration of sunlight in the water, and that allows aquatic plants to grow at a greater depth (Check my "Beneath the Surface" book, pp. 19-23 for a more detailed treatment of light effects). It can also greatly affect the behavior of fish and other animals. Those that are sensitive to light will seek deeper water. This can affect fishing because there may be more activity at night.

Excerpts, Part 2

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There are, however, some potential mitigating factors that could work in the favor of Ten Mile. One is its great depth, which might protect many parts of the lake from mussel growth. Another is the large area of sandy bottom that covers much of the lake. Sand is not

A final note about the spread of AIS both into and from Ten Mile Lake. Since Ten Mile is at the top of the Boy River watershed, all lakes downstream could be exposed to zebra mussel veliger-contaminated water emanating from Ten Mile. Birch Lake is the first downstream lake, and it is connected to Ten Mile by a roughly mile-long stretch of the Boy River. What are the prospects for Birch? Fortunately, the characteristics of that stretch of stream will be protective of Birch Lake. A number of studies have looked at downstream spread of zebra mussel veligers. For a typical stream, any lake less than 12 miles downstream is considered to be at great risk of contamination by veligers coming from an upstream contaminated lake. For highly vegetated, slow-moving streams, however, even a mile of separation may be sufficient for protection. The Boy River is in this latter category. Both its low flow and abundant aquatic vegetation may act as deterrents to rapid spread of veligers. Nevertheless, Birch lake should be closely monitored from now on.

Treatment Options

- Treatment options are limited, and our AIS specialist did not express hope that any would have success. Because there were multiple indications of adult zebra mussels, and they were located at various points in the larger west basin, localized containment is very unlikely/impossible. Treatment costs are expensive (\$9300 in localized Christmas Lake case study in MN)
- Many of our surrounding lakes were found by positive test result for veligers, the microscopic babies. We have actual adult zebra mussels that are likely already reproducing. They may have been present for more than a year without anyone noticing

Treatment Options,

Low-Dose Copper Treatment (Lake Minnetonka,

- **Method:** Researchers from the [Minnesota Aquatic Invasive \(MAISRC\)](#) and the USGS used a low-dose ionic copper form target free-floating zebra mussel offspring (*veligers*) in spec bays.  Minnesota Aquatic Inva... +1
- **Result:** The treatment successfully suppressed veliger num during peak reproduction windows while minimizing harm to However, complete lake-wide eradication remains difficult d adult populations.  EarthTec QZ +3

Potassium Chloride / Potash (Lake Winnipeg, Mar

- **Method:** Following a successful quarry eradication in Virgini chloride (potash fertilizer) at a targeted dose of 100 parts p silt-curtain-isolated harbors.  International Joint Commi...
- **Result:** The chemical successfully killed targeted mussels in though subsequent monitoring found a small number of sur difficulty of absolute containment in open-water

[Christmas Lake](#) in Shorewood, Minnesota, was the site of a pioneering 2014–2015 pilot project to test whether [partial-lake treatments](#) could eradicate a localized infestation of [invasive zebra mussels](#).  Invasive Species Corpo... +1

Treatment Overview

- **Discovery:** A small colony of zebra mussels was discovered near the public boat launch in August 2014.  Taylor & Francis Online +1
- **Phase 1 (2014 Multi-Step Treatment):**
 - Applied [Zequanox](#) (a biological pesticide made from dead microbe cells) in September.
 - Followed with EarthTec QZ (a copper-based algaecide/molluscicide) in October and November.
 - Injected 1,000 pounds of potash (potassium chloride) under the ice near the boat ramp in December.  maisrc +2
- **Phase 2 (2015 Follow-Up):** After adult mussels were found just outside the initial treatment zone, crews applied potash again in June and expanded to a 10-acre treatment area in July 2015.  Invasive Mussel Collab... +1

Outcome

While the initial 2014 treatment successfully killed off mussels within the small target containment zone, subsequent monitoring found that mussels had dispersed further. By late 2015, zebra mussels were detected lakewide, and eradication efforts were officially halted.  Taylor & Francis Online +2

Containment Options

- We should continue posting a boat inspector at 11th Crow Wing to discourage the spread of Zebra Mussels to other area lakes
- Assume DNR will post specific bright colored signage of Zebra Mussel infestation (have seen orange signs at lakes like Garfield)
- Need to post address of decontamination station in Park Rapids

The Hubbard County Watercraft Decontamination Station is located at [812 S Henrietta Ave, Park Rapids, MN 56470](#).

Station Details & Services

- **Cost:** Free watercraft decontamination service provided by the Hubbard County Aquatic Invasive Species (AIS) Program.
- **Hours:** Typically open 7 days a week from 10:00 AM to 6:00 PM (May through September/early October). [PR](#) Park Rapids Enterprise +1
- **Appointments:** Required in advance. You can schedule an appointment by calling **218-616-1631** or the on-call number at **218-252-6738**. [littlesandlakemn.com](#) +1
- **Process:** Staffed by certified Level II inspectors using hand removal, high-pressure washing, and hot water (100–140°F) to kill invisible veligers, zebra mussels, and other invasive species. [maisrc](#) +2

Containment Cont'd

- Lakeshore providers (people who move docks and lifts in and out of the lake as a paid service) should be immediately notified by owner if they are taking docks and lifts out for the season. If they use a pontoon boat with forks, the boat will have to be decontaminated before shifting to next lake. They have to undergo AIS specific training so they should know this; however they may have not yet heard about 11th CW as ZM
- Any sale of lakeshore equipment, boats, or other should be dry for 21 days as provided by DNR. This allows time for the zebra mussels to dry out and die
- Be so extra, extra careful if you take your boat out of 11th and potentially travel to other lakes. We do not want the same thing that happened to us to happen to others

10th Crow Wing Impact; Other downstream CW lakes

- Dr Carlson suggested that:

Internet research says 2 miles from outlet of Eleventh to inlet of Tenth Crow Wing Lakes

spread of zebra mussel veligers. For a typical stream, any lake less than 12 miles downstream is considered to be at great risk of contamination by veligers coming from an upstream contaminated lake. For highly vegetated, slow-moving streams, however, even a mile of separation may be sufficient for protection. The Boy River is in this latter category. Both its low flow and abundant aquatic vegetation may act as deterrents to rapid spread of veligers. Nevertheless, Birch lake should be closely monitored from now on.

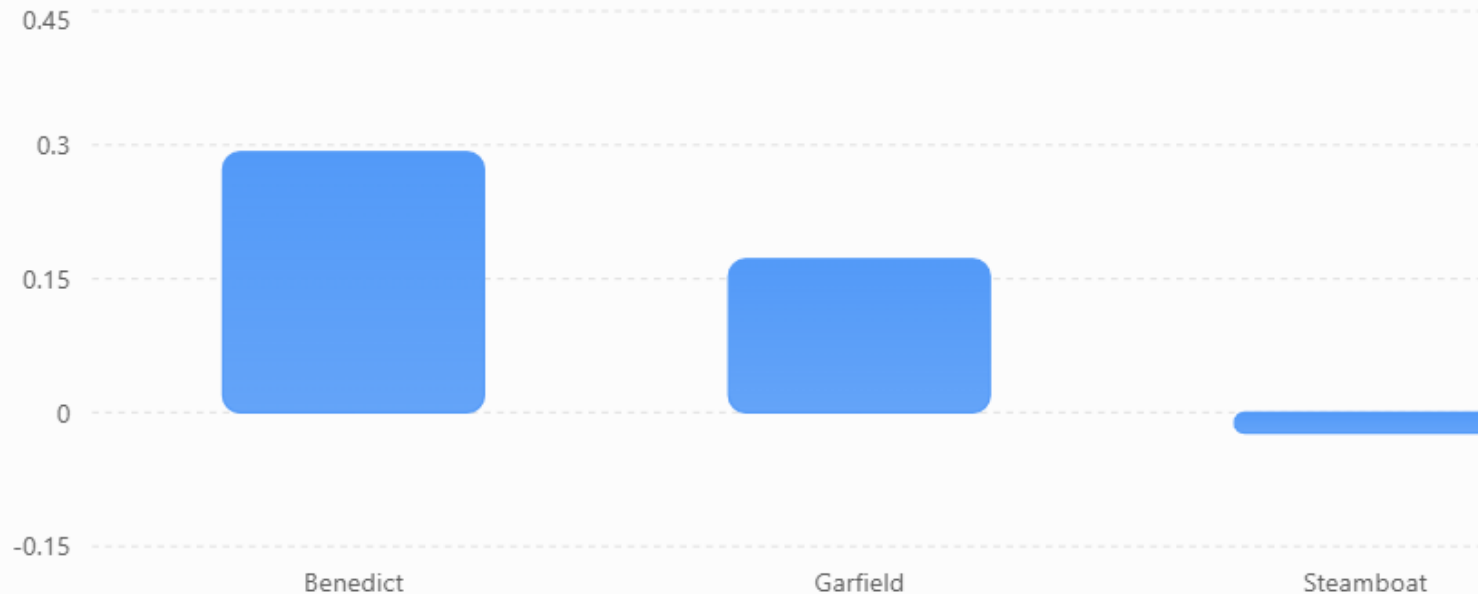
- Question out to DNR AIS Specialist if there are any stream containment options. The veligers are .002 - .003" in size, so any type of filtration would likely plug up flow immediately
- Recommend switching monitoring dollars in L.A. from Eleventh to Tenth Crow wing. **Need a volunteer** for this to take monthly samples to Park Rapids (during the week)

Area Lakes with Zebra Mussels

What can we learn from their experiences?

Water clarity change — 2020–2025

Annualized change in Secchi depth for the three lakes with sufficient recent monitoring. Wolf Lake has no recent Secchi data.



Benedict and Garfield show improving clarity; Steamboat is essentially stable. Values are annualized trends.

Interpretation: Benedict has the strongest improvement—about **0.292 m/year**, or roughly **0.96 ft/year**. Garfield is improving about **0.56 ft/year**. Steamboat is essentially flat, declining only about **0.08 ft/year**.

All three were reported in 2017 w/ Zebra Mussels

Area Lakes Cont'd

Change in phosphorus, 2020–2025

Negative = declining phosphorus / generally favorable. Positive = increasing phosphorus.

Phosphorus change — recent monitoring

Annualized change in total phosphorus. Negative values indicate declining phosphorus; positive values indicate increasing phosphorus.



Benedict and Steamboat phosphorus trends are based on only two years of phosphorus observations, so they should be interpreted cautiously.

Eight-year-period summary

Lake	2025 clarity	2025 phosphorus	Clarity change	Phosphorus change	Assessment	
Benedict	11.5 ft	8.5 μg/L	+0.96 ft/yr	−0.5 μg/L/yr	Improving	
Garfield	9.5 ft	19 μg/L	+0.56 ft/yr	−1.06 μg/L/yr	Improving	
Steamboat	12.0 ft	11 μg/L	−0.08 ft/yr	+2.5 μg/L/yr	Watch	
Wolf	No recent data	No recent data	—	—	Insufficient data	

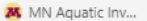
Benedict currently has the best combination: **very low phosphorus (8.5 μg/L)** and **increasing clarity**. Garfield is also showing a favorable pattern, with both clarity and phosphorus improving. 🌿 Lakequality +1

Steamboat is the interesting one for your zebra-mussel analysis. Its **clarity is essentially stable while phosphorus is increasing**, despite a current phosphorus concentration of only 11 μg/L and an overall A water-quality grade. The phosphorus trend, however, is based on only **two years of observations**, so I would not characterize it as a confirmed long-term deterioration. 🌿 Lakequality

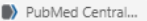
Area Lakes Cont'd

Property values: what do we actually know?

I would not put a measured percentage loss on Hubbard County properties at this point.

Hubbard County has historically been unusually exposed because roughly **60% of taxable land value comes from lake property**, with some townships reaching 70–87%. 

Older Hubbard County AIS planning documents modeled hypothetical losses of **10%, 13% and 30%** for several lake systems. However, the often-repeated **13% figure was based on a Wisconsin study of Eurasian watermilfoil**, not a measured 13% loss caused by zebra mussels. It should therefore **not** be presented as the expected Hubbard County zebra-mussel loss. 

Interestingly, economic research is more complicated than the conventional narrative. A Minnesota analysis found that, in **Otter Tail and Becker counties**, the presence of zebra mussels itself did not measurably affect lakeshore property values. Other research has found positive property-value effects associated with increased water clarity from dreissenid filtration. 

Bottom line: there is a strong economic *risk*, but I don't find defensible evidence yet showing that Hubbard County homes have actually lost X% of their value because of zebra mussels.

What about actual sales on these lakes?

There are some encouraging signs, although they are **not proof that zebra mussels have no effect**.

For example, a Benedict Lake property sold for \$950,000 in 2020 and is currently being marketed at substantially more than that; however, that is a single property and cannot establish a lake-wide trend.



More broadly, Hubbard County is highly exposed to lake-property economics: historical county analysis found that approximately **60% of total taxable land value in Hubbard County came from lake property**, and 70–87% in several of the county's major tax-generating townships. 

My assessment for the four lakes

Steamboat:  **No demonstrated property-value damage.** This is probably the most useful comparison lake because it has an established zebra-mussel history. Its current water quality remains good, so there isn't an obvious water-quality mechanism that would have depressed values.

Garfield:  **No demonstrated zebra-mussel discount.** The complication is that Garfield now also has starry stonewort, making it particularly difficult to isolate which AIS, if any, is affecting buyer behavior.

Benedict:  **No demonstrated decline; strong market evidence.** Current high-value transactions suggest that buyers continue to place substantial value on the lake. Again, individual sales aren't sufficient to prove causality.

Resources

- DNR Zebra Mussel Link:
 - [Zebra mussel \(*Dreissena polymorpha*\) | Minnesota DNR](#)
- Dr Carlson Article, Zebra Mussel
 - [11-22-19+Zebra+Mussels.pdf](#)
- Current Distribution of Hubbard Cty Lakes with Zebra Mussels:
 - [Zebra Mussel | Hubbard County Aquatic Invasive Species Tracker](#)

Questions & Group Discussion