Invasive Species Early Detection and Native Plant Community Assessment

Steve Henry Aquatic Survey Professionals

Lake Irving (DOW# 04-0140-00) County: Beltrami
Surveyed: 7/26/2026 Water Temp (°F): 81 Air Temp (°F): 87

Method:

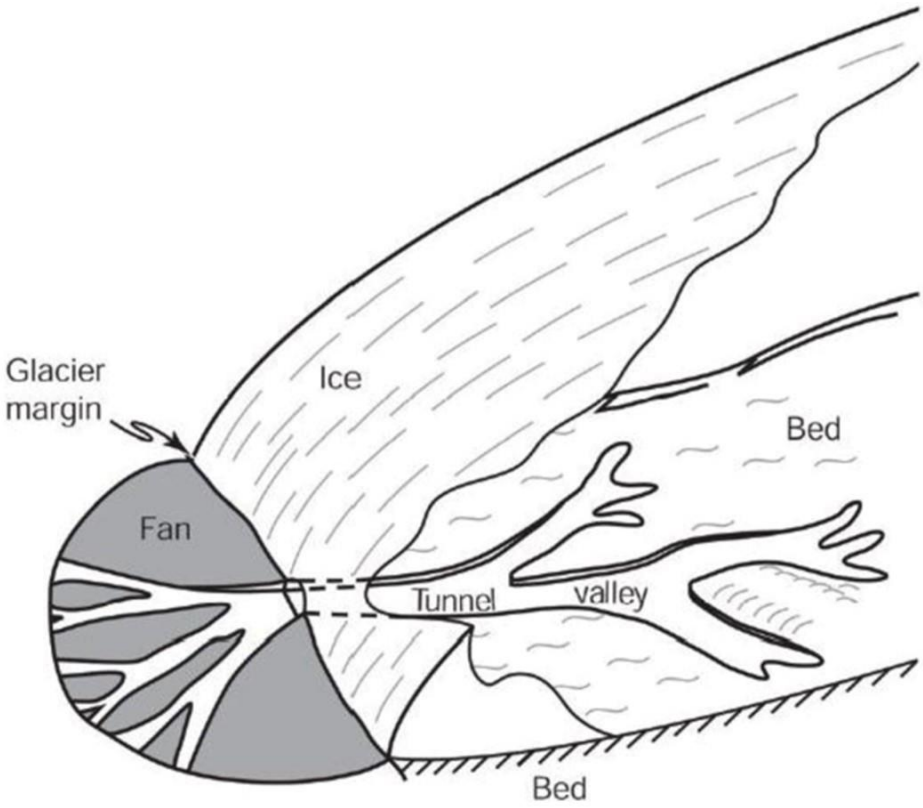
Steve and Isaac Henry with Aquatic Survey Professionals performed an Aquatic Invasive Species Early Detection and Native Plant Community Assessment on Lake Irving following the methodology described by Minnesota Department of Natural Resources in the "Guidance for Delineating Invasive Aquatic Plants" (2020). The boat navigates the lake moving from shallow water out to the point where water is deep enough that no vegetation is present. Using visual, sonar, and rake observations populations of Starry Stonewort and any other invasive species encountered are detected and delineated. Observations and waypoints were made every 50 meters with closer spacings when delineating the edges of any infested area. Additionally native plant communities and bottom composition are sampled at many sites and depths around the lake. Numerous factors are monitored including bottom content, plant coverage, historical indications, variations in clarity, and potential stressors. The observations are interpreted based on my 21 years in water quality, lakeshed assessment, aquatic plant management, and lake water quality dynamics. Lake Irving is definitely a special setting and situation but does draw comparisons with several lakes I have worked on and studied. Invasive species density was recorded on a data sheet using a 1-3 scale with 3 being Abundant and notes on sediment composition, native plant communities, and nuisance conditions were made in a Rite-in-the-Rain notebook.

Results:

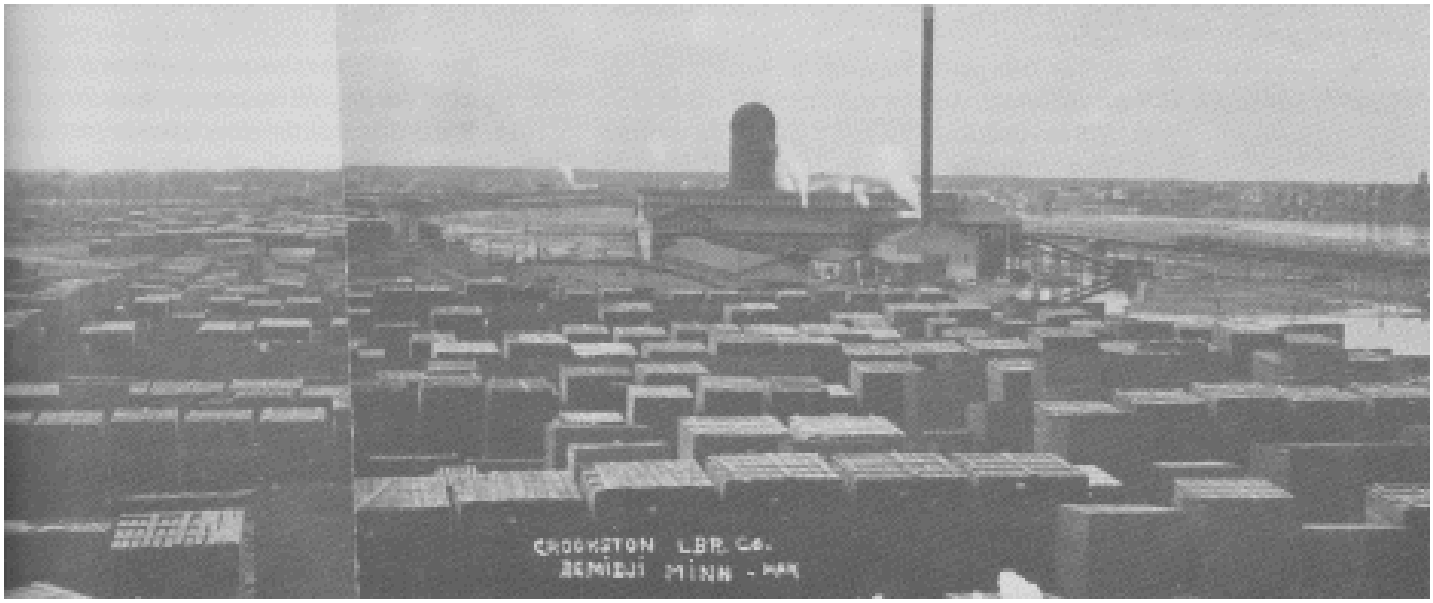
Lake Irving has a unique watershed position overlaid with a long and diverse history of human interaction. The lake's position in the watershed has delivered runoff and nutrients from a significant area into this shallow lake system since glaciers retreated from the landscape. Human use certainly dates back several thousand years and some type of settlement has existed nearby for nearly as long. Significant changes occurred as Europeans settled the area and Lake Irving was a focal point of the early sawmills and logging industry. Contemporary impacts are primarily recreational watercraft use and development in the watershed. Invasive aquatic plants are not known to contribute to the lake's conditions and were not documented in the lake during this survey. Zebra Mussels were observed during the survey and in some situations Zebra Mussels can accelerate plant growth. Recent changes in water quality and clarity have been observed over the past 4 years alongside the expansion of the plant community and development of nuisance plant growth in some areas. Increased water clarity expands the range of plant growth making more of the lake suitable for plant establishment.

As glaciers retreated from the landscape thousands of years ago meltwater carved deep channels below the ice. Occasionally the ice roof over the channel would collapse and become buried preserving the channel structure. Once the ice retreated completely these buried ice blocks melted and lakes were formed. One channel, a tunnel valley, ran through the Lake Bemidji, Lake Irving, Lake Marquette, Lake Plantagenet axis creating the basins we now know. As the ice retreated surface drainage patterns formed with the Mississippi River headwaters starting high on the glacial moraine and draining down to a connection point on Lake Iriving. Lake Irving is the first major basin on the Mississippi

River after it leaves Lake Itasca. This watershed position delivers a significant volume of runoff and nutrients into Lake Irving since even clean stream water is not as clean as lake water.



Native American villages have certainly existed adjacent to Lake Irving historically. The peninsula between Irving and Bemidji is very similar to a site on Otter Tail Lake where thousands of artifacts were excavated during a road project. Documentation of humans impact of Lake Irving after European settlement is much easier to locate. Bemidji Area History has some very good material that gives some insight into early impacts to Lake Irving. The peninsula became the focal point for sawmills and by 1910 the Crookston Sawmill located in this area was the second largest in the country. This industrial scale development liekly wiped out any trace of earlier settlements and tremendous distrubance to Lake Irving. Log drives down the Mississippi River used splash dams to hold back logs and water to be released in a big flush downriver. This mobilized large amounts of sediment and organic matter much of which likely settled into Lake Irving. Large amounts of wood waste, bark and sawdust, likely also settled in the lake. The disturbance of grading railroads, access roads, and the several severe fires the site experienced likely also contributed to the accumulation of additional material in the lake bottom. I understood that the impacts were likely significant but some of the photos still surprised me. See them at **Bemidji Minnesota Area History** **or** **https://lakesnwoods.com/BemidjiHistory2.htm**

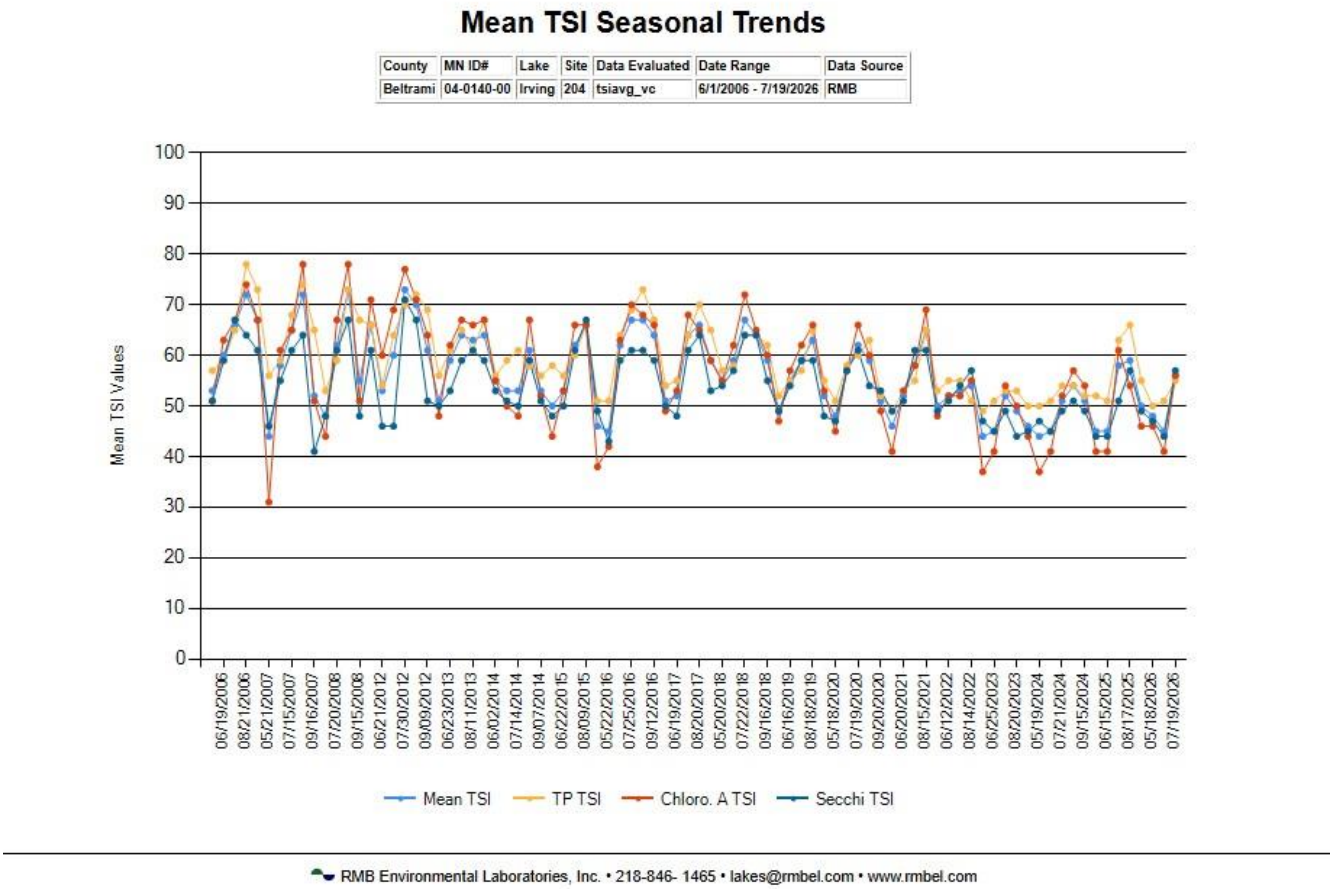


The Crookston Mill prior to the devastating 1924 fire. From Bemidji History.

As additional sediment and organic matter settled to the lake bottom there was a reduction in the volume of this already shallow basin. Lake managers often classify lakes into Shallow less than 15 feet deep, Deep more than 30 feet deep, and Mid-Depth. Each type lake reacts to nutirent inputs in a unique manner. Deep lakes generally store nutrients away and they don't return to the system, Mid-Depth lakes can store nutrients but in stressful conditions those nutrients may cycle back, Shallow lakes like Lake Irving don't have much capacity to lock away nutrients and when disturbed those nutrients are released back into the water. When nutrients are released from the lake bottom they can be in a soluble plant available form which will cause an immediate increase in algae and plant growth. In shallow lakes large boat motors and strong winds can stir nutrients and organic matter from the lake bottom back into the water column. This source of nutrients is referred to as legacy pollution and certainly contributes to the conditions in Lake Irving. Historical water quality data has a stronger signature of this type of nutrient release while recent years show less extreme nutrient spikes. Shallow lakes especially those with a large or urban watershed like Lake Irving have two stable conditions and can oscillate between them. One stable condition is clear water and heavy vegetation while the other is murky water with little aquatic vegetation. Shallow lakes can temporarily exist in between these two end points but will trend towards one and stabilize there. The shift from one condition to the other can be rather immediate and dramatic.

Shallow Lakes video addresses water quality, ecology and recreation - Ramsey-Washington Metro Watershed District or https://rwmwd.org/news/shallow-lakes-video-addresses-water-quality-ecology-and-recreation/

Snapshots-story-ShallowLakes_BarbP_0.pdf or https://bwsr.state.mn.us/sites/default/files/2018-12/Snapshots-story-ShallowLakes_BarbP_0.pdf



Water quality samples from recent years show lower levels of nutrients and higher water clarity in Lake Irving compared to earlier data and fewer occurences of very high nutrient levels. The graph above uses Trophic State Index which relates your clarity, algae, and nutrient levels to a common scale. You can see that levels of all three have been declining and with Total Phosphorus declining significantly. If legacy phosphorus is released at a low level plants and algae can rapidly remove it from the water so this source may still be ongoing. Some of the apparent improvement in water quality is due to zebra mussels filtering the lake water and re-depositing particulate on the lake bottom as seston, a mixture of digested waste and rejected particles. This process reduces the nutrients in the water column by moving them to the lake bottom.

Lake Irving has generally reflected the nutrient levels of the incoming Mississippi River water with in-lake observations similar to the levels in water samples taken from the river near the Highway 2 bridge. It's likely that the inflow from the river flushes all the lake water out at least a few times a year if not more often during high flows. This keeps the water quality in the lake tied to the quality of the river. The data sets of river and lake water quality samples do not overlap so I cannot compare similar dates, I can only draw inference from the relative levels at both sample sites over the years. The stream site data is linked below.

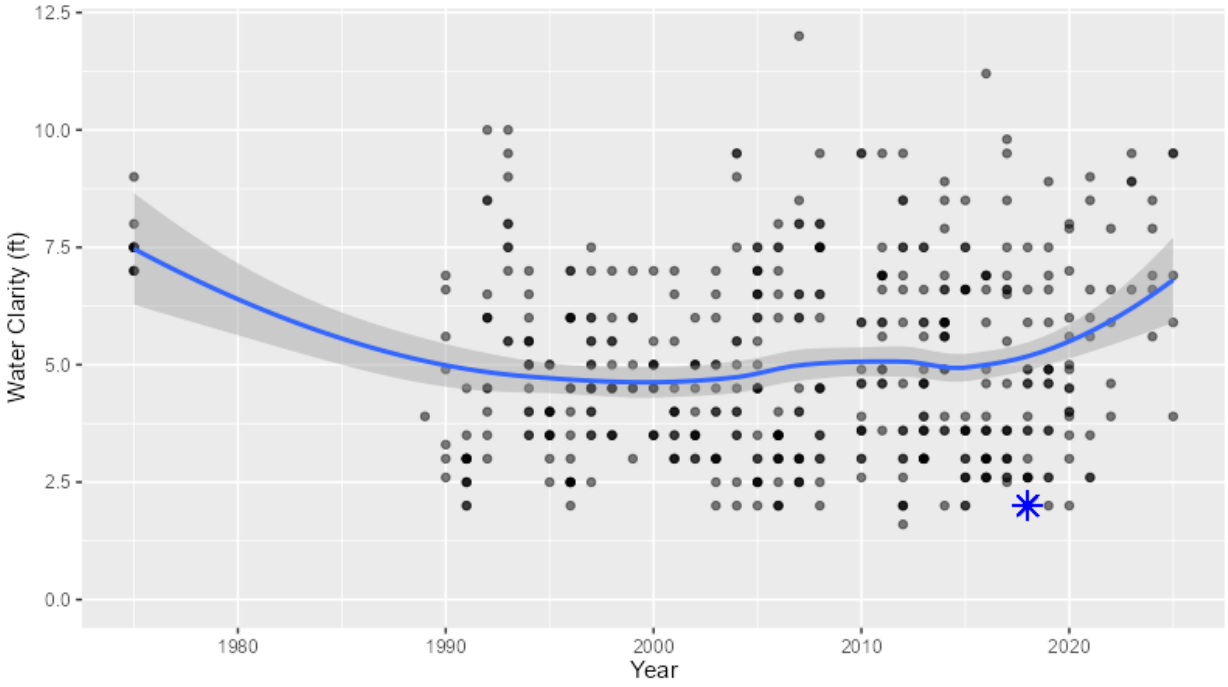
Surface Water or https://webapp.pca.state.mn.us/surface-water/station/S002-618 or via MPCA EDA

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Recently, around 2018, Lake Irving was infested by zebra mussels which are invasive filter feeders. These invasives can filter suspended organic matter, sediment, and algae from the water. This process can remove suspended material and increase water clarity, that material is shunted from the water column back to the lake bottom or plant community. The mussels digest organic matter filtered from the water and expell seston and soluble plant avaialable nutrients. This process converts mineral and organic nutrient sources to a plant available form and when zebra mussels are living on aquatic plants they can act as a growth accelerating fertilizer delivery device. Zebra Mussels can consume much of the free floating algae, plankton, that live in a lake. Prior to zebra mussels the algae levels in Lake Iriving averaged more than 20 ug/l and peaked each summer over 50. Since zebra mussels established in the lake algae levels average less than 10 and peak under 20 each summer. Plankton compete for available nutrients with aquatic plants, in the absence of a healthy plankton community aquatic plants have more access to available nutrients. This nutrient availability can also be expressed by the bountiful growth of filamentous algae which can Zebra Mussels cannot consume. During our survey of Lake Irving zebra mussels were observed but were not as abundant as we see in some lakes.

As zebra mussels strip particles from the water clarity improves dramatically. Over the past several years water clarity as measured with a a Secchi disc has improved on Lake Irving according to the MPCA dataset. Plants generally grow to 1.5 times the Secchi depth so recent increases in observed water clarity would suggest the native plant community has recently expanded from a historical maximum depth of about 7 or 8 feet down to the current observed maximum depth of plant growth being 12 feet deep. As the plant community has expanded pioneer species have benefitted the most with Coontail becoming abundant out to and in some places beyond 12 feet. Coontail has the capacity to grow unrooted as a free floating or partially settled plant enabling it to rapidly expand into newly suitable habitats. Unfortunately Coontail will grow in excess of 10 feet tall greatly increasing the area of the lake where watercraft will encounter nuisance plant growth. Of the plants causing nuisance conditions in Lake Irving Coontail was the most common culprit. Due to it’s presence adjacent to the recreational area of the lake Coontail was encountered first when leaving open water, as the depth decreased Flat Stem Pondweed became more prominent in the community. In shallower depths that were likely historically vegetated, 6 to 8 feet, Flat Stem Pondweed was often growing abundantly and dense impeding watercraft.

Further increases in water clarity could establish Coontail across much of the lake basin at depths where it would not interfere with recreation. This could stabilize the deeper sediments greatly reducing the amount of sediment and organic material disturbed by watercraft activities. This would moderate the lake’s condition and provide a suitable starting point for aquatic plant management efforts. Many lakes have seen conditions stabilize about ten years after zebra mussel infestation with a subsequent slight decrease in the density and abundance of aquatic vegetation.



MPCA Water Clarity in Lake Irving

During the survey we noticed local variations in water clarity across Lake Irving. We are constantly observing the aquatic plant community or if it's too deep trying to see the plants as they come back into view. Upon launching the boat we noted a brown tint or strong tea color to the water. Initially crossing back and forth over the band of vegetation adjacent to the access clarity was reasonable, we found that to be true in most nearshore where depths are less than 6 feet. Our next stop was the large hump where vegetation is matted to the surface. At this site we found visibility was poor adjacent to deep water and the water appeared to have significant fine suspended material not plant matter or algae. Within the vegetation clarity was higher than in deep water nearby but the tremendous amount of vegetation generally blocked our access. The deeper sections of the lake also appeared to have a gradient to water clarity with the area east of the main hump having the lowest clarity and the southwest area having the most water clarity. We did survey Lake Irving on a Sunday and watercraft usage was very high by our ratings with multiple watercraft normally visible moving at high speed across the lake at any particular time you chose to look. Unconsolidated lake bottom is susceptible to resuspension by powerful outboard motors and visual observations seem to suggest that some resuspension is occurring in Lake Irving. During the survey our sonar indicated very soft sediment at depths over 10 feet and our rakes samples confirmed that with loose decaying plant matter common in deep water and very little resistance to the rake dragging. While certain boats affect the lake bottom more than others all watercraft cause some lake bottom disturbance. Underwater cameras reveal wakesurfing impacts on lakes

Quality native plant communities were present in some areas distributed around the lake. These areas were often localized and usually shallow, in general clarity was better in these areas. In particular the south and southwestern shorelines had the highest quality plant communities and less incidence of nuisance conditions. The eastern shoreline and the northwestern corner of the lake had fair native plant communities but a much higher incidence of nuisance

conditions. The three underwater humps in Lake Irving had extensive native plant coverage with good diversity. The main hump rises to less than 6 feet of water and plants are matted to the surface obstructing any boat traffic, we tried. The othe two smaller humps to the east are slightly deeper. The plant communities on those humps were significantly impacted by watercraft traffic with motors clipping off and entangling plants. We witnessed several boats and jetskis crossing these humps and during the survey we often had to clear the propeller and motor of entangled plants. See the maps later for more information.

In most of the nearshore zone, less than 6 feet deep, a diverse native plant community existed. In some areas this community has grown close to the water surface but this is to be expected in shallow waters. Overall nuisance conditions were actually lower in the less than 6 foot range compared to the 6 to 10 foot range. Given the diversity community it seems to be intact from decades ago and is well stabilized but could be seen as a nusiance in some locations. The next depth range was 6 to 8 feet deep where Flat Stem Pondweed, Coontail, Clasping Pondweed, and Illinos Pondweed were common native species encountered. Flat Stem Pondweed was the most common native an it can form tall extensive beds where conditions were suitable but in Lake Iriving this was limited to the large sunken island where plant growth is abundant to the surface and boating impossible. In most areas of this depth band Clasping Leaf Pondweed formed a significant portion of the community and Illinois Pondweed was less common. In some areas these species were interacting with recreational boaters and dislodged fragments of plants were commonly observed drifiting across the lake. Filamentous algae was common on the plants in the samples indicating nutrient availability was occuring on at least an occasional basis. Beyond 8 feet deep the community was dominated by Coontail with some Flat Stem Pondweed present in places. Coontail is a pioneer species and can live as a free floating unrooted plant allowing it to rapidly expand into newly suitable habitats. When rooted Coontail will grow in excess of 8 feet tall and can reach up to or near the surface in waters as deep as 10 feet. Beyond 10 feet deep Coontail was present as clumps and unrooted but settled individuals. There were occasional plants observed and sampled as deep as 12 feet, almost entirely Coontail, with some deeper samples returning plant fragments from a mix of species but our observation was that rooted plants did not occur beyond 12 feet deep.

Recommendations:

Community Boat Channels – Developing three or four community access channels would allow access to the lake's open water without disturbing the plant community. MN DNR regulates access channel clearing and this could be an option for any homeowner seeking access to open water. These channels can get expensive and lake residents can cooperate on utilizing an individual operator to mechanically remove excess vegetation for numerous sites or establish one channel that serves numerous land owners. Community efforts can significantly reduce the cost and increase the frequency of maintenance.

Education – Informing residents about their impacts on the growth and abundance of aquatic vegetation can reduce some of the nuisance conditions. Watercraft disturbance of the plants or lake bottom fuels additional plant growth so recreational use is best to the west and south of the main island to avoid resuspension of nutrients from the shallower eastern areas. Transiting to Lake Bemidji is the best option for high power water sports. When using Lake Irving boaters should transit to open water and avoid areas less than 10 feet deep especially when traveling at speed. Stirring up the lake bottom and dicing the plants provides additional food for the zebra mussels.

Watershed Runoff and Sediment Reduction – Continue projects in the Lake Irving Lakeshed that reduce runoff and the transport of sediment and/or organic material. Reducing runoff reduces the amount of food for the zebra mussels which directly reduces the nutrient availability to the plants. As the lake settles into it's new clear water well vegetated state nutrients will be store in the lake bottom and overall nutrient availability will likely decline. If inputs of nutrients continue from runoff, upstream sources, or immediate sources then plant growth may continue to be excessive. This is especially true if the nutrient source consists of plant available soluble nutrients.

Alum Treatment – Alum can be applied in lakes that have legacy pollution impacting their water quality. Alum binds to nutrients and locks them onto the lake bottom. If a lake is not deep enough the Alum layer is disturbed and cannot lock in the nutrients. In lakes where water only resides temporarily, for a year or less, incoming nutrients can overwhelm the Alim application or the Alum can wash downstream prior to flocculating onto the lake bottom. Lake Irving is not a good candidate for Alum treatment due to high flushing rate and shallow nature. The alum effectiveness would be limited and short lived in Lake Irving. Alum does not effect the uptake of nutrients by plants and would not reduce their growth.

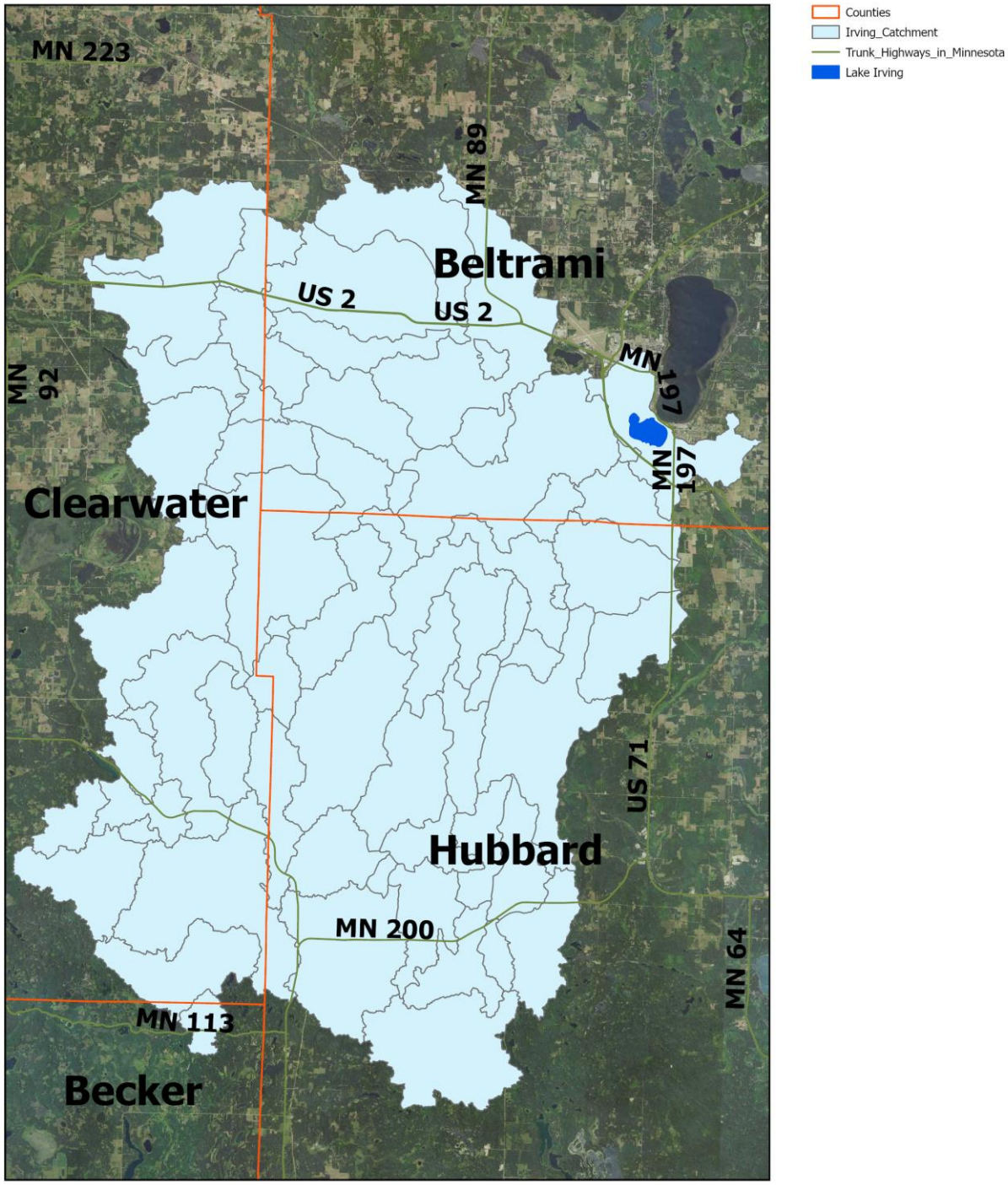
Monitor clarity, TSS, and TSVS before and during the weekend – Sampling the lake water after a busy weekend can provide insight into what impacts might be occurring. This can be as easy as checking water clarity in the morning on a Thursday and again in the morning on Sunday. If clarity is reduced watercraft are disturbing the lake bottom and plant beds. Specific water samples can also be taken and analyzed. Total Suspended Solids is a measure of everything in the water column. That sample can then be heated and all organic matter burned off to determine the amount of Volatile Solids. If either TSS or TSVS are elevated after a weekend watercraft are likely contributing to elevated nutrient levels and plant growth in Lake Irving.

MN DNR APM Open Water Control Permit – Minnesota DNR does work with lake groups to manage nuisance vegetation in certain situations. It may be possible to obtain an Open Water Control Permit to manage certain areas that are major contributors to nuisance conditions or problematic nutrients. Area 12 on the following maps is positioned such that many boaters encounter this plant bed while recreating. This dislodges significant amounts of plant matter and impacts recreational boating. Mechanical harvesters could remove over 10 acres of plants at this site through MN DNR APM permit. There would be a significant cost to the removal, trucking, and disposal of that much plant material.

Minnesota has graded lakes through the new Lake Health format, follow this link to see how Lake Irving scored.

Explore Watershed Lakes: Minnesota Department of Natural Resources or https://whaf-lakes.dnr.state.mn.us/lakedetails/04014000/topic/summary or via LakeFinder > Irving > Lake Health

Lake Irving Watershed



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Lake Irving - All Sites



- Public Accesses
- AfterIrvingTrack
- AfterIrvingWP
- AfterIrvingWP selection

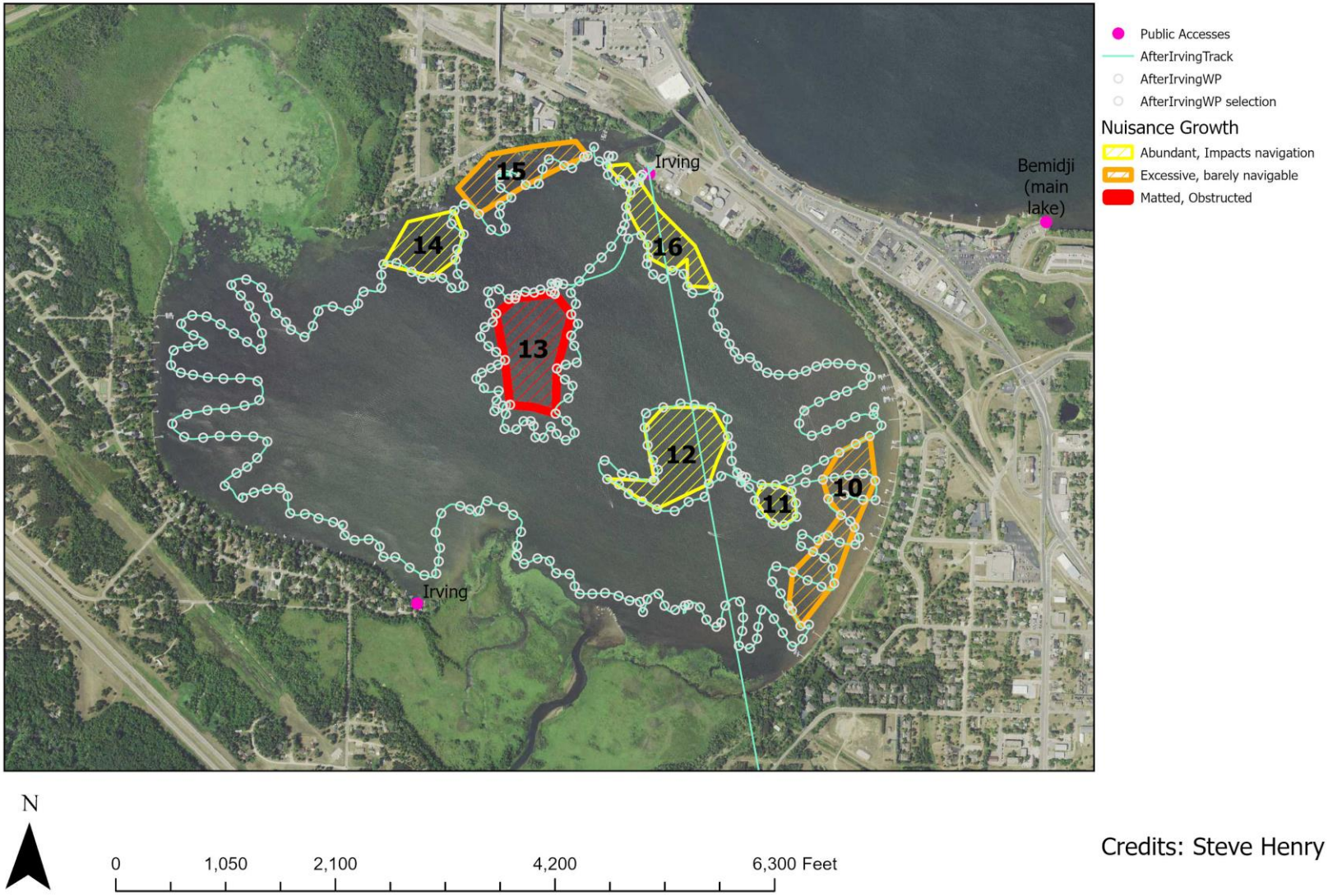
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0 1,050 2,100 4,200 6,300 Feet

Credits: Steve Henry

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Lake Irving - Nuisance Plant Growth



Credits: Steve Henry