2024 Aquatic Plant Survey and Invasive Species Detection Report Round Lake near Nisswa



Prepared for the Round Lake Association

Survey by Aquatic Survey Professionals – MN DNR Certified Aquatic Plant Surveyors

Survey Dates June 14th 2024

Report by Aquatic Survey Professionals – Steve Henry

© 2024 Aquatic Survey Professionals

18-0373-00

Lake and Watershed Characteristics

Round Lake is in Crow Wing County Minnesota just south of Nisswa and east of State Highway 371. Round Lake is known for it's shallow and sandy shorelines perfect for recreation. Round Lake is also known for good walleye fishing. Stretching 2.1 miles in length east-west and 1.7 miles north-south the lake covers 1650 surface acres and is a significant recreational and fisheries resource for the area. Access to Round Lake is provided by a MN DNR public water access on the south side of the lake. A boatable channel also connects the lake with Gull Lake to the west going under State Highway 371. The Round Lake access has at least 11 parking spaces for vehicles with trailers which is an indication of the significant use the lake receives.

Round Lake is in the Pine Moraines and Outwash Plains subsection of the Northern Lakes and Forest ecoregion where White and Red Pines historically dominate the forests and deep sandy soils limit runoff by collecting rainfall into groundwater aquifers. This ecoregion features deep coarse textured soils connected to groundwater networks that feed numerous lakes, streams, and rivers. Many lakes in this ecoregion occupy kettle depressions left behind by the drainage of meltwater from glaciers where ice blocks were deeply buried then melted later and the overlying sediments collapsed. Round Lake lies in the Brainerd Sand Plain that was created as the Rainy lobe of the Saint Croix glacial phase melted and drained to the south, this drainage water left an outwash fan of sorted sediments that covers much of Crow Wing County. Sections of Round Lake's shoreline are formed of abandoned lake shoreline left dry as the Gull River channel scoured deeper. Much of the abandoned lake bottom was reflooded when the Gull Lake dam was installed dramatically increasing the water levels and creating large sandy gravel flats around the lake that are less than 4 feet deep. At one point in time Round Lake, North Long Lake, Lake Hubert, and Gull Lake were all portions of one larger basin. Immediately west of Round Lake around Gull Lake the outwash plain ends and the landscape becomes much rougher. This area was formed where greater amounts of ice was buried by outwash and glacial drift. Ice was extensive in this area and the melting left a rough surface as nearly the entire area collapsed.



Sketch of a how kettle lakes are formed in outwash areas.

A high quality aquatic plant community is present throughout Round Lake but diversity is limited in most areas by the consistent outwash gravel bottom type. Some small areas have higher levels of lake bottom fertility (silt) and support more diverse plant communities. These silty areas are also more conducive to invasion by Curly Leaf Pondweed which was observed in Round Lake. This plant species has an advantage in that it grows under the ice before the native species. Curly Leaf Pondweed dies off around the 4th of July fouling shorelines and releasing nutrients that can contribute to algae blooms and the growth of rooted slime. Another invasive species observed in Round Lake was zebra mussels. Invasive species do not have the predators, pests, and diseases that kept them contained in their native range. Overall the aquatic plant community in Round Lake is rated moderate by the State of Minnesota. The plant community in Round Lake is not the average of other lakes in the watershed.

The water quality in Round Lake is considered mesotrophic, with moderate fertility and high clarity. The lake has slightly lower fertility than most lakes in this area. Minnesota Pollution Control notes there is evidence that the lake's clarity has been improving by approximately 2.2 feet per decade over the period of record, 1984 to 2022. This improvement occurred as one jump in clarity between 2013 and 2014 with observations improving by 5 feet in that time period. This increase in clarity coincided with the invasion of zebra mussels which consume the free floating algae, digest it, and deposit the waste on the shallow lake bottom clearing the water. This shift of nutrients from the water column to the shallow lake bottom fuels increased plant growth in the shallow waters and the production of green slime which is a rooted algae

that is not susceptible to consumption by zebra mussels. Visit <u>Surface Water (state.mn.us)</u> to review the water quality data specific for Round Lake.

Round Lake is partially spring fed but also has a moderate sized 24,583 acre watershed that drains to the lake. The lake's watershed has a significant amount of natural cover which provides natural protection to the water quality and lake health. Around 16% of the watershed is forested, 26% is wetlands, and only 8% is developed or agricultural. The State of Minnesota has done water quality modeling which indicates that watersheds with over 75% natural land cover can maintain their water quality and Round Lake is fairly well protected in consideration of this metric. The increase in runoff, erosion, nutrient loading, and human traffic associated with higher levels of development disturbs the lake's natural community and is associated with an increased risk of invasive species establishing in a lake. Maintaining the existing natural landscape and water storage and absorption capacity is key to preserving the quality of Round Lake.

The Round Lake Improvement Association's members work to preserve the quality of the lake with numerous programs to protect the fishery and loon population while preventing Aquatic Invasive Species (AIS) from impacting the lake users. This aquatic plant survey was implemented to monitor changes in the plant community that have occurred since the 2009 survey and could indicate changes in the health of the lake. The survey was also designed to detect any invasive species so rapid response efforts can be implemented to control them. Increased water temperatures, longer growing seasons, erratic precipitation, and increases in colored dissolved organic matter are combining to change the diversity, density, and distribution of plants in the lake and other characteristics of lakes across Minnesota. Long term monitoring is essential to provide an understanding of how these environmental changes will affect the future of Minnesota's lakes.

Lake Area	Area 15' deep or less	Maximum Depth	Shoreline Length	10 yr. Average Water Clarity
1650 acres	627 acres	51'	6.61 miles	16'

Survey Design

The 2024 aquatic plant survey sampled the same sites that were sampled during the aquatic vegetation survey performed in 2020. While on the lake the sonar was monitored and additional sample locations established when invasive plants were encountered to delineate the area occupied by invasive plant species. Prior to the survey public access and resort areas were mapped and intensive survey sample sites established around them. The sample locations created were uploaded to a chart plotter GPS unit on our survey boat. Once on the water the boat was navigated to each sampling site and a double headed weighted garden rake attached to 30 feet of rope was used to collect a sample of the aquatic vegetation. Visual and sonar observations were also used to ensure the plants gathered fully reflected the vegetation present at each site. The plants sampled with the rake were examined and all species sampled were

identified and their abundance was ranked using a 1 to 3 scale with 1 being sparse, 2 being common, and 3 being abundant. Species abundance was calculated as the total number of species at each sample site. The frequency of occurrence is the number of sites where a species was observed divided by the total number of sampling sites. Additionally, all samples are extensively examined for the presence of aquatic invasive plants, fish, and mollusks. This final report was developed that outlines all the plant species encountered, the frequency of each species, and their average growth density. Maps are developed for the report that show the locations where each species that occurred at more than 4% of sample points was encountered and that species density at each of those points. Comparisons were made between the surveys completed in 2020 and 2024 to detect changes in the plant community.

Survey Objectives

This survey examines and physically samples the aquatic plant community of Round Lake to:

- 1. Identify any invasive species present in the lake and determine their distribution.
- 2. Identify the native species present in the lake, their distribution, and growth density.
- 3. Determine the number of species present in the lake.
- 4. Determine the percentage of the lake occupied by vegetation.
- 5. Detect any changes occurring in the distribution, density, and diversity of the plant community.
- 6. Develop distribution and density maps for the common native species, unique native species, and any invasive plant species encountered.

7. Provide the results to the Minnesota Aquatic Invasive Species Research Center's PI Charter plant survey database.

Survey Results – Intensive Areas

Public Access

The public access area is along the south shoreline in an area with extensive shallow sandy flats. Near the shoreline only a few species of thin scattered vegetation were observed but several small clumps of Curly Leaf Pondweed were noted and marked. Other species in this area were mainly Variable Leaf Pond Weed, Wild Celery, Chara, and a few examples of other Pondweeds. The offshore area features an inside bend in the drop off which collects nutrients and organic matter increasing vegetative diversity and growth but this area is over 600 feet offshore.

Sebago Resort

The area in front of Sebago Resort was searched carefully for any invasive species. There is a very shallow stony gravel shelf in front of the resort which limits the diversity of native species found here. The vegetation present was mainly Chara and Variable Leaf Pondweed with no invasive species found. Emergent aquatic plants are found along this area and just to the

north near the point. One notable item from this area was the incredible coverage of the lake bottom by zebra mussel shells which almost completely cover the lake sediments.

Inlet from North Long

The inflowing creek located at the inlet brings sand and organic matter into Round Lake from the east. Organic matter travels out into the lake and is distributed by waves and wind induced currents contributing to the dense and diverse plant community observed adjacent to this area. Wild Celery, Sago Pondweed, Bushy Pondweed, and Clasping Leaf Pondweed are common in this area reflecting the greater availability of nutrients and presence of a silt layer over the sand which is the preferred habitat for Wild Celery. Contrary to the previous area the eastern and southeastern shoreline have very little evidence of zebra mussels either alive of empty shells.

Outlet to Gull Lake

Much of the shoreline along State Highway 371 is shallow and ranges from gravel to sand. This sand is prone to movement by wind and boat induced currents creating a variable shallow sandbar on both sides of the buoys present. Very little vegetation was observed in this area with just a few Chara and some Variable Leaf Pondweed scattered outside the boating channel. There was also some Bladderwort immediately adjacent to Highway 371. No invasive species were found in this area.

Survey Results – Full Lake

The weather was good for surveying with moderate winds generally from the northwest. Visibility was very good with observations exceeding 10 foot depths in some areas. The day featured temps as high as 80 degrees and water temps were over 70 degrees. These ideal temps did result in significant boat traffic but we were able to navigate around other boaters and circle back to check waypoints that were initially obstructed by swimmers or other boaters.

During the 2024 survey vegetation was observed at 277 of the 389 sample points which is 72% of sites. In the previous survey the sites with vegetation was very similar with 83% of sites having vegetation. This represents a generally very stable plant community, the 2020 survey was later in the year and the growth of Bushy Pondweed may have allowed it to show up more often on the sample rake increasing the number of observations both of that species and of vegetated points. Many lakes are seeing increased density, distribution, and diversity of aquatic vegetation in the past few years but that trend was not observed in Round Lake. Vegetation was found as deep as 18 feet of water which is normal for Minnesota lakes and very close to what was observed in 2020. The average number of species per sample was 1.41 when comparing all sites and the maximum number of species at any one site was 6. These are low numbers compared to most Minnesota lakes but similar to the 2020 survey and reflects the low fertility condition of the lake and generally sandy lake bottom. Looking at just the vegetated sample sites the average number of species was 1.95 and the most common number of species was 1. The most common species observed in 2024 were Chara Spp at 23.7% of sites, Bulrush at 23.1%, and Variable Leaf Pondweed at 21.1%. These species were also commonly observed species in the 2020 survey. There were some species that had significant changes in distribution when comparing the surveys. Chara spp. And Variable Leaf Pondweed in particular increased in abundance going from 9% frequency in 2020 to a frequency of more than 20% in 2024. These species were common in 2 to 7 feet of water on Round Lake and both move around the lake as a seed or spore that sprouts in the spring and will persist in that location if the fertility is sufficient to fuel good growth. A total of 26 species were observed in the lake with variable distribution see the following pages for more information.

Assessment - Floristic Quality Index

The State of Minnesota uses floristic quality index as a measure to evaluate aquatic plant communities in lakes to gauge if degradation is occurring. The FQI score is used as a means for prioritizing lakes for protection or restoration through the States One Watershed One Plan process. "The floristic quality index has been proposed as a tool to assess anthropogenic effects of plant communities" Radmoski, Perleberg <u>Application of a versatile aquatic macrophyte integrity</u> <u>index for Minnesota lakes - ScienceDirect</u>

The average FQI score of lakes in the same watershed as Round Lake is about 32. The range of values documented by MN DNR in this watershed is from 25 to 38. The result of this survey is an FQI of 32 for Round Lake indicating a high quality aquatic plant community.



Species Observed, Frequency, and Changes from previous Survey

Table of Species and Occurrence

Emergent Species	% Occurrence	Count of Occurrence	Density When Present
Bulrush	23.1%	90	1.6
Cattail	1%	4	2
Wild Rice	1.3%	5	1.00
Floating Leaf Species	% Occurrence	Count of	
		Occurrence	
Floating Leaf Pondweed	2.6%	10	1.00
Yellow Water Lily	2.6%	10	1.00
Submerged Species	% Occurrence	Count of	
		Occurrence	

Chara	23.7%	92	1.15
Variable Leaf Pondweed	21.1%	82	1.01
Coontail	13.6%	53	1.49
Wild Celery	11.1%	43	1.05
Curly Leaf Pondweed	5.4%	21	1.71
Fries Pondweed	4.9%	19	1.00
Canada Waterweed	4.6%	18	1.06
Clasping Leaf Pondweed	4.6%	18	1.00
Whitestem Pondweed	3.6%	14	1.00
Flatstem Pondweed	3.3%	13	1.31
Narrow Leaf Pondweed	3.1%	12	1.00
Northern Water Milfoil	2.8%	11	1.00
Cladophora	2.8%	11	1.00
Bushy Pondweed	1.5%	6	1.00
Illinois Pondweed	1.0%	4	1.00
Spike Rush	1.0%	4	1.00
Crowsfoot	1.0%	4	1.00
Bladderwort	0.5%	2	1.00
Water Marigold	0.5%	2	1.00
Sago Pondweed	0.5%	2	1.00
Aquatic Moss	0.3%	1	1.00
	Total Occurrences	551	



Comparing the surveys it appears that disturbance tolerant species are increasing in coverage but this is not without exception. Species intolerant to disturbance have generally remained steady to slightly declined. Bushy Pondweeed is the exception to this overall trend

since it is tolerant to disturbance but has declined in abundance. Bushy Pondweed occupies the same habitat niche as Variable Leaf Pondweed and Chara and the increase in those two species may account for the decrease in Bushy Pondweed coverage. Additionally Bushy Pondweed grows throughout the summer and surveying slightly earlier may have reduced to occurrence of Bushy Pondweed on the sample rake. Similarily the decrease in Wild Celery may reflect the growth stage at this time of year. Most native species were at or approaching full growth at the time of the survey while Bushy Pondweed and Wild Celery continue growing until September and may have been documented on the survey rake fewer times due to the reduced size of the plants given the earlier date of the 2024 survey which was timed to occur before Culry Leaf Pondweed died back for the year which occurs around the 4th of July.



Abundance of Species – Whole Lake

Þz Round Lake - Chara 0.42 0 • 0.85 0 0 0 000 1.7 Miles 0 Chara None Sparse Common Credits: Steve Henry Aquatic Survey Professionals Abundant

Chara Spp in Round Lake

Legend

⊳z Round Lake - Bulrush 0 0.42 0 0 0 0 0 0 0 0 0.85 0 000 000 0 0 1.7 Miles © None Credits: Steve Henry Aquatic Survey Professionals Sparse Common Legend Abundant

Bulrush in Round Lake



Variable Leaf Pondweed in Round Lake

>z -Round Lake - Coontail 0 0.42 0 000 0.85 0 0 0 000 0 0 0 1.7 Miles Coontail None Sparse Credits: Steve Henry Aquatic Survey Professionals Common Abundant Legend

Coontail in Round Lake

Wild Celery in Round Lake





Curly Leaf Pondweed in Round Lake Point Intercept Survey Sites

Curly Leaf Pondweed in Round Lake - All Survey Sites

The delineation of Curly Leaf Pondweed resulted in significantly more observations than the Point Intercept Survey alone. Delineations are designed to detect invasive species.



≻z 0 Round Lake - Fries Pondweed 0 0.42 o c 0 0 0.85 1.7 Miles Credits: Steve Henry Aquatic Survey Professionals Fries Pondweed Fries Pondweed Sparse None Abundant Common Legend

Fries Pondweed in Round Lake



Canada Waterweed in Round Lake



Clasping Leaf Pondweed In Round Lake





Narrow Leaf Pondweed in Round Lake

















Emergent Aquatic Plant Communities in Round Lake

Down and Side Scanning Sonar for Aquatic Invasive Species Detection

As technology has improved aquatic plant survey techniques have adjusted to incorporate those improvements. Until recently aquatic plant surveys were based solely on using a sample rake to document the plants at pre-established survey points. Those survey points were spaced 200 feet or further apart in an even grid across the lake providing only a limited snapshot of the plant community. In 2020 Minnesota DNR approved a new Standard Operating Procedure for Invasive Species Delineations that utilizes sonar and visual observations to continuously document the lake's plant community as the surveyor navigates around the lake. Aquatic Survey Professionals combines these two survey techniques to provide our clients with a data set comparable to their previous surveys while also continuously examining the lake bottom to detect any newly introduced invasive species.

Sonar images can appear grainy and coarse, seemingly of limited value in documenting a lake's plant community. Aquatic surveyors gain hundreds of hours of experience monitoring these sonar images alongside thousands of rake obtained plant samples. Over time surveyors learn that each species has a distinctive appearance that changes over the season. Eurasian Water Milfoil is taller and denser than most native species in spring returning images with a different color pattern. By mid-summer Eurasian Water Milfoil develops a dense head over moderate stems often in tall patches that are slightly open near the bottom with a unique appearance on the sonar images. Starry Stonewort is referred to as 'Super Chara' by researchers which matches it's sonar appearance. Starry Stonewort is taller and denser than Chara but generally shorter than other native species. Starry Stonewort grows very dense and usually in well-defined patches with no natives intermixed, it's appearance on sonar is distinctive. Eventually surveyors learn how to 'calibrate' each lake's plant community to the sonar images within 30 minutes of starting their survey on that lake. This allows surveyors to detect unusual sonar images, drop a new waypoint on top of that location, and carefully examine that unusual growth with multiple rake tosses and visually.

Side scanning sonar covers both sides of the boat track and has an adjustable scan width. Up to 200 feet in each direction can be displayed on the sonar unit which covers a track width of 400 feet. Normally the side scanning is set closer to 100 feet to keep the image clarity high, this increases the survey coverage from one small point every 200 feet to a continuous swath of observations 200 feet wide tracking back and forth across the lake. Combined with visual observations made continuously as the boat tracks the lake the 'density' of observations sky rockets compared with traditional point surveys. See the example images on the next page.

These images were produced with side scan set to 80 feet allowing the surveyor to see that far to each side of the boat track. The black area represents the water below the boat, the black area is equal to the water depth. Sample waypoints can be dropped on this screen to mark suspicious sites. Those waypoints are correctly offset to the side and behind the boat exactly on top of the suspicious growth allowing the surveyor to navigate back for additional sampling.



Lake Health Stats – From MN DNR

Explore Watershed Lakes: Minnesota Department of Natural Resources (state.mn.us)

Minnesota DNR has developed a new lake health evaluation framework that draws together the results from numerous programs implemented through their various divisions. This framework is meant to be more comprehensive and informative while still stimulating the interest of lake residents in how each evaluation is performed and ranked. Following the link above will lead you to information on each evaluation and descriptions of the ranking system.

Informative Ranking added by Aquatic Survey Professionals 🛛 Excellent 🛠 Good 🖶 Fair 🔾 Poor 💻

Lake Health Score	60 💛
Lake Health Grade	C+ 💛
Major Watershed Lake Health Mean Score	66
Major Watershed Lake Health Minimum Score	45
Major Watershed Lake Health Maximum Score	90
Water Quality Score	48
Major Watershed Water Quality Mean Score	55
Major Watershed Water Quality Minimum Score	25
Major Watershed Water Quality Maximum Score	94
Phosphorus Score	65
Major Watershed Phosphorus Mean Score	69
Major Watershed Phosphorus Minimum Score	35
Major Watershed Phosphorus Maximum Score	92
Total Phosphorus (μg/l)	19
Total Phosphorus Regional Goal (µg/l)	30
Total Phosphorus Percent Deviation from Goal	14
Total Phosphorus Goal Status	At or Above Goal
TP Sensitivity Index (inches)	3
TP Sensitivity Significance Priority Class	Highest 🛖
Water Clarity Score	32
Major Watershed Water Clarity Mean Score	42
Major Watershed Water Clarity Minimum Score	2
Major Watershed Water Clarity Maximum Score	97
Five-year mean Water Clarity Meters	3 🛑
Water Clarity Regional Goal	2
Water Clarity Percent Deviation from Goal	55
Water Clarity Goal Status	At or Above Goal
Water Clarity ID for Lake Browser	18037300
Impairments	Mercury in fish
Biology Score	57 🛑

Major Watershed Biology Mean Score	50
Major Watershed Biology Minimum Score	27
Major Watershed Biology Maximum Score	74
Fish Community Quality	68
Major Watershed Fish Community Quality Mean Score	68
Major Watershed Fish Community Quality Minimum Score	27
Major Watershed Fish Community Quality Maximum Score	100
Fish IBI Score	59
Fish IBI Threshold	45
	Deep lakes with complex
Fish IBI Lake Type	shorelines
Fish IBI % Deviation From Threshold	31
Fish IBI Status	At or Above Threshold
Fish IBI Aquatic Life Use Judgement	Full Support
Lake Plant Community Quality	47 中
Major Watershed Lake Plant Community Quality Mean	43
Score	
Major Watershed Lake Plant Community Quality Minimum	27
Score	67
Major Watershed Lake Plant Community Quality Maximum	67
Score	32
Plant FQI Score	32
Plant FQI Inreshold	20 28w
Plant FQI Ecoregion	57 57
Plant FQI % Deviation From Inreshold	At or Above Threshold
Plant FQI Status	
Biological Significance Class	High
Hydrology Score	75
Major Watershed Hydrology Mean Score	88
Major Watershed Hydrology Minimum Score	62
Major Watershed Hydrology Maximum Score	100
Lake Watershed Health Index	94
Major Watershed Lake Watershed Health Index Mean	92
Major Watershed Lake Watershed Health Index Minimum	59
Major Watershed Lake Watershed Health Index Maximum	100
Lake Watershed Transport Capacity Class	6
Percent Disturbed	8 🗙
Watershed to Lake Area Ratio	14.9
Watershed to Lake Area Class	More than 10
Score the Shore	55 💻

Major Watershed Score the Shore Mean	76
Major Watershed Score the Shore Minimum	53
Major Watershed Score the Shore Maximum	90
Shoreland Zone Score	21
Shoreline Zone Score	14 💻
Aquatic Zone Score	20
Score the Shore Rating	Low 💻
Stewardship	Not Scored
Benefit to Cost Assessment Class	Highest
Percent Forested	16
Percent Grass and Shrub	2
Percent Wetland	26 🖈
Percent Pasture and Hay	2
Predicted Total Phosphorus Load (pounds/year)	2,130
Phosphorus Load Reduction Goal (pounds/year)	110

Status of the Fishery

Round Lake is a 1,650 acre lake located just south of Nisswa in Crow Wing County. The lake reaches depths of 51', with 38% of the lake less than 15' deep. Water clarity is good with a secchi disk reading of 22'. Although the lake is heavily developed, there are still large beds of emergent vegetation (primarily bulrush). Protection of aquatic vegetation, especially emergent vegetation, is important for maintaining good water quality. Aquatic vegetation is also critical for fish spawning areas as well as providing cover for fish.

Round Lake is stocked annually with newly hatched walleye fry (627,000/year). A contingency stocking also added 607 lbs or 13,890 walleye fingerlings in 2018, and 714 lbs (8,094 fingerlings and yearlings) in 2014. The gillnet catch of 5.5 walleyes/net was average compared to similar lakes. Average length was 16.1", with 93% measuring at least 12.0" in length.

Northern pike on Round Lake have had a 30" minimum size limit since 2003. The northern pike gill net catch of 5.9/net was average when compared to similar lakes. Average length was 26.0", with 15% measuring at least 30.0" in length.

Largemouth bass were sampled by spring electrofishing at a low rate of 11.4/ hr. run-time. Average length was 13.1". Six smallmouth bass were also sampled, with an average length of 15.4".

Bluegills were caught in average numbers at 20.4/trap net. Average length was 4.9", and 12% were at least 7.0" in length. Yellow perch were also caught in average numbers at 21.5/gill net. Most of the perch caught were too small to be of interest to anglers with an average length of 6.6". However there were a few larger individuals caught with the biggest measuring 10.4". Yellow perch are an important forage species, especially for walleyes and northern pike.

Round Lake is designated as AIS (aquatic invasive species) infested waters because of zebra mussels. Lake users are required to inspect and remove any aquatic plants and animals from their watercraft and trailers as well as pull the plug and drain all water from the watercraft, including bilges, livewells and baitwells.

For More Information

Brainerd Area Fisheries Supervisor 1601 Minnesota Dr Brainerd, MN Phone: 218-203-4301 Email: <u>Brainerd.Fisheries@state.mn.us</u> Website