RMB ENVIRONMENTAL LABORATORIES

2021

Clearwater Lake Plant Survey

PREPARED BY

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CLEARWATER

Lake Summary

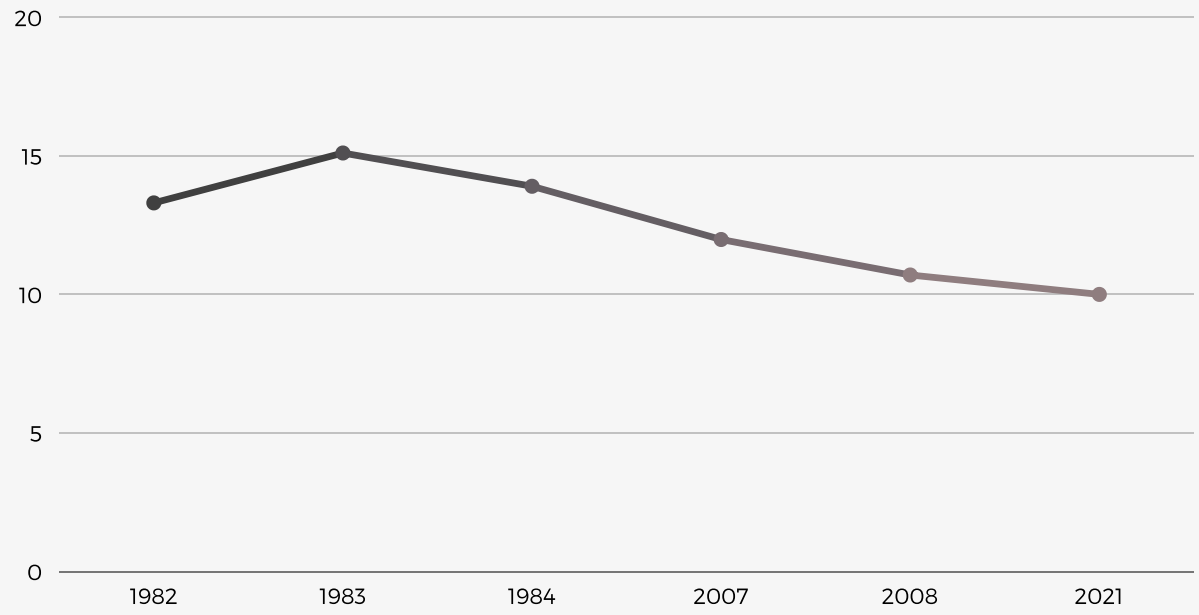
Clearwater Lake (DOW 18-0038-00) is a large 905-acre lake located south of Deerwood, Minnesota in Crow Wing County. Clearwater Lake has a maximum depth of 54 feet and a mean depth of 24 feet. 252 acres, or 28% of Clearwater Lake is considered littoral zone. The littoral zone is the area of a lake that is less than 15 feet deep. Since the water is shallow in this area, it permits light penetration to the bottom of the lake aiding plant growth.

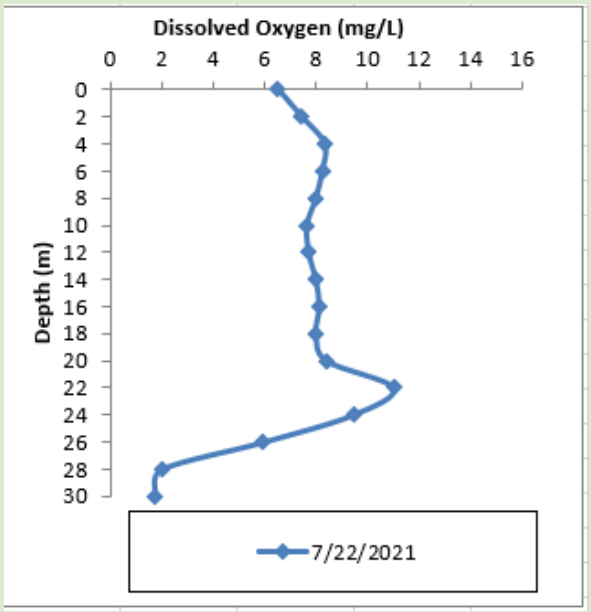
Clearwater is classified as a mesotrophic lake as measured from 1982-2021 by a mean secchi depth of approximately 10 feet. Continual annual monitoring can help track trends in water quality in the lake.

Water Quality Statistics

Water quality can impact the speciation and quantity of aquatic plants. Phosphorus is an important nutrient for plant growth. Generally, it is the limiting nutrient in many Minnesota lakes, meaning that the more phosphorus that is available, the more plants and algae will grow. Sunlight also plays a large role in plant growth. Typically in Minnesota lakes, we see the littoral zone ranging up to about 15 feet. The littoral zone is the area of the lake where sunlight penetrates through the water and reaches the bottom of the lake, ultimately aiding plant growth. The average secchi disk reading is about 15 feet on Clearwater Lake. The graph below illustrates the average yearly secchi disk readings recorded for Clearwater Lake.

Yearly Average Secchi Disk Readings





2021 Water Chemistry Results Site 202

	TP	CHLA	Secchi
Surface	6 ug/L	3.12 ug/L	11 ft
Mid	18.0 ug/L	12.0 ug/L	
Bottom	24 ug/L	8.01 ug/L	

Methods & Objectives

The point intercept survey followed our RMBEL Standard Operating Procedure (SOP) and the DNR's document, Minnesota Lake Plant Survey Manual (2016). The goals and objectives were discussed with the Lake Association prior to the survey to ensure all goals were met during the survey.

Goals:

1. Eurasian watermilfoil presence and density
2. Native plant taxa observed and the estimated abundance
3. Identification of taxa to the level of species when possible
4. Frequency of occurrence of each taxon found
5. Frequency of all aquatic plants found
6. Estimation of species abundance using MN DNR ranking system
7. Distribution maps for common species
8. Determination of any additional invasive aquatic plants

This rake would be designated as a 3, since there is one species of plant covering the entire rake.

Methods:

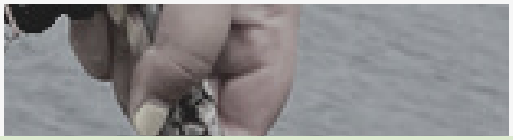
A double-headed weighted garden rake attached to a rope was used to complete the survey vegetation. The vegetation that was found under the surface was assigned a number between 0 and 3.

1 =Sparse (<25% of rake covered)

2=Common (>25% but <75%)

3=Abundant (>75% of rake covered)

Water depths at each site were recorded in 1-foot increments using an electronic depth finder.



July 2021

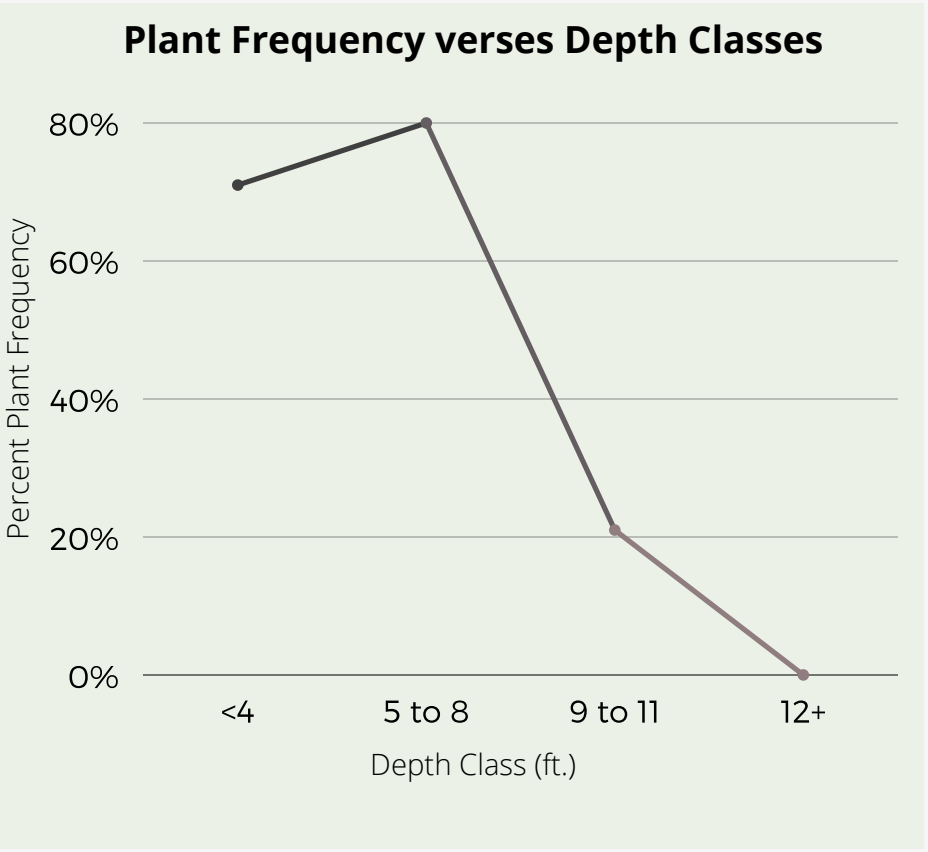
Survey Results

The weather was conducive for the survey with sunny skies, temperatures reaching 75 degrees and little wind. Water temperatures were in the mid-low 70s.

Plant abundance was greatest between five to eight feet of water. As depths increased beyond that range, the presence of vegetation decreased and became less dense (Figure 4).

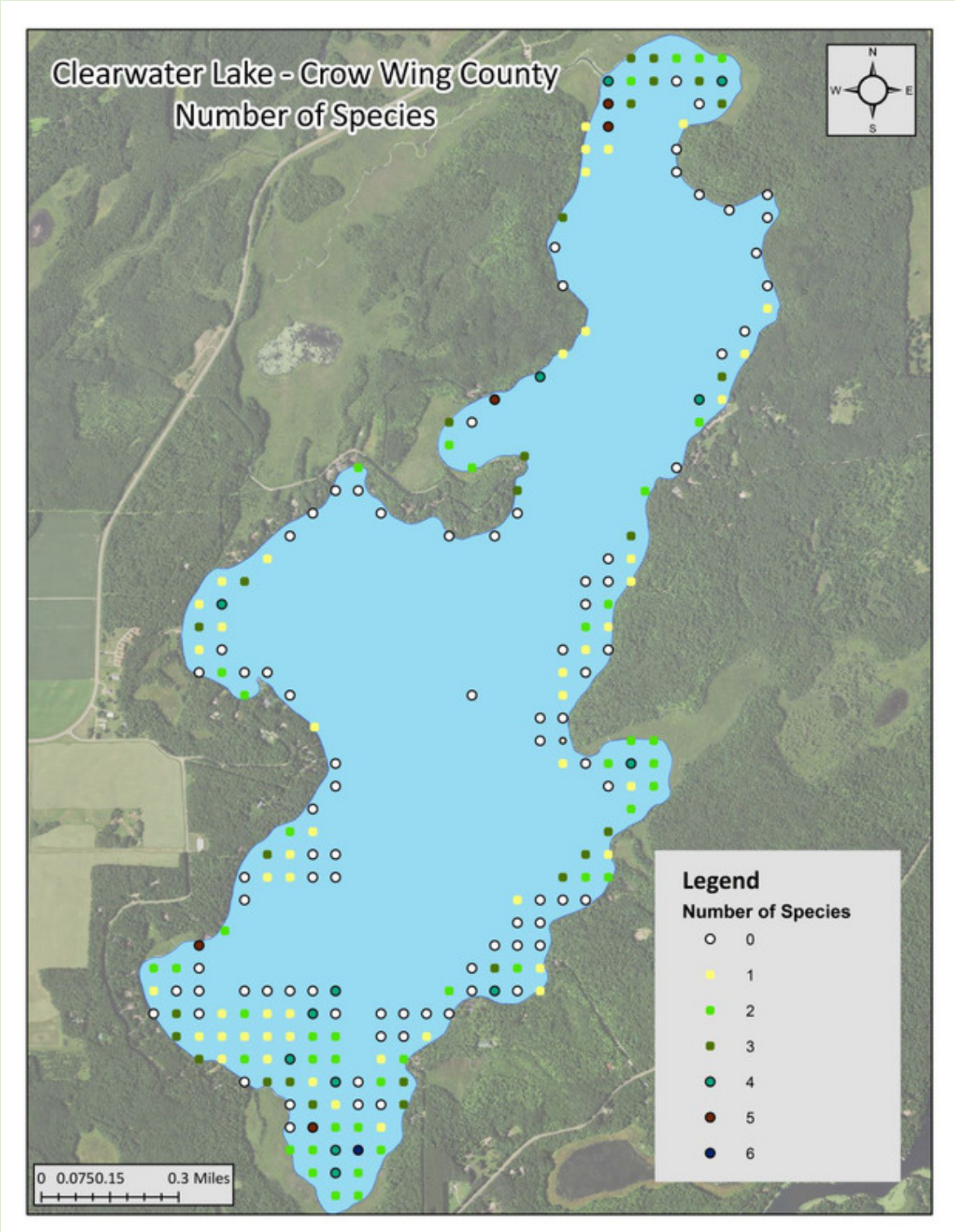
226 points were observed and sampled for aquatic vegetation. Sampling occurred to a maximum depth of 25 feet. No vegetation was found at 75 sites, which is 33% of all sites sampled. The top three most abundant submergent species observed were chara, celery, and busy pondweed. White waterlilies were by far the most frequently observed floating plant and bulrush was the most common emergent plant.

The average number of plants per rake sample on Clearwater Lake was 2.



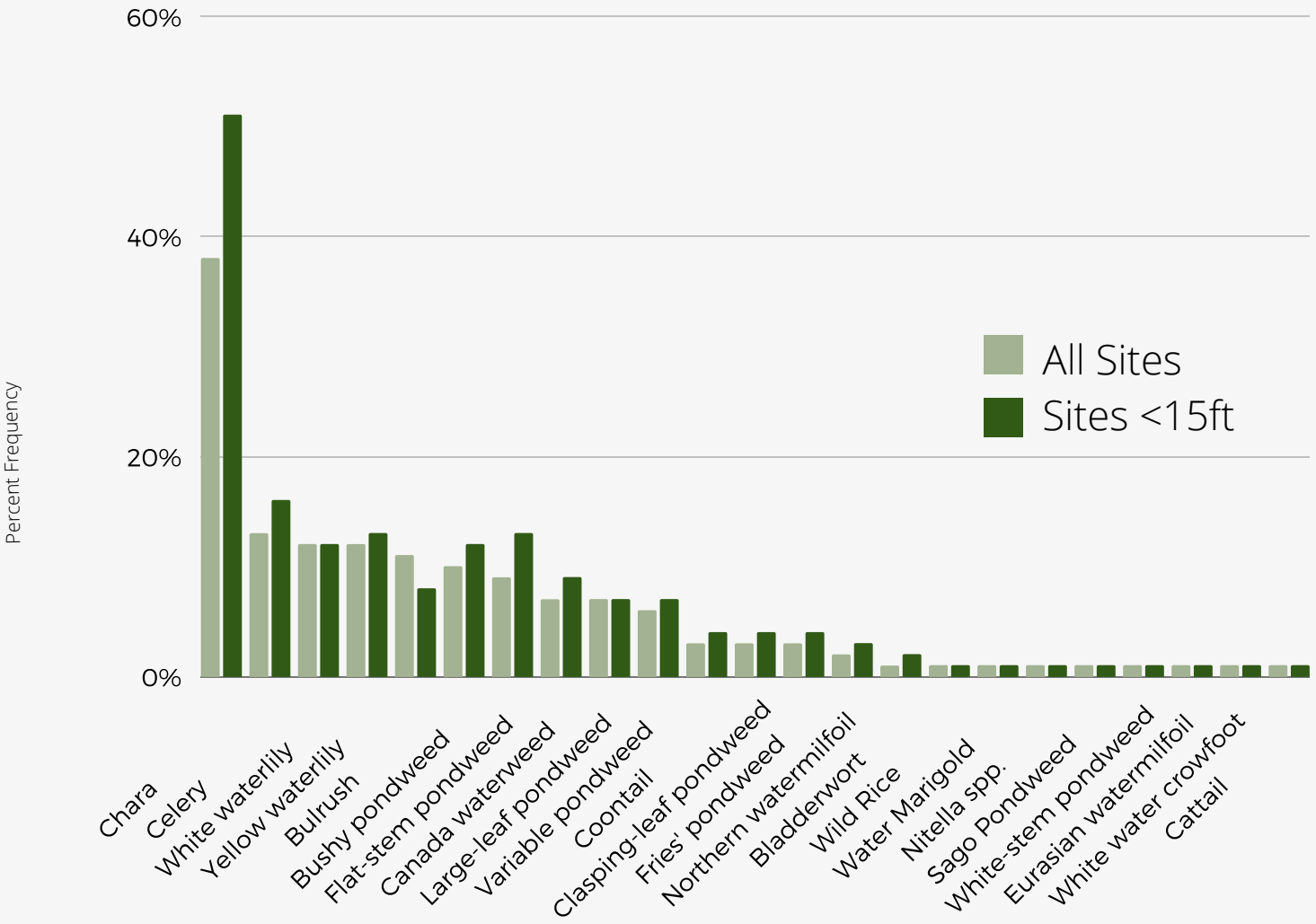
Aquatic Plant Abundance

23 different types of native plants were found across the sampling area. As well as the invasive Eurasian watermilfoil. Six was the maximum number of species found at a specific point.



Aquatic Plant Frequency

The frequency of plants in a given location depends greatly on the substrate, depth of the water, nutrient supply, and light availability. Due to an early ice out, warm temperatures and low water levels in 2021, we were potentially able to observe a larger variety of native plants.



The most commonly observed plant was:

Chara

Chara is a native macro algae that typically grows in shallower areas of the lake. It has a strong musty odor.

Plants Identified

SUBMERSED

Submersed plants grow primarily under the water's surface. Upper leaves may float near the surface and flowers may extend above the surface. Plants are often rooted or anchored to the lake bottom.

Common Name	Scientific Name	Count	Frequency All sites	Frequency <15 ft
Chara	Chara spp.	87	38%	51%
Water celery	Vallisneria americana	30	13%	16%
Bushy pondweed	Najas flexilis	23	10%	12%
Flat-stem pondweed	Potamogeton zosteriformis	21	9%	13%
Canada waterweed	Elodea canadensis	16	7%	9%
Large leaf pondweed	Potamogeton amplifolius	15	7%	7%
Variable pondweed	Potamogeton gramineus	14	6%	7%
Coontail	Ceratophyllum demersum	7	3%	4%
Clasping leaf pondweed	Potamogeton perfoliatus	6	3%	4%
Fries' pondweed	Potamogeton friesii	6	3%	4%
Northern watermilfoil	Myriophyllum sibiricum	5	2%	3%
Bladderwort	Utricularia macrorohiza	3	1%	1%
Water marigold	Bidens beckii	3	1%	1%
Nitella	Nitella spp.	3	1%	1%
Sago Pondweed	Stuckenia pectinata	1	<1%	<1%
White-stem pondweed	Potamogeton praelongus	1	<1%	<1%
Eurasian watermilfoil	Myriophyllum spicatum	1	<1%	<1%
White water crowfoot	Ranunculus aquatilis	1	<1%	<1%

Plants Identified

FLOATING

Floating plants are rooted beneath the surface with leaves that rest on the surface of the water.

Common Name	Scientific Name	Count	Frequency All sites	Frequency Sites <15ft.
Yellow waterlily	Nuphar variegata	26	12%	12%
White water lily	Nymphaea odorata	27	12%	12%

Plants Identified

EMERGENT

Emergent plants grow above the surface of the water. These plants are typically observed near the shoreline and can help to serve as a natural buffer.

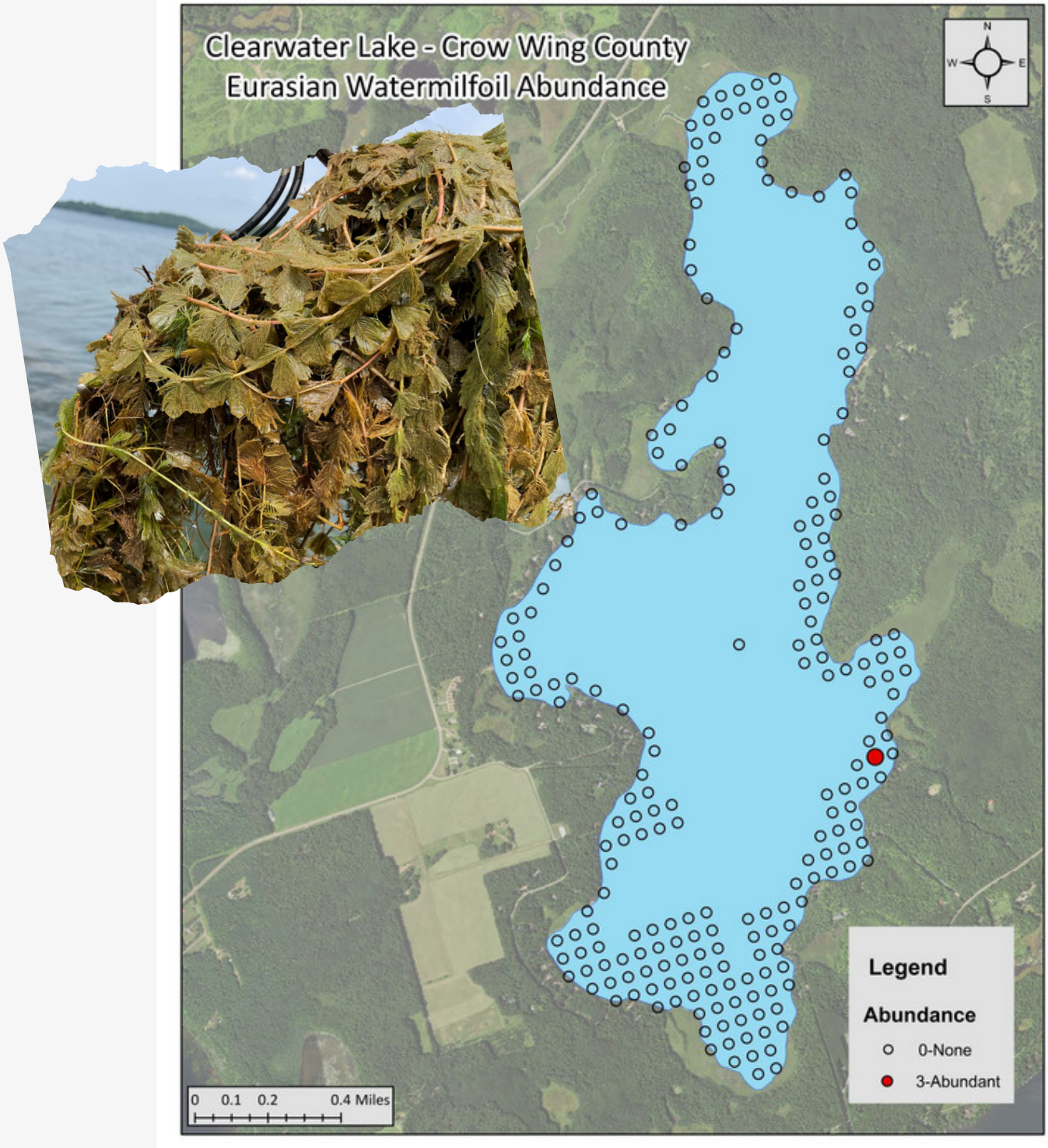
Common Name	Scientific Name	Count	Frequency	Frequency
Bullrush	Scripus acutus	25	11%	8%
Cattail	Scripus acutus	1	<1%	<1%

2021 Survey Statistics

Total number of plants	23 species
Total number of plant occurrences	151 sites
Total number of sites	226 sites
Total number of sites <15 ft.	27 sites

Eurasian Watermilfoil

Eurasian watermilfoil is an invasive plant that can grow up 20 feet tall. Eurasian watermilfoil reaches peak growth in mid-summer and can flower twice a year. It forms thick mats that reduces the amount of sunlight that the native plants can receive. Eurasian watermilfoil was only found at one location in 2021; however it was very dense in this area.



Abundant Species

Chara (Chara spp.)

Chara is a macro algae that feels crunchy and has a distinct musty order. Sometimes chara is referred to as a muskgrass and it is often found in shallower areas of the lake. Chara helps to stabilize the sediment on the bottom of the lake as well as provides food and habitat for many aquatic animals.

Abundant Species

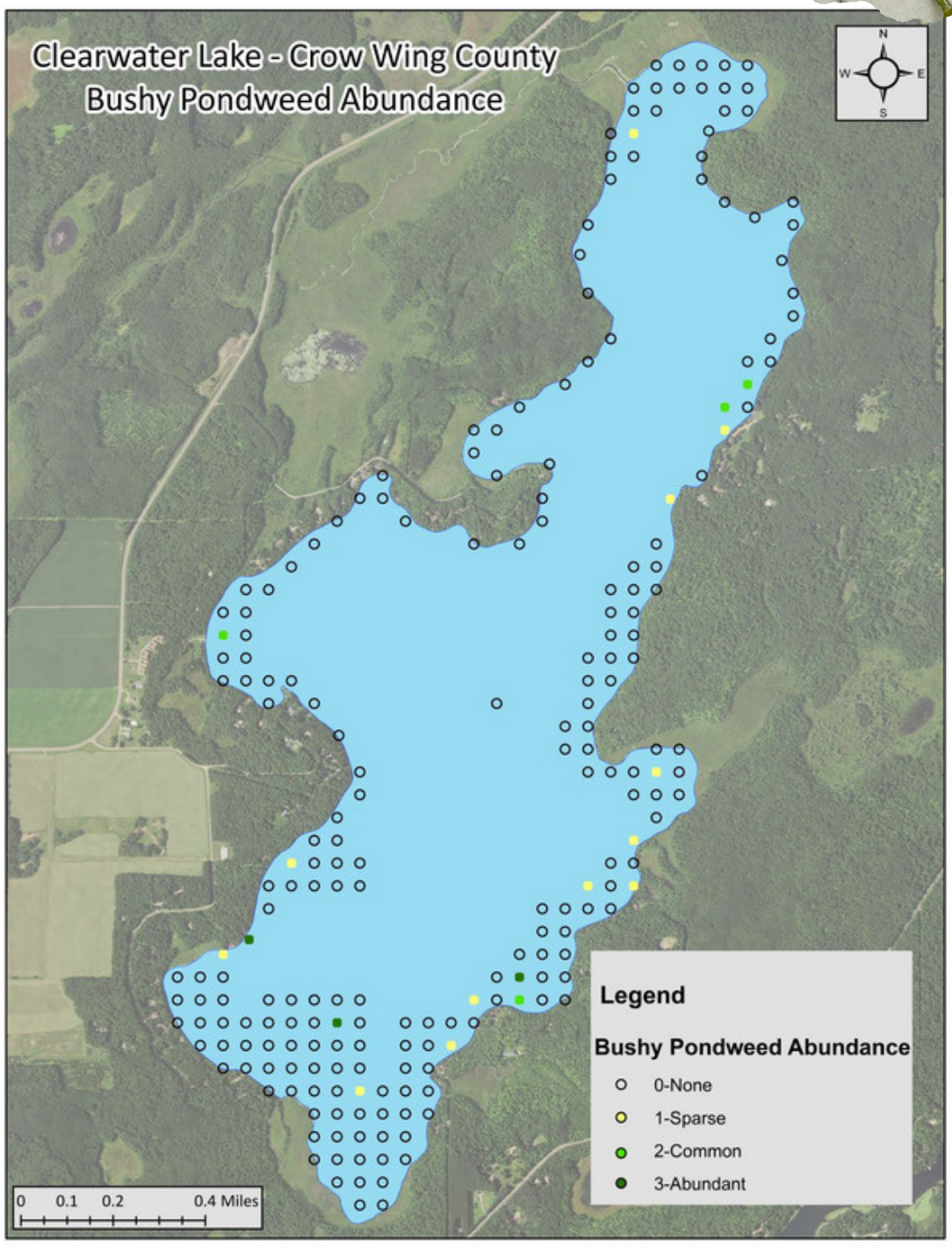
Celery (Vallisneria americana)

Water celery prefers sandy sediment in lakes and streams. The leaves can appear wavy and have a wide stripe of cells down the middle that can appear shiny. The female flowers have long spiraled stalks that are often seen in groups around mid-summer.

Abundant Species

Bushy Pondweed (Najas flexilis)

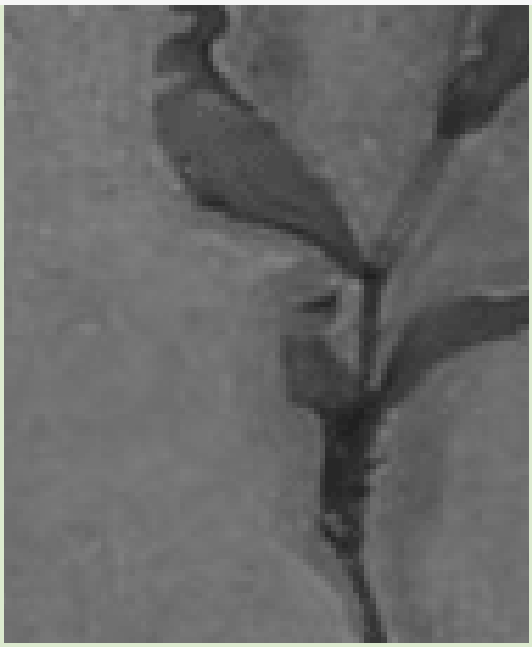
Bushy pondweed is the common name for slender naiad. It can be found in shallow or deep areas of lakes but is most commonly found growing with chara spp. It can grow up to 1 meter long, but is typically found much shorter.



Discussion

Clearwater Lake is a relatively deep lake located north central Minnesota. The presence of plants and the depth at which one finds them is related to the water clarity. In areas where the sunlight does not reach the lake's bottom, there most likely, will not be plants present. Clearwater Lake has an average clarity of about 11 feet, and plant abundance was greatest between five to eight feet of water. After nine feet, plant abundance dropped off quickly, and no vegetation was found past 18 feet.

The Minnesota DNR lists the littoral area of Clearwater Lake to be approximately 28% of the total surface area. In general, the littoral area is approximated as the area of the lake that is 15 feet deep or less; in this plant survey, no plants were found deeper than 15 feet.



Eurasian watermilfoil was the only invasive species found on Clearwater Lake. It was only observed in one location during this survey. This could be due to the fact that treatment had occurred before the survey was completed. In order to better understand the distribution of Eurasian watermilfoil, it would be best to have a survey completed before treatment is performed.

LAKE LEARNING

BENEFITS OF AQUATIC PLANTS

If you've spent any length of time at your favorite Minnesota lake, chances are you're no stranger to aquatic plants. Maybe you've cast into lily pads looking for bass, watched minnows dart to safety in plant beds, pulled in an anchor covered with green vegetation, or waded through a few plants while swimming.

Unfortunately, most people see aquatic plants as a problem. They perceive lakes or lakeshores with lots of so-called "weeds" as messy and in need of cleaning. But what a cabin owner sees as a weedy mess is an essential part of a lake's or river's ecosystem (MN DNR).

LAKE LEARNING

THE BENEFITS OF AQUATIC PLANTS

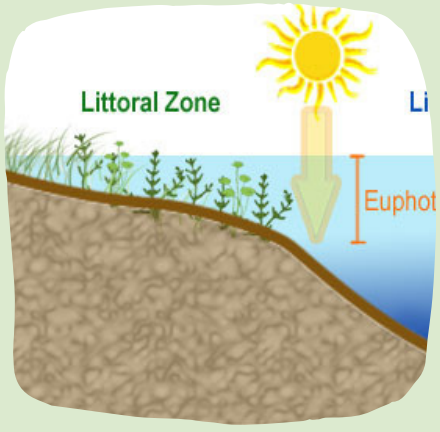
What they do and where they are found?

Plants help to maintain water clarity and provide habitat for fish, insects, and water fowl.

Plants reduce nutrient mixing by stabilizing the bottom sediment and can lock up nutrients helping to limit algae growth.

Plants also produce oxygen in the water column, as a biproduct of photosynthesis.

The depth at which one finds plants is related to the water clarity. In areas where the sunlight does not reach the lake's bottom (usually deep areas), there won't be plants present.



LAKE LEARNING

Protecting native aquatic plant beds will ensure a healthy lake and fishery. If a swimming area is necessary in front of people's docks, clear only a small area of plants. Clearing a whole 100 foot frontage is not necessary and can contribute to additional algae blooms. The natural, healthy state of shallow lakes and bays is to have clear water and abundant native plant growth.

Homeowners should be careful not to cut or remove large areas of native plants in the lake. When aquatic plants are uprooted, the lake bottom is disturbed, and the phosphorus in the water column gets used by algae instead of plants. This can contribute to "greener" water and more algae blooms.

Some aquatic plants in Minnesota are not native and they may cause problems. Control of these species may be done to reduce interference with boating or swimming, to reduce the risk of spreading invasive species to un-infested waterbodies, or in some situations to attempt to produce ecological benefits such as increases in native plant communities. A DNR permit is needed for removal of aquatic plants including aquatic invasive species, and also for plant control devices such as weed rollers.

Resources

Resources

DNR Guide to Aquatic Plants: https://www.dnr.state.mn.us/shorelandmgmt/apg/index.html

Permits to control aquatic plants: https://www.dnr.state.mn.us/shorelandmgmt/apg/permits.html

DNR AIS Specialists: https://www.dnr.state.mn.us/invasives/ais/contacts.html

AIS permits: https://www.dnr.state.mn.us/invasives/training_permits.html

EDA: Guide to typical Minnesota water quality conditions: https://www.pca.state.mn.us/quick-links/eda-guide-typical-minnesota-water-quality-conditions

Literature Cited

Blickenderfer, Mary. 2007. A Field Guide to Identification of Minnesota Aquatic Plants. University of Minnesota Extension.

Borman, Susan et. al. 1997. Through the Looking Glass...a Field Guide to Aquatic Plants. University of Wisconsin Extension.

Madsen, J. D. 1999. Point intercept and line intercept methods for aquatic plant management. APCRP Technical Notes Collection (TN APCRP-M1-02). U.S. Army Engineer Research and Development Center, Vicksburg, MS. www.wes.army.mil/el/aqua

More 2021 Survey Photos