Pelican River Watershed District

Aquatic Vegetation Survey Report

Munson Lake
Becker County

August 15, 2018

Introduction

Munson lake is a 134 acres recreational development lake with heavily developed shoreline. It is located just southwest of the City of Detroit Lakes city limits, between Long Lake and Lake Sallie. Munson Lake has a maximum depth of 26 feet and has a littoral area of approximately 48 acres (36% of lake surface area). The lake receives water primarily from stormwater runoff and groundwater interaction as there is no significant surface water inlets. Water flows out of the on the lake on the southeast corner through a series of historic MN DNR fisheries rearing ponds to Lake Sallie.

Munson is classified as a mesotrophic lake with good water quality that supports a healthy fishery and allows many types of recreational use. Munson is dimictic, mixing in the spring in the fall, and remain well mixed in the upper 5-6 meters (16.5-19.5 feet). Water quality on Munson has been stable for the last 10 years with the exception of total phosphorus level, which showed a 20% improvement from the previous ten-year period (1998-2007). Water clarity averages are nearly 11 feet with total phosphorus levels of 18ppb.

The purpose of the vegetation survey of Munson is describe the current aquatic plant community including the plant species, the frequency, and investigate any invasive plant infestations.

Methods

Pelican River Watershed District staff, interns Alissa Chalberg and Eli Disse, conducted a survey of aquatic vegetation on August 15, 2018. The point-intercept survey followed the methods described by Madsen (1999). Geographic Information System (GIS) software was used to create grid of points across the littoral zone (≥ 15ft.) of Munson Lake at 50-meter intervals for a total of 145 survey points (Figure 1). A Global Positioning System (GPS) was used to navigate to each point where the water depth was recorded at 1-foot increments using an electronic depth finder.

Figure 1. Vegetation point intercept survey point on Munson Lake

Surveyors recorded all plant species found in a one meter squared sample site at the pre-designated side of the boat. A double-headed garden rake attached to a rope was used to survey vegetation not visible from the surface(Figure 2). Each plant occurrence and relative abundance water recorded at survey points. Relative abundance was documented on a scale of 0-3 (Table 1). Plant identification followed Skawinski (2018). Data was entered in an Excel database. Frequency of occurrence was calculated for each species.

Scale	Descriptions
0	No plants present
1	Low Abundance, plant coverage ≤ 1/3 of the survey site or rake head
2	Moderate Abundance, plant coverage ≥ 1/3 but ≤ 2/3 of the site or rake head), and 3 indicated greatest abundance ≥ 2/3 of rake head or survey site
3	Great Abundance, plant coverage ≥ 2/3 of rake head or survey site

Table 1: Description of plant abundance scale (0-3)

Figure 2: Double headed garden rake attached to rope

Figure 3: Double headed garden rake holding and Muskgrass sample, an abundance indicator of 3.

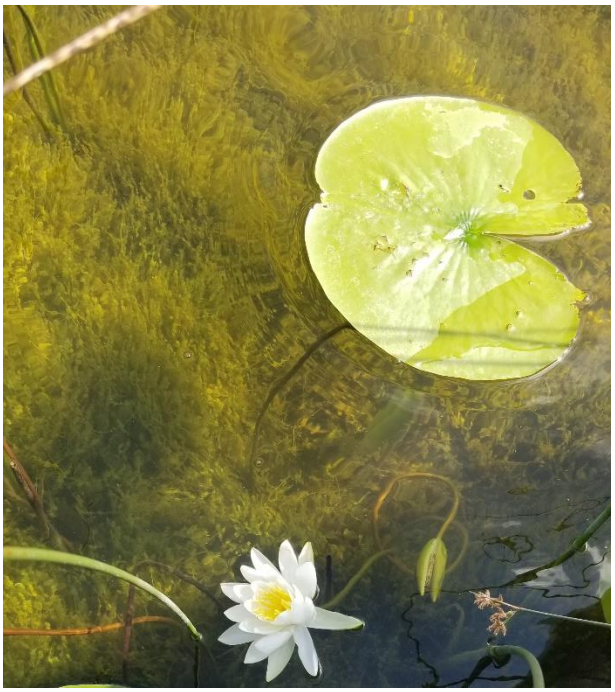

Figure 4: Sample site with sporadic White waterlily, an abundance indicator of 1

Results

A total of 12 native aquatic plant species were recorded on Munson Lake, including 3 emergent, 1 floating leafed (Table 1). The most common occurring plants included Northern watermilfoil, muskgrass, Illinois pondweed, coontail, sago pondweed and yellow waterlily. No invasive plant species were observed.

Northern Milfoil *(Myriophyllum sibiricum)* was the most frequently found plant on Munson Lake at 33% of the survey sites (Table 1, Figure X). It is a submerged plant that is characterized with five to 11 pairs of thread-like leaflets on each leaf. The leaves are arranged with four to five whorls around the stem. Stems emerge in the spring and produce flower spikes by mid-summer. Winter buds are produced in early fall and remain dormant until spring. Leaves and fruit of northern milfoil are consumed by a variety of waterfowl. The feathery foliage traps detritus and provide habitat for invertebrates. Beds of the plant also provide shade, shelter, and foraging opportunities for fish.

Muskgrass (*Char sp.)* is a submerged, macroscopic algae that is common in many hard water Minnesota lakes. It was observed at 32% of the survey sites on Munson (Table 1, Figure X). It has a characteristic musky odor. It can form dense growths on the lake bottom even though though they true stems or roots. Muskgrass is able to adapt to a variety of sediment and depths and helps stabilize the lake bottom sediments a provides fish habitat.

Illinois pondweed *(Potamogeton illioensis)* has stout stems that emerge from thick rhizomes and was observed at 28% of the sample sites (Table 1, Figure 10). They are usually found in water that has a high pH and has good water clarity and can grow in shallow water up to 3 meters (10 ft) deep. It can overwinter by winter-hardy rhizomes and, in some cases, may survive green below ice cover. The fruit is an important food source for waterfowl and is often grazed by muskrat, deer, and beaver. Illinois pondweed offers excellent shade and cover for fish and good surface area (large leaves) for invertebrates.

Coontail *(Ceratophyllum demersum)* roots loosely to sediments and is typically found on lakes with low pH and soft water. Coontail has a tolerance for low light conditions and will grow several meters deep. Because of it tolerance for low light conditions and cool water, it will overwinter as an evergreen plant, continuing photosynthesis at a reduced rate under the ice. This gives it an advantage in spring when it resumes vigorous growth. The stiff whorls of the leaves off prime habitat for a host of critters, particularly during winter when other plants are reduced to roots and rhizomes. Coontail also provides food for waterfowl, which feed on both its foliage and fruit. The bushy stems harbor many invertebrates and provide important shelter and foraging opportunities for fish.

Sago Pondweed *(Stuckenia pectinate)* grows in a wide variety of sediment and water conditions and was observed at 19% of the survey sites (Table 1, Figure 7). In very turbid water, in is often the last rooted plant that can survive. The plant overwinters by its hardy rhizomes and tubers which are produced throughout the growing season before the foliage dies back in the fall. Sago pondweed is considered one of the top food producers for waterfowl, which graze on both the fruit and the tubers of the plant. It also provides shelter for a variety of juvenile fish species.

Yellow waterlily *(Nympaea odorata),* which is often generalized at a "lily pad", is floating leaf plant that emerges from fleshy, buried rhizome, producing heart shaped leaves and yellow flowers. This plant was found at 12% of the survey sites (Table 1, Figure 9). It was usually found on quiet water in water less than 2 meters (6.5ft). The yellow flowers occur throughout the summer, where they will open in the morning and close by midafternoon. When done blooming, the flowers dip below the surface of the water where the seeds mature into fruit (Figure 4). The seeds provide food for waterfowl while the fleshy rhizome is consumed by deer, muskrat, beaver, and porcupine. The leaves provide shade and shelter for fish, amphibians, reptiles, and invertebrates.

Discussion

The overall results of the aquatic vegetation survey show that Munson Lake show macrophyte dominated with no apparent invasive plant species. Munson has good water quality with improving nutrients level in the last 10-year period, compared to the previous period. While not as many overall species were found throughout the lake as some other in the area, there was an excellent diversity of plants at each point surveyed. There were 45 points that were excluded from the diversity analysis because they were greater that 15-feet deep where no plants were found. 82% (82) of the survey sites contained 3 or more plant species. 32% of the sites had 6 or more species present with 2 having 9. There were 6 site that where no plants were found, which were <15-feet deep.

Healthy native aquatic vegetation is important to lakes because of their ability to maintain water clarity and good habitat. Plant uptake nutrients from sediment and store in their tissues which limit algae growth. They produce oxygen as a byproduct of photosynthesis, which oxygenates the water column, allow to a more robust fishery. Plant root structure stabilizes lake sediments and prevent them from being disturbed and mixing into the water, reducing water clarity and resuspending nutrients. Emergent plants help dissipate water energy and prevent shoreline erosion. The plant communities also provide habitat for invertebrates, waterfowl, loon, and cover for fish. Aquatic plants provide food and shelter for a variety of animals, some more obvious that other, but all are essential to a balanced ecosystem. A native and diverse plant community is important for the maintaining the good water quality and ecosystem balance of Long Lake.

Oftentimes, without understanding the complexities if a lake's ecosystem, people view aquatic plants as a problem "weed" that should be removed to help "clean up the lake". Unfortunately, this misunderstanding actually has they opposite effect of the intended action of improving the health of the lake. The aquatic plant community should be protected for the benefits that is provides to the lake and not viewed as a "weed" to be removed.

While lakes with few plants do exist, they also are limited in the number of fish, frogs, duck, turtle and wildlife in general. Lakes are classified as being algal-dominated or macrophyte (plant)-dominated. Algal-dominated lakes tend to have poorer water clarity, fewer plants, and contain fish species with poor eyesight such as carp or bullhead. Macrophyte-dominated tend to have clear to bluish water, high water clarity, healthy and diverse vegetation, and little to no noticeable algae. It is important to remember the plants and algae are in constant battle for nutrients. Maintaining a healthy plant community will help limit that amount of nutrients available for algal growth.

Plant Diversity at Survey Points		
# of Plants	**Count**	**Frequency**
9	2	1
8	3	2
7	11	8
6	16	11
5	18	12
4	18	12
3	14	10
2	6	4
1	6	4
0	6	4

Table 2: Plant diversity at each survey point and the frequency of the diversity at each point.

2018 Lake Munson Vegetation Survey				
Plant Form	**Common Name**	**Scientific Name**	**Count**	**Frequency**
SUBMERGED-ANCHORED: These plants grow primarily under the water 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.	Northern watermilfoil	*Myriophyllum sibiricum*	48	33
	Muskgrass	*Chara sp.*	46	32
	Illinois pondweed	*Potamogeton illinoensis*	40	28
	Sago pondweed	*Stuckenia pectinata*	23	16
	Narrowleaf pondweed	*Potamogeton sp.*	16	11
	Whitestem pondweed	*Potamogeton praelongus*	4	3
	Large leaf pondweed	*Potamogeton amplifolius*	1	1
SUBMERGED-LOOSELY ANCHORED: These plants do not have true roots. They may attach to sediments by basal ends or float freely in the water column	Coontail	*Ceratophyllum demersum*	36	25
FLOATING LEAF: These plant are rooted in the lake bottom and have leaves that float on the water surface. Many have colorful flowers that extend above the water	Yellow waterlily	*Nuphar variegata*	17	12
EMERGENT: These plants extend well above the water surface and are usually found in shallow water, near shore.	Bur-reed	*Sparganium sp.*	*4*	3
	Hardstem bulrush	*Scirpus acutus*	*3*	2
	Cattail	*Typha sp.*	*1*	1

Table 2: Aquatic Plants of Munson Lake, Becker County, August 5, 2018

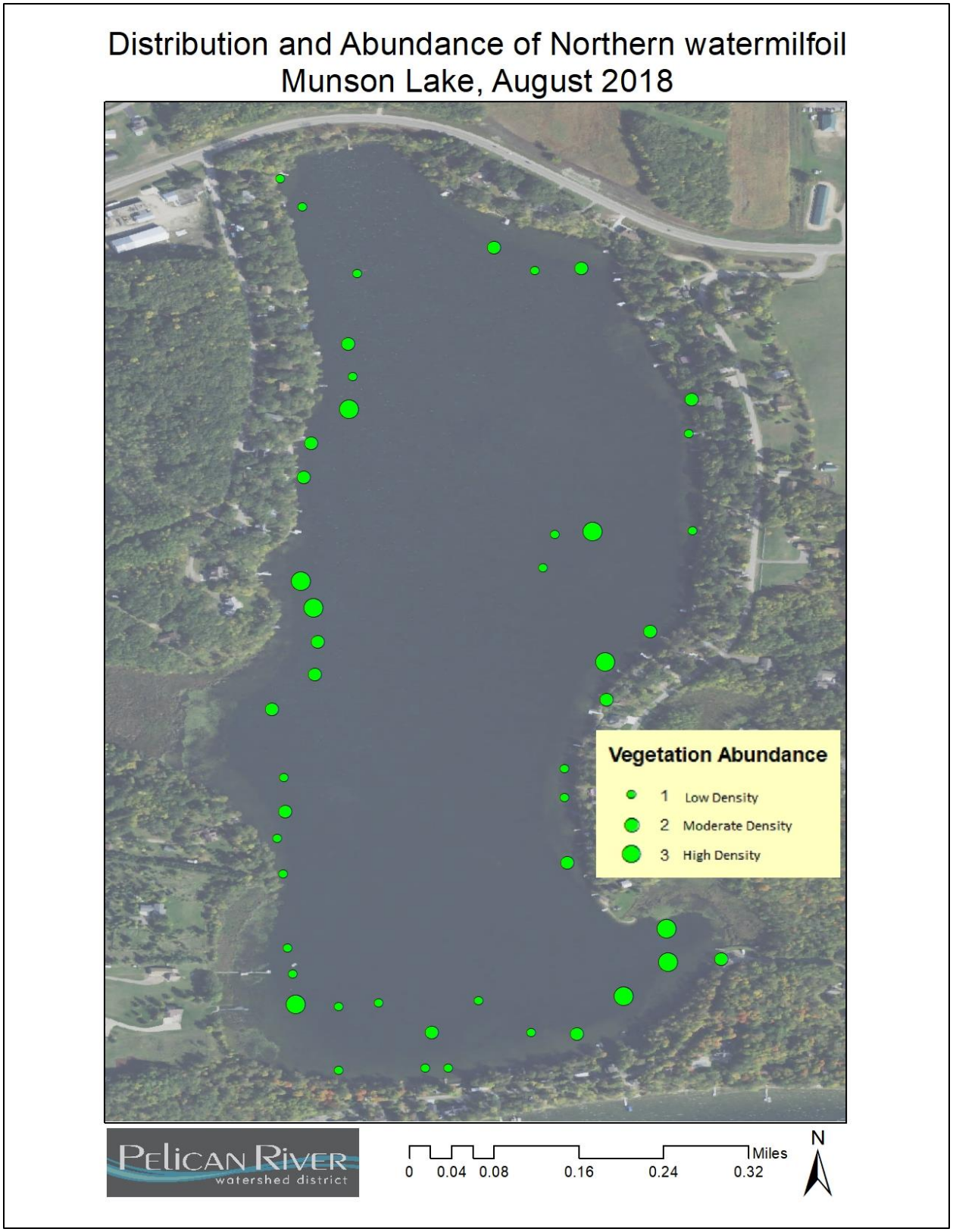

Figure 5: Distribution and abundance of Northern watermilfoil in Munson Lake, August 15, 2018

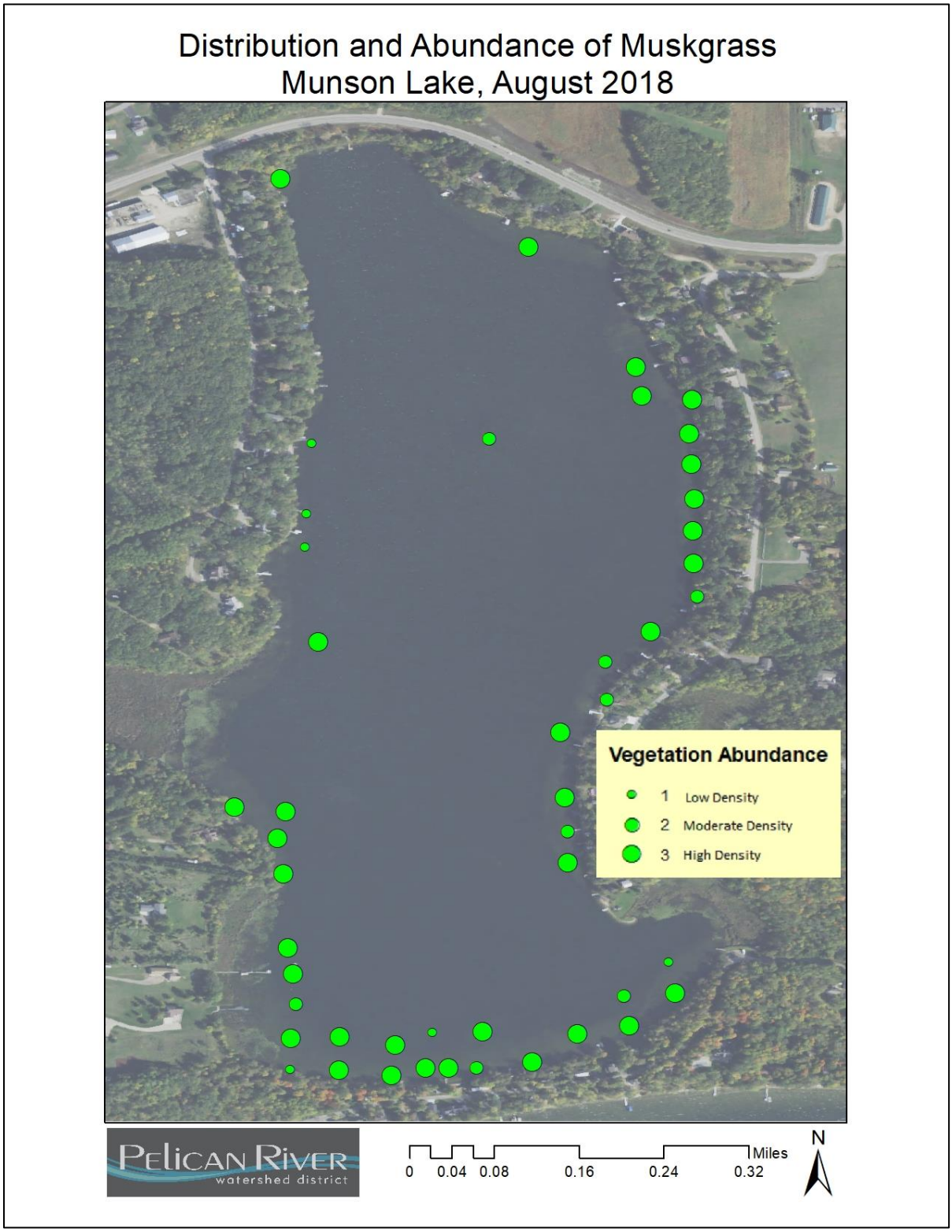

Figure 6: Distribution and abundance of Muskgrass in Munson Lake, August 15, 2018

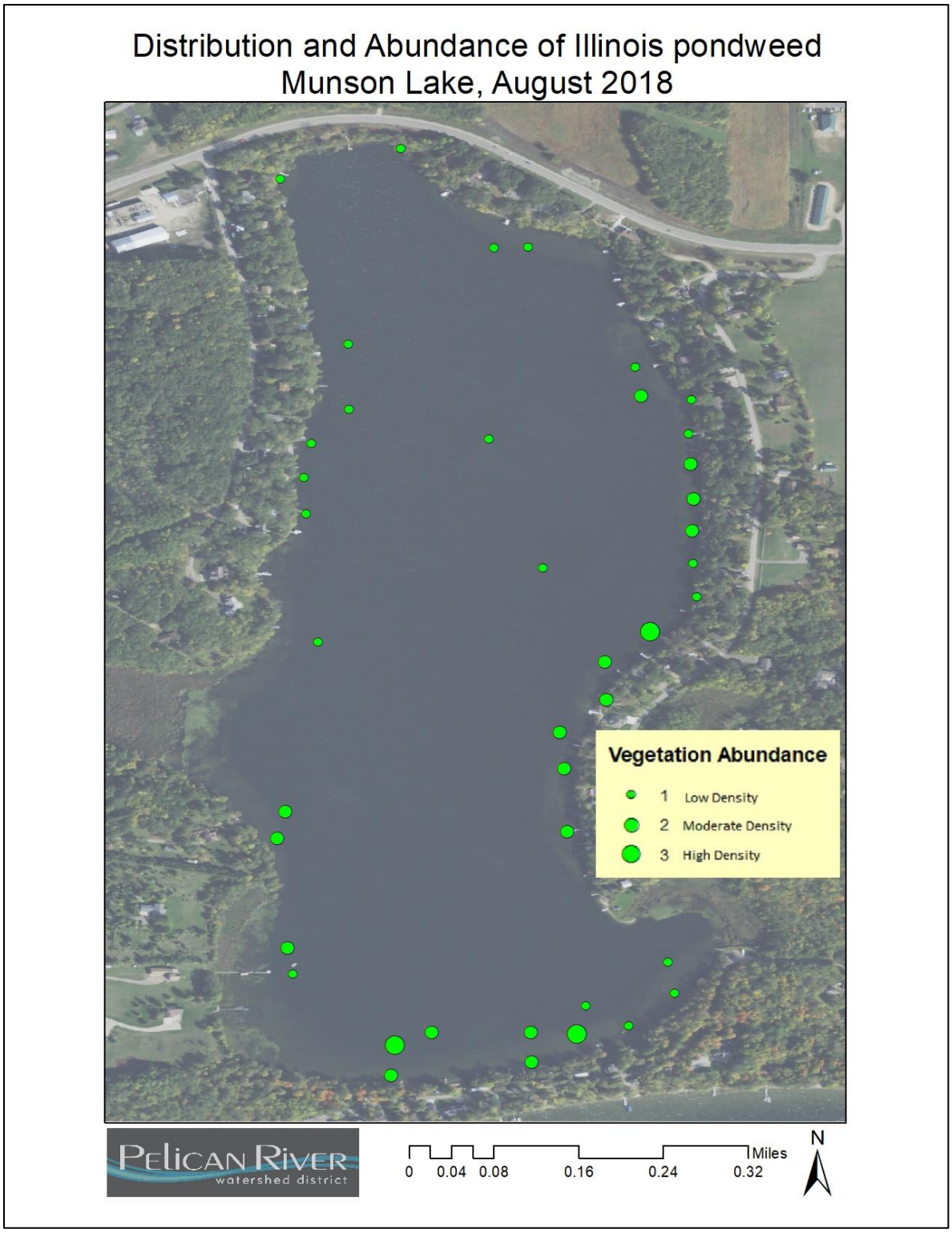

Figure 7: Distribution and abundance of Illinois pondweed in Munson Lake, August 15, 2018

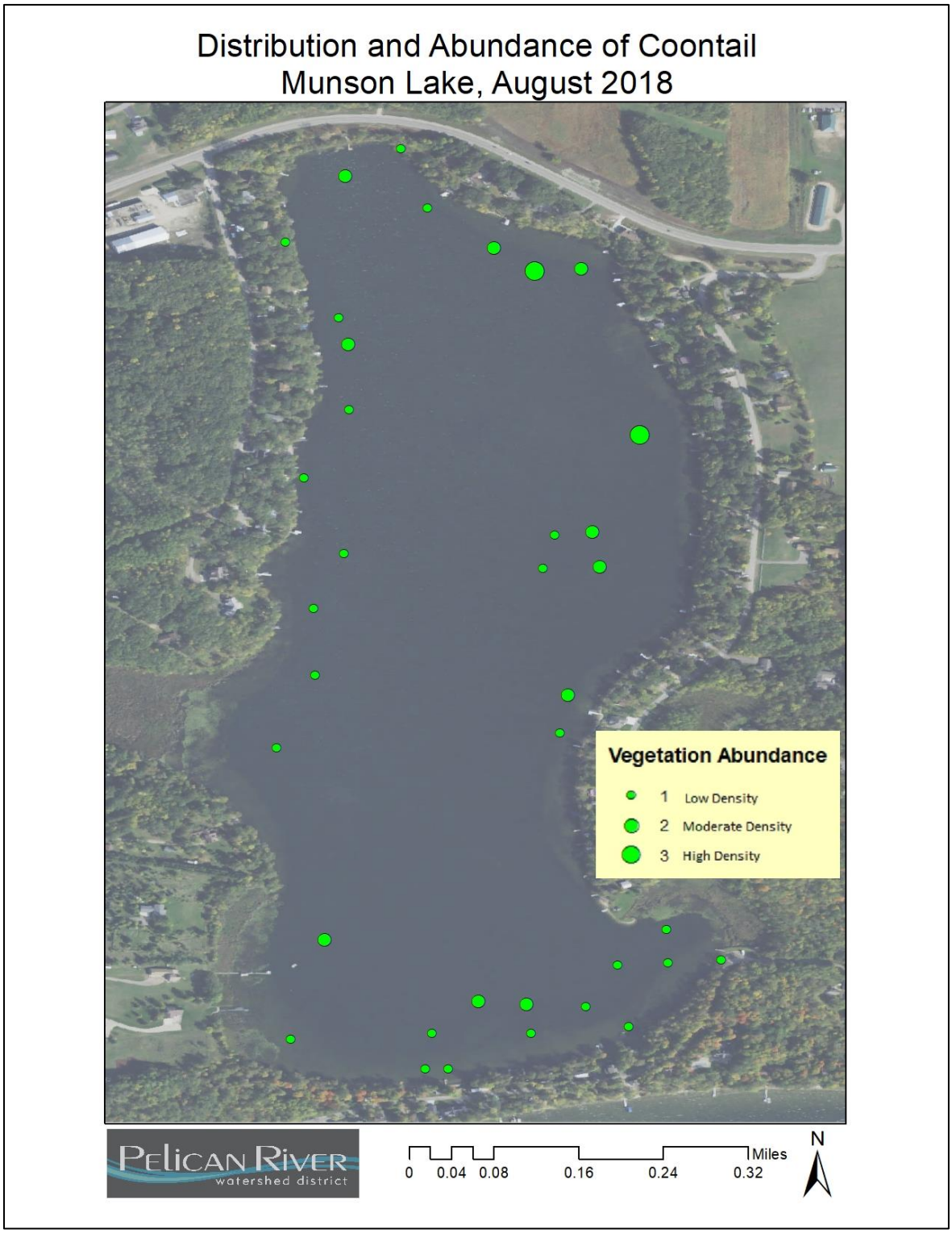

Figure 8: Distribution and abundance of Coontail in Munson Lake, August 15, 2018

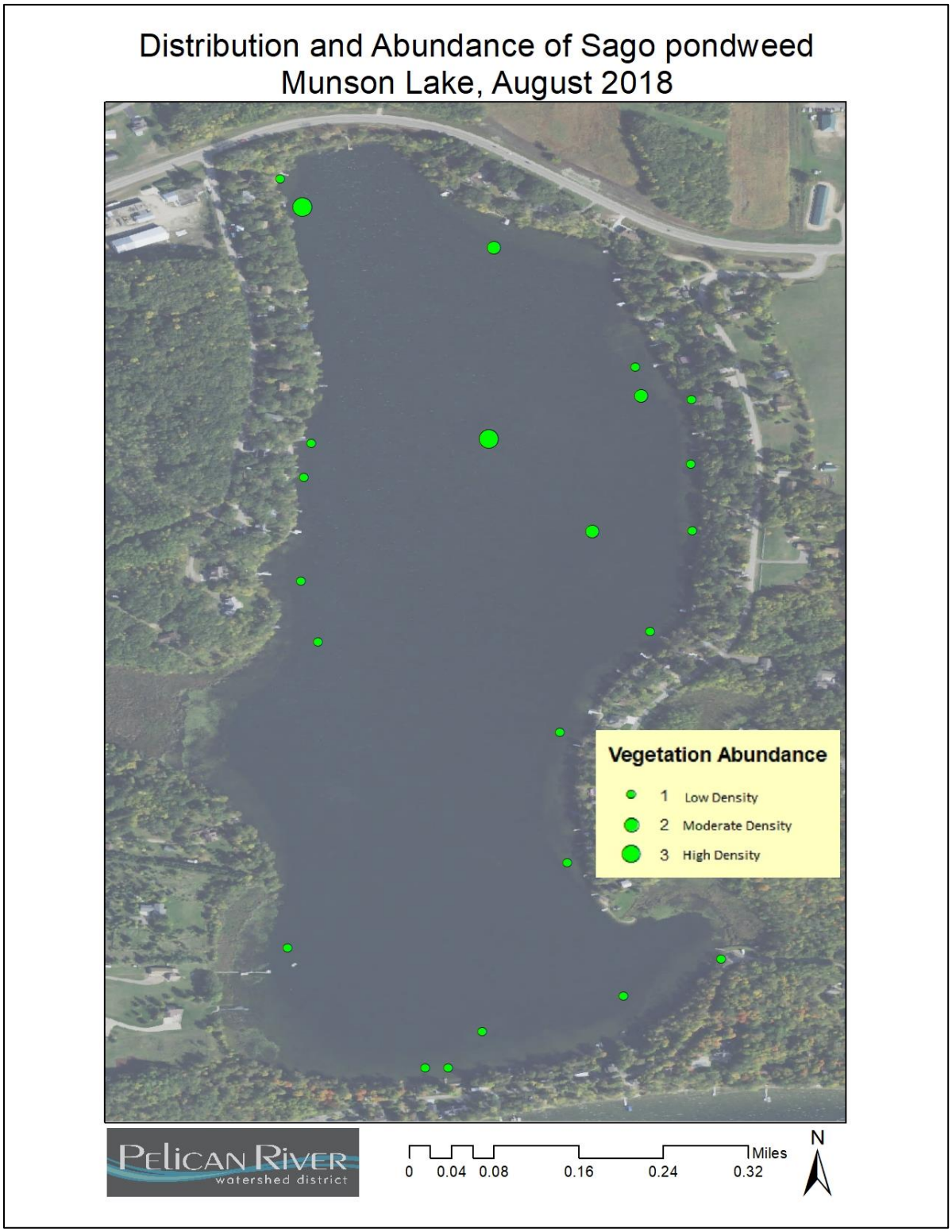

Figure 9: Distribution and abundance of Sago pondweed in Munson Lake, August 15, 2018

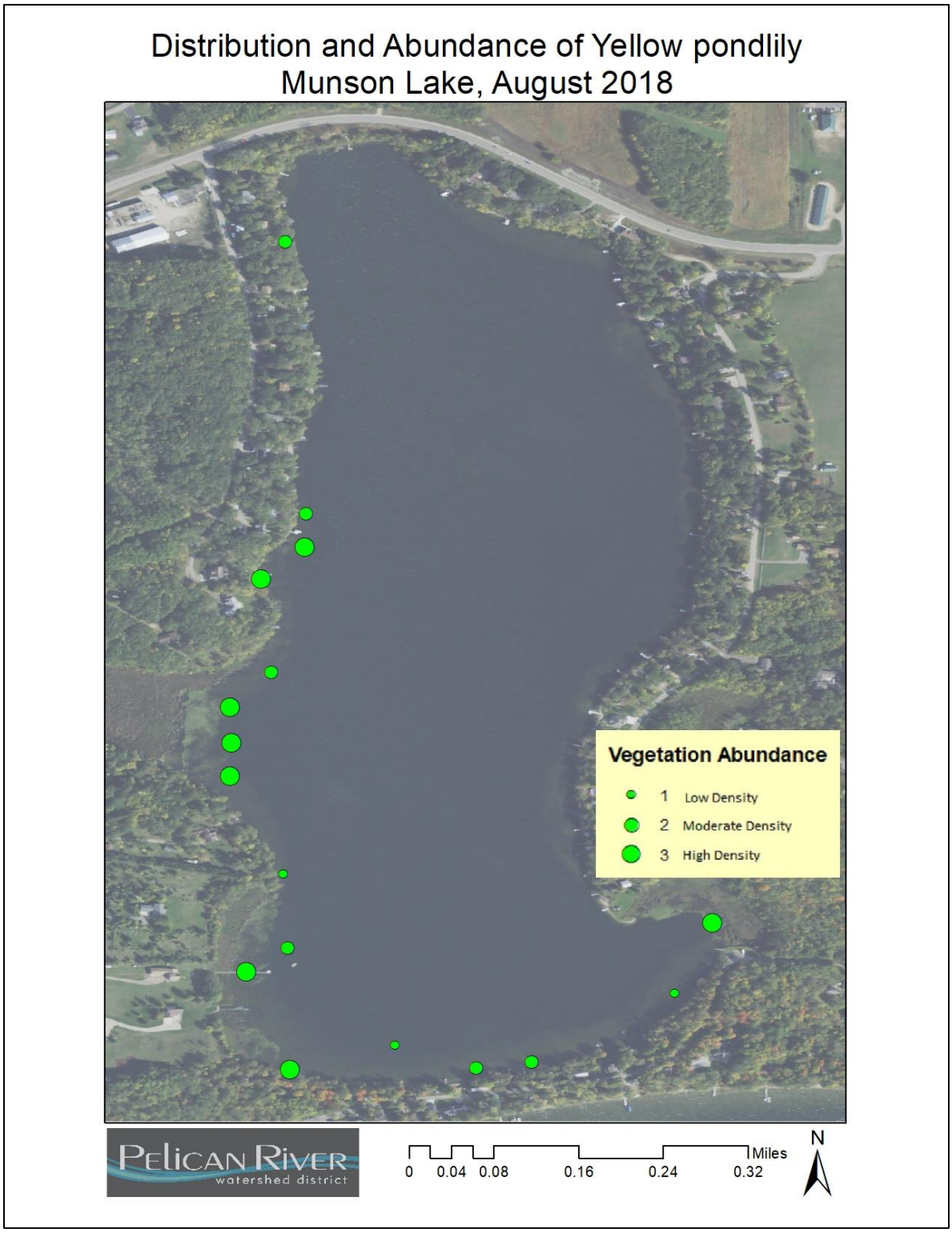

Figure 10: Distribution and abundance of Muskgrass in Munson Lake, August 15, 2018

Literature Cited

Borman, Susan et. al. 1997. Through the Looking Glass. A Field Guide to Aquatic Plants. Wisconsin Lakes Partnership. University of Wisconsin – Stevens Point

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, Vicksbury, MS. www.wes.army.mil/el/aqua

Skawinski, Paul M. 2018. Aquatic Plants of the Upper Midwest. A photographic field guide to our underwater forests. Third Edition