
Big Floyd Lake and North Floyd (Mud) Lake, Becker County, MN 2020 Aquatic Vegetation Management Report



Prepared by:

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Project Details

Lake: Big Floyd (EQuIS# 03-0387-02-206) and North Floyd (Mud) (EQuIS# 03-0387-01-207)

Lake Surface Area: 1,178 acres **Littoral Area:** 861 acres **County:** Becker

Survey Type: Point-intercept aquatic plant surveys (2020)

Date of Survey (most recent): July 17, 2020 – July 30, 2020 (PRWD)

Surveyor[s]: Meagan Powers and Austin Aune

Report Updated: December 2022

Author[s]:

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Report Details

G. L. Kemper. 2022. Big Floyd Lake & North Floyd (mud) Lake, Becker County: 2020 Aquatic Vegetation Management Report. Water Resource Coordinator Pelican River Watershed District, 211 Holmes Street W., Detroit Lakes, MN 56501. 26 pp.

Summary

The purpose of this report is to provide an overview of aquatic plant distribution and the management of invasive aquatic plants in Big Floyd Lake and North Floyd Lake, Becker County in 2020. Historical data on water quality, invasive aquatic plant management permits and point-intercept surveys are all summarized in this report. This summary will guide future invasive aquatic plant control projects and can evaluate changes in native plant communities.

Lake Description

Big Floyd and North Floyd combined is 1,178 acres with 861 acres classified as littoral (<15 feet deep). Floyd Lake is located north of the City of Detroit Lakes and contains a heavily developed shoreline. The lake is divided into two distinct basins, known locally as Big Floyd and North Floyd. The lakes are heavily used for game fishing, boating, and other summer, and winter recreational activities. The larger of the two basins, Big Floyd, has a littoral area (<15 ft) that accounts for nearly 70% of the lake area, with emergent aquatic plants very common. North Floyd littoral area (<15 ft) coverage is approximately 60%. There is one MN DNR owned public access located on the southeast side of Big Floyd. North Floyd Lake does not have a public access but is accessible via a channel between the two basins.

The major water source into North Floyd is Becker County Drainage Ditch 12/Campbell Creek. There are two minor inlets located on the west side of North Floyd, and the southwest side of Big Floyd. Campbell Creek is an intermittent, high gradient stream and is the major nutrient source to North Floyd Lake. Sections of Campbell Creek were ditched and straightened in the early 1900s for agricultural benefit and included partially drawing down Campbell Lake and draining the surrounding wetland areas. Becker County Ditch 11-12 discharges into Campbell Creek, a natural channel which drops almost 80 feet in 2 miles before reaching North Floyd. Through the lower reach, Campbell Creek flows through highly erodible soils, and carries a heavy sediment load to North Floyd. Generally, Big Floyd also contributes some flow to North Floyd, although it is thought the source of this water is mainly from groundwater. Other minor water sources include overland flows and groundwater seeps and springs. The outflow is located on the east side of North Floyd and connects to Little Floyd through a Becker CSAH21 road culvert.

Both lakes have undergone increased development pressure in the past 15 years. Big Floyd underwent conversions of seasonal cabins to permanent year-round residential homes and increased second-tier development. In 2017, the Ironman Golf Course, located between Big and Little Floyd Lakes was converted to residential lots. Big Floyd's shoreline is extensively developed with approximately 76% of 300 parcels exhibiting moderate to significant shoreline modification. In the mid-2000's, the north side of North Floyd was converted from agriculture pasture to residential lots. Since the conversion, approximately 12% of North Floyd's 67 parcels have moderate to significant shoreline modification. Utilization of rip-rap, vegetation/tree removal, sand blankets and retaining walls are prominent alteration practices.

Residential properties primarily use septic systems, with a few parcels using holding tanks. It is anticipated parts of Big Floyd may be annexed into the City of Detroit Lakes as it is an area identified in the "Future Utility Extension/Annexation Area" of the City of Detroit Lakes Comprehensive Plan. This area is also

within the City of Detroit Lakes “extra territorial” 2-mile area, which means the City has influence on the specifics of new developments.

Both Big and North Floyd Lakes are dimictic lakes. Most of the time Big Floyd’s water is clear, with moderate phosphorus and algae concentrations, good game fish populations, and moderate aquatic plant growth. Big Floyd exhibits above average water quality in comparison with other District Lakes and is considered mesotrophic with annual averages of 12.5 feet of water clarity and 18 ppb in-lake phosphorus concentrations. In comparison, North Floyd suffers from poor water clarity, high phosphorus, and severe algal blooms as a result of almost 100 years of elevated phosphorus and sediment loading from ditched Campbell Creek. In North Floyd, there is a phenomenon occurring known as “internal phosphorus loading” which recycles and releases phosphorus back into the water column causing algae blooms. This is due to decades of legacy phosphorus that has accumulated in the lake sediment. In late summer, after water “turnover”, North Floyd experiences occasional algae blooms caused by the release of phosphorus from the enriched lake sediments. North Floyd is considered borderline eutrophic as the annual average of in-lake phosphorus concentrations have remained in the 32-34 ppb range.

The District partnered with the Natural Resource Conservation Service (NRCS) to develop an Upper Pelican River Watershed Plan and Environmental Assessment (2007) to identify the major sources of nutrients and sediment loading in the Upper Pelican River reach including Campbell Creek and the Pelican River/Ditch 13 area from Little Floyd Lake to Detroit Lake. The plan recommended a strong non-degradation policy for Big Floyd; Campbell Creek short term reductions of 25% TP loading, 50% reductions long-term to North Floyd and to improve North Floyd water quality to 25ppb in-lake concentration to benefit downstream Little Floyd Lake water quality.

The District partnered with NRCS, Becker County Soil and Water Conservation District, and landowners to prioritize and install over 25 agricultural BMPs in the upper Campbell Creek watershed in 2012 and 2013 including terrace/tile structures, stream bank buffers, and wetland restorations (cost share with Federal, State and local funding of over \$250,000). While these efforts resulted in reduction in farm field soil erosion, the lower portion of Campbell Creek’s confined stream channel remains highly erodible. However, there has been some improvement in North Floyd annual water clarity in the past decade from 7.5 ft (1998-2007) to 8.5 ft (2008-2017), but no improvement in the phosphorus concentration. Campbell Creek and it’s watershed, continues to be a source of nutrients and sediment to North Floyd Lake, especially during spring runoff and summertime high intensity rainfall events. The District will continue to assess and implement additional measures to reduce external and internal phosphorus inputs and sediment loading into North Floyd Lake. The non-degradation measures for Big Floyd include Stormwater management, shoreline enhancements, and septic treatment.

Management History

The lake has no known Aquatic Invasive Species Plants (AIS) currently (2020), PRWD will continue to monitor the lake for AIS.




Survey Objectives

In 2020, a Point-intercept Survey assessed the distribution of aquatic plants in Big Floyd Lake. The primary purpose for this type of survey is to 1) develop baseline knowledge of the current plant community in a lake, and over time, 2) compare year to year plant variation (in plant presence and spatial location) and 3) track invasive aquatic plants. Moreover, this survey will help the PRWD and our partners to monitor native plant communities and evaluate possible responses to invasive aquatic plant management via herbicide control. It is important to note that distributions and occurrences of aquatic plants may vary from year to year due to natural variations (water clarity, snow cover, water temperatures, and natural fluctuation in plant species) or human induced alterations, such as, herbicide and shoreline management activities.

Survey Methods

PRWD surveyors used a point-intercept survey method developed by John Madsen in “Aquatic Plant Control Technical Note MI-02, 1999” during the 2020 Survey. Points were placed 72 meters apart using a Geographic Information System (GIS), comprising of 332 (270 Big Floyd and 62 North Floyd) points on a grid (Figure 1). Plant samples were collected by throwing and dragging a double-sided rake along the lake bottom at each point. All plant taxa (submerged, floating-leaf, emergent and free floating) were recorded to species or genera during the survey following Skawinski (2018). Plant samples were assessed on the boat to determine species presence/absence and abundance. The abundance rake rating are as follows: 1: sparse, 2: common/ frequent/ occasional, and 3: abundant/matted (Table 3). Frequencies of occurrence percentages (i.e., how often a plant species was sampled in the lake) were calculated based on the littoral zone.

Table 3. Quantitative rake abundance ranking (0-3) used to estimate plant abundance for each species based on rake coverage and/or visual observation (PRWD). A zero (0) ranking indicates no target plants were retrieved or observed in a sample.

Abundance Ranking	Rake Coverage	Description
1		Sparse; plants covering <25% of the rake head
2		Common; plants covering 25%-75% of the rake head
3		Abundant; plants covering >75% of the rake head

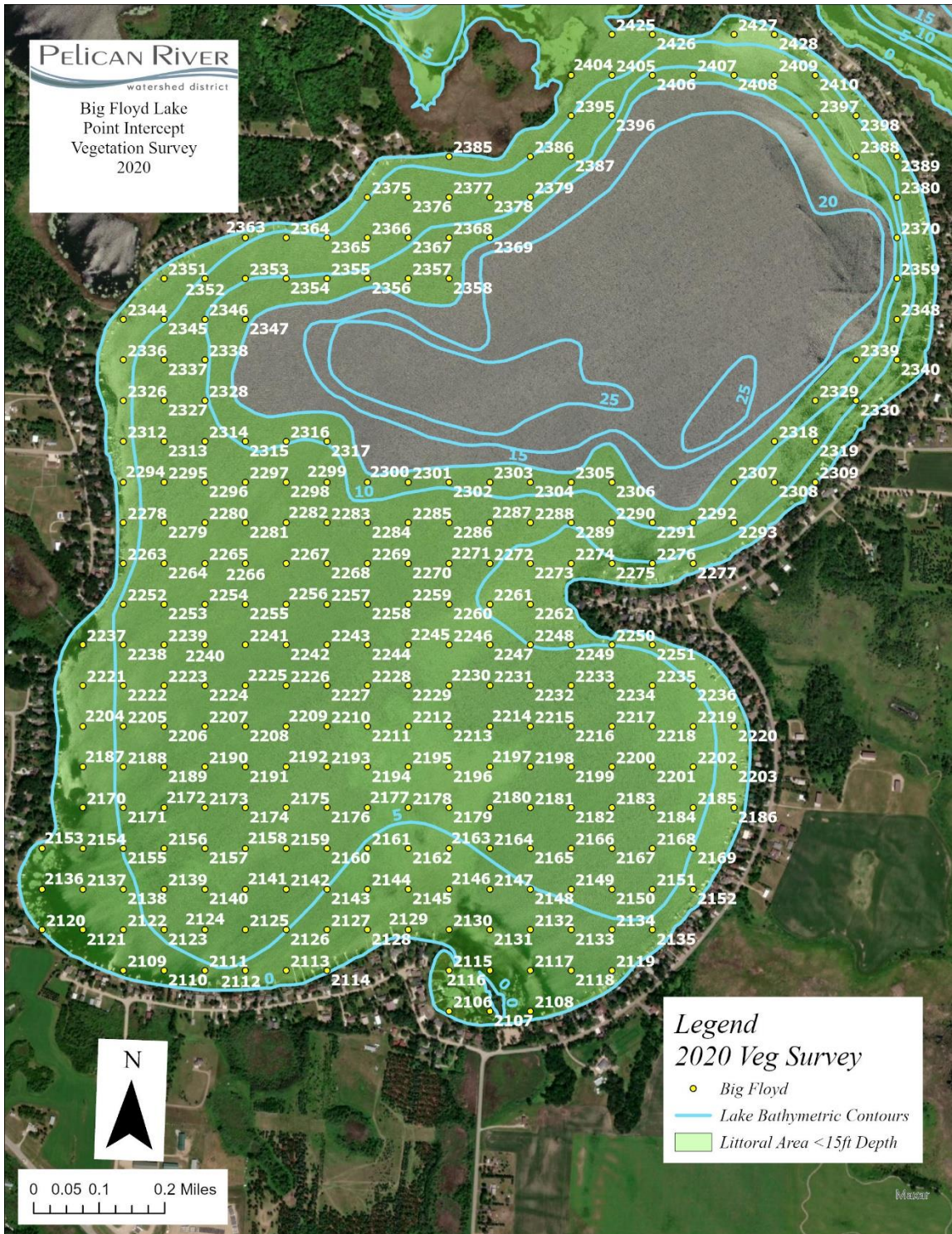


Figure 1 – Point-intercept Survey Grid. Point-intercept survey grid for Big Floyd Lake, Becker County (EQuIS# 03-0387-02-206). A total of 270 points were surveyed in 2020 at 72 meters apart.

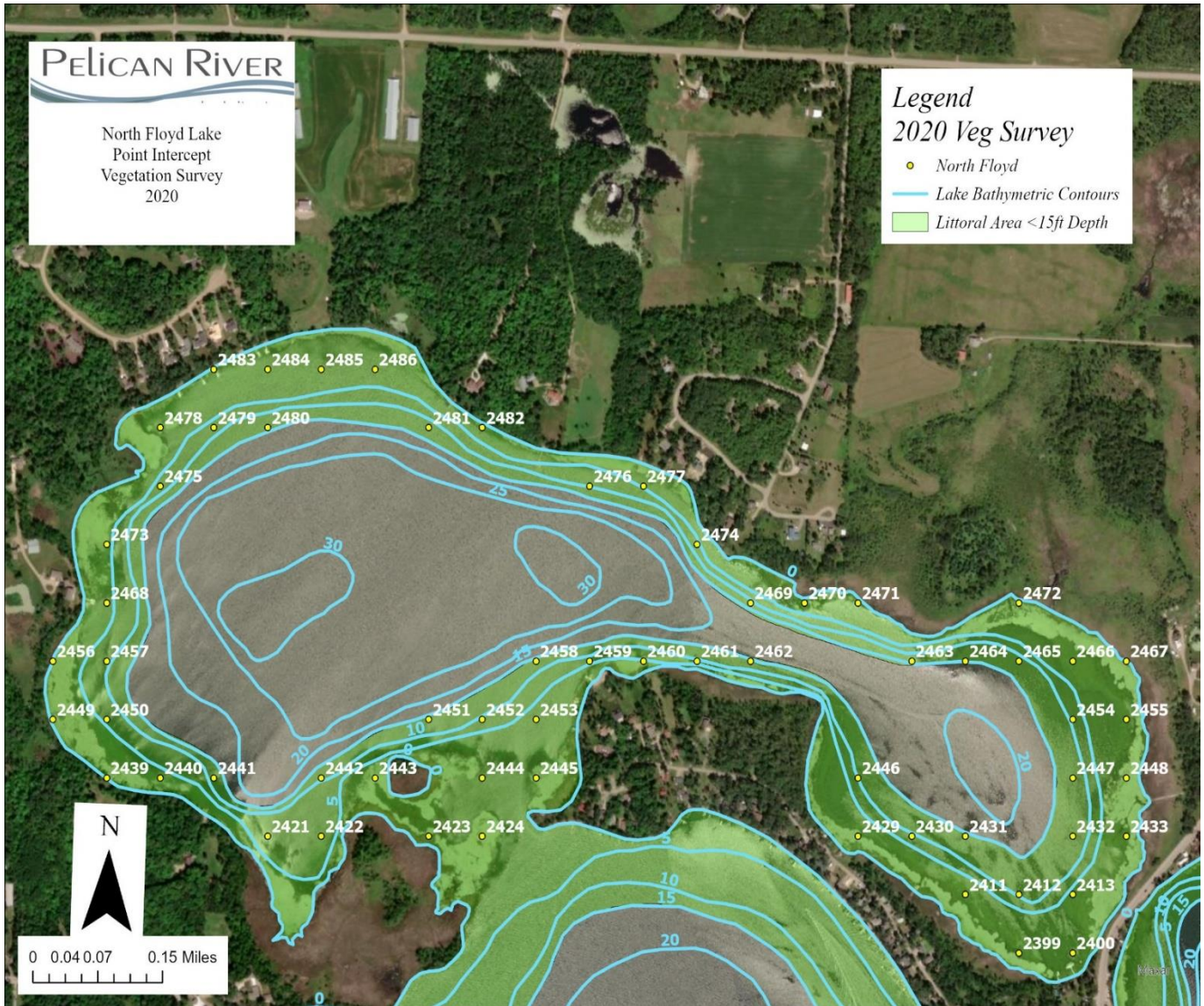


Figure 2 – Point-intercept Survey Grid. Point-intercept survey grid for North Floyd Lake, Becker County (EQuIS# 03-0387-01-207). A total of 62 points were surveyed in 2020 at 72 meters apart.

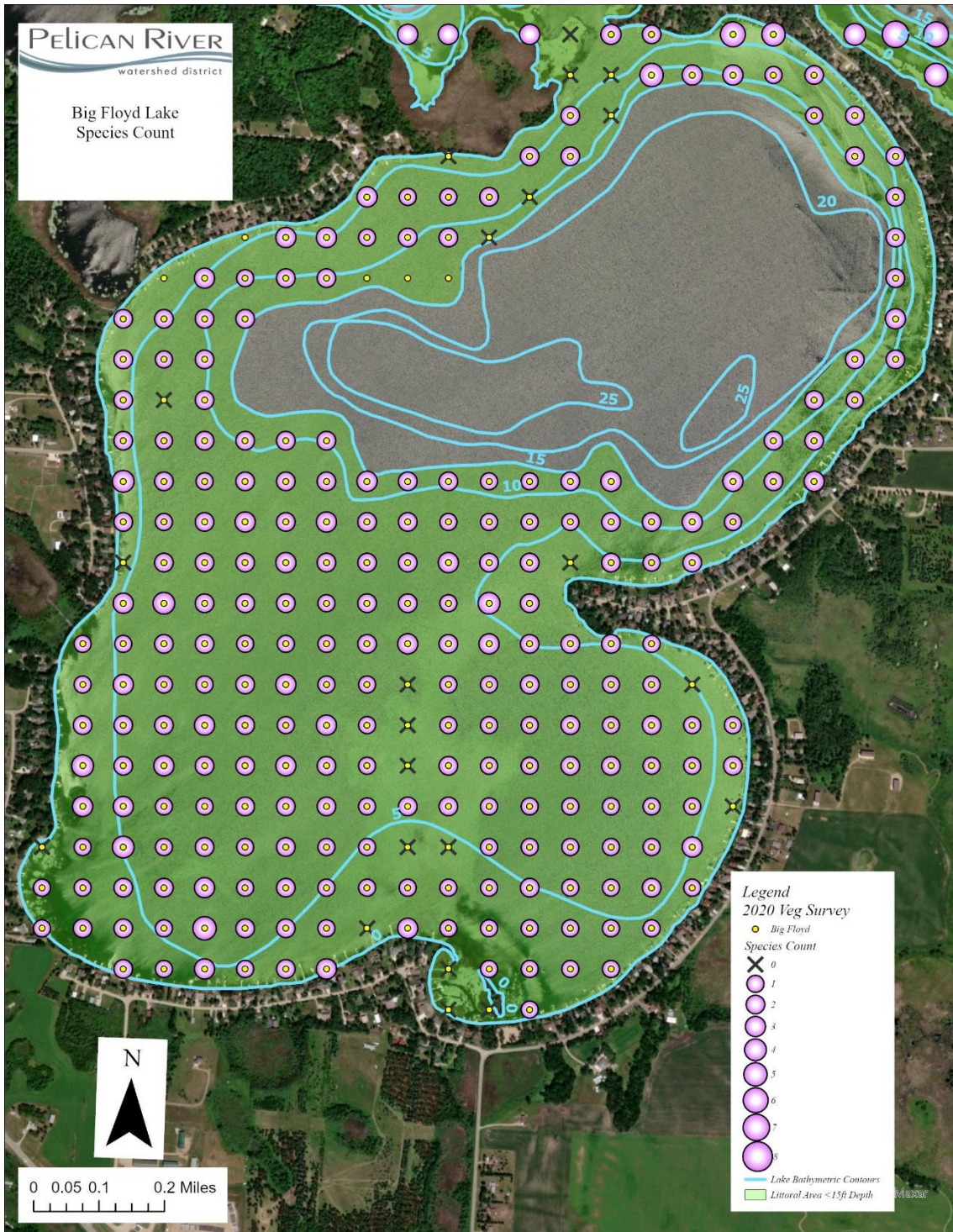


Figure 3 – Species Richness Distribution. Number of species at each site from the 2020 point-intercept survey in Big Floyd Lake, Becker County (EQUIS# 03-0387-02-206). Densities ranged from 0 to 8 at each point, with an 8 indicating the richness in species presence and 0 indicating no species.

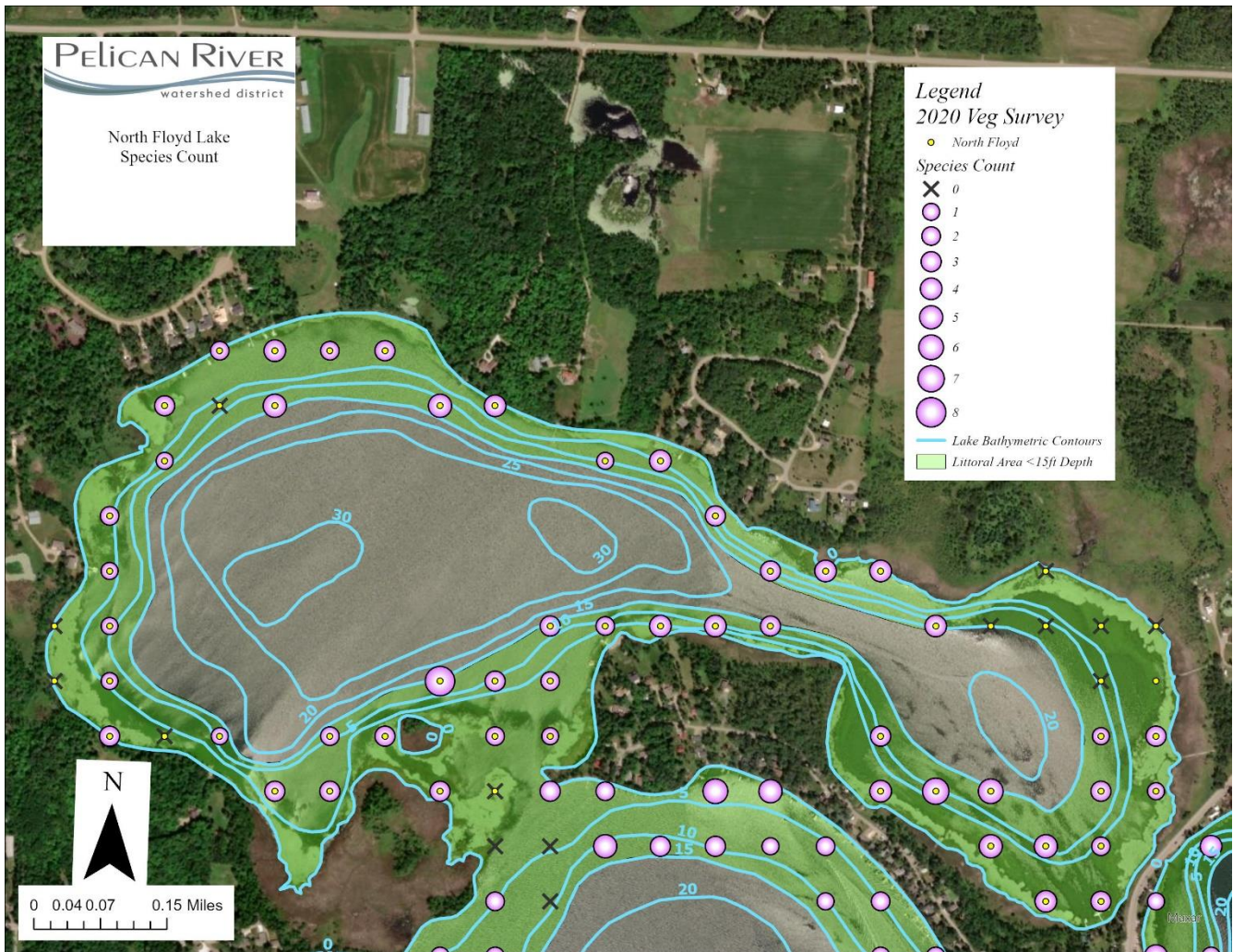


Figure 4 – Species Richness Distribution. Number of species at each site from the 2020 point-intercept survey in North Floyd Lake, Becker County (EQuIS# 03-0387-01-207). Densities ranged from 0 to 8 at each point, with an 8 indicating the richness in species presence and 0 indicating no species.

Survey Observations

The vegetation point-intercept survey of Big Floyd Lake (EQuIS# 03-0387-02-206) and North Floyd (Mud) (03-0387-01-207) conducted by the PRWD occurred between July 17th and July 30th, 2020. Plants were rooted to a maximum depth (95%) of 15.1 feet, with depths ranging from 0 – 15 feet. However, since 861 acres is considered the littoral zone (< 15 feet deep and where aquatic plants are likely to be found) it was very rare to find any rooted plants deeper than 15 feet.

90% of the points on Big Floyd had submersed native vegetation (Tables 4) with a mean submersed native taxa per point of 2.3. Big Floyd Lake has up to 10 submersed native taxa (Table 4). North Floyd Lake has up to 8 Submersed native taxa (Table 5).

Table 4 - Point-intercept Metrics. Summary of PRWD point-intercepts metrics Big Floyd Lake, Becker County (EQuIS# 03-0387-02-206). Shaded values were calculated from littoral depth range (0-15 feet).

Metric	JULY 2020
Surveyor	PRWD
Total # Points Sampled	270
Max depth of growth	15
Depth Range of Rooted Veg (ft.)	0.0 – 15.0
Max Depth of Growth (95%) (ft.)	15
# Of Vegetated Points in Max Depth Range	243
# Points in Littoral (0-15 feet)	270
% Points w/ Submersed Native Taxa	90%
Mean Submersed Native Taxa/ Point	2.3
# Submersed Native Taxa	10
# Submersed Non-Native Taxa	0
% Points w/ Submersed Non- native Taxa	0

Based on the 2020 point-intercept survey, the submersed native plant community within the littoral area in Big Floyd Lake was primarily dominated by Macroalgae (*Chara* spp./ *Nitella* spp.) 90%, Leafy Pondweed (*Potamogeton foliosus*) 15%, Illinois Pondweed (*Potamogeton illinoensis*) 5%, Northern Watermilfoil (*Myriophyllum sibiricum*) 4%, White-stem Pondweed (*Potamogeton praelongus*) 3% (5, 6, 7, 8, & 9). These aquatic plants are central to a healthy fish population, offering shelter and providing food and habitat to wildlife. Big Floyd Lake also has the following floating leaf and emergents: Common Bladderwort (*Utricularia macrorhiza*) 44%, (Figures 10). These emergent plants are especially good at preventing shoreline erosion, habitat and providing food sources for waterfowl. Plants also absorb nutrients and reduce algae, thereby improving water quality.

Big Floyd Lake has an average of three species per sampling site. Figure 3 displays the spatial distribution and species richness (# of species per sample point) of all native submersed species from the 2020 point-intercept survey.

81% of the points on North Floyd had submersed native vegetation (Tables 5) with a mean submersed native taxa per point of 3.9. North Floyd Lake has up to 8 Submersed native taxa (Table 5).

Table 5 - Point-intercept Metrics. Summary of PRWD point-intercepts metrics North Floyd Lake, Becker County (EQuIS# 03-0387-01-207). Shaded values were calculated from littoral depth range (0-15 feet).

Metric	JULY 2020
Surveyor	PRWD
Total # Points Sampled	62
Max depth of growth	15
Depth Range of Rooted Veg (ft.)	0.0 – 15.0
Max Depth of Growth (95%) (ft.)	15
# Of Vegetated Points in Max Depth Range	50
# Points in Littoral (0-15 feet)	62
% Points w/ Submersed Native Taxa	81%
Mean Submersed Native Taxa/ Point	3.9
# Submersed Native Taxa	11
# Submersed Non-Native Taxa	1
% Points w/ Submersed Non- native Taxa	0

Based on the 2020 point-intercept survey, the submersed native plant community within the littoral area in Big Floyd Lake was primarily dominated by Coontail (*Ceratophyllum demersum*) 61% Macroalgae (Chara spp./ Nitella spp.) 54%, Northern Watermilfoil (*Myriophyllum sibiricum*) 33%, Common Water Moss (*Drepanocladus spp.*) 18% (11, 12, 13, & 14,). These aquatic plants are central to a healthy fish population, offering shelter and providing food and habitat to wildlife. Big Floyd Lake also has the following floating leaf and emergents: Star Duckweed (*Lemna trisulca*) 34%, and Common Bladderwort (*Utricularia macrohiza*) 21%, (Figures 15, and 16). These emergent plants are especially good at preventing shoreline erosion, habitat and providing food sources for waterfowl. Plants also absorb nutrients and reduce algae, thereby improving water quality.

North Floyd Lake has an average of around 4 species per sampling site. Figure 4 displays the spatial distribution and species richness (# of species per sample point) of all native submersed species from the 2020 point-intercept survey.

Table 6 - Plant Frequency Occurrence. Percent frequency of occurrence for observed plant species within the littoral zone (0-15 feet) in Big Floyd Lake, Becker County (EQuIS# 03-0387-02-206).

July 2020 b		
Taxonomic Name	Common Name	Frequency (%)
SUBMERSED NON-NATIVE		
<i>These plants spread or have been introduced beyond its native range and are either causing harm or have the potential to cause harm.</i>		
NONE OBSERVED		
SUBMERSED NATIVE		
<i>These plants are rooted plants with flaccid or limp stems and most of their vegetative mass is below the water surface, although small portions may stick above the water.</i>		
<i>Chara spp./Nitella spp.</i>	Macroalgae	90%
<i>Ceratophyllum demersum</i>	Coontail	2%
<i>Drepanocladus spp.</i>	Water Moss	2%
<i>Myriophyllum sibiricum</i>	Northern Watermilfoil	4%
<i>Potamogeton foliosus</i>	Leaf Pondweed	15%
<i>Potamogeton illinoensis</i>	Illinois Pondweed	5%
<i>Potamogeton praelongus</i>	Whitestem Pondweed	3%
<i>Potamogeton richardsonii</i>	Richardson's Pondweed	1%
FLOATING LEAF		
<i>These plants are rooted in the lake bottom and have leaves that float on the water surface. Many have colorful flowers that extend above the water.</i>		
<i>Utricularia gibba</i>	Creeping Bladderwort	1%
<i>Utricularia macrorhiza</i>	Common Bladderwort	44%
EMERGENT		
<i>These plants extend well above the water surface and are usually found in shallow water, near shore.</i>		
Observed but not specified		4%
EMERGENT NON-NATIVE		
<i>These plants spread or have been introduced beyond its native range and are either causing harm or have the potential to cause harm.</i>		
NONE OBSERVED		
FREE FLOATING		
<i>These plants float freely on the water surface. The entire plant is suspended on the water, allowing the plant to be moved around the pond by wind and water currents.</i>		
<i>Lemna trisulca</i>	Star Duckweed	2%

b Percent frequency for 2021 (PI Survey Method) calculated for 0-15 feet zone.

Table 7 - Plant Frequency Occurrence. Percent frequency of occurrence for observed plant species within the littoral zone (0-15 feet) in North Floyd Lake, Becker County (EQUIS# 03-0387-01-207).

July 2020 b		
Taxonomic Name	Common Name	Frequency (%)
SUBMERSED NON-NATIVE		
<i>These plants spread or have been introduced beyond its native range and are either causing harm or have the potential to cause harm.</i>		
	NONE OBSERVED	
SUBMERSED NATIVE		
<i>These plants are rooted plants with flaccid or limp stems and most of their vegetative mass is below the water surface, although small portions may stick above the water.</i>		
<i>Chara spp./Nitella spp.</i>	Macroalgae	54%
<i>Ceratophyllum demersum</i>	Coontail	61%
<i>Drepanocladus spp.</i>	Water Moss	18%
<i>Myriophyllum sibiricum</i>	Northern Watermilfoil	33%
<i>Potamogeton foliosus</i>	Leaf Pondweed	10%
<i>Potamogeton illinoensis</i>	Illinois Pondweed	2%
<i>Potamogeton richardsonii</i>	Richardson's Pondweed	7%
FLOATING LEAF		
<i>These plants are rooted in the lake bottom and have leaves that float on the water surface. Many have colorful flowers that extend above the water.</i>		
<i>Nymphaea odorata</i>	Pond Lilly	2%
<i>Utricularia gibba</i>	Creeping Bladderwort	3%
<i>Utricularia macrorhiza</i>	Common Bladderwort	21%
EMERGENT		
<i>These plants extend well above the water surface and are usually found in shallow water, near shore.</i>		
	Observed but not specified	16%
EMERGENT NON-NATIVE		
<i>These plants spread or have been introduced beyond its native range and are either causing harm or have the potential to cause harm.</i>		
	NONE OBSERVED	
FREE FLOATING		
<i>These plants float freely on the water surface. The entire plant is suspended on the water, allowing the plant to be moved around the pond by wind and water currents.</i>		
<i>Lemna trisulca</i>	Star Duckweed	34%

b Percent frequency for 2021 (PI Survey Method) calculated for 0-15 feet zone.

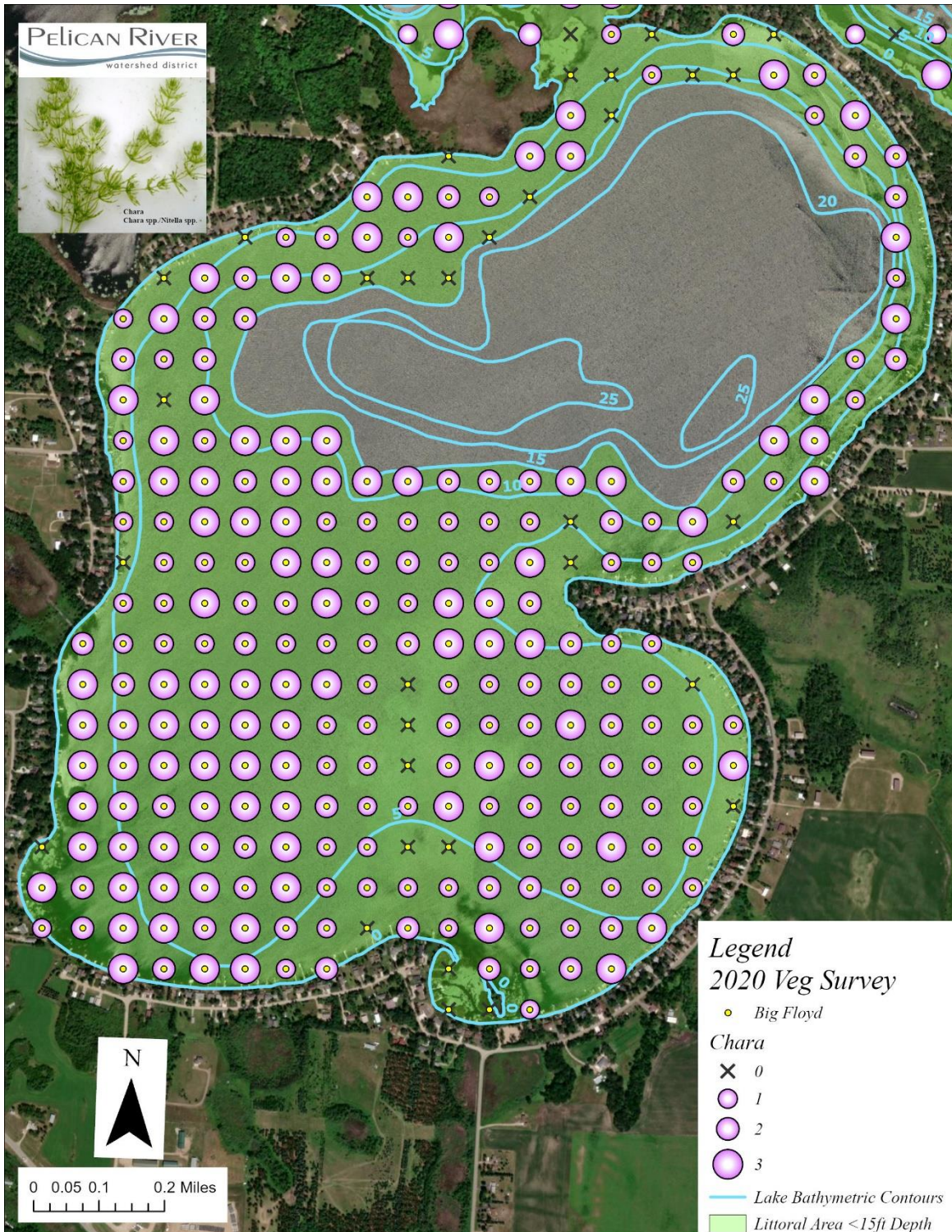


Figure 5 – Chara Distribution. Plant distribution from the 2020 point-intercept survey for Northern Chara in Big Floyd Lake, Becker County (EQuIS# 03-0387-02-206). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

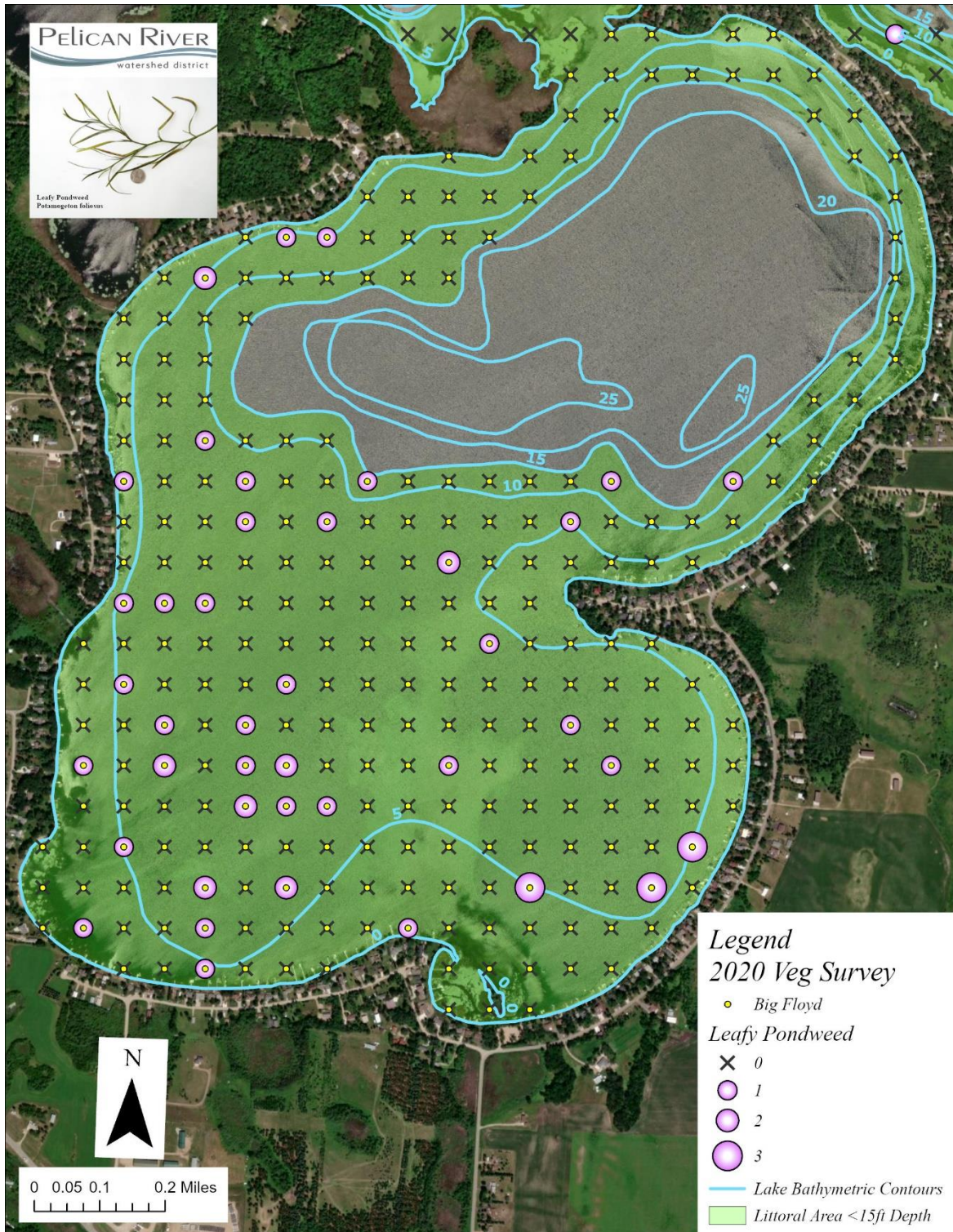


Figure 6 – Leafy Pondweed Distribution. Plant distribution from the 2020 point-intercept survey for Leafy Pondweed in Big Floyd Lake, Becker County (EQUIS# 03-0387-02-206). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

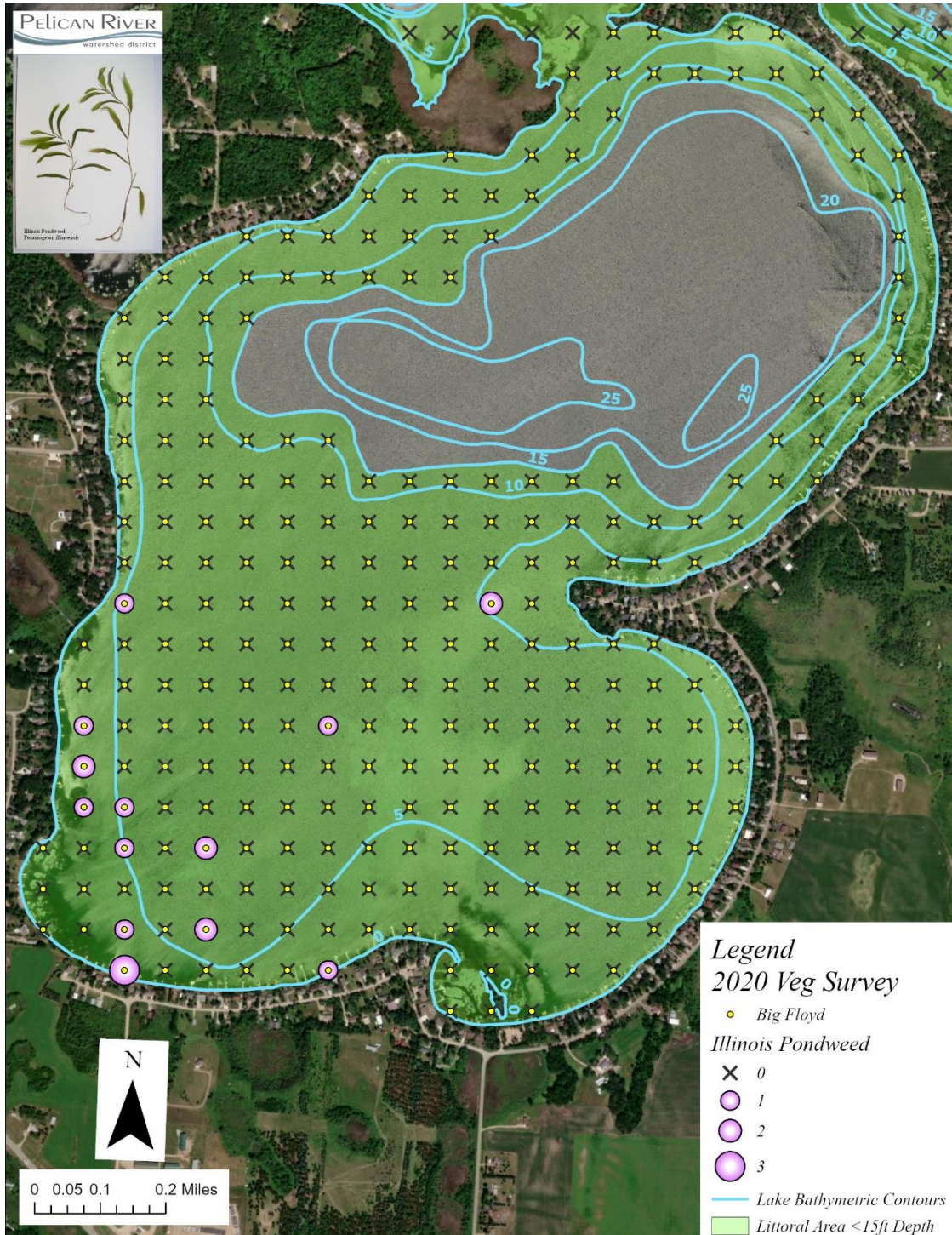


Figure 7 – Illinois Pondweed Distribution. Plant distribution from the 2020 point-intercept survey for Illinois Pondweed in Big Floyd Lake, Becker County (EQUIS# 03-0387-02-206). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

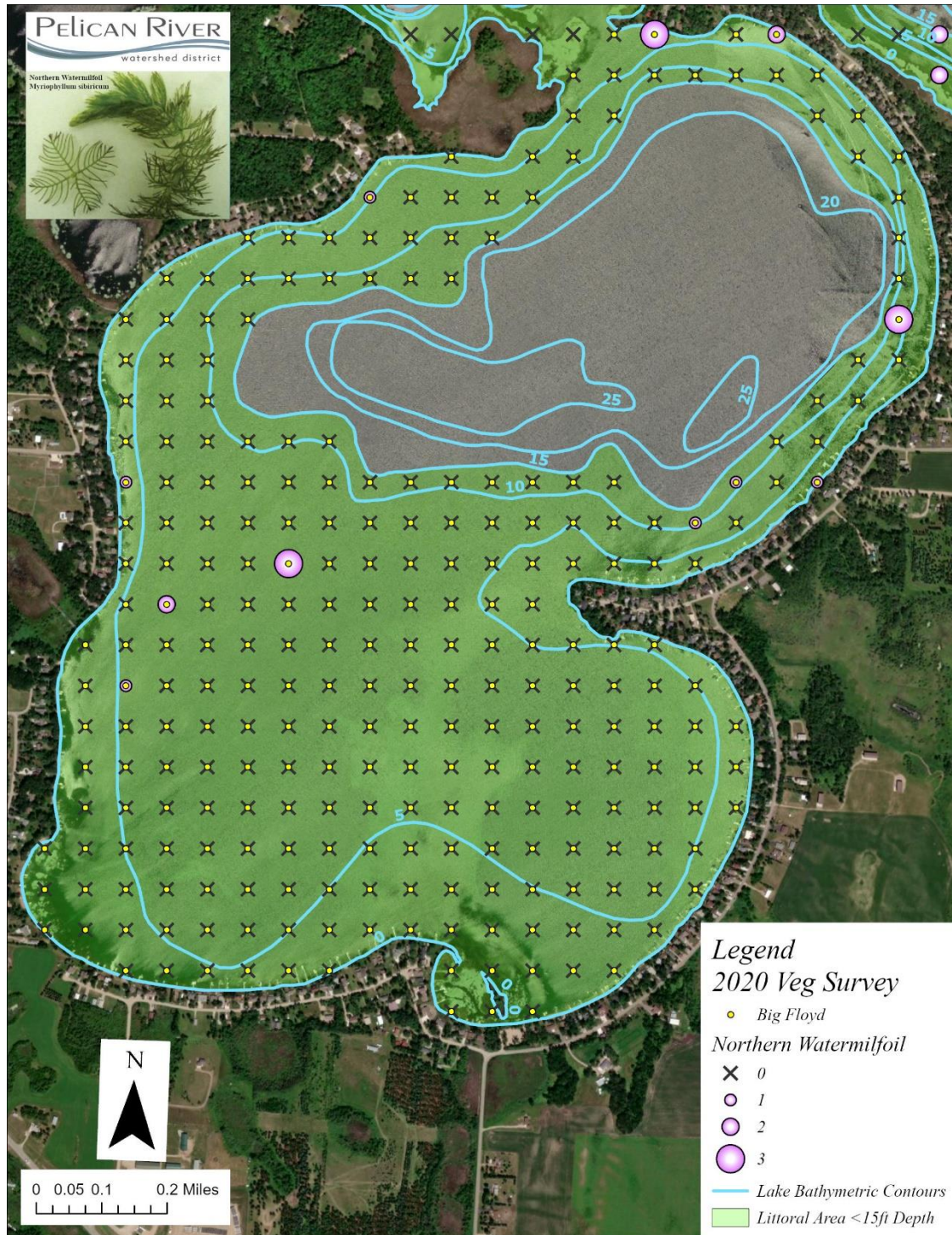


Figure 8 – Northern Watermilfoil Distribution. Plant distribution from the 2020 point-intercept survey for Northern Watermilfoil in Big Floyd Lake, Becker County (EQUIS# 03-0387-02-206). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

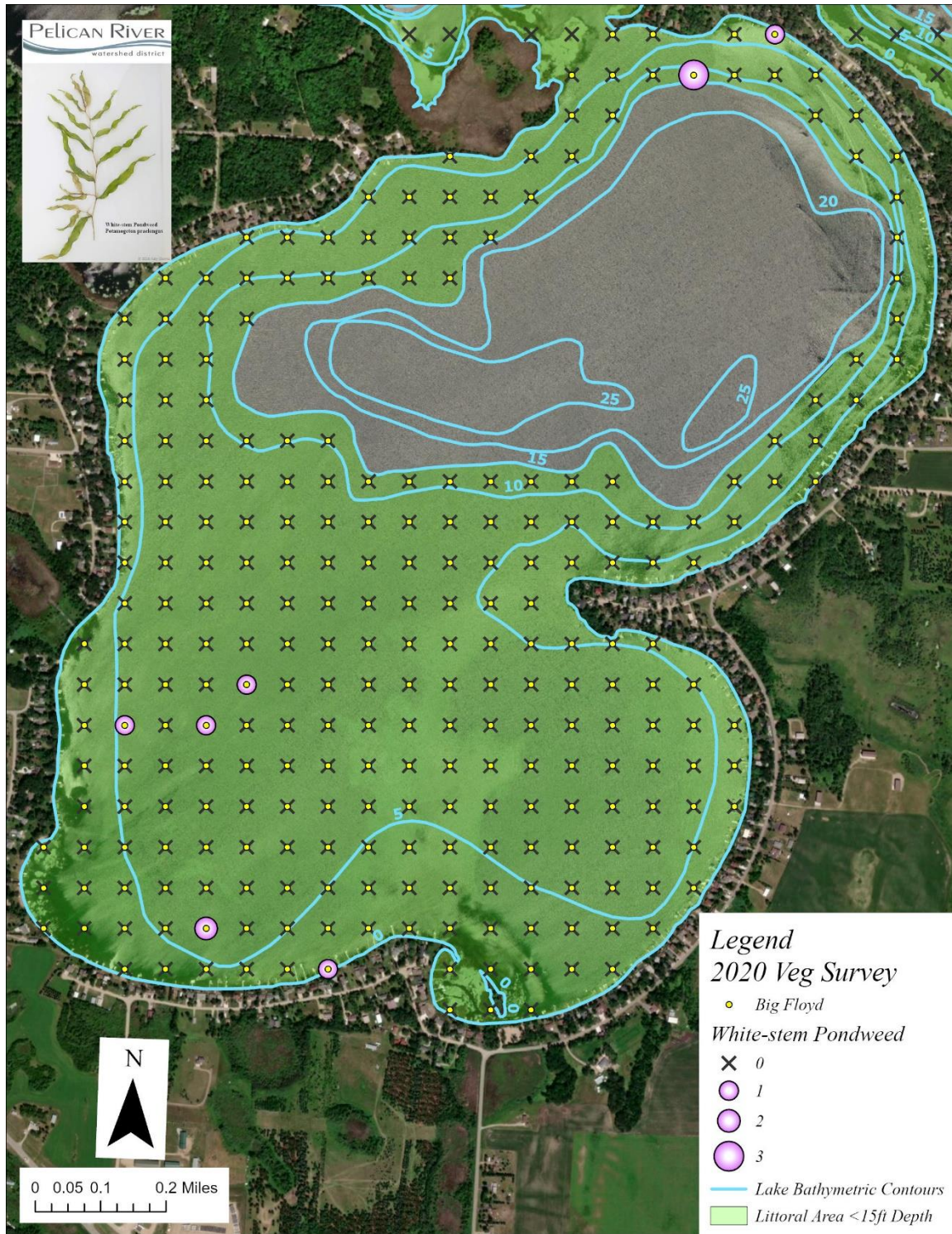


Figure 9 – White-stem Pondweed Distribution. Plant distribution from the 2020 point-intercept survey for White-stem Pondweed in Big Floyd Lake, Becker County (EQUIs# 03-0387-02-206). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

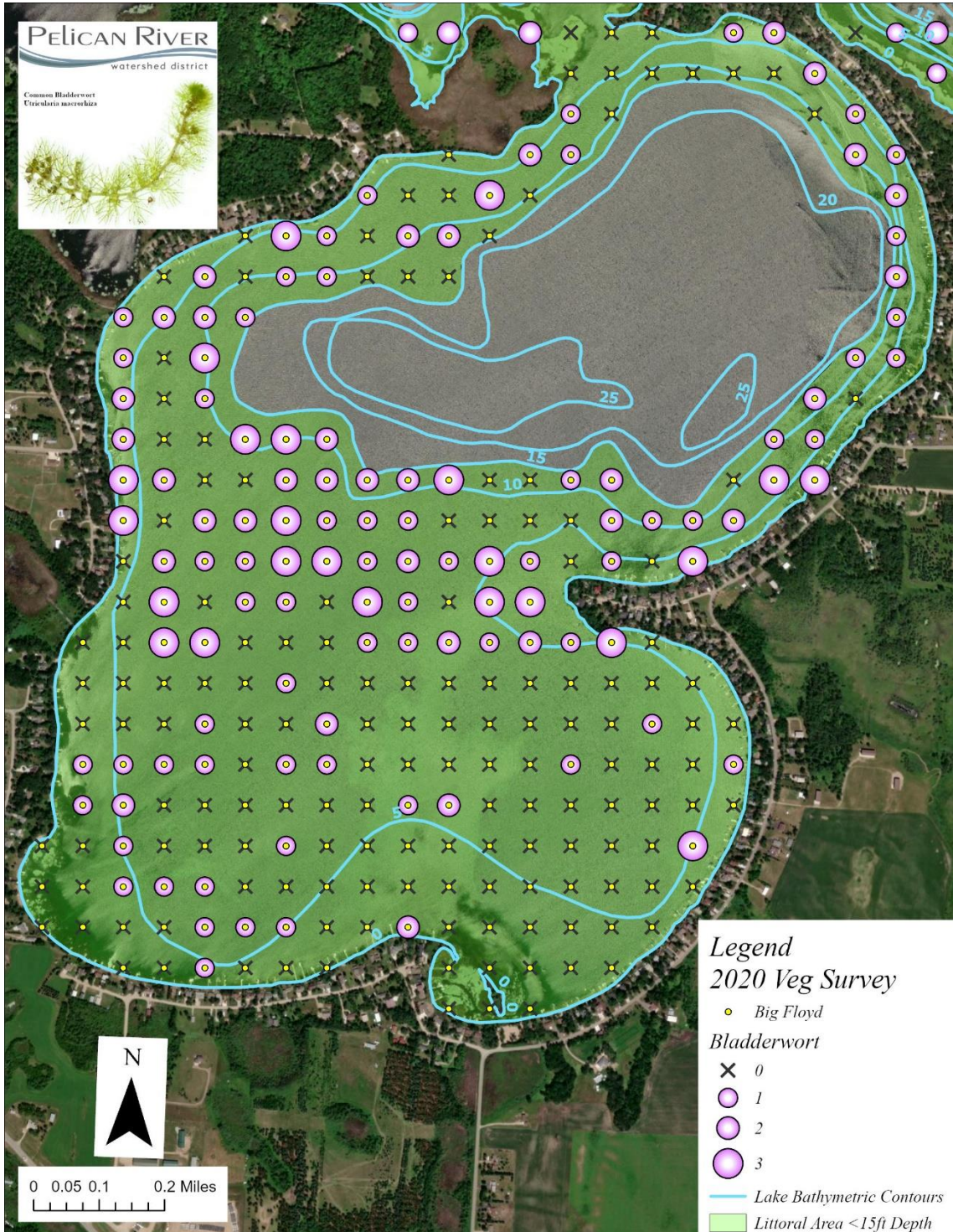


Figure 10 – Common Bladderwort Distribution. Plant distribution from the 2020 point-intercept survey for Common Bladderwort in Big Floyd Lake, Becker County (EQuIS# 03-0387-02-206). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

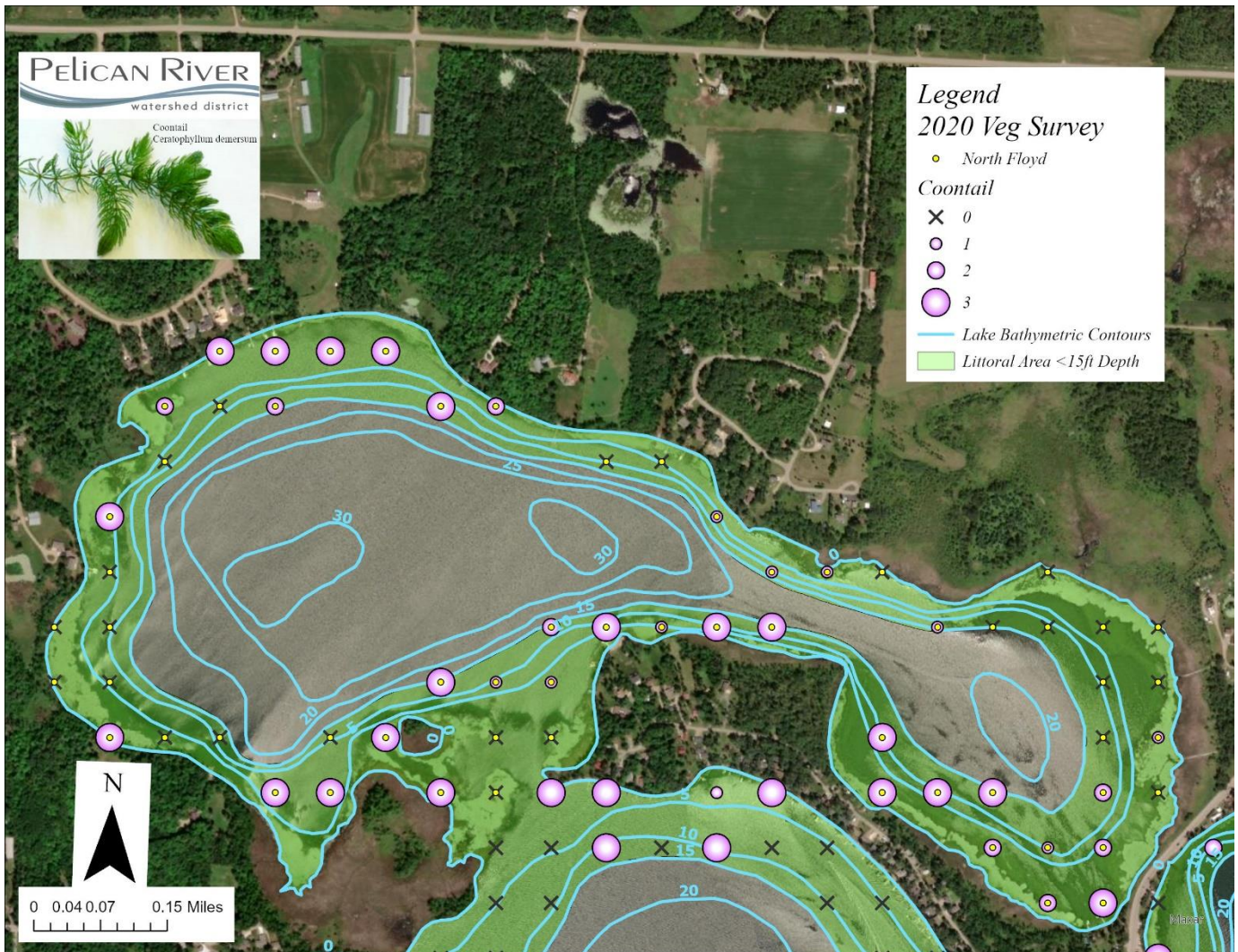


Figure 11 – Coontail Distribution. Plant distribution from the 2020 point-intercept survey for Coontail in North Floyd Lake, Becker County (EQUIS# 03-0387-01-207). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

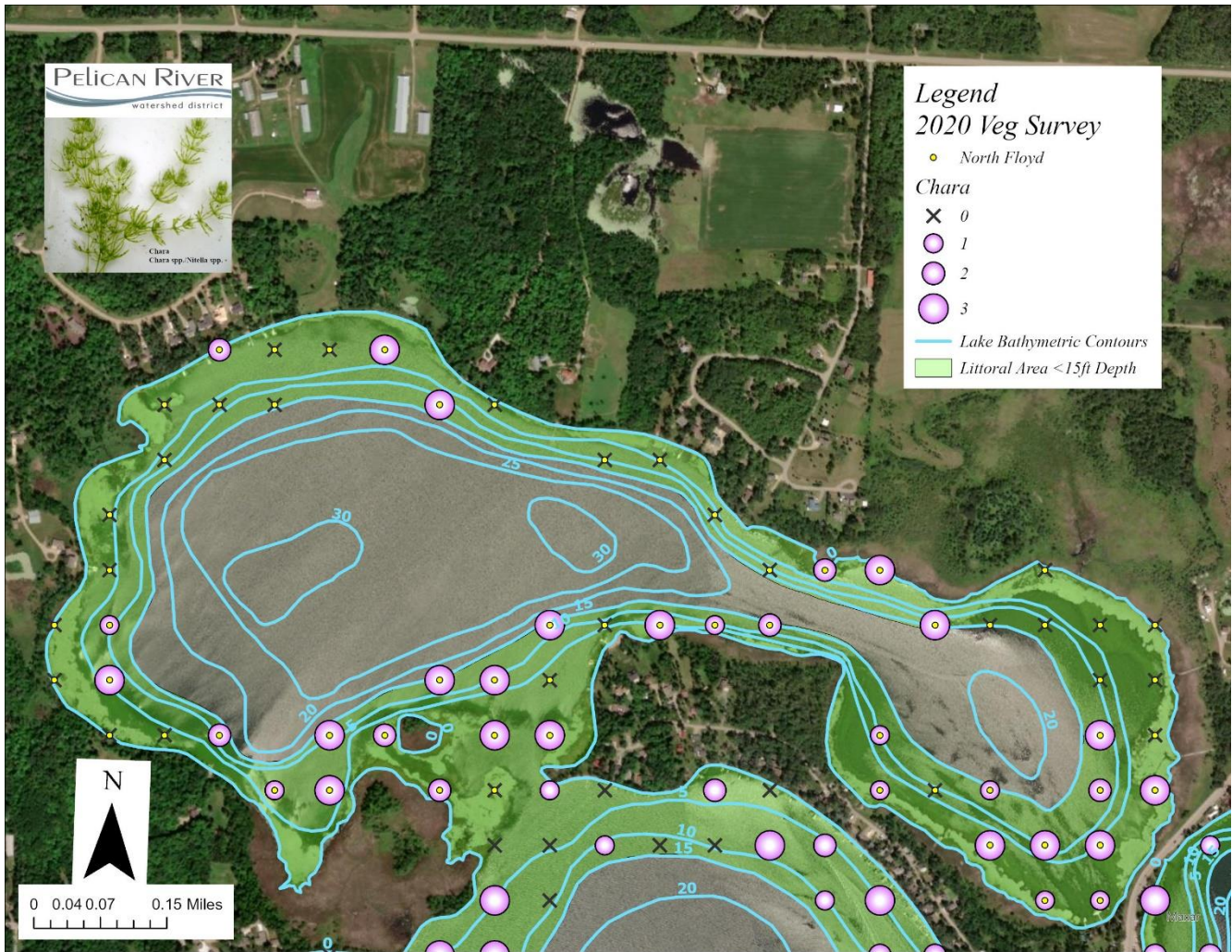


Figure 12 – Chara Distribution. Plant distribution from the 2020 point-intercept survey for Chara in North Floyd Lake, Becker County (EQuIS# 03-0387-01-207). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

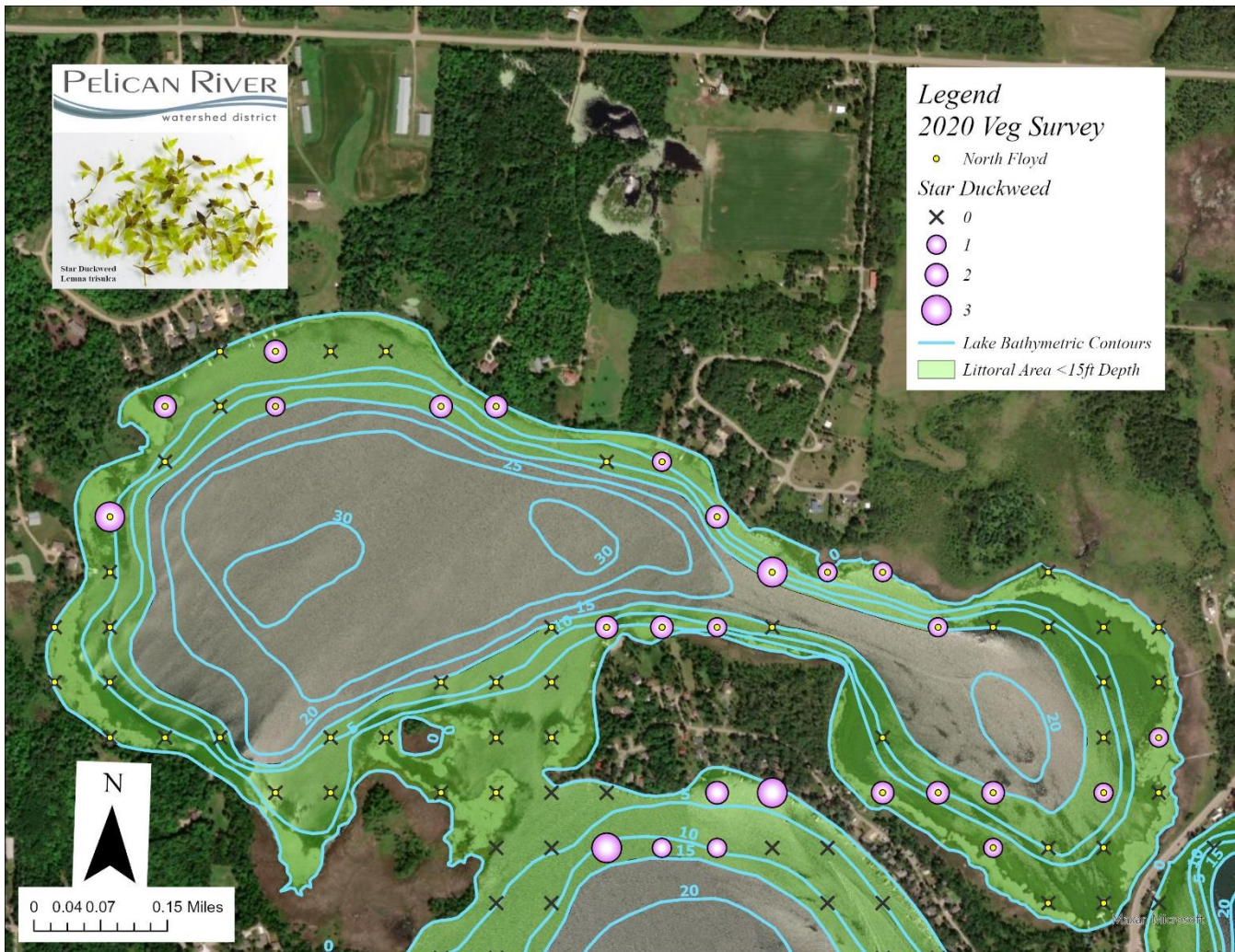


Figure 13 – Star Duckweed Distribution. Plant distribution from the 2020 point-intercept survey for Star Duckweed in North Floyd Lake, Becker County (EQuIS# 03-0387-01-207). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

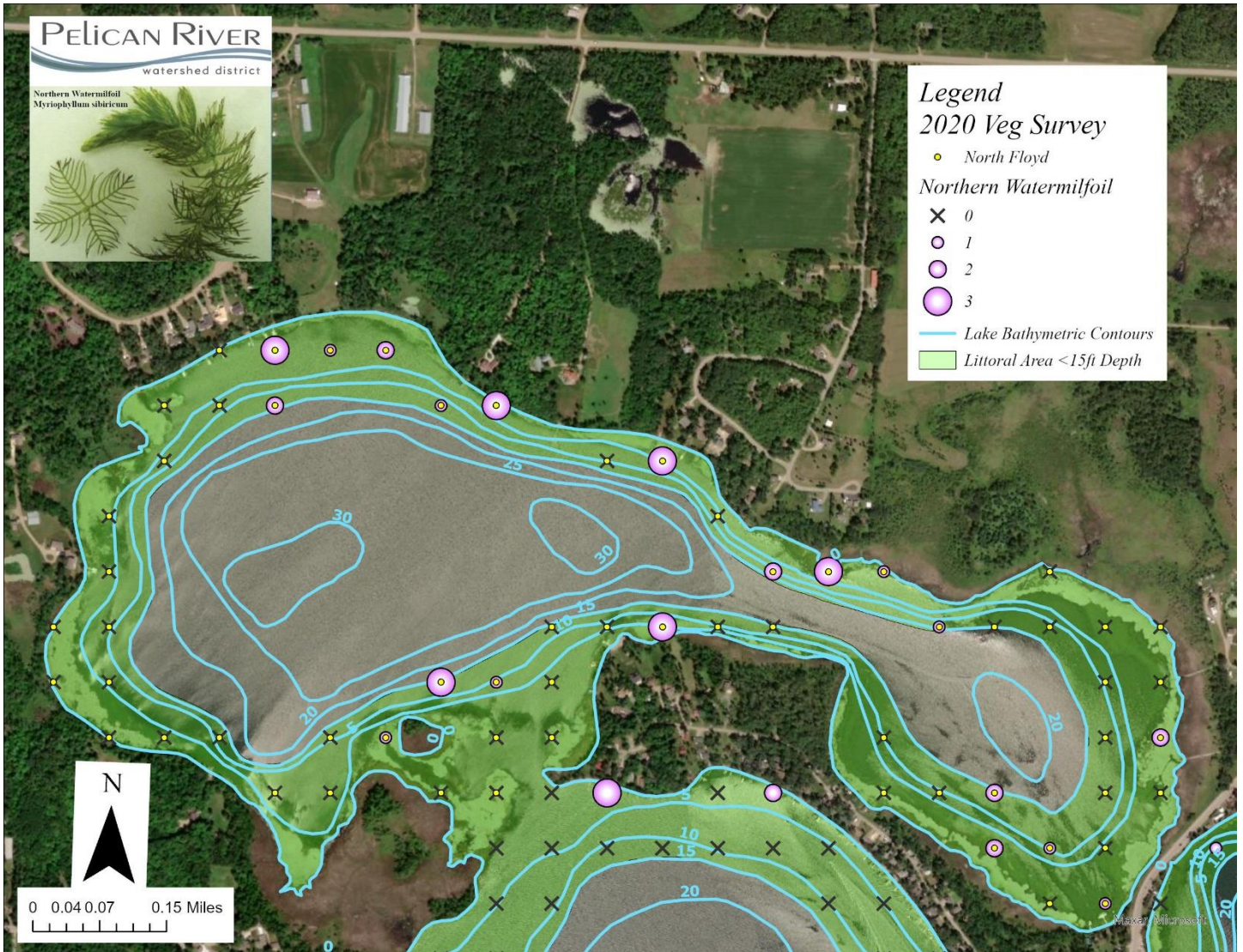


Figure 14 – Northern Watermilfoil Distribution. Plant distribution from the 2020 point-intercept survey for Northern Watermilfoil in North Floyd Lake, Becker County (EQuIS# 03-0387-01-207). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

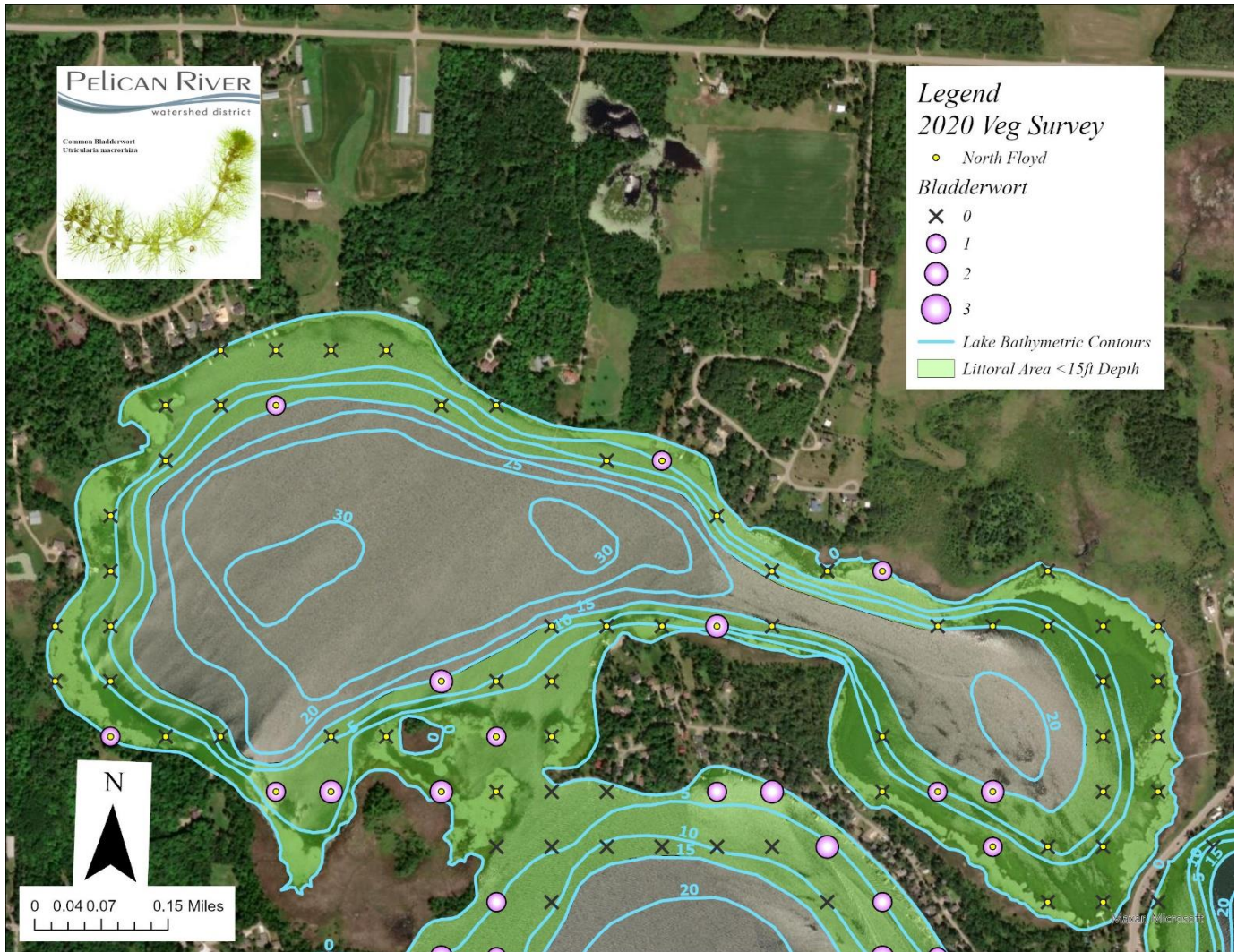


Figure 15 – Common Bladderwort Distribution. Plant distribution from the 2020 point-intercept survey for Common Bladderwort in North Floyd Lake, Becker County (EQuIS# 03-0387-01-207). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

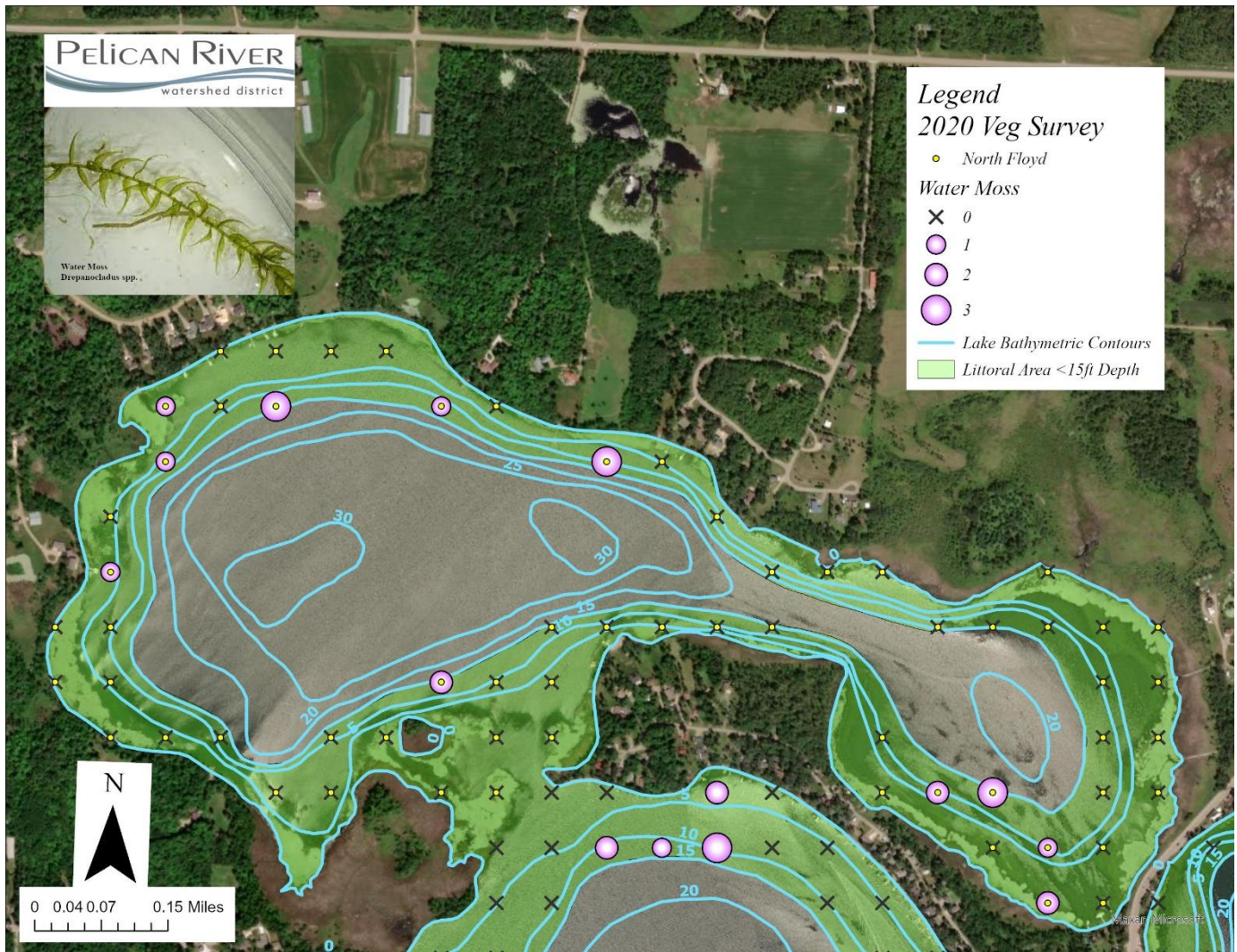


Figure 16 – Water Moss Distribution. Plant distribution from the 2020 point-intercept survey for Water Moss in North Floyd Lake, Becker County (EQUIS# 03-0387-01-207). Densities ranged from 0 to 3 at each point, with a 3 indicating dense plant presence and 0 indicating no plants.

Literature Cited

Skawinski, Paul M. (2018). *Aquatic Plants of the Upper Midwest*. (Third Edition). Wisconsin: Paul M. Skawinski.

Madsen, J. (1999). *Point-intercept and line intercept methods for aquatic macrophytes management*. APCRP Technical Notes Collection (TN APCRP-M1-02). Vicksburg, MS: U.S. Army Engineer Research and Development Center.