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Consulting Services

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Aquatic Plant Survey Report
Big Pine Lake (Aitkin Co.)

Point-Intercept Method

July 18, 2021

DOW# 01015700

Survey & Report completed by: Eric Fieldseth, AIS Consulting Services

Report Date: August 23, 2021 — Eric Fieldseth, AIS Consulting Services

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Introduction

An aquatic plant point-intercept survey was conducted on Big Pine Lake on July 18, 2021 by AIS Consulting Services. The purpose of the survey was to characterize the aquatic plant community in the lake and look for the presence of invasive aquatic plants. Big Pine Lake is listed as infested with zebra mussels, but no invasive aquatic plants have been observed to date.

Summary of Results

During the survey we observed 24 unique aquatic plant species in the lake, of which 19 were submerged aquatic plant species. No invasive plants were observed during this survey.

Aquatic plants were found growing out to a depth of 22 feet. Frequency of occurrence for each species was calculated off of both the legal definition of littoral area, which is up to 15 feet of water, and the actual observed littoral during the survey which is the depth zone where aquatic plants were found growing, which is 22 feet.

There is a good diversity of native aquatic plants in Big Pine Lake, with 8 species being found at greater than 10% of sample points and dominating the aquatic plant community in the lake. The most common species found were Northern watermilfoil, being found at 33.8% of sample points; followed by Narrowleaf Pondweed (30.4%), Chara (28.8%), Flatstem Pondweed (26.3%), Coontail (16.3%), Robbins Pondweed (11.7%), Variable Pondweed (11.3%) and Wild Celery (11.3%). The remaining 16 species were all found at less than 10% of sample points. 5 different emergent plants were found, including Watershield, White Water Lily, Bullhead Pond Lily, Bulrush and Sagittaria sp.

Methods

Point-Intercept Survey

Sample points were created in ArcGIS and spaced 65 meters apart across the lake. We then uploaded bathymetric contours for the lake from the Minnesota Geospatial Commons and overlayed the sample points. Waypoints that appeared deeper than 30 feet were then deleted, leaving a total of 335 sample points. These sample points were then uploaded to a GPS unit and used to navigate to each sample point in the field. If points were inaccessible due to shallow depth or dense emergent vegetation, it was noted and the point was skipped.

At each point, the depth was taken with our sonar unit and recorded. The sample rake was tossed on a designated side of the boat approximately 1 to 2 meters, and dragged on the lake bottom back to the boat before retrieving. A density rating was given to each species on the rake, as well as an overall rating for the entire sample. Density ratings are based on the percent of rake head occupied by the plant sample. Plants that were not collected on the rake but were observed within the sample area were given a density of "0", and were not included in any statistics, but were marked at that location.

Rake Density Ratings - *estimated coverage of rake head by plant sample*

1 = **Covering up to 1/3 of the rake head** *(plants typically scattered)*

2 = **Covering between 1/3 to 2/3 of rake head** *(plants common)*

3 = **Covered entire rake head** *(dense stands of plants)*

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Figure 1. Big Pine Lake Point-Intercept Survey Grid, 65 meter spacing (335 sample points)

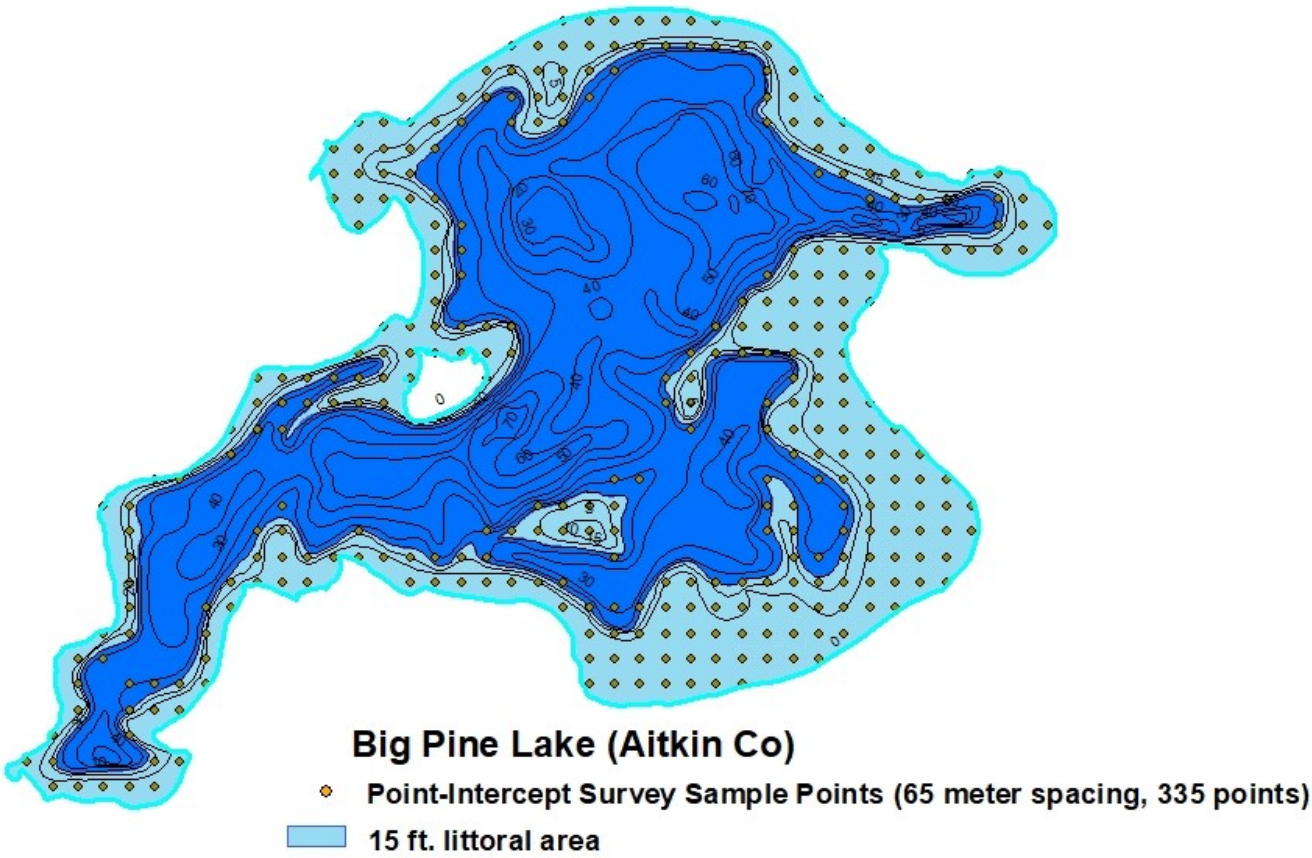

Figure 2. Number of sample points by depth range

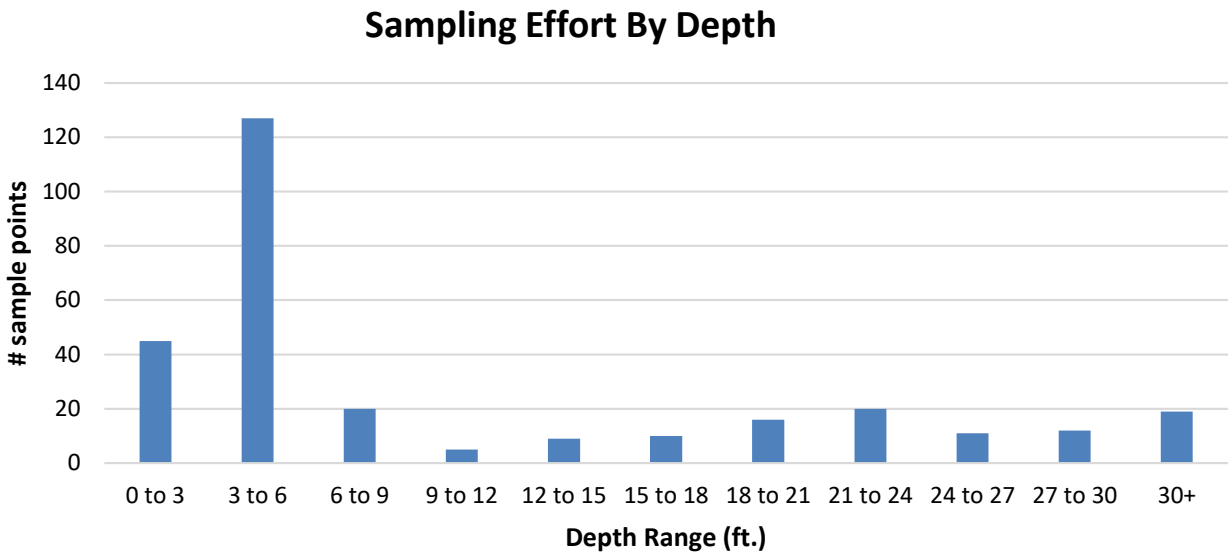

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Figure 3. Summary of aquatic plant community metrics from Big Pine Lake July 18, 2021

Surface Area (acres)	638.03
Littoral Area (≤ 15 ft.) (acres)	259
Maximum Depth (ft.)	78
Number of sample points	335
Points innaccessible	41
Points actually sampled	294
Max. Depth of Plant Growth (ft.)	22
Species Richness (all species)	24
Species Richness (submerged plants)	19

	15 ft. littoral	observed littoral (22 ft.)
Littoral Points Sampled (≤ 15 ft.)	207	240
% Littoral Points Vegetated	87.0%	80.8%
Mean Number of Native Species/Littoral Point	2.47	2.22
Mean Number of Invasive Species/Littoral Point	0	0
Mean number of Species/Littoral Point	2.47	2.22

Figure 4. Percent of sample points with vegetation by depth range

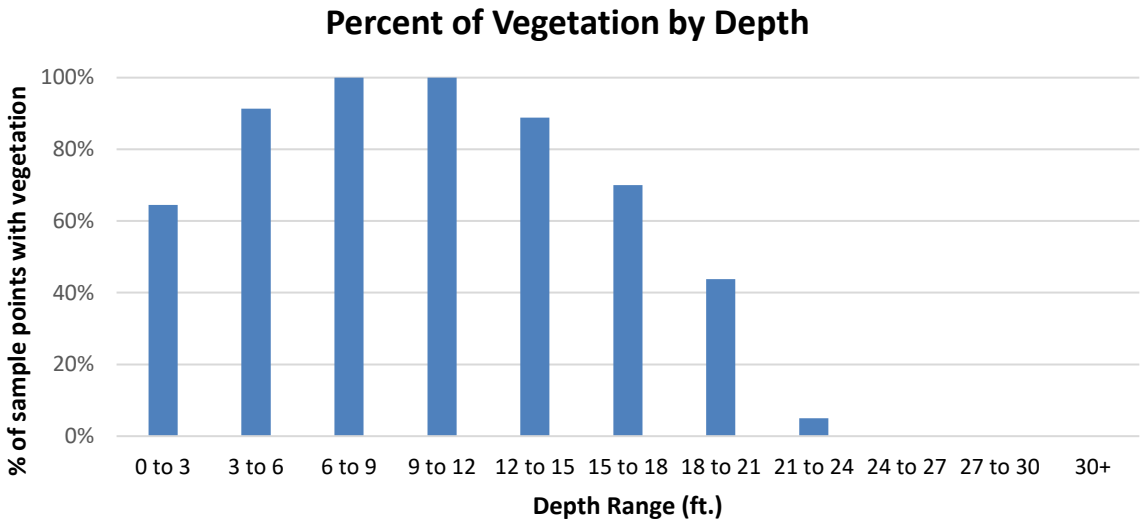

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Figure 5. Overall vegetation density from July 18, 2021 point-intercept survey

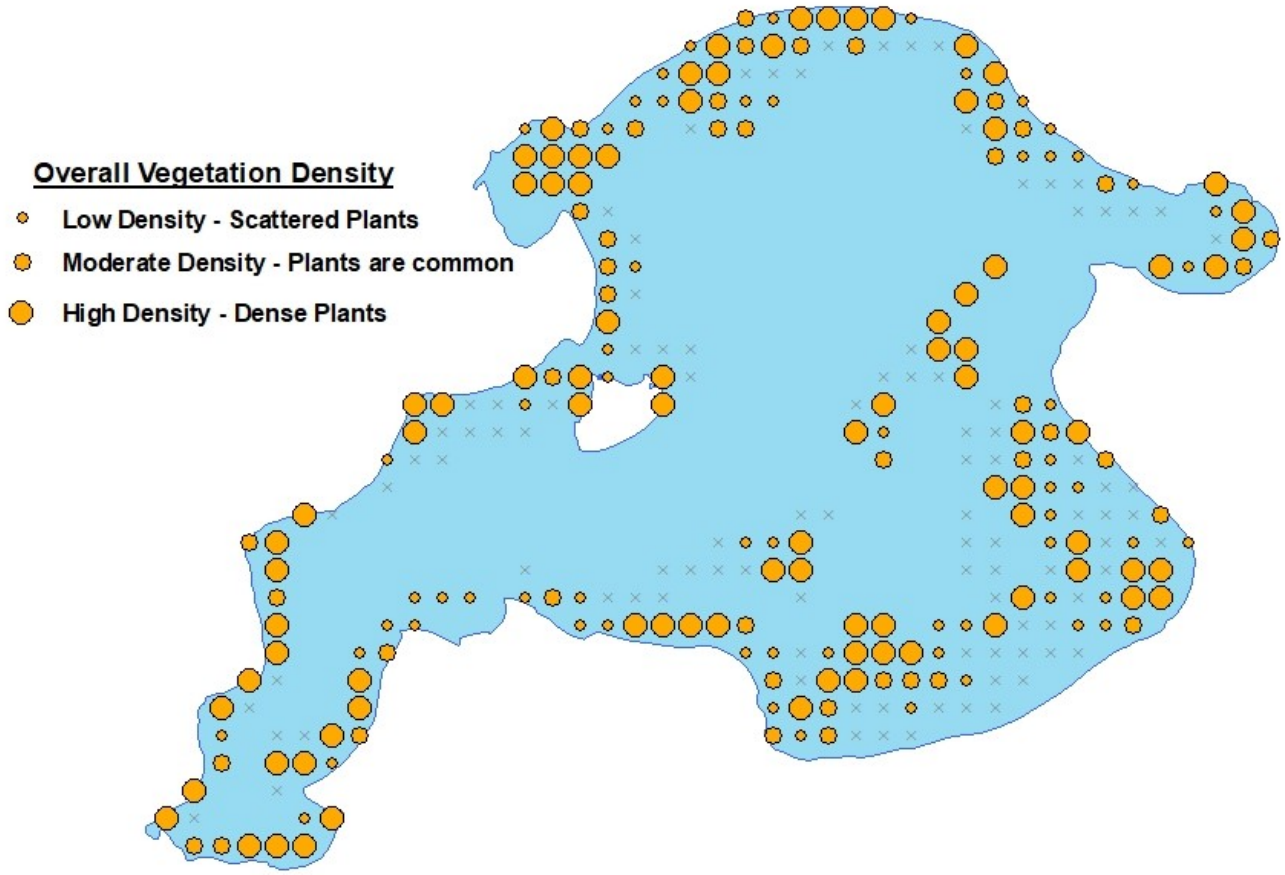

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Figure 6. Percent frequency of occurrence for plant species observed during Big Pine Lake July 2021 point-intercept survey. Calculated using 15 ft. littoral and observed littoral (22 ft.).

		15 ft. littoral	observed littoral (22 ft.)
Common Name	**Scientific Name**	**% Occurrence**	**% Occurrence**
Submersed Plants			
Northern Watermilfoil	*Myriophyllum sibiricum*	37.7%	33.8%
Narrowleaf Pondweed	*Potamogeton sp.*	33.3%	30.4%
Chara	*Chara sp.*	33.3%	28.8%
Flatstem Pondweed	*Potamogeton zosteriformis*	30.0%	26.3%
Coontail	*Ceratophyllum demersum*	14.5%	16.3%
Robbins Pondweed	*Potamogeton robbinsii*	13.0%	11.7%
Variable Pondweed	*Potamogeton gramineus*	13.0%	11.3%
Wild Celery	*Vallisneria americana*	13.0%	11.3%
Clasping Leaf Pondweed	*Potamogeton richardsonii*	11.1%	9.6%
Elodea	*Elodea Canadensis*	10.1%	8.8%
Water Stargrass	*Heteranthera dubia*	8.7%	7.5%
Large-leaf Pondweed	*Potamogeton amplifolius*	7.7%	6.7%
Sago Pondweed	*Stuckenia pectinata*	5.8%	5.0%
Bushy Pondweed	*Najas flexilis*	4.4%	3.8%
White-stem Pondweed	*Potamogeton praelongus*	1.5%	1.3%
Southern Naiad	*Najas guadalupensis*	1.0%	0.8%
White water crowfoot	*Ranunculus aquatilis*	1.0%	0.8%
Water marigold	*Bidens beckii*	1.0%	0.8%
Nitella	*Nitella sp.*		1.3%
Emergent			
Watershield	*Brasenia schreberi*	4.8%	4.2%
White waterlily	*Nymphaea odorata*	1.5%	1.3%
Bullhead Pondlily	*Nuphar variegata*	1.0%	0.8%
Bulrush	*Schoenoplectus sp.*	present	present
Sagittaria sp.	*Sagittaria sp.*	present	present

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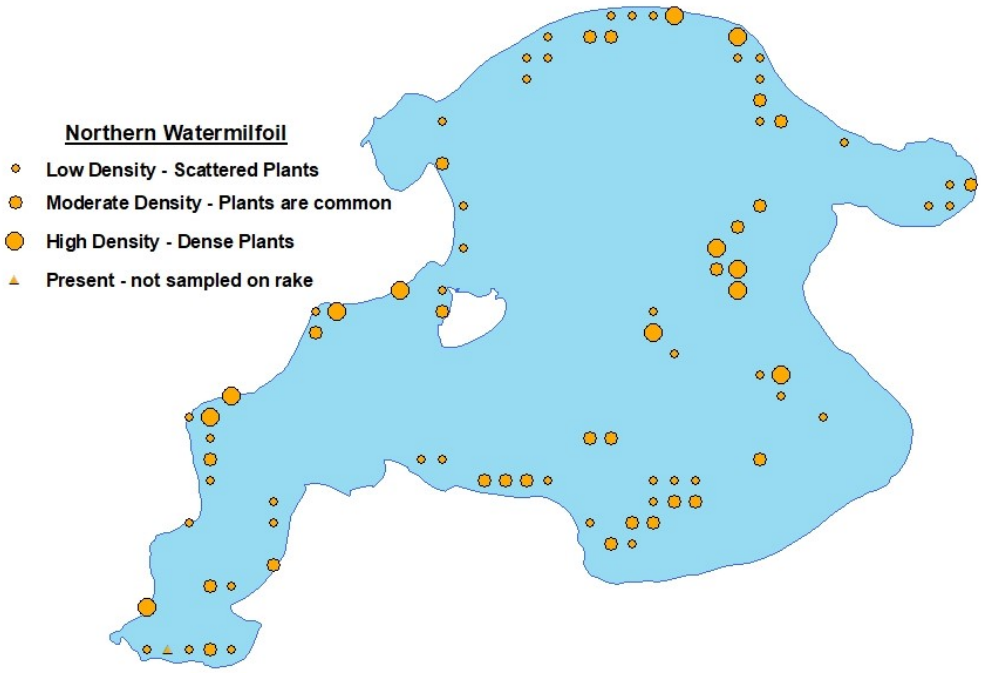
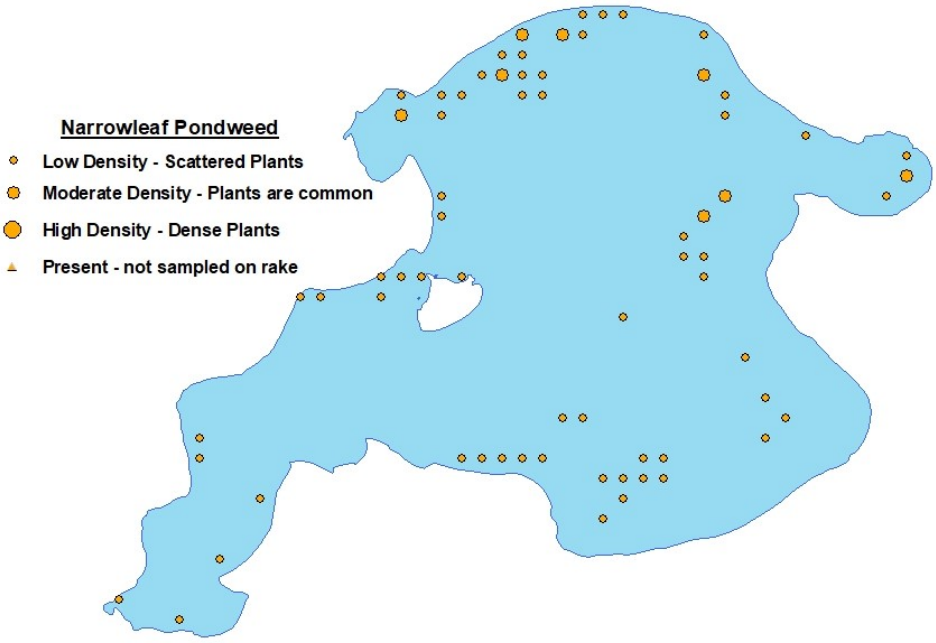
Distribution Maps of Aquatic Plants Observed in Big Pine Lake during July 18, 2021 Point-intercept Survey

Northern watermilfoil (*Myriophyllum sibiricum*)



Narrowleaf Pondweed (*Potamogeton sp.*)



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Chara (*Chara sp.*)

Flatstem Pondweed (*Potamogeton zosteriformis*)

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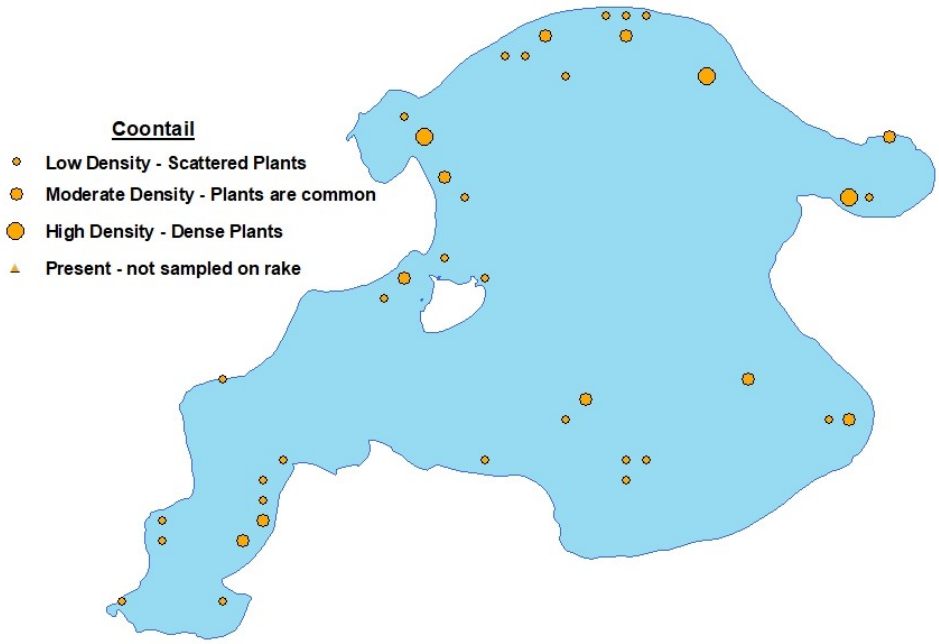
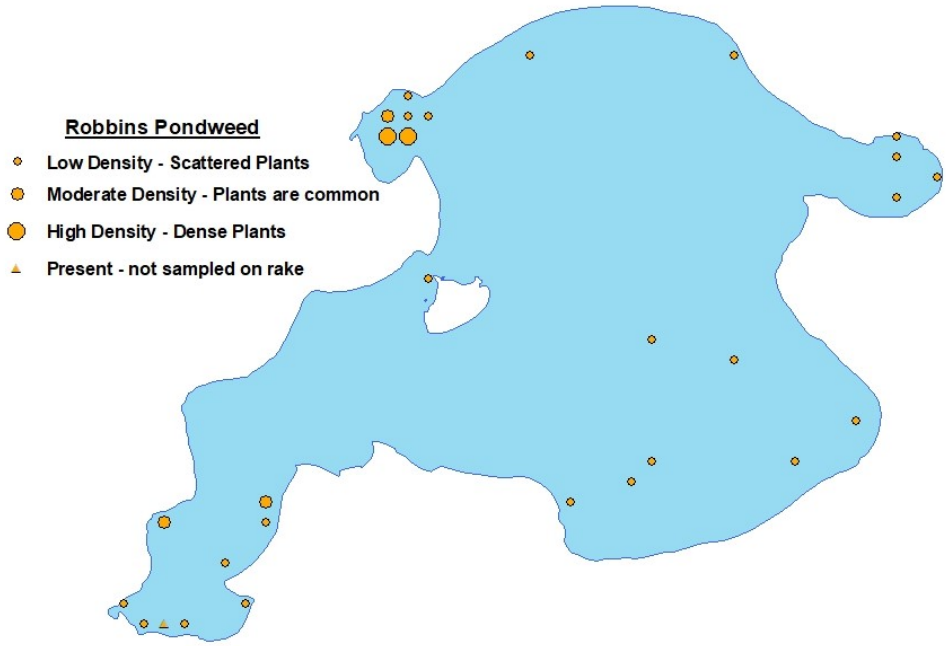
Coontail (*Ceratophyllum demersum*)



Robbins Pondweed (*Potamogeton robbinsii*)



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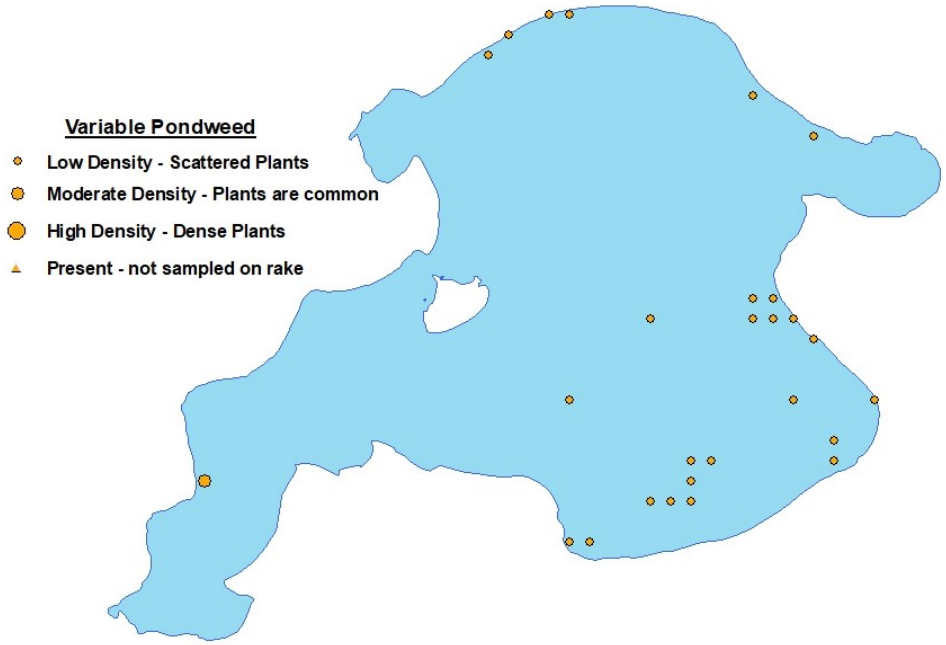
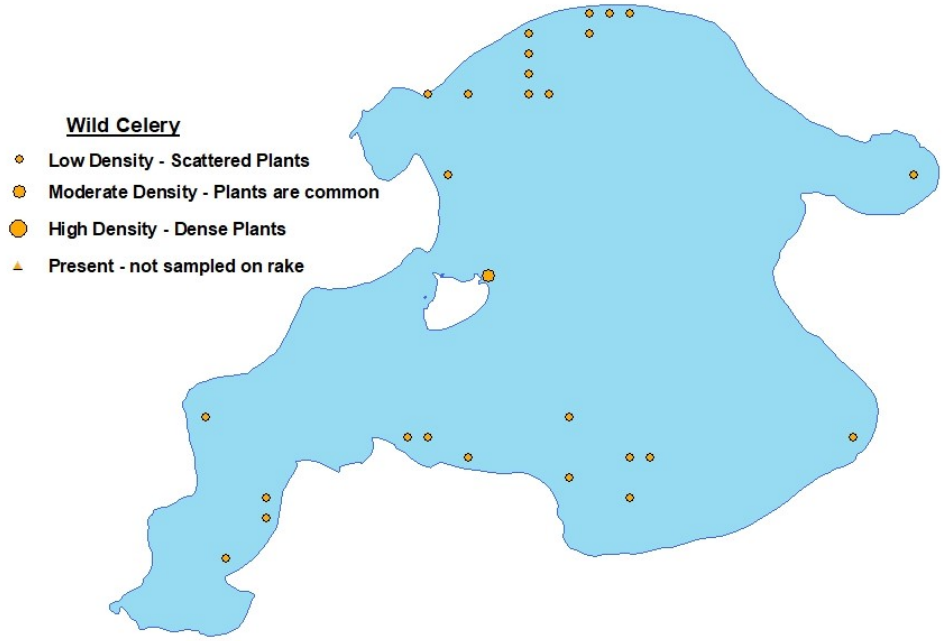
Variable Pondweed (*Potamogeton gramineus*)



Wild Celery (*Vallisneria americana*)



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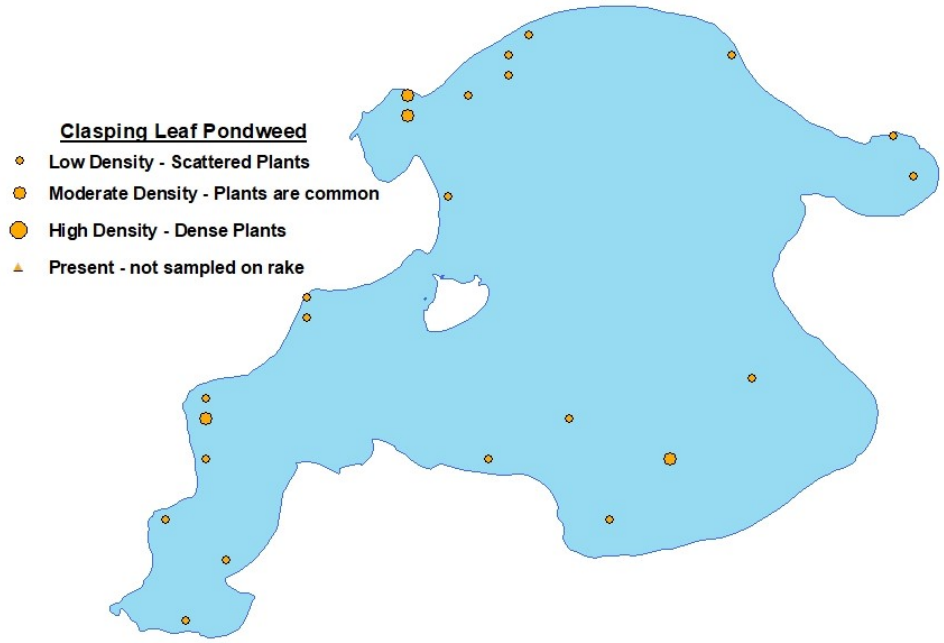
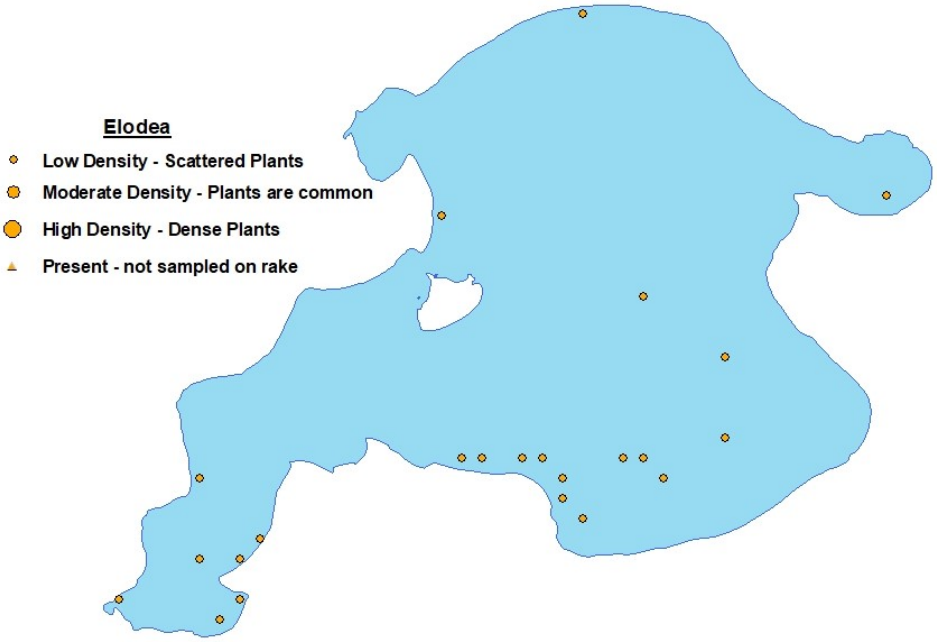
Clasping Leaf Pondweed (*Potamogeton richardsonii*)



Elodea (*Elodea canadensis*)



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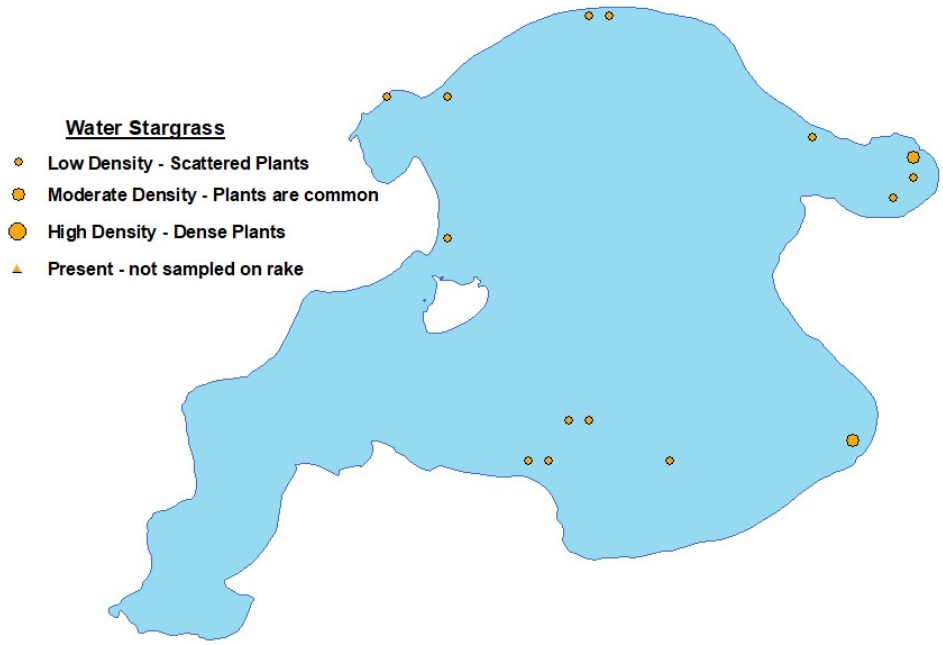
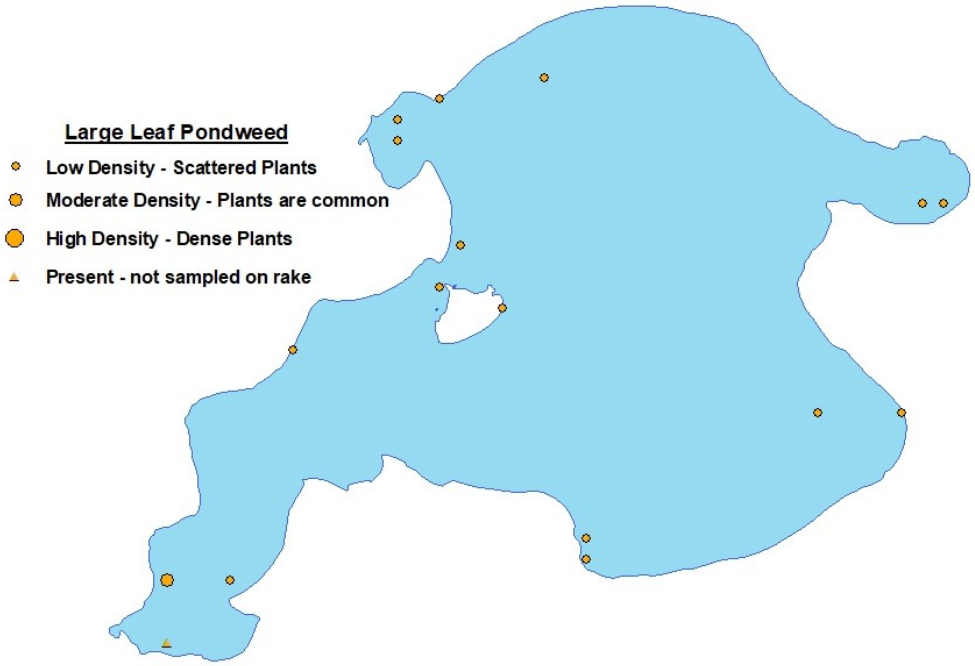
Water Stargrass (*Heteranthera dubia*)



Large-leaf Pondweed (*Potamogeton amplifolius*)



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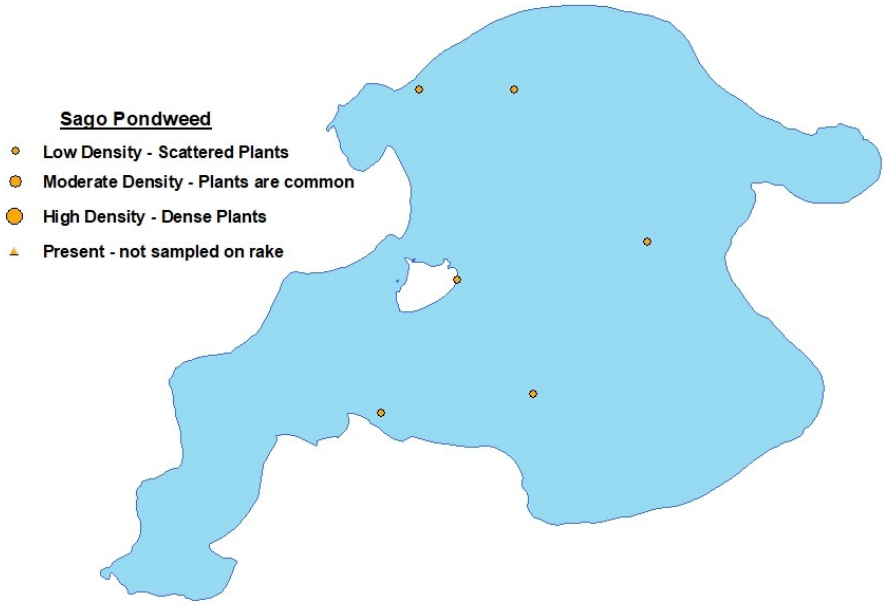
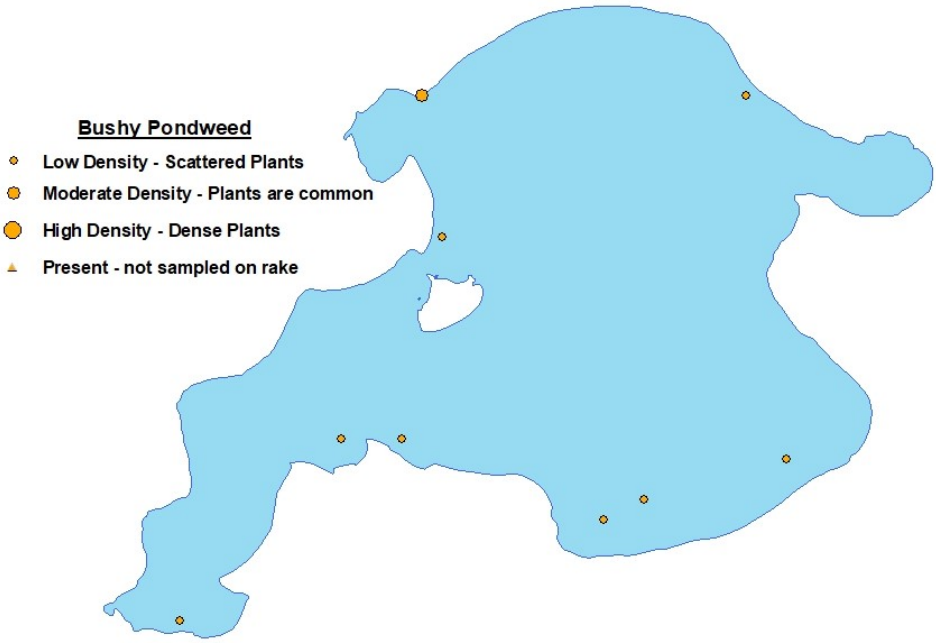
Sago Pondweed (*Stuckenia pectinata*)



Bushy Pondweed (*Najas flexilis*)



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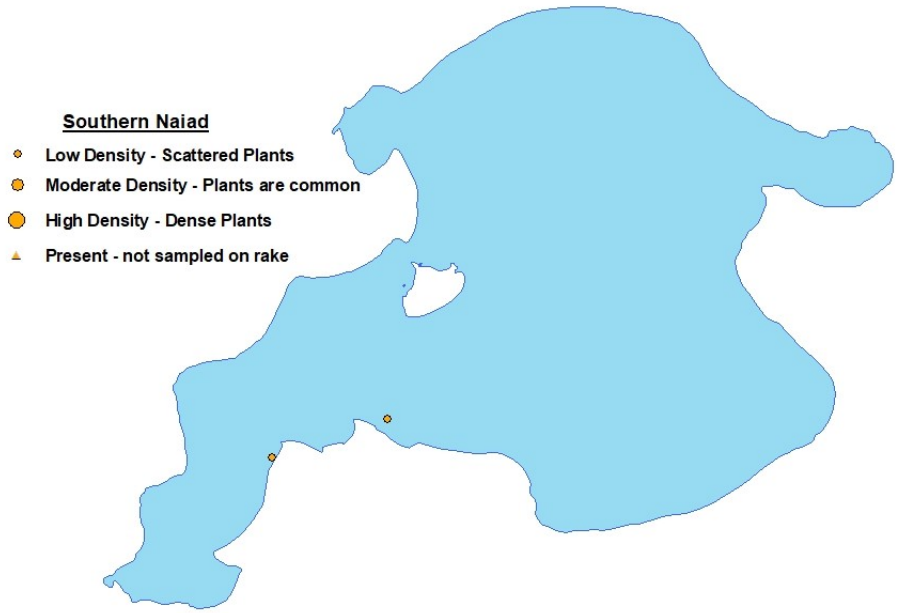
White-stem Pondweed (*Potamogeton praelongus*)

Southern Naiad (*Naja guadalupensis*)



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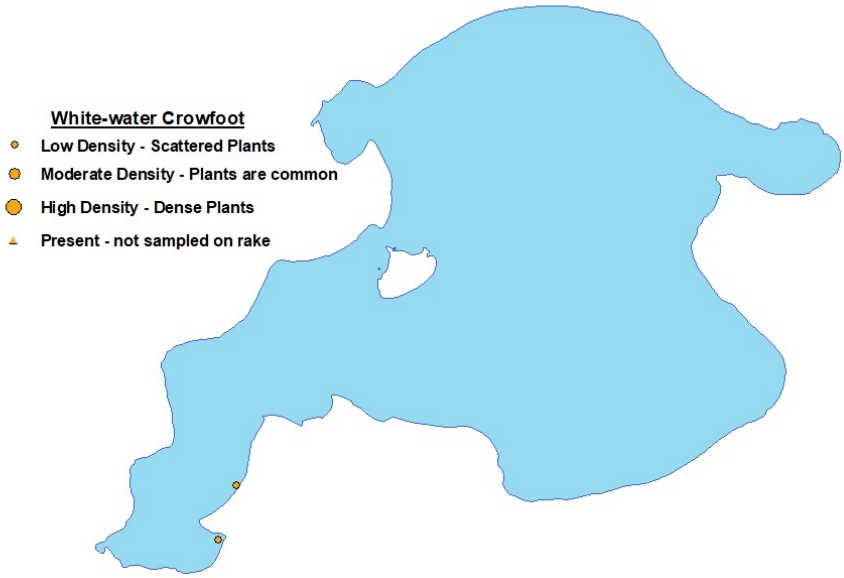
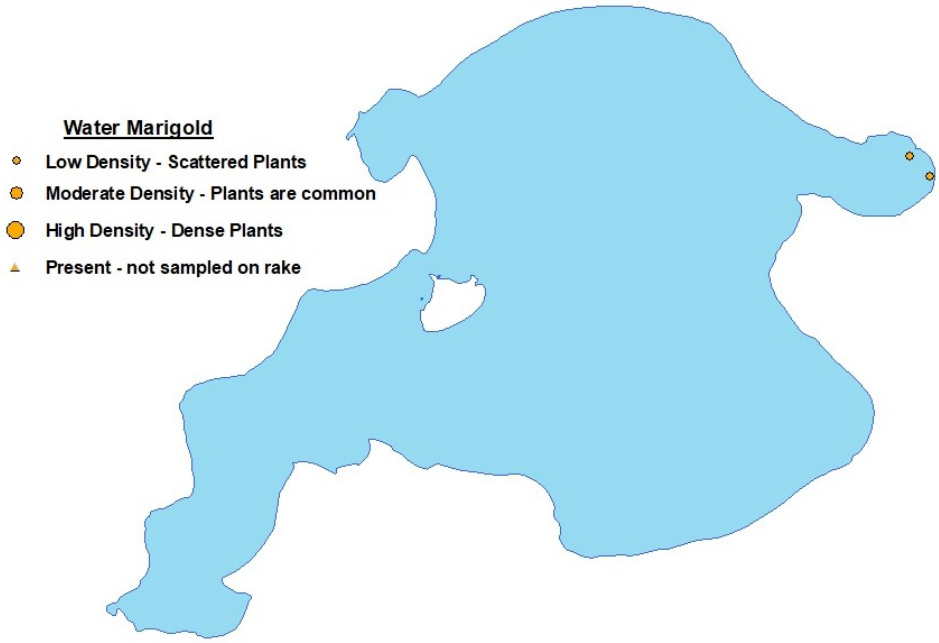
White water crowfoot (*Ranunculus aquatilis*)



Water Marigold (*Bidens beckii*)



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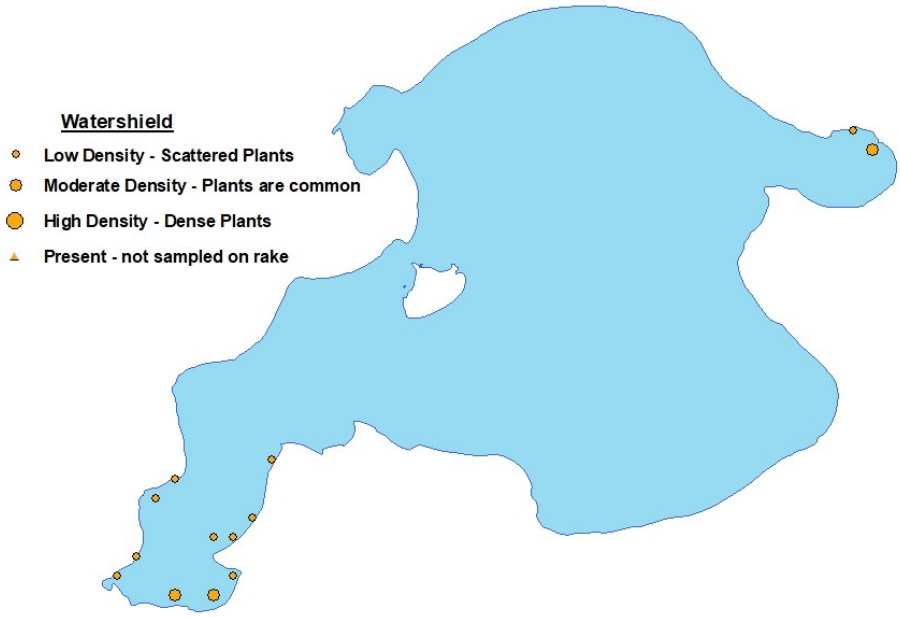
Nitella (*Nitella sp.*)

Watershield (*Brasenia schreberi*)



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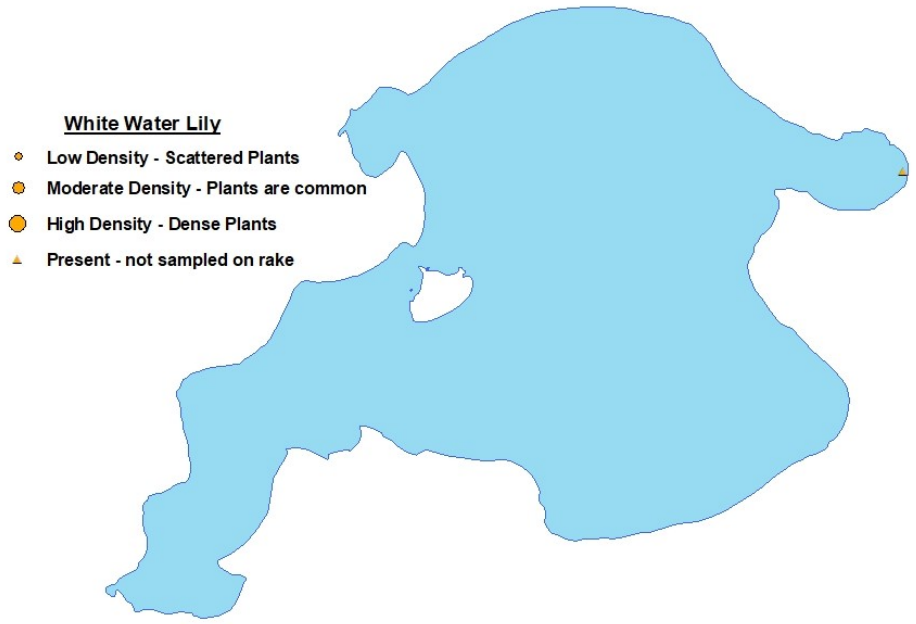
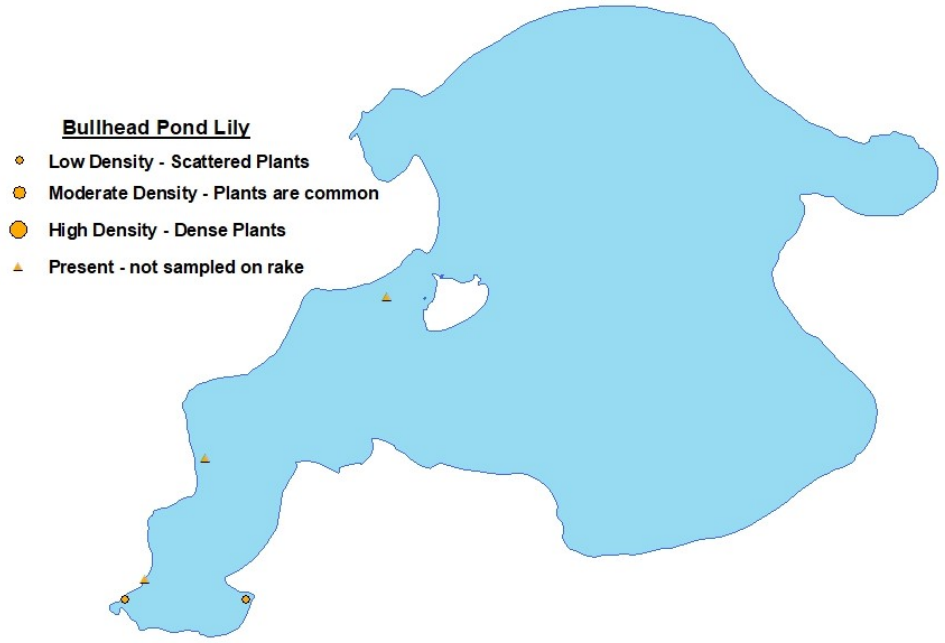
White Water Lily (*Nymphaea odorata*)



Bullhead Pond Lily (*Nuphar variegata*)



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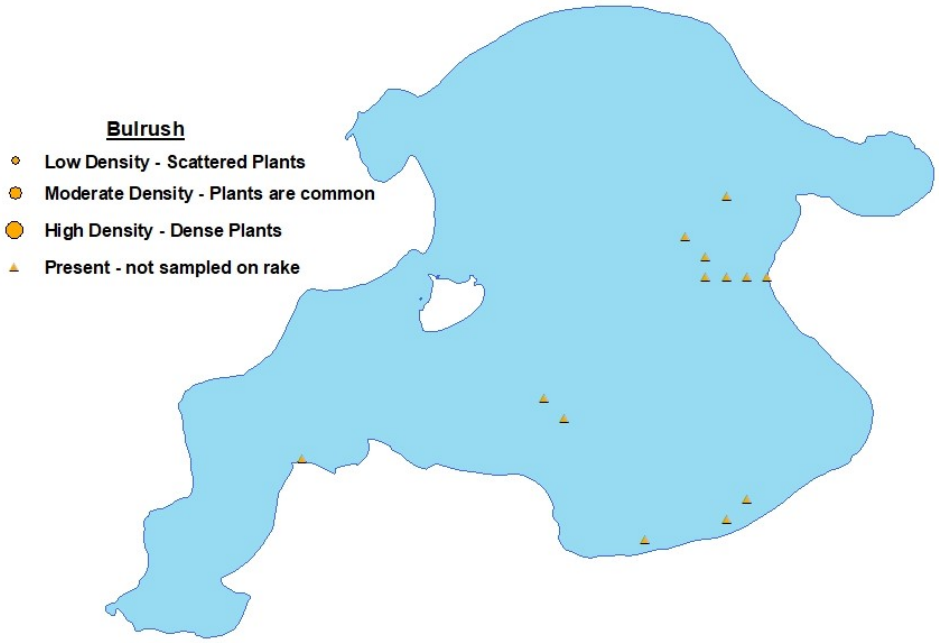
Bulrush (*Schoenoplectus sp.*)



Sagittaria (*Sagittaria sp.*)