Fish Lake; Echo Bay (56-0768-00)

Aquatic Vegetation Survey

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Lake: Fish Lake; Echo Bay **DOW Number**: 56-0768-00 **Date of inspection:** 8/5/2015

County: Otter Tail **Observers**: Emelia Hauck, Patrick Sherman

Author of report: Emelia Hauck **Date of report**: September 15, 2015

Introduction

Echo Bay in Fish Lake (DOW 56-0768-00) is a small bay off Fish Lake located in Otter Tail County near Pelican Rapids, MN. According to the Department of Natural Resources, Echo Bay has a maximum depth of 48 feet and the whole of Fish Lake contains a littoral area of about 48 percent which permits light penetration and allows plant growth.

Fish Lake is classified as a mesotrophic lake with good water clarity as measured by mean secchi depth of approximately 14 feet over the last ten years. Total phosphorus and chlorophyll-a (values that provide a measure of the amount of algae in the water) are considered average.

Table 1. Water quality means over the last 10 years for Fish Lake; Echo Bay Lake.

Lake	Trophic State	Mean Secchi depth (ft)	Phosphorus (ug/L)	Chlorophyll a (ug/L)
Fish Lake; Echo Bay	Mesotrophic	14	11.7	4

In the past, Echo Bay has been considered by developers as a potential site for development. This survey was completed to document the current pristine conditions of the bay, the vegetation and fish and wildlife habitat.

Objectives of Survey

This survey describes the aquatic plant community of Fish Lake; Echo Bay Lake including:

1) Vegetation data to include; sample point number, depth, plant taxa observed, and the estimated abundance of each taxon.
2) Identification of taxa to the level of species when possible.
3) Frequency of occurrence of each taxon found, stating the number of points used as the denominator for the calculations.
4) Combined frequency of all aquatic plants found
5) Estimation of maximum depth of submersed vegetation
6) Estimation of abundance of species sampled using MN DNR ranking system
7) Distribution map for common species
8) Determination of any invasive aquatic plants

Methods:

The point-intercept survey followed methodology described by Madsen (1999). Geographic Information System (GIS) software was used to generate sample points across the littoral zone surface in 50 meters by 50 meters grid with a few points added around the perimeter for better shoreline cover, resulting in a total of 144 potential survey points on Echo Bay. In the field, 134 points were sampled and vegetation was not found beyond 24 feet in depth. Ten points were unreachable due to their shallow nature and abundance of cattails. A Global Positioning System (GPS) unit was used to navigate the boat to each sample point. Water depths at each site were recorded in 1-foot increments using an electronic depth finder.

A double-headed, weighted garden rake, attached to a rope (Figure 1 and 2) was used to survey vegetation. Vegetation that was found under the surface by use of the double-headed garden rake was assigned a number between 1 and 4; 1 being rare (≤ 1/3 of the rake head covered), 2 being scattered (>1/3 but ≤ 2/3 of the rake head covered), 3 being common (> 2/3 of the rake head covered), and 4 being abundant (plants over top of rake head). Plant identification followed Blickenderfer (2007).

Figures 1 and 2. Double-headed, weighted garden rake, attached to a rope used to survey aquatic vegetation.

Frequency of occurrence was calculated for each species as the number of sites in which a species occurred divided by the total number of sample sites. Frequency was calculated for all sampled locations as well as locations 18 feet or less. The average number of native submersed plants per rake sample was calculated as the total number of plants sampled divided by the number of sample locations.

Sampling points were also grouped by water depth and separated into 5 depth zones for analysis. Depth zones included less than 3 feet, 4 to 8 feet, 9 to 15 feet, 15 to 24 feet, and over 25 feet (Figure 8).

Summary

On August 5, 2015, 134 locations were observed and sampled for a point intercept survey of aquatic vegetation (Figure 3). Eighteen different types of native plants were found across the bay. The weather was good for the survey with partially cloudy skies, temperatures reaching 79 degrees and some wind.

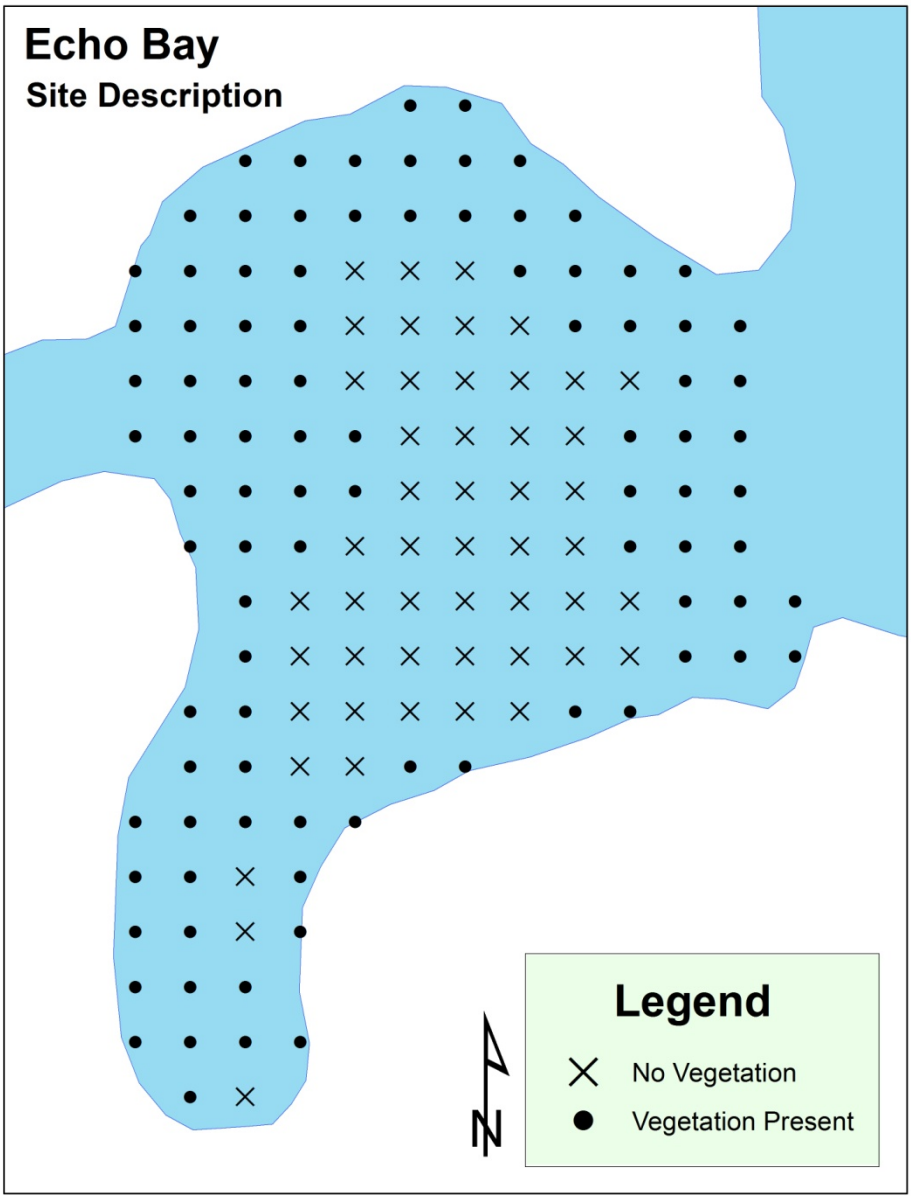

Figure 3. Echo Bay Point-Intercept Survey with site description, August 5, 2015.

Three submerged species and one emergent species made up the majority of plants sampled in Echo Bay. Chara (*Chara sp.*) was sampled at 29.66% of all sites and 42.16% of sites less than 25 feet, Bulrush (*Sirpus acutus*) was sampled at 26.9% of all sites and38.24% of sites less than 25 feet, and Coontail (*Ceratophyllum demersum*) and White Waterlily *(Nymphaea odorata)* were both sampled at 19.31% of all sites and 27.45% of sites less than 25 feet. (Figures 4, 5, 6, 7 and Table 2).

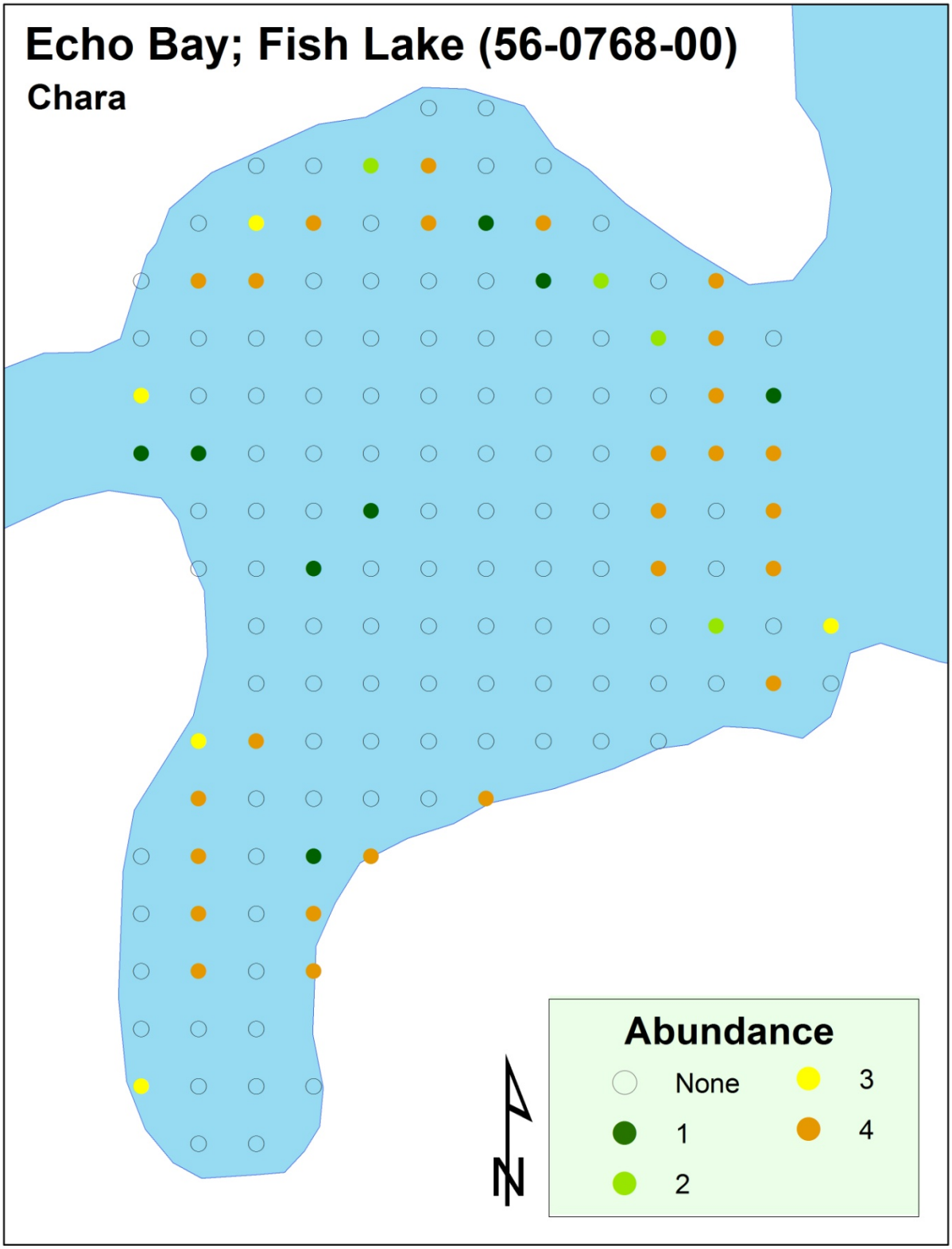

Figure 4. Locations with density of Chara present, Echo Bay, Otter Tail County, MN: August 5, 2015.

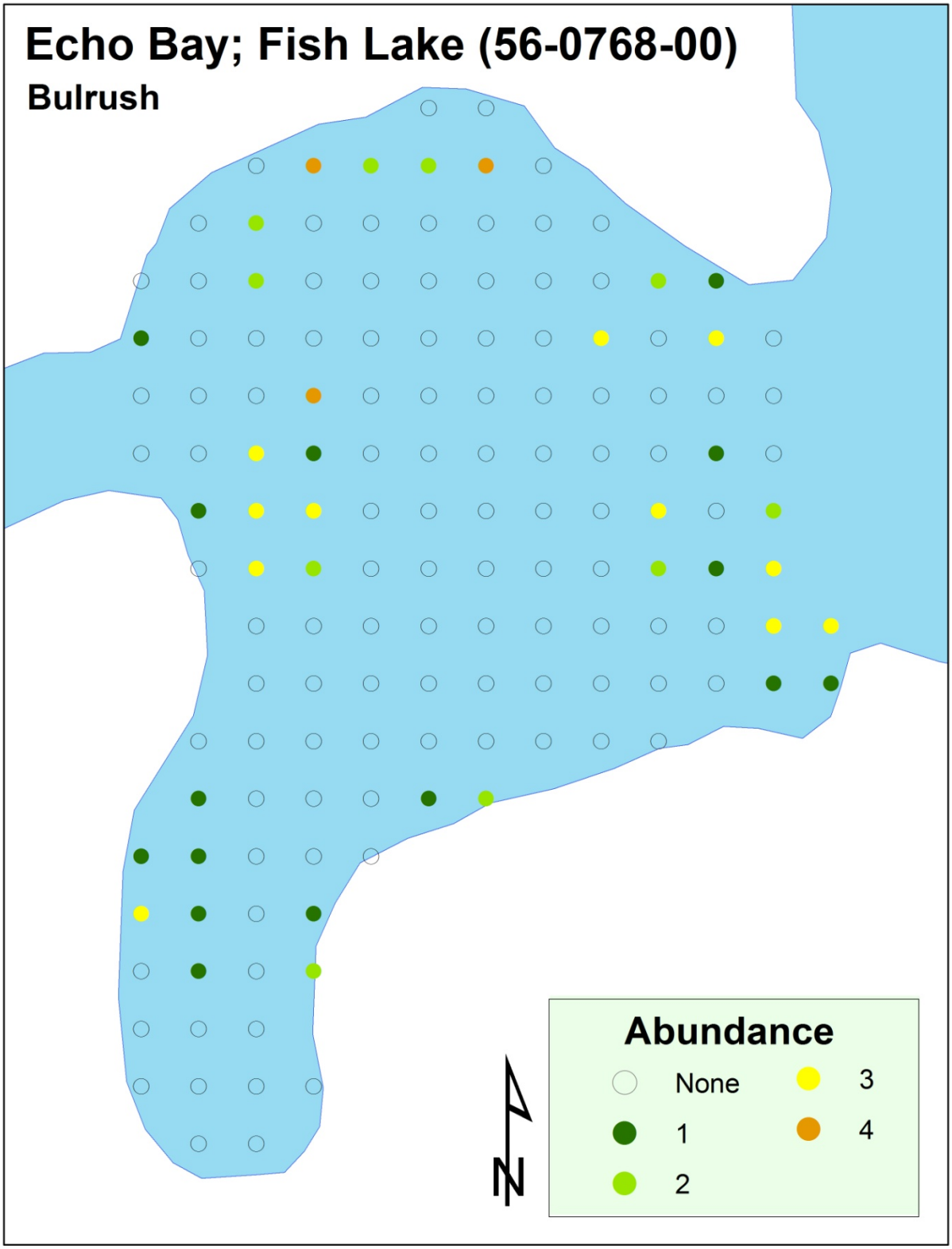

Figure 5. Locations with density of Bulrush present, Echo Bay, Otter Tail County, MN: August 5, 2015.

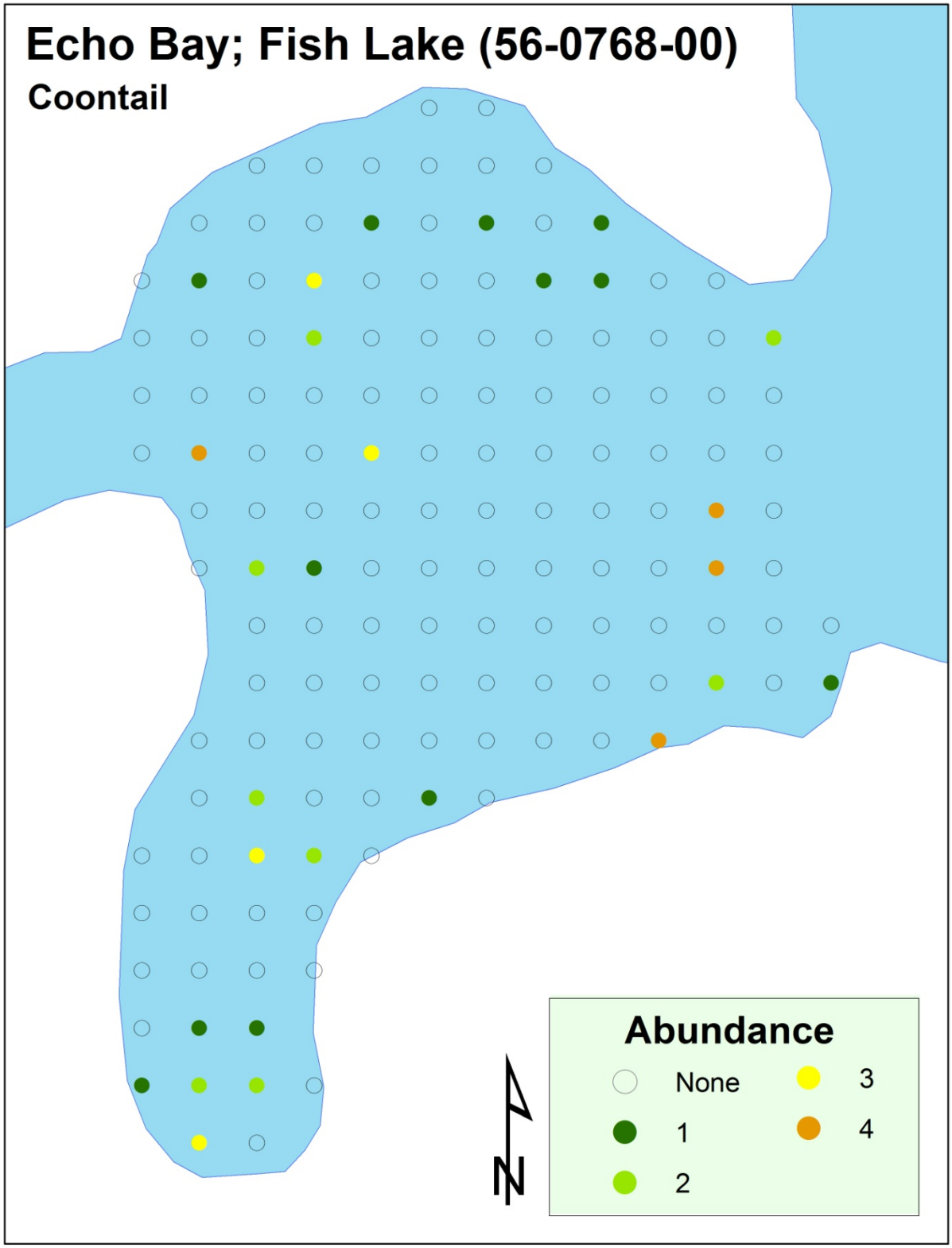

Figure 6. Locations with density of Coontail present, Echo Bay, Otter Tail County, MN: August 5, 2015.

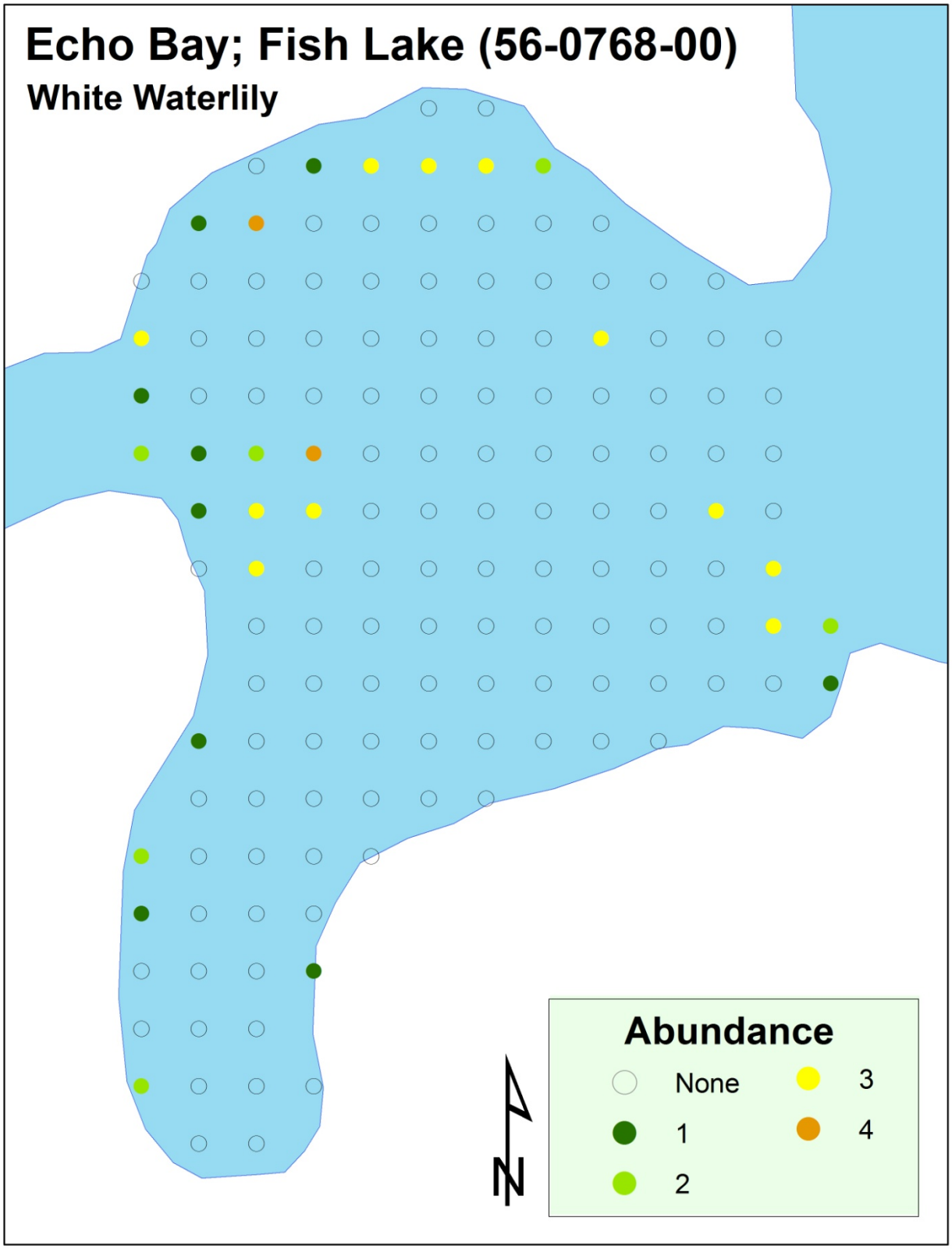

Figure 7. Locations with density of White Waterlily present, Echo Bay, Otter Tail County, MN: August 5, 2015.

Table 2. Aquatic plants surveyed from Echo Bay in Fish Lake, Otter Tail County, MN: August 5, 2015.

Echo Bay in Fish Lake				All sampled sites	All sites less than 25 feet
Life Form	**Common Name**	**Scientific Name**	**Count**	**Frequency (%)**	**Frequency (%)**
SUMBMERGED - 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.	Canada Waterweed	*Elodea canadensis*	2	1.39%	1.96%
	Chara	*Chara sp.*	43	29.86%	42.16%
	Claspingleaf Pondweed	*Potamogeton richardsonii*	7	4.86%	6.86%
	Coontail	*Ceratophyllum demersum*	28	19.44%	27.45%
	Flatstem Pondweed	*Potamogeton zosteriformis*	9	6.25%	8.82%
	Greater Bladderwort	*Utricularia vulgaris*	6	4.17%	5.88%
	Bushy Pondweed	*Najas flexilis*	7	4.86%	6.86%
	Northern water milfoil	*Myriophyllum sibiricum*	24	16.67%	23.53%
	Illinois Pondweed	*Potamogeton illinoensis*	6	4.17%	5.88%
	Sago Pondweed	*Potamogeton pectinatus*	14	9.72%	13.73%
	Water Marigold	*Bidens beckii*	2	1.39%	1.96%
	White Water Buttercup	*Ranunculus longirostris*	1	0.69%	0.98%
FLOATING - LEAF -These plant leaves float on water and are anchored to the bottom of the lake.	White Waterlily	*Nymphaea odorata*	28	19.44%	27.45%
	Yellow Waterlily	*Nuphar variegata*	18	12.50%	17.65%
	Star Duckweed	*Lemna triscula*	2	1.39%	1.96%
	Floatingleaf Pondweed	*Potamogeton natans*	6	4.17%	5.88%
EMERGENT - These plants extend well above the water surface and are usually found in shallow water, near shore.	Bulrush	*Scirpus acutus*	39	27.08%	38.24%
	Cattail	*Typha sp.*	16	11.11%	15.69%
Total number of plants (species diversity for the lake)			18		
Total number of plant occurrences			258		
Total number of sites			144		
Total number of sites <25 feet			102		

Sampling occurred to a maximum depth of 30 feet; however, no plants were found to be growing beyond 24 feet of water. Plant abundance was greatest between one and eight feet of water. As depths increased beyond that range, the presences of vegetation decreased and became less dense (Figure 8).

Of the 144 sampled locations in Echo Bay, 51 sites had no vegetation present. A total of 102 sites were observed at locations with depths of 25 feet or less.

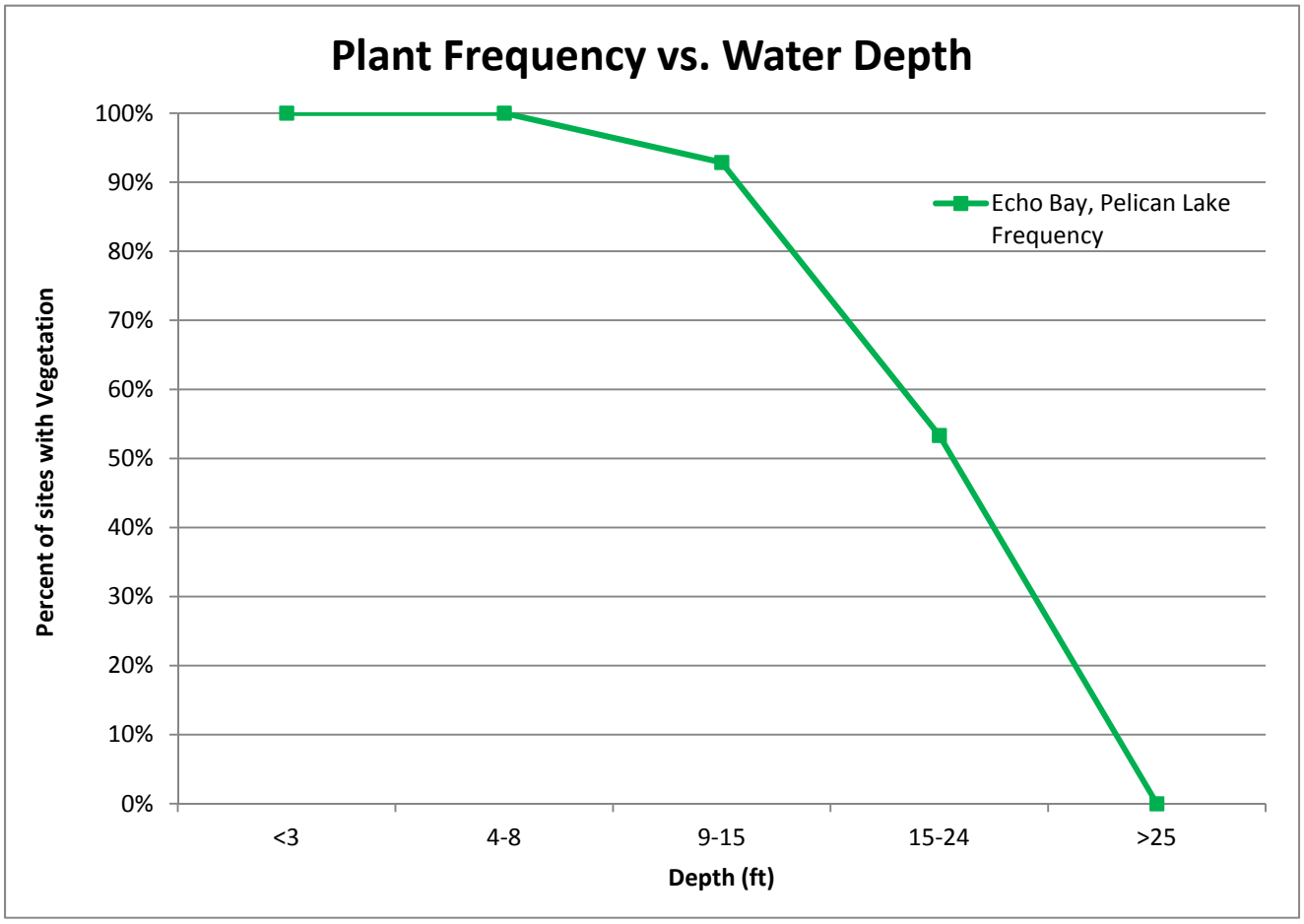

Figure 8. Frequency of vegetation vs. water depth, Echo Bay, Otter Tail County, MN: August 5, 2015.

The average number of plants per rake sample on Echo Bay was 1.8 for all sampled depths and 2.5 for depths less than 25 feet. Nine was the maximum number of species sampled at one location in Echo Bay while values of one and two species were sampled regularly (Figure 9).

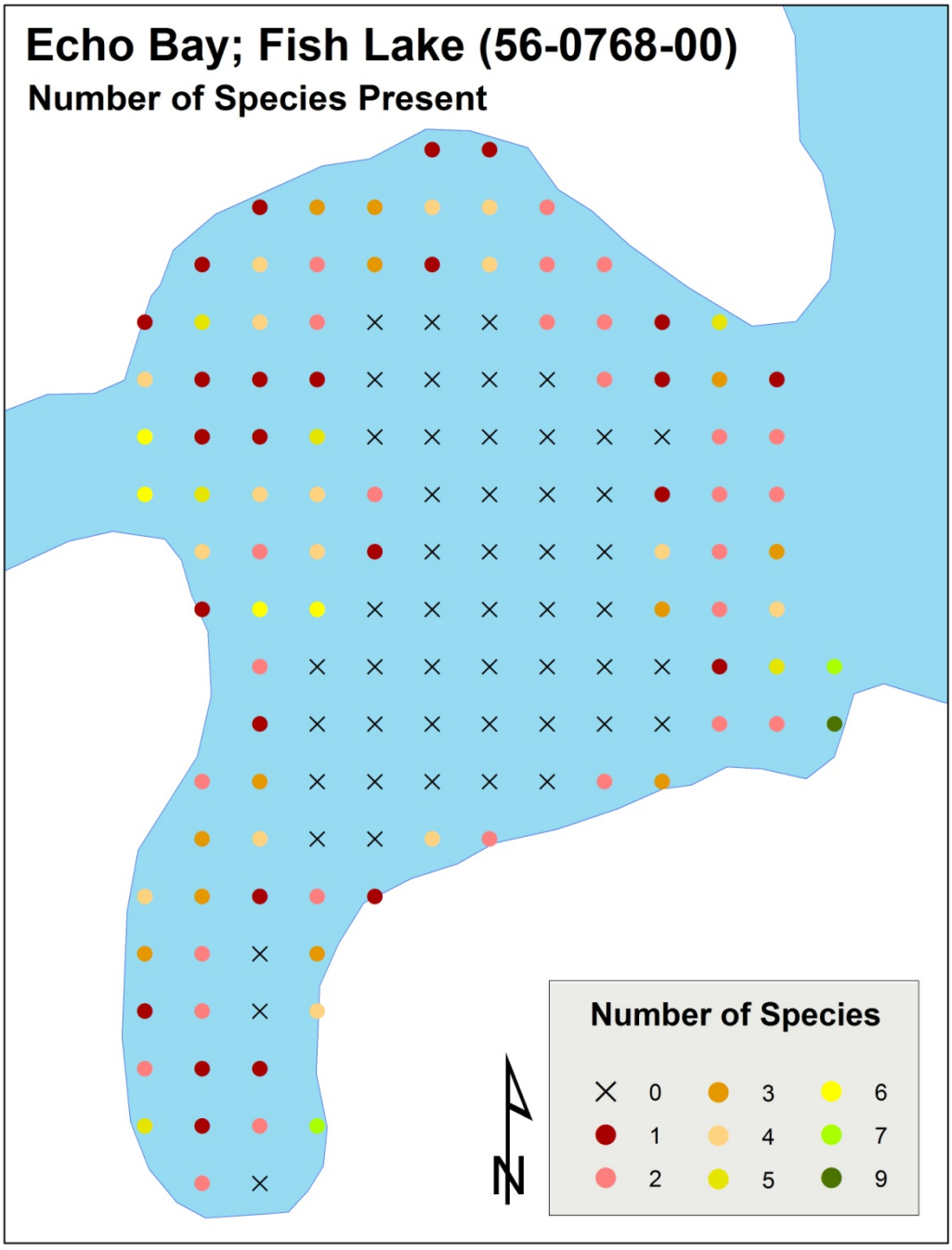

Figure 9. Number of species present per site, Echo Bay, Otter Tail County, MN: August 5, 2015.

Other native plants sampled in Echo Bay include Cattail (*Typha sp.),* Claspingleaf Pondweed *(Potamogeton richardsonii),* Canada Waterweed (*Elodea canadensis),* Northern water milfoil (*Myriophyllum sibiricum*), Bushy Pondweed (*Najas flexilis*), Flatstem Pondweed (*Potamogeton zosteriformis*), Greater Bladderwort *(Utricularia vulgaris)*, Illinois Pondweed (*Potamogeton ilinoensis*), Floatingleaf Pondweed (*Potamogeton natans),* Sago Pondweed *(Potamogeton pectinatus),* White Water Buttercup *(Ranunculus longirostris*), Yellow Waterlily (*Nuphar variegata*), Star Duckweed *(Lemna triscula),* and Water Marigold *(Bidens Beckii)* (Figure 10).

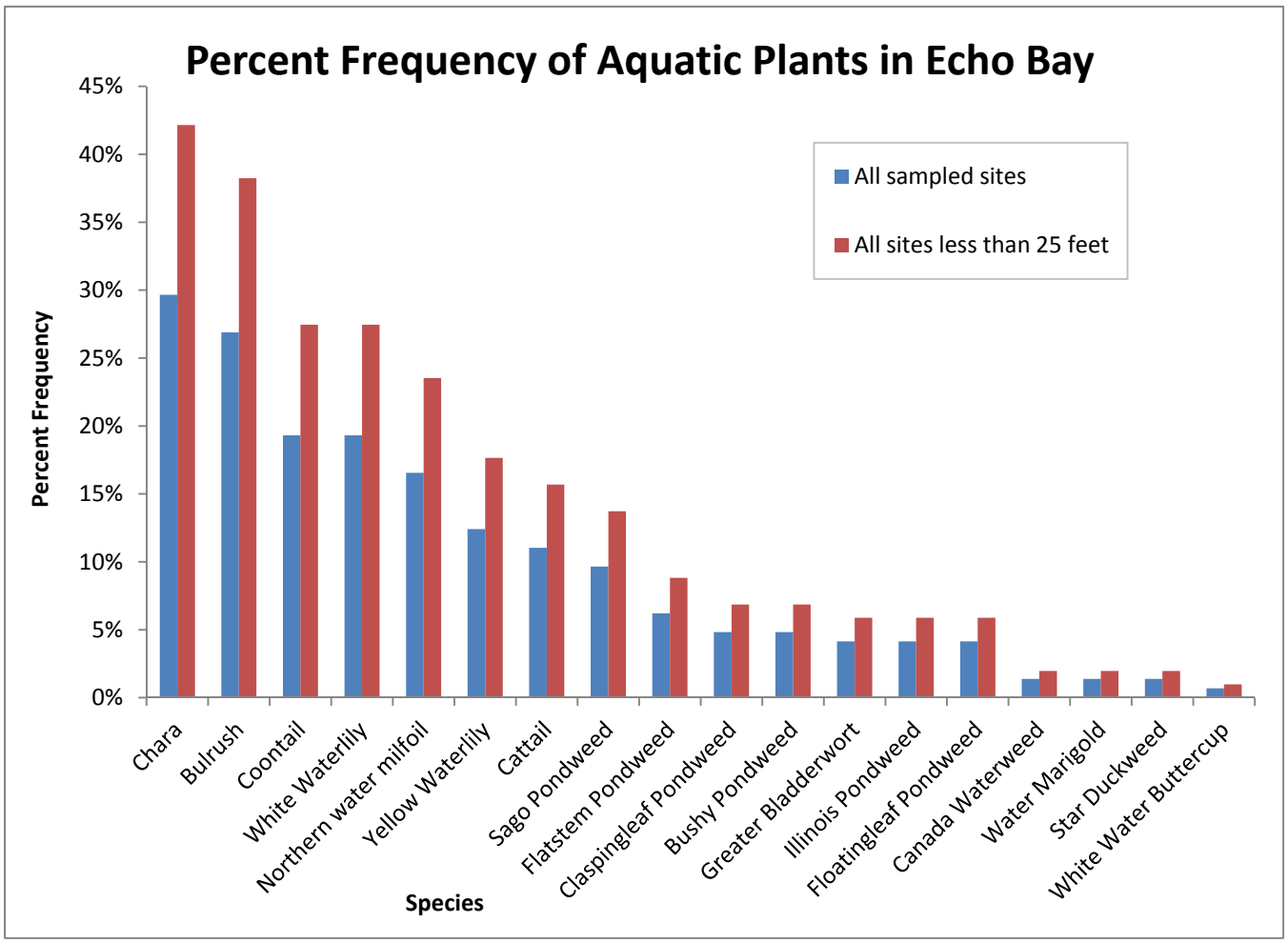

Figure 10. Frequency of occurrence for aquatic plant species in Echo Bay, Otter Tail County, MN: August 5, 2015.

Discussion

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 won't be plants present. Echo Bay has an average clarity of approximately 14 feet, and the majority of plants were found in less than 15 feet of water.

The overall results of this plant show that Echo Bay has a very healthy native plant community. No aquatic invasive plants were found in Echo Bay Aquatic plant communities are important to a body of water because of their ability to maintain water clarity and good fish habitat. Plants in all lakes lock up nutrients in their tissues which limit algae growth keeping lakes clear and healthy. Aquatic plants produce oxygen throughout the water column as a byproduct of photosynthesis, which oxygenates the water column. Plants also help to keep the sediments stable at the bottom of the lake and prevent it from mixing into the water column. Tiny invertebrates (zooplankton and aquatic insects) eat algae and use plants as a hiding place from predators such as perch, sunfish and crappies.

In addition, some plants are found more often in lakes with good water clarity, such as Muskgrass (*Chara*). Muskgrass was found at 43 sites in Echo Bay (Figure 4, Table 2). Though it gives off a 'musky' odor when brought to the surface, it is a great bottom stabilizer and slows the suspension of sediments; therefore, large communities of it can greatly benefit water quality and clarity. This plant is also wonderful habitat for fish and is a favorite food for waterfowl.

Coontail is also a great native plant and is common in Echo Bay (Figure 10). It has a unique ability to draw a great abundance of nutrients from the water, which increases water clarity. It also has a tolerance for cold weather and low oxygen levels, which allows it to remain alive longer into the winter and provides great habitat for many critters.

Bulrush is very important to a lake for many reasons. It provides spawning habitat for crappies, filters the water, and helps to prevent shoreline erosion by acting as a wave break. It is imperative to protect bulrush beds in lakes for these reasons. Larger leave plants, such as the pondweeds, are important spawning and hiding areas for panfish.

Homeowners should be careful not to cut or remove large areas of native plants in the lake. If large areas of plants were removed from these lakes, that phosphorus would be taken up by algae instead and cause green murky water. In addition, removing native plants makes room for invasive plants to come in and colonize. A diverse native plant community can be good protection against invasive aquatic plant invasion. The natural, healthy state of Echo Bay is to have clear water and abundant native plant growth.

Echo Bay is a very important area, biologically, for Pelican and Fish Lakes. It is where much of the fish spawning in the group of lakes occurs, and provides wildlife habitat such as nesting sites for loons. It is the only large tract of undeveloped lakeshore in the Pelican Group of Lakes.

RMB Survey Photos:

Figure 11. A rake sample of a healthy population of plant species. Photo from a 2015 vegetation survey.

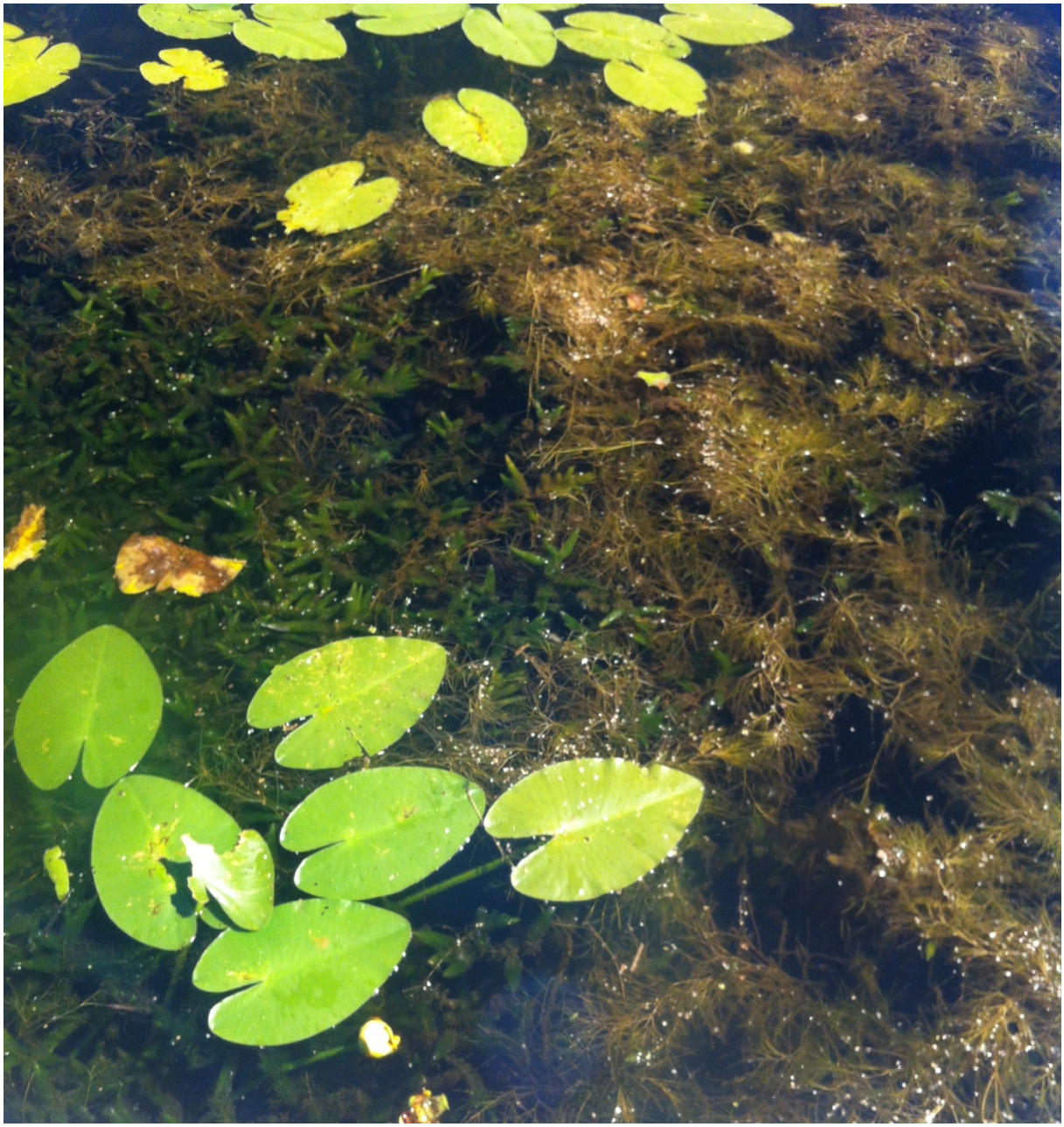

Figure 12. Yellow Waterlily, Coontail, and Sago Pondweed in Echo Bay, Fish Lake, Otter Tail County, MN: August 5, 2015.

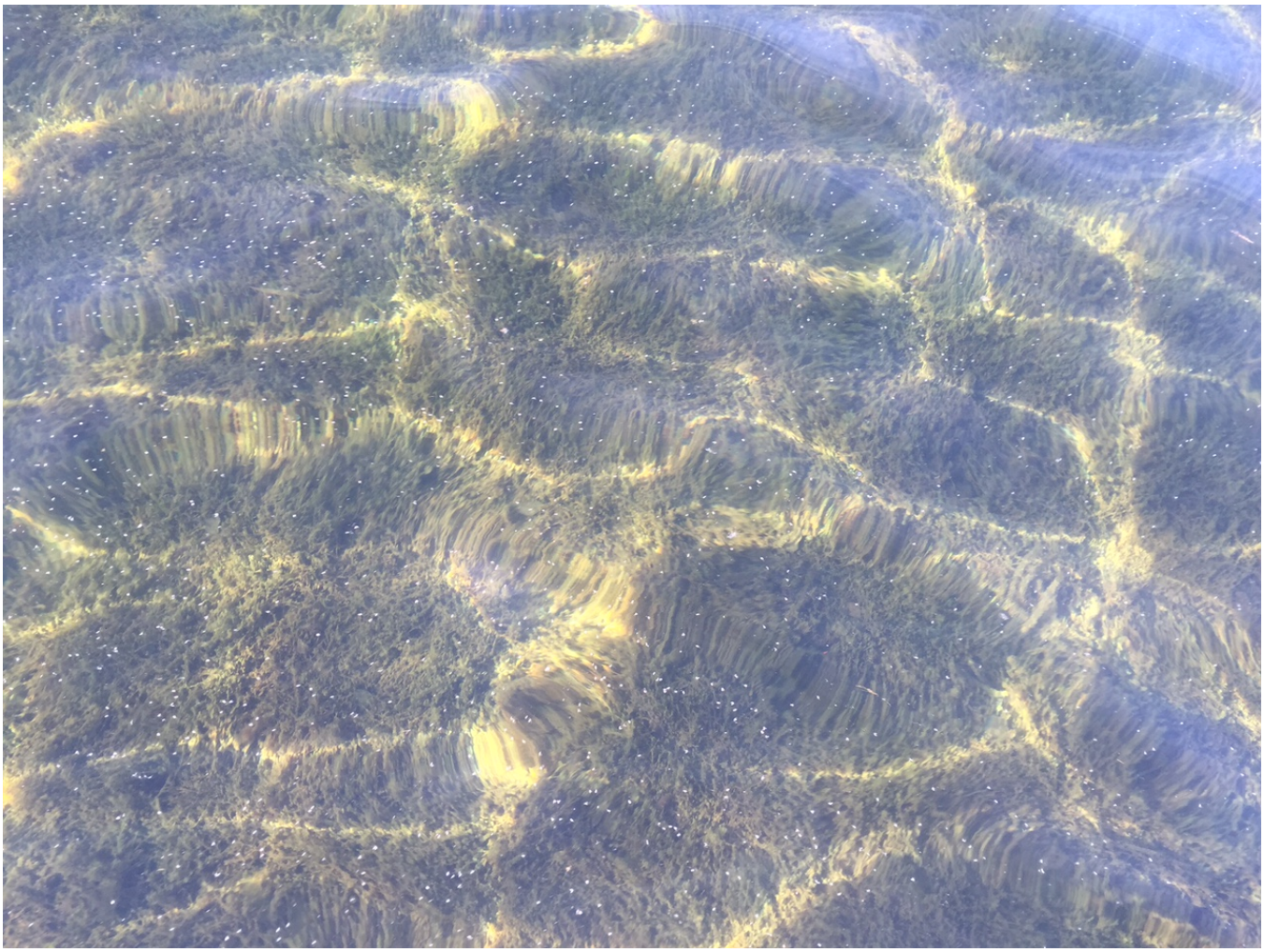

Figure 13. Muskgrass (*Chara)* beds under clear water.

Literature Cited

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