AQUATIC PLANT SURVEY
OF
PARADISE LAKE

Prepared For the Paradise Lake Association

by

TIP OF THE MITT WATERSHED COUNCIL

August, 1996

INTRODUCTION

Paradise Lake is a shallow, productive 1,913 acre lake. The maximum and mean depths are seventeen and four feet respectively. In recent years, residents of Paradise Lake seem to have become increasingly concerned about the amount of aquatic plant growth in the lake. By late summer, rooted aquatic plants grow to the lake's surface in several large areas, greatly restricting boating, swimming, fishing, and other recreational activities. The Paradise Lake Association is considering methods to control the growth of aquatic plants. The Association contracted with the Tip of the Mitt Watershed Council to assess the species composition, distribution, and relative abundance of the lake's vegetation. The purpose of the survey was to gather baseline information for use in determining which type of control methods may be effective or needed.

METHODS

The submergent vegetation of Paradise Lake was surveyed in July and August, 1996. Collections were made from 134 sampling points along 24 transects. Transects ran between recognizable shoreline landmarks. Sampling location was determined by taking a compass bearing on a third shoreline landmark.

A 15 tooth bow rake (the common yard and garden variety) on a 14 foot pole was used to gather plants at the majority of sampling points. In areas deeper than 13 feet, a weighted plant grapple on a line was used.

Representative species of commonly occurring plants were placed in one gallon zip-lock plastic bags and placed in a refrigerated cooler for later identification. A complete species list was not a goal of the survey, and uncommonly occurring species were not identified. Notes were taken on species collected and relative abundance at various locations. Identifications were made by referring to several taxonomic references, including Hotchkiss (1967), Prescott (1969), and Voss (1972, 1985). At each sampling point, information on water depth and sediment characteristics was also recorded.

The locations of the sampling points were plotted on an enlarged U.S. Geological Survey 7.5 minute topographic map. The results were entered into a Geographic Information System computer program known as C-Map for production of a covertype map.

RESULTS

Ten species of aquatic plants were commonly collected. A list with a description of each follows:

1. Chara sp. (commonly called stonewart or muskgrass). This is a type of filamentous algae which resembles higher plants. It has a musky odor and gritty surface texture. It usually grows in low, dense mats.

2. Najas flexilis (Water Naiad). A small plant usually only growing to a height of several inches above the sediment. It has small, narrow leaves tapering to a fine point.

3. Potamogeton amplifolius (big-leaf pondweed). A tall rooted aquatic plant, with large, arched leaves which are sometimes reddish in appearance. It also sometimes develops floating leaves.

4. Potamogeton robbinsii (fern pondweed). A distinctive looking species with stiff leaves in two rows on opposite sides of the stem. It attains a maximum height of several feet.

5. Potamogeton praelongus (white-stem pondweed). This species somewhat resembles P. amplifolius in that it is a very tall plant (having been known to grow to the surface from water up to 22 feet deep). However, it has narrower and longer leaves which are more greenish in appearance. All species of Potamogeton which bear fruit develop a spike-shaped cluster of nut-like seeds at the tip of the plant late in the season.

6. Vallisineria americana (tape grass or wild celery). This plant is characterized by long ribbon-like leaves. It grows submerged, often times in deep water. It spreads by rhizomes It also flowers and produces seeds atop a spiraled stalk. This plant is an important food for waterfowl

7. Myriophyllum heterophyllum (two-leaved or variable milfoil). It is one of seven species of milfoil found in Michigan. Milfoils are primarily submerged plants with compound leaves in groups ringing the stem (whorls). The leaflets are thread-like and resemble a double-sided comb when examined closely. As its common name implies, this species can vary in appearance within a lake. It usually has unbranched greenish-brownish stems and very dense foliage, and has been said to resemble green ropes under the water.

8. Myriophyllum spicatum (Eurasian milfoil). The other six species present in Michigan all being native. It is an invasive species, often becoming very abundant and crowding out other species. Unlike any other species of milfoil in Michigan, it has 14 or more pairs of leaflets per well-developed leaf and reddish stems which branch near the surface.

9. Elodea canadensis (Elodea or waterweed). A very widespread aquatic plant. This plant has short green leaves arranged in closely spaced whorls.

10. Utricularia sp. (bladderwart). Initially, it may resemble milfoil, but the leaflets are not comb-like. It is a carnivorous plant with numerous bladder-like structures which trap microscopic aquatic life. It usually grows in relatively shallow water.

During the course of the survey, the presence of four basic vegetation community types became apparent. The attached map shows the areas distribution of these communities. A description of each follows.

Covertype One. This is primarily an unvegetated area in shallow areas of the lake. It is usually characterized by a firm sand bottom with little accumulation of organic matter and with scattered with clam shells. In some areas gravel, rocks, and boulders are present, especially immediately along the shore. The bottom characteristics in this area result from the size of the waves on this large lake, which exert a churning action on the bottom in water less than six feet deep, washing away small mineral particles (silts and clays) and organic material. Plants are absent because of turbulent conditions, and because the sand and coarser material is poor habitat in terms of rooting substrate and nutrient content. This covertype covers approximately 564 acres, or 29.5% of the lake.

Covertype Two. This area is best described as a diverse, patchy assemblage of plants. The density is variable, but is relatively low to moderate. At some sampling points eight different species were present, while at others only one or two were found. In all cases, the plant assemblage seemed to be ever-changing, with no sizeable, distinct, mappable sub-units present. This area occurred at depths between six and ten feet. Sparse growths of Eurasian milfoil were present. In places, whitestem pondweeds grew up close to the surface, but even in areas of maximum density (one plant per square meter) they did not seem dense enough to interfere with recreational activities. This covertype covers approximately 497 acres, or 26.0% of the lake.

Covertype Three. This area is characterized by very dense plant growth reaching to the lake surface. It is dominated by Eurasian milfoil and whitestem pondweed. Although other species were usually present, they composed a relatively small percentage of the sample biomass. As with community two, this area occurred at depths between six and ten feet. However, it was apparent that there was a greater accumulation of organic material due to the ease with which the rake could be pushed deeply into the sediment. This covertype covers approximately 317 acres, or 16.6% of the lake.

Covertype Four. This area is sparsely vegetated to unvegetated. The most common species was Vallisineria, which grew in the shallower portions of the covertype. Although there were soft, deep organic accumulations on the bottom, it is likely that light penetration in the darkly stained lake waters is a limiting factor, This covertype covers approximately 534 acres, or 27.9% of the lake.

CONCLUSION

It appears that vegetation conditions which seriously limit recreational activity are limited to covertype three, or approximately 16.6% of the lake. Because this is the first aquatic plant survey to document covertype or areal coverage, it is not known whether this covertype is expanding. It is possible that the area of covertype three is expanding, as the growth of plants produces thicker organic bottom deposits which in turn are conducive to the production of more aquatic plant growth.

Eurasian milfoil, only recently observed in the lake, is now distributed throughout the lake. It appears to be becoming most dense, and is overwhelming other vegetation, in covertype three.

Since water quality monitoring began in Paradise Lake about 25 years ago, the lake has been known to be very high in nutrients, and thus very productive in terms of plant growth. However, there is no indication that recent water quality changes have caused accelerated plant growth.

Regardless of the cause of the plant growth, several possible control techniques are available. These include chemical treatment (controversial because of concern about environmental damage), harvesting, sediment removal (dredging), sediment tilling (rotovation), and reduction of controllable nutrients. Appendix One summarizes these and other aquatic plant management techniques.

RECOMMENDATIONS

1. Avoid use of aquatic herbicides. The Watershed Council feels that there are too many uncertainties regarding the use of these toxic compounds, including human safety, mortality of non-target organisms, and possible ground water contamination

2. Distribute the vegetation covertype map. Widespread distribution of the map may help lake users to better understand the nature of the plant growths, and avoid recreational problem areas.

3. Continue aquatic plant monitoring. On-going monitoring at periodic intervals will help reveal trends and the need for specific types of actions.

4. Support and implement comprehensive lake management. Increasing plant growth is a symptom of a eutrophication problem. Treatment of the cause of the problem (in this case, reduction of sediment and nutrient loading) is often considered the best course of action. Specific actions include (but are not limited to) education of shoreline residents, establishment of septic maintenance districts, small community waste treatment for the Village of Carp Lake, and removal of weeds which wash ashore.

5. Harvest small areas of plants in covertype three. The Watershed Council believes that harvesting is the least environmentally disruptive form of aquatic plant management. In addition, it is also the least expensive and most feasible. We suggest creating several open lanes through the linear areas of covertype three using simple hand-operated equipment and volunteer labor, and assessing the results. If the effort seems worthwhile, it can be continued or expanded in the future according to environmental impacts or perceived needs. Since Erasion milfoil is already extensively fragmented by boat motors and other factors and distributed by wind throughout the lake, it should not be a concern with mechanical harvesting.

SUGGESTED AQUATIC PLANT IDENTIFICATION REFERENCES

Borman, S., R. Korth, and J. Temte. 1997. Through The Looking Glass, A Field Guide to Aquatic Plants. Wisconsin Lakes Partnership 248 p.

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APPENDIX ONE