Aquatic Plant Survey
Upper Straits Lake, Oakland Co., Michigan

Conducted October, 2007

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1.0 Introduction

Upper Straits Lake is a 323 acre lake located in Southeastern Michigan in Oakland County. The infestation and excessive growth of Eurasian watermilfoil *(Myriophyllum spicatum)* (EWM) has become a major concern for property owners surrounding the lake, given its tendency to dominate vegetative communities once it becomes established. Eurasian watermilfoil (EWM) is an invasive, exotic aquatic plant from Europe and Asia that is thought to have invaded the United States in the 1930's. This invasive species tolerates a wide range of growing conditions and out-competes native vegetation which can lead to a monoculture of EWM. Thick beds of EWM limit recreational use, reduce biodiversity, and induce an unbalanced fishery. Furthermore, a severe infestation of milfoil can cause thermal stratification, and lead to a reduction in natural circulation causing dissolved oxygen problems. As a management technique, harvesting has been the primary method of aquatic macrophyte control for the past 20 years on Upper Straits Lake.

EnviroScience Inc. is the expert in biomonitoring and lake management services. We maintain one of the largest aquatic and ecological survey departments in the Midwest. In addition to a large in-house staff of aquatic ecologists, we are closely allied with a number of universities and nationally recognized experts. EnviroScience also offers the only natural way to control Eurasian watermilfoil, the MiddFoil® process, which uses the milfoil weevil *(E. lecontei)* as a biological control. This is a long term approach for controlling EWM versus alternative methods which are performed annually. The members of the Upper Straits Lake Association wanted the lake surveyed to calculate the amount of EWM in order to evaluate MiddFoil® as a possible future management technique.

2.0 AVAS Survey Methods

Qualitative vegetation sampling was performed on October 2 and 3, 2007 using the Michigan DEQ guidance contained in Standard Procedures for Surveying Aquatic Plants. This method involves performing visual and rake tow surveys along sections of the littoral zone. For the Upper Straits Lake project, a map of the lake shoreline was divided into 90 sections (App. A). In

each of these zones, the presence and relative density of each aquatic plant species was determined, and the information was recorded on the Standard Aquatic Vegetation Assessment Site Species Density Sheet (AVAS) developed by the State of Michigan (App. B) On the AVAS density sheets the approximate percent cover was reported rather than narrative ranges. On the summary sheet, however, these percentages were translated into cover codes A, B, C, and D to describe the approximate coverage of each plant within the map area, as described in the following table.

Cover Code	Approximate Cover Range
A	1-2%
B	3-20%
C	21-60%
D	61-100%

Visual and rake surveys were performed at each site until no new species were encountered and the biologist conducting the survey was comfortable that adequate information had been obtained to estimate the density of each species encountered. Species of questionable identity were placed in a plastic bag, appropriately labeled and identified using taxonomic keys at the completion of the survey. The boundary of each AVAS was determined using differential GPS technology. GPS information was also used to estimate the relative width of the vegetative band in the littoral zone.

3.0 Survey Findings

The October survey identified eighteen different aquatic plant species including thirteen submergent and five emergent species. The lake was divided into 90 AVAS sample locations, and a total of 317 rake tow samples were taken as part of this survey. Two exotic species were found, Eurasian watermilfoil and Starry stonewort *(Nitellopsis obtusa),* out of the 18 species present (Table 1). According to the calculated cumulative cover (CC) value, Upper Straits Lake is dominated by two algal species - Starry stonewort (46.1 CC) and Chara (28.2 CC). Starry stonewort was found in 77 of the 90 AVAS locations. At the time of the survey, Eurasian

watermilfoil, was found in 45 of the 90 AVAS locations making up 15.1 percent cumulative cover. The heaviest infestation of EWM occurred in AVAS locations 6-13 along the southeastern shore. Biologists also identified a milfoil weevil (larvae) in this area along with damage indicative of weevils on a few of the milfoil stems collected on the rake tow.

Several other submergent macrophytes were found less frequently such as elodea, wild celery, coontail, naiad and various other pondweed species. The survey identified five emergent aquatic plant species, some of which were common enough to contribute to the aquatic community. These included: white waterlily, sedges and common rush. No plants were present at AVAS locations 53-55, 58 and 72. Each of these species is considered highly beneficial to lake ecosystems.

Table 1. Aquatic Plant Species Encountered in Upper Straits Lake

Common Name	Scientific Name	Cumulative Cover
1. Eurasian watermilfoil	*Myriophyllum spicatum*	15.2
2. Starry stonewort	*Nitellopsis obtusa*	46.1
3. Chara	*Chara spp.*	28.2
4. Variable pondweed	*Potamogeton gramineus*	2.3
5. White stem pondweed	*Potamogeton praelongus*	0.02
6. Illinois pondweed	*Potamogeton illinoensis*	0.03
7. Large leaf pondweed	*Potamogeton amplifolius*	0.33
8. Sago pondweed	*Potamogeton pectinatus*	1.3
9. Small pondweed	*Potamogeton pusillus*	0.03
10. Coontail	*Ceratophyllum demersum*	0.68
11. Elodea	*Elodea Canadensis*	0.62
12. Naiad	*Najas* spp.	1.76
13. Wild Celery	*Vallisneria Americana*	2.14
Emergent plant species observed:		
14. White waterlily	*Nymphaea* spp.	2.46
15. Pickerelweed	*Pontederia cordata*	0.68
16. Cattail	*Typha* spp.	0.35
17. Sedge	*Carex* spp.	2.47
18. Common rush	*Juncus effusus*	3.56

4.0 Discussion

A major species of concern for the Upper Straits Lake Association is EWM due to its invasive

potential and tendency to dominate plant communities in northern lakes. This non-indigenous nuisance species is common to many lakes in Michigan. It frequently out-competes desirable native vegetation and tends to form dense monocultures which may contain several hundred stems per square meter. This is primarily due to its fast growth rate and canopy-forming growth habit, which allows it to shade out more desirable native vegetation. Unlike most vegetation, EWM does not stop or slow its growth when it hits the water surface. The plant floats on the water surface and may continue to grow several inches per day under ideal conditions. EWM is able to dominate the plant community in many lakes because it does well in a wide variety of sediment conditions, can tolerate low light, and low temperatures. Dense colonies of plants and the floating mats which can result can interfere with all types of recreation, provide poor fish habitat, and may contribute to degraded water quality.

At present, Starry stonewort appears to be out-competing Eurasian watermilfoil and likely poses more of a long-term threat. Starry stonewort is an exotic species that has been popping up in lakes in Michigan over the past two decades and more so over the last few years. Starry stonewort is macroscopic green algae, similar to Chara. Chara (also known commonly as muskgrass or stonewort) is very common and abundant throughout the United. This low-growing species can form dense mats in both muddy and sandy substrates. Chara or muskgrass has a characteristic skunky odor and is often encrusted by calcium carbonate, giving the plant a hard crusty feel. Muskgrass is a favorite waterfowl food; algae and invertebrates found on it also provide additional grazing for fish and waterfowl. The plant is also valued as fish habitat, providing excellent cover for young game fish. Additionally it aids in improving water clarity by keeping sediment down. Starry stonewort has the same benefit of chara, however, it tends to be much more invasive. Starry stonewart can grow up to seven feet tall, decrease biodiversity and negatively impact fish spawning habitat.

Native aquatic plant species as a group provide essential habitat for fish and for organisms that provide food for both juvenile and adult fish. Fish also depend on these plants for cover to protect their young and as an area for predator avoidance. The plants also play an important role

in nutrient cycling and in oxygenating the water column. As with most native species, these rooted aquatic plants seldom grow so dense that active management is required. In general, aquatic plants are essential components of lake ecosystems. Aquatic plants contribute to the beauty of the lake, stabilize banks, oxygenate water, protect fish, provide spawning habitat, and serve as food sources for waterfowl and wildlife. When excessive growth by one or more species of plants begins to form a monoculture and interfere with recreational use of the lake, the plants become "weeds" and require active management. As with a garden, management implies encouraging certain plants and controlling others. Of the aquatic plant species found in Upper Straits Lake, Starry stonewort appears to require active management.

5.0 Conclusions and Recommendations

The littoral zone of Upper Straits Lake is heavily dominated by Starry stonewort, and this problem is likely to continue to get worse if not managed. A variety of methods are currently available for controlling nuisance aquatic plants. These include physical, mechanical, chemical, and biological methods. All aquatic plant management techniques have positive and negative attributes. Selection of a method needs to be based on economic, environmental, technical, and sometimes regulatory constraints. To date, mechanical harvesting has been used with some success to improve conditions in selected areas of the lake. Starry stonewort can be managed using algaecides, or by the current method, harvesting, which has the benefit of rapidly decreasing plant biomass and removing it from the lake.

Continued mechanical harvesting, however, needs to be approached carefully in Upper Straights Lake because harvesting of Eurasian watermilfoil is not recommended. The plant spreads by fragmentation and regrows significantly more rapidly than most native vegetation. Every fragment cut by the harvester and not removed has the potential to form another colony somewhere else in the lake.
For these reasons, harvesting can actually promote the spread of EWM in the lake.

In recent years, considerable attention has been directed toward the milfoil weevil, *Euhrychiopsis lecontei* as a long-term control method for Eurasian watermilfoil. This beetle is

native to North America and extensive laboratory and field studies have confirmed that the beetle is a milfoil specialist. Following ten years of university research, the weevil was made commercially available now called MiddFoil® supplied by EnviroScience, Inc. Over the past ten years, the weevil has been stocked in a variety of lakes throughout the Midwest and Eastern United States with considerable success. A number of these projects have successfully integrated weevil introduction with herbicides and mechanical harvesting. As mentioned above, EnviroScience biologists found a milfoil weevil and damage by weevils on EWM collected on the rake tows in the southeastern end of the lake indicating the existence of an indigenous population. This is an extremely positive indication that the lake has the necessary requirements to sustain a population of weevils.

The primary goal of aquatic plant management in Upper Straits Lake should be to control the exotic plants, Starry stonewort and Eurasian watermilfoil. Although already widely distributed and abundant throughout the lake, Starry stonewort will continue to spread and become increasingly dense if not actively controlled. The EWM should also be controlled to prevent continued spread. If action is taken to control only the Starry stonewort, open areas become available for potential colonization by EWM.

For reasons discussed above, we believe that the Upper Straits Lake Association has two basic options for continued plant management- treatment of the Starry stonewort using either harvesting or herbicides/algaecides and treatment of Eurasian watermilfoil using either herbicides or the milfoil weevil. Use of the milfoil weevils has several advantages over herbicides and these include:

- Weevils are a much more environmentally sound and sustainable solution;
- Weevils can provide long-term permanent control versus annual application of herbicides; and
- Weevils are much more cost-effective over a period of 3 to 5 years because only one application is needed.

EnviroScience biologists recommend stocking ten to twenty units (1 unit= 1,000) of weevils in

the southeastern end of the lake as an aggressive step to establish a large and permanent population of weevils to control EWM while treating the southwestern end along with some dense areas in the northern part of the lake with either an algaecide or aggressive harvesting.

Based on the October 2007 aquatic plant survey, it appears that Upper Straits Lake would be an excellent candidate for an integrated management plan using multiple techniques. The contiguous nature of the EWM bed along southeastern shore, the finding of an indigenous weevil population and the presence of naturalized shoreline bode well for a successful stocking program. As weevils bring the EWM under control along with managing the Starry stonewort by other means, we expect a fairly rapid increase in the native plant community.

Appendix A

Upper Straits Lake AVAS Map

Appendix B

AVAS Species Density Sheets