

3 SEPTEMBER 2017

## INTRODUCTION

Freshwater Physicians conducted a water quality, zooplankton, and fishery survey of Ogemaw Lake on 16-18 August 2017. We measured the dissolved oxygen-temperature profile at the deep (24 ft) station, collected zooplankton, and did several seine hauls and set trap nets at various stations to characterize the current ecological integrity of Ogemaw Lake. Since there was objection to setting gill nets, which are critical to catching larger fishes, we set twice as many trap nets than we usually do and remained an extra day to set them twice. We also requested scale and stomach contents samples from sport fishers on the lake to supplement the samples of larger fishes we need for a good outcome. We are indebted to the people who assisted us on the lake, especially William Pietron, who provided use of pontoons, access, guidance in places to set nets and seine, and their opinions on issues we need to address while compiling data and writing the final report.

## RESULTS

### Water Quality

Some of the water chemistry data are not available yet, so we will report only on what we measured during the study. The most important parameter we examined was the dissolved oxygen profile at the deep stations. Although not ideal, there was still some dissolved oxygen (ca. 1-2 mg/L) in the bottom waters of the 24 ft deep station. First, presence of dissolved oxygen provides a firewall against the release of phosphorus from the sediments which occurs when the dissolved oxygen is zero (anoxia). This is a good finding. Second, warm water fish usually require at least 3 mg/L to survive, while cool water fish (northern pike, walleyes) require 5 mg/L and cold water as well. Hence during summer these fishes (northern pike and walleyes) would be squeezed between too hot water at the surface and low dissolved oxygen in the cool water on the bottom. Growth may be reduced and fish stressed during this period of summer. The Secchi disk (water transparency) reading was 12.3 ft which makes Ogemaw Lake a mesotrophic lake (Secchi disk reading between 7.5 and 15 ft). The dissolved oxygen readings also support this designation, which is much better than eutrophic which most Michigan lakes are. The pH values were as expected (high on the surface, low on the bottom), while conductivity (the ability of water to conduct electricity) was around 350-443 uS, which is also within common boundaries and on the low side, also a good outcome.

### Zooplankton

A sample for this group was collected and awaits analysis in the laboratory.

### Fish

Based on our sampling during 2017, we collected seven species of fishes plus an additional one, Iowa darter, that was eaten by a largemouth bass. The list included: bluegill, largemouth bass, northern

pike, pumpkinseed, mudminnow, yellow bullhead, Iowa darter, and yellow perch. This is low species diversity and we expected to collect more species. The lack of collection of any minnows was particularly surprising. We are aware of stocking many fathead minnows in the recent past; we collected none of them. This suggests that they did not survive and either died or were preyed on by the predators in the lake. There was one other small prey species we observed in the diet of small largemouth bass: the Iowa darter and we collected the mudminnow in seine hauls. These species add diversity, but are not abundant enough to contribute much to the energy requirements of top predators. The mudminnow is usually eliminated from lakes with large largemouth bass populations, but apparently the aquatic vegetation is dense enough to provide cover for this rare species. One of the observations we made was the extensive macrophyte growth throughout the lake, which includes unfortunately two invasive plant species Eurasian milfoil and starry stonewort which need to be controlled but with care so as not to disrupt the native species in the lake. Native plant species provide important nursery habitat, spawning substrate, and food organisms for fishes and retard wave activity so as not to disturb sediments and put more nutrients into the water column. There are several areas that are almost wetlands that are particularly important nursery areas. We collected one large black crappie, one northern pike, but no walleyes. The diets we documented were also encouraging, since all the fish in which food was observed, were eating an abundance of insects, snails, and fish prey items. The yellow bullheads, which were common in our trap nets, were consuming large numbers of bluegills, a yellow perch, and crayfish. Channel catfish were stocked in the past but we did not collect any. The bluegills and pumpkinseeds were eating caddisflies, fingernail clams, snails, and the large mystery banded snail (the ones with the green band), which were observed commonly along shore. Pumpkinseeds are noted for eating mollusks: snails, fingernail clams, and sometimes are used to control snails which are intermediate hosts for swimmers itch. The presence of caddisflies is a good indicator of high water quality since caddisflies and mayflies that were also found in stomachs of yellow perch, need high concentrations of dissolved oxygen to exist in a lake. Small sizes of yellow perch were collected; we collected no large individuals but did get some young-of-the-year (YOY) fish, which is a good sign that they reproduced and had some survival. There were many YOY bluegills and a good abundance of YOY largemouth bass, also indicating good reproduction. The sunfish family spawns in nests in gravelly or sandy areas, so you have excellent substrate for successful spawning of these species. The lack of more black crappies is disappointing, since your lake seems ideal for this species as well. They eat large numbers of small bluegills, which were abundant in the lake. We have not aged any of the fish we collected or that were submitted for analyses so have no information on fish growth at this time.

## **CONCLUSIONS**

Overall, there are good findings and some not so good. We do not have all the data required to form final conclusions and as you are aware, these types of studies are limited, and especially in this case, since we did not use gill nets. We do have some preliminary thoughts. The studies so far showed that your water quality seems to be fairly good and you still have dissolved oxygen on the bottom which we did not expect. As noted, this is good for preventing phosphorus release from the sediments, which would contribute nutrients to the lake the following spring and fuel more plant and algal growth. Low dissolved oxygen however, will deter cool water fishes, such as northern pike and walleye, from

occupying the bottom regions of the lake during summer stratification, which will result in poor growth and stress. Conditions may also get worse later in the summer. The fish study showed low diversity of species, with the lack of minnows being the most obvious. This is perplexing, since we saw many areas with abundant aquatic plants and areas of large sandy substrates, that are prime habitat for minnows in many of the lakes we have sampled. This suggests severe predation by largemouth bass, which has been noted in other lakes. Considering the abundance of macrophytes, which should provide cover for minnows, there should be more minnows around. The fact that fathead minnows were stocked in previous years and that none were found suggests this species is not the right fit for your lake. There may not be any that can survive the predation gauntlet, but we prefer to use species that are common in other lakes (bluntnose minnow) or golden shiner, which grows large and can provide prey for a wide range of sizes of top predators. There is an abundance of bluegills and pumpkinseed young-of-the-year which will take up the slack. There seems to be a balanced population of bluegills and pumpkinseeds and largemouth bass inhabiting the lake, which are the ideal fish community for your type of lake-productive, with an abundance of aquatic plants and sandy substrate which promotes good spawning by smallmouth, largemouth, pumpkinseeds, black crappies, and bluegills. Reports are that there is a good number of larger largemouth bass (we collected one large fish) and some large northern pike as well. The diets were interesting since they showed that those eating food were consuming the prey resources efficiently and the presence of mayflies and caddisflies in diets is a manifestation of a high quality lake, with adequate dissolved oxygen to support these sensitive species.

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