File: OrangelkPreLimRep2025.doc

16 August 2025

David J. Jude, Freshwater Physicians, Inc.

PRELIMINARY REPORT ON THE WATER QUALITY AND FISHERIES OF ORANGE LAKE, OAKLAND COUNTY, MICHIGAN

Introduction

Freshwater Physicians, Inc. conducted a water quality and fish study on Orange Lake on 13-14 August 2025 with the excellent assistance from Progressive Companies, who provided Jared Laughlin and a boat to conduct the study. We set nets, did a zooplankton tow, and sampled the water quality on day 1 then returned on day 2 to pull up the nets. Orange Lake is a 40-acre lake according the MDNR lake map, with large parts difficult to inaccessible to traverse as we ably learned because of shallowness of these areas and dense growth of the alga *Chara*. We were told the lake had a maximum depth of 10 ft, but we could only locate 8 ft maximum east of the launch site. The area, despite the presence of large houses around the whole lake, is a wildlife sanctuary and we were treated to a herd of bucks that ran past our launch site, swans, geese, an egret, and many ducks. We also were introduced to the presence of some grumpy, cantankerous snapping turtles, that were reluctant to leave our boat despite our attempts to "encourage" them to leave. They were also thankful to us for providing ample food in the shape of fish in our gill nets and trap nets, on which they ravenously fed.

Methods

We sampled the water quality of Orange Lake by anchoring in the deep hole (8 ft) east of the launch site. We measured the dissolved oxygen and water temperature at the surface, 1 m, and 1.5 m using a YSI dissolved oxygen- temperature meter and we collected a water sample at each depth; water was analyzed for pH and conductivity back in the lab, while additional samples were also prepared for sending to the GVSU water quality laboratory after filtering and freezing. There chlorides, nitrates, soluble reactive phosphorus, and ammonia will be analyzed after the samples are delivered there after the field season (sometime in late

August). When the data are delivered and fish aged we will prepare a final report – sometime this winter. We also measured the water transparency using a Secchi disk and collected a zooplankton sample with a vertical tow at the site.

We used three gear to collect fishes. A seine was deployed at only two sites near the launch site; we attempted to seine at a third on the east end of the lake, which ended up in a disaster! The seine and seiners were mired in the thick sediment there and spent a couple of hours trying empty the seine of the muck and cleaning it enough so we could put it back on the boat. We apologize to the property owners there who will wonder if beavers took over the lake on their lawn. We also left a large, rubber baby frog with a Halloween human head attached that we found along the shore in a old boat there. It will be useful come Halloween. We kept enough fish to try to characterize the fish community at the site, determine spawning success, and fish species diversity.

Second, we set two gill nets in front of the access site. We checked it before we left on day 1 and we captured so many bull heads that we detached one of the gill nets with the correct mesh size and only deployed another shorter one over night to see if we could catch at least one northern pike (we did). We also set two trap nets one at the launch site and one at the north end of the lake near the lily pads there. On day 2 we picked up the gill net set over night and brought in the two trap nets.

Results

Water Quality

The water transparency in Orange Lake at the deep hole was astoundingly clear; the Secchi disk sat on the bottom at 8.1 ft. The cutoff for trophic status of a lake is any reading >7.5 ft and <15 ft is termed mesotrophic (the middle range for water clarity), something we were surprised to see, thinking it would definitely be eutrophic. There did not appear to be much of an algae bloom in the lake. One of the reasons for this is that the alga *Chara*, which dominates the plant community in the lake along with lily pads, is outstanding in tying up nutrients, which promotes high water clarity. It also provides great habitat for small fishes.

The dissolved oxygen too was surprising being low but present in enough quantities for all warm water fishes mostly >5 mg/L and probably the cool water ones too (northern pike). We expected to see anoxia (no dissolved oxygen on the bottom) but the dissolved oxygen was 5.35 at the surface, 5.26 at 1 m, and 4.72 mg/L near bottom (2.7 m). Apparently the open areas to the west provide enough wind energy to keep the lake from stratifying; the water temperatures were comparable: 28.1, 28, and 27.8 C from surface to bottom.

However, those temperatures are a threat to northern pike since they need cool water to flourish and 28 C is close to their upper maximum tolerance level. We would expect them to not do well in Orange Lake, especially during summer and especially this year which has been so hot. We expect they will not grow much during summer and will be stressed.

The pH values were at normal levels and conductivity (ability of the water to conduct electricity- negative ions) ranged from 696 to 870 micro Siemens. Conductivity levels are elevated but not so high as to generate a lot of concern.

Macrophytes and Algae

The lake is dominated by dense mats of the alga *Chara* in the nearshore zone and in the middle of the lake, which is a detriment to movement because they grow close to the surface. Lily pads (white water lilies) are common along the north, part of the south, and some in the east end of the lake. Cattails dominate the shoreline on the SE shoreline and sediments are thick there as well. Some thinleaf pondweed, flatstem pondweed, and some Illinois pondweed were also noted.

Zooplankton

A zooplankton sample was collected. These are critical links in the food chain as larval fish need them in their diet and some juvenile and adult fishes eat them too. Zooplankton eat algae so can also control algal abundance in lakes. We will send our sample to the lab for analysis and report on findings when they are delivered this winter.

Fish

As noted we collected fishes with three types of gear: seines, gill nets (two were set), and two trap nets. We collected 11 species: largemouth bass, northern pike, bluegill, pumpkinseed, green sunfish, black, yellow, and brown bullheads, golden shiner, bluntnose minnow, and green sunfish. Notably absent were yellow perch. We pulled the gill nets prior to departing on day 1 and the first one had a large number of bullheads in it prompting us to not re set that net, but we instead re set a smaller net which had larger mesh sizes so we might catch a northern pike, which we did on day 2. We did two seine hauls in the launch area, which resulted in catches of bluegills, pumpkinseeds, many YOY (young-of-the-year) largemouth bass and a few juveniles, as well as a bluntnose minnow and we also saw a small school of larval fish which we believe to be bluntnose minnows. We noted above our aborted

attempt to seine in the east end of the lake. On day 2 we pulled the re set gill net which showed that about 80% of the fish we caught had been chewed up by turtles. We caught a few bullheads, a northern pike that was heavily damaged, some bluegills and large pumpkinseeds as well as a large golden shiner. The trap net nearest the launch contained a small snapping turtle, a few bullheads, some small largemouth bass, and a few pumpkinseeds. The trap net set on the north end near the lily pads contained a very large catch of large largemouth bass (about 11), two snapping turtles (one huge), and a few bluegills and pumpkinseeds. These largemouth bass were the largest catches of large bass we have ever collected. We removed scale samples from the largemouth bass and returned them to the water but three large individual were deceased. These fish were processed in more detail with diet information collected when they had eaten something. The grouchy snapping turtles were also returned to the water.

Summary and Conclusions

Orange Lake is morphologically challenged and in the latter stages of filling in with sediment, the end stage of a lake's life. As a result, it also has a dense stand of the alga *Chara* in many nearshore areas and in the middle of the lake. As we noted, the presence of such an abundance of *Chara* could be a positive feature of the lake, since they are one of the best alternatives to what we usually see: dense beds of Eurasian milfoil or even worse Starry Stonewort a close relative to *Chara*; both are invasives, difficult to control once they enter a lake, and costly to remove. They also crowd out native species, provide too much cover for forage fish such as bluegills, and become so dense as to prevent recreational boat movement. *Chara* is also important in helping to control nutrients, since they precipitate phosphorus by increasing pH and causing calcium carbonate particles to sink to the bottom and take phosphorus with them. This could also be the reason the water chemistry was way better than we thought, having dissolved oxygen all the way to the bottom and high water transparency (all the way to the bottom at 8 ft). Conductivity was elevated and indicates that there are many negative ions in the water (example chlorides). We await further chemical analyses to determine if chlorides are the problem. Because most of the houses and roads are far removed from the lake, we would not expect to see some of the high chloride levels we see in other lakes where winter salting contributes large amounts of chlorides to the lake and elevates the conductivity.

The fish population was also surprising in some ways and typical in others. There were 11 species collected which is fairly good by most inland standards. There are some huge largemouth bass in the lake and they should be returned to the lake after capture to

ensure a good fishery for this species. They appear to be reproducing adequately; the sandy shoreline at the launch is a great area for both bluegills and pumpkinseeds which were actively guarding nests along the south shore by the launch site. Largemouth bass also build nests earlier in spring and they along with the other sunfish seem to have produce a good year class during 2025. If there is ever a lack of reproduction by these three species, more sand and gravel at the launch site will improve their spawning success. Sometimes boxes with gravel in them have been put in lakes to encourage largemouth bass to reproduce. The second most important sport fish is probably the northern pike, but we suspect they are rare (we caught one which was destroyed by a snapping turtle). There is no tributary in which they could spawn but they do spawn sometimes along shore in vegetation. We sometimes recommend stocking them in situations where the habitat is suitable for them (cool water in a stratified lake) but spawning habitat is lacking. However, we do not recommend them for Orange Lake, since the water temperature is way to high for this cool water fish and we suspect they are severely stressed during summers (water temperature was 28 C – 82 F). It appears that there are some very nice large bluegills and pumpkinseeds (pumpkinseeds seem to be more abundant). Pumpkinseeds eat a large quantity of snails and mollusks (shown in our diet information), which may give them an advantage over the bluegills. We suspect the *Chara* is great habitat for snails. The lake supports three species of bullheads: brown (the apparent most abundant based on our catches), black, and yellow (least common). These species are very abundant in the deeper parts of the lake and would provide some great fishing for young people if they were to go out at night and fish with worms or a piece of fish. Of course they have three nasty spines that need to be dealt with and some folks find they are good eating as well. There are several rare species as well. We caught one green sunfish. We were also encouraged to see two forage minnows in the lake: bluntnose minnows and golden shiners. They appear to be rare however, which is unfortunate. We often recommend stocking of both species in lakes if the situation demands more forage, and the golden shiner is particularly a good source since they seem to do well in turbid lakes and they grow to 12 in in length providing great food for fish like northern pike.

I do note the lack of two species: yellow perch and black crappie that are usually present in most inland lakes. I do not recommend stocking any yellow perch as they may be susceptible to prey by northern pike, but it might be worth putting some into the lake to see if they reproduce. I do recommend you think about stocking some black crappies as the lake seems to be adequate habitat for this species.

Lastly, I have to comment on sources of nutrients for Orange Lake. I saw vast lawns all the way from large houses down to the lake with no green belts (strips of vegetation and small trees that would slow down runoff from fertilizers used on lawns). I should also note that fertilizations of lawns should be phosphorus-free and we recommend no fertilizers at

all if you want to help promote better water quality in Orange Lake. The same goes for herbicides and pesticides: we are polluting our planet with toxic substances and more recently plastic particles are in all of us. The frogs, insects, and birds will be thankful.