Fish Habitat Assessment

Windswept Pines - Long Lake
Michigan

June 22, 2022

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1.0	06/18/2022	Initial Draft	Thomas Clement	Kuhn Rogers Group
1.1	6/22/2022	Typos and minor revisions	Thomas Clement	

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Table of Contents

Appendices

Tables

Figures

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1 Introduction

Kuhn Rogers PLC hired Cardno to conduct a fish habitat assessment of the near shore area adjacent to 121 N. South Long Lake Road, Traverse City, MI 49685 as it relates to a proposed dredging project in the lake. The proposed project involves dredging of an 88' long by 18' wide channel with a total lakebed impact of 2,970 square feet (0.07 acres). The channel would provide access to a proposed boat house and basin currently proposed to be constructed in an upland location. The inland boathouse basin and landward channel would be a total of 8,460 square feet of newly created aquatic area connected to the lake. Cardno's fisheries biologist was contracted to conduct a fish habitat assessment of the proposed impact area and provide an expert opinion on the perceived impacts to the fish habitat and fishery of Long Lake.

1.1 Lake Description

Long lake is 2,860-acre lake located in Grand Traverse County. The shoreline of long lake is 88,272 feet in length. Of the 2,860 acres approximately 733 acres (25%) of the lake is less than 10 feet deep. There are five islands located within long lake each adding additional shoreline and near shore habitat. Long lake is classified as an oligotrophic lake (GLEC et al. 2021). Oligotrophic lakes are typically lakes that are deep lakes with cool water and are generally considered to be low productivity, maintaining a cold or cool water fishery.

Most of the 733 acres that are less than 10 feet in water depth have a sand substrate with some areas having gravel. The deeper water areas of the lake are mostly muck and organics (Hettinger 2018). A 2005 study by Great Lakes Environment Center showed that approximately 1.7 percent of the total lake area was inhabited by aquatic vegetation (GLEC 2009). In 2017 the DNR completed a fisheries survey of Long Lake using their standard Status and Trends gear. There were 19 species captured including several centrarchid (sunfishes) species (Hettinger 2018). The DNR report also provides an extensive background of the lakes physical, chemical and fishery sampling history not included in this report. Of additional note in the DNR report is that the lake was classified as having a "high dwelling density" with 22.3 dwellings per 3,281 feet of shoreline.

2 Methodology

Cardno staff conducted a field assessment of the near shore habitat (from the shore to a water depth of 5 feet) on May 26th, 2022, at the subject property. The habitat within the site was quantitatively and qualitatively assessed for the presence of several key habitat characteristics including, substrate type, wood/woody debris, macrophytes and other “cover”. Cover for this study includes structural objects that fish can use to help maintain their position either vertically or horizontally, access prey, hide from predators, minimize competition with other fish, and avoid excessive light (Fisher et al. 2012). Habitat types that were identified were mapped using a sub-meter accurate GPS and documented with photographs (Appendix A).

In addition to mapping the identified habitat a 500 micrometers (µm) mesh dip net was used to sample the macroinvertebrate community. An area of approximately 100 square feet was sampled. Macroinvertebrates were identified down to Family.

3 Results

Cardno identified two habitat types within the 255 feet by 70 feet area (0.36 acres) surveyed. Approximately 81% of the site (0.29 acres) was dominated by sand with little or no (<10%) vegetation. The remainder of the site (0.07 acres) was sparsely to moderately (50-75%) vegetated dominated (>90%) by fully submerged *Eleocharis* with some (5%) *Potamogeton* (pond weeds) species present (Figure 1). The 60% or more of the vegetation in the vegetative areas had algae growing on it. The substrate in the vegetated areas was a mix of sand and organics with 15% of the area being dominated by decomposing leaves and twigs.

The site was devoid of any source of large cover including dense macrophyte beds or wood/woody debris. In addition, during the survey there was no evidence of abandoned or active centrarchid spawning beds.

Several families of macroinvertebrates were captured during dip netting (Table 1). Macroinvertebrates were sparse to moderately abundant within the sampled area with the two snail families being the dominant group. The focus of the sampling effort was on the vegetated areas as in the sandy areas only snails were captured.

Table 1. Order or family of macroinvertebrates captured during dip net sampling.

Order/Family	Count
Baetidae (Mayfly)	10
Dreisseniidae (zebra/quagga mussel)	1
Limnephilidae (caddis fly)	8
Planorbidae (snail)	10
Physidae (snail)	9
Gomphidae (dragon fly)	5
Libellulidae (dragon fly)	3
Isopoda (Order; aquatic sow/pill bug)	3
Coenagrionidae (damsel fly)	4
Diptera (order; flies)	12

4 Conclusion & Discussion

The current shoreline of the site is 255 feet of hard armored (sheet piling) which offers no habitat value. In addition to the sheet piling there is a PVC pipe that exits the sheet piling on the northeast side of the site. The pipe was described as a storm water runoff pipe, that allows water to flow from the southern portion of the site towards the lake and eventually draining into the lake with minimal, if any. filtering of the storm water. The aquatic near shore habitat is a mix of no cover of macrophytes (81%) and sparse to moderately vegetated areas (19%). The entire site is devoid of any major cover as defined by *Fisher et al.* (2012)

Based on the results found during the May 26th sampling, the habitat within the site is of limited quantity and quality as it pertains to supporting the fishery of Long Lake. The assessment of the importance of the habitat for the fishery of Long Lake was based on the fish species present in the lake based on the 2017 DNR survey along with the known requirements of those fish species to carry out their lifecycle and if the identified habitat provided a rare or unique set of conditions that the species required. The vegetation that was present does not provide significant habitat for any fish species. Additionally, the lack of any cover within the site does not make for great breeding habitat for any species presently found in the lake, as all species are associated with some type of cover or a more gravel/cobble dominant substrate (Lane et al. 1996).

The area may provide some feeding habitat, but this would be in the form of transient feeding. Fish may move into the area looking for food and then leave the area relatively quickly because there is no cover promoting sustained use of the area. The macroinvertebrate community was used to qualitatively determine if the area provided a significant source of prey for juvenile or small fish species that would not be found elsewhere in the lake. Because the macroinvertebrate community was of moderate to sparse density any alternations to the habitat would likely not impact feeding abilities of insectivores.

If approved, the proposed channel would impact less than 0.01% of the shallow water/near shore area of the lake. As referenced above the entirety of the project site provides limited quantity and quality of fish habitat, for that reason, it is my opinion, it would not have an unacceptable impact to the fishery or fish habitat of Long Lake. Additionally, within the permit application, it was proposed that the sheet piling along the shoreline be removed and a softer, naturalized shoreline be constructed which would ultimately improve the habitat of the entire site. Both the DNR and EGLE promote the installation of natural shorelines, and it was specifically called out in the 2018 fisheries report (Hettinger 2018) as an activity that would benefit the nearshore ecology of Long Lake.

The benefits of a naturalized shoreline include stormwater runoff filtering, improved habitat for amphibians and insects and in some instances can also improve the habitat for the fishery (Polis et al. 1997, Paetzold et al. 2005, Strayer and Findlay 2010, Vadeboncoeur et al 2011, Jude and Pappas 1992). The proposed design and plantings for the natural shoreline would provide a significant habitat improvement of the shoreline. The proposed plantings of emergent wetland species along the shoreline (planting list provided in permit application) will increase the site's ability to provide habitat for fish. Upon installation of the naturalized shoreline habitat will immediately increase for juvenile fish at the site by providing shallow water cover in the form of the newly planted vegetation within the waters edge. As the shoreline planting matures some of the species specifically Pickerel weed, (*Pontederia cordata*) will begin to migrate into deeper water forming new cover and habitat. The naturalization of the shoreline and eventual maturation will increase the habitat for aquatic macroinvertebrates which will ultimately increase the food available to juvenile and small bodied fish species such as shiners. These habitat improvements would offset the minimal impacts of the construction of a dredged channel on the subject site. In addition, the permit applicant plans on removing the PVC pipe from the shoreline and create/enhance existing wetlands to allow for natural stormwater filtration/infiltration rather than directing the stormwater into the lake. The removal of the Direct-flow pipe would reduce the direct flow of stormwater runoff, which has been shown to reduce nutrient and sediment input into waterbodies.

If it is found that the state does not believe that the naturalizing of the shoreline and removal of drainpipe is not enough to mitigate for the minor impacts of the dredged channel, cover could be added to the near shore area to increase the quantity and quality of the habitat on site and within the lake. Recommended

cover types include wood/woody debris in the form of logs, root balls/wad or tops of trees along with the planting of macrophytes. Planted macrophytes could include submergent species (*Potamogeton* species, *Certophyllu*m species, etc.), emergent species (*Sagittaria latifolia*, *Pontederia cordata*, and *Scirpus* (bullrushes) and floating species (*Nuphar* and *Nymphea* species). The addition of even one of these types of cover would improve the overall habitat provided by the site and would significantly offset any minor impacts dredging would have on the site and fishery.

Since increased walleye populations are a goal of the DNR (Hettinger 2018) an additional mitigation strategy would be to install a nearshore rock reef. The installation of these types of reefs have shown to increase walleye reproduction especially in lakes that have poor overall spawning habitat (sand/muck substrate with minimal gravel beds) like Long Lake. To install a near shore rock reef gravel/cobble/stone (3- 12 inches) could be installed from the highwater mark to a water depth of 6-12 feet (Bassett 1994). The shoreline of the site appears to be wave swept, which would aid in the oxygenation of the walleye eggs as they incubate.

For the reasons outlined in this report, my knowledge and understanding of fisheries ecology, and the potential for improving habitat with actions proposed by the permit applicant it is my opinion that the dredged channel will not have significant, adverse effects on the natural resources. Further the proposed action of naturalizing the currently armored shoreline would improve the habitat provided by the site.

5 Citations

Bassett, C. E. (1994). Use and evaluation of fish habitat structures in lakes of the eastern United States by the USDA Forest Service. Bulletin of Marine Science 55(2-3): 1137-1148

Fisher, W., Bozek, M., Vokoun, J., & Jaconson, R. (2012). Freshwater Aquatic Habitats. In A, Zale, D, Parish & T, Sutton (Ed.), *Fisheries Techniques* (3rd ed, pp. 101-161). American Fisheries Society

Great Lakes Environmental Center, Northwestern Michigan College. (2021). 2021 Water quality report and historical analysis Long Lake, Mickey Lake, Ruth Lake.

Hettinger H., L. (2018) Long Lake. Michigan Department of Natural Resources Status of the Fishery Resource Report: SFR Report: No. 2018-262

Jude, D. J., and J. Pappas. (1992). Fish utilization of Great Lakes coastal wetlands. Journal of Great Lakes Research 18:651–672.

Lane, J. A., Portt, C. B., Minns, C. K. (1996). Spawning habitat characteristics of Great Lakes fishes. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2368: v+48p.

Paetzold, A., C. Schubert, and K. Tockner. (2005). Aquatic terrestrial linkages along a braided-river: riparian arthropods feeding on aquatic insects. Ecosystems 8:748–759.

Polis, G., W. Anderson, and R. Holt. (1997). Toward an integration of landscape and food web ecology: the dynamics of spatially subsidized food webs. Annual Review of Ecology and Systematics 28:289–316.

Strayer, D. L., and S. E. G. Findlay. (2010). Ecology of freshwater shore zones. Aquatic Sciences 72:127–163.

Vadeboncoeur, Y., P. B. McIntyre, and M. J. Vander Zanden. (2011). Borders of biodiversity: life at the edge of the world's large lakes. BioScience 61:526–537.

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Long Lake Fish Habitat Review

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Data Sources:

GIS Analyst: christopher.hong

Appendix A Photo Pages

Photo 1. Photo Point 1, view towards deeper water

Photo 2. Photo Point 1, view towards shore

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Photo 3. Photo Point 2, view towards deeper water

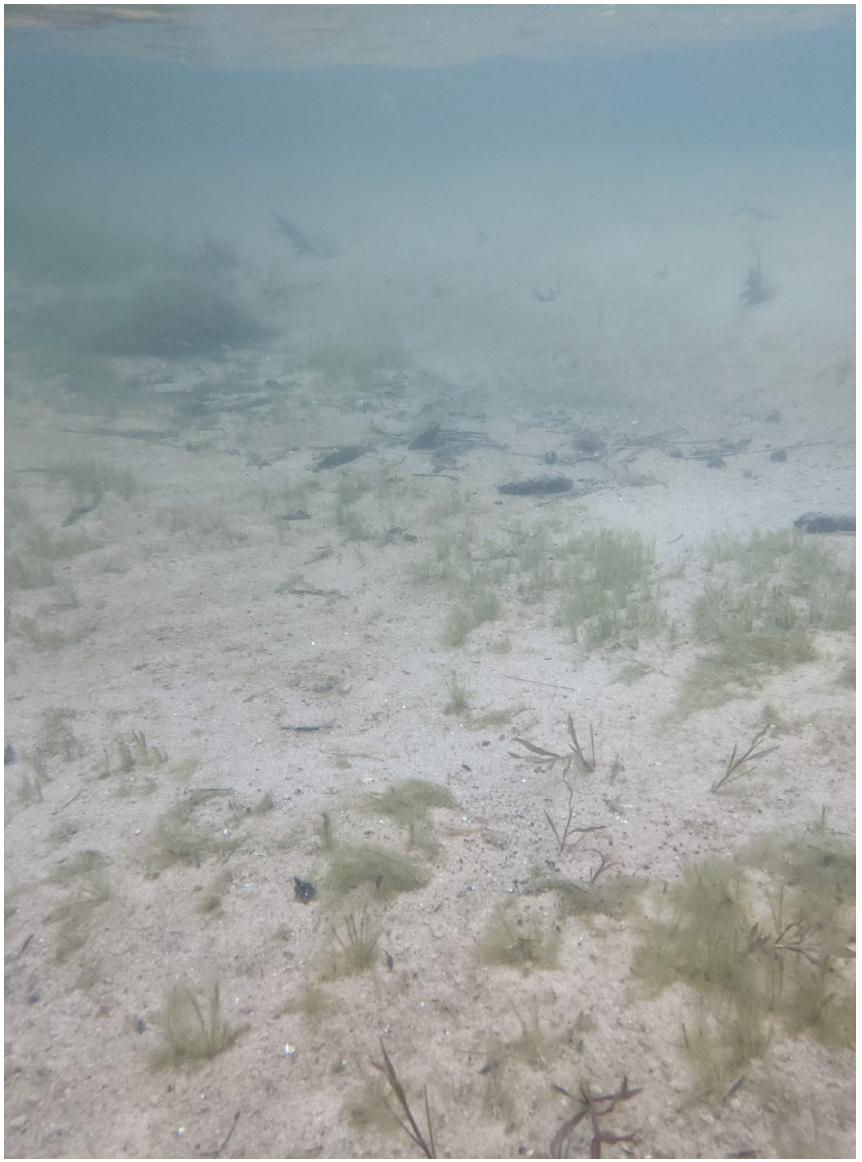

Photo 4. Photo Point 2, view towards shore

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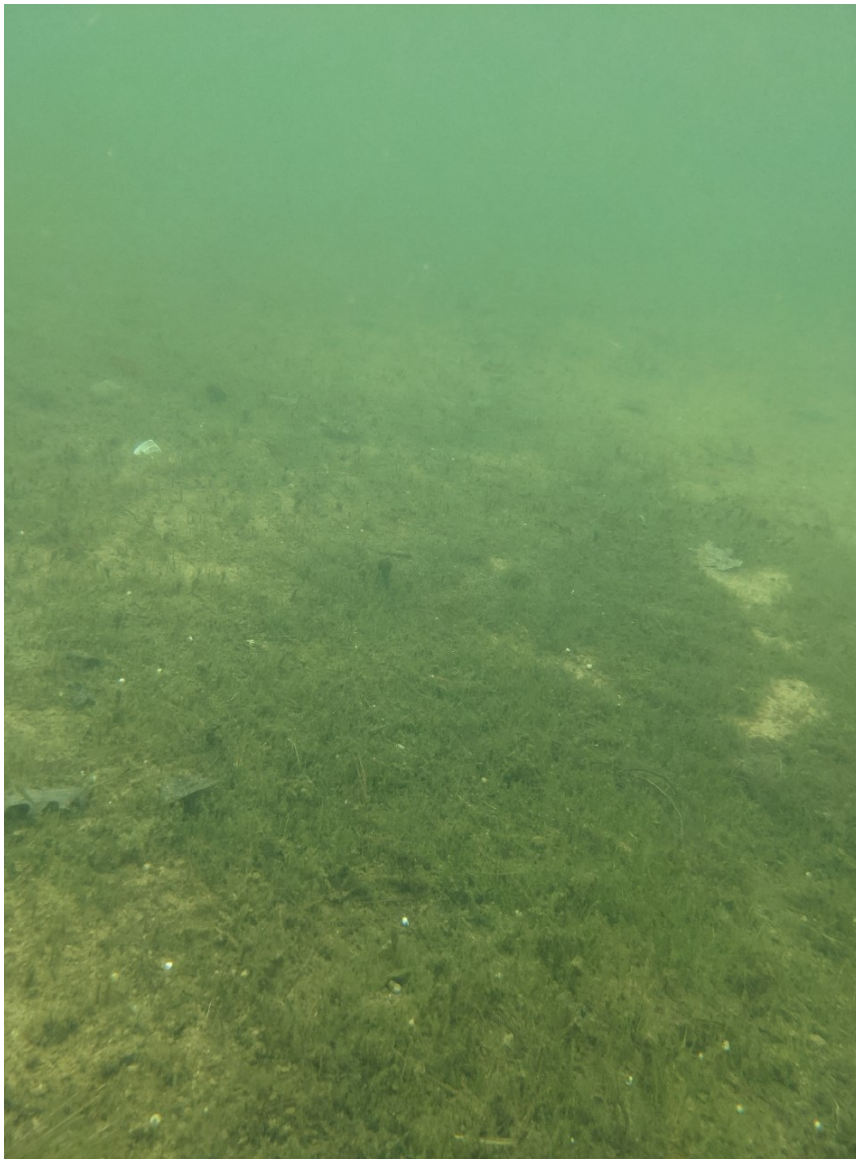

Photo 5. Photo Point 3, view looking south through site

Photo 6. Photo Point 3, view towards shore

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Photo 7. Photo Point 4, view toward deeper water

Photo 8. Photo Point 4, view towards shore

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Photo 9. Photo Point 5, view toward deeper water

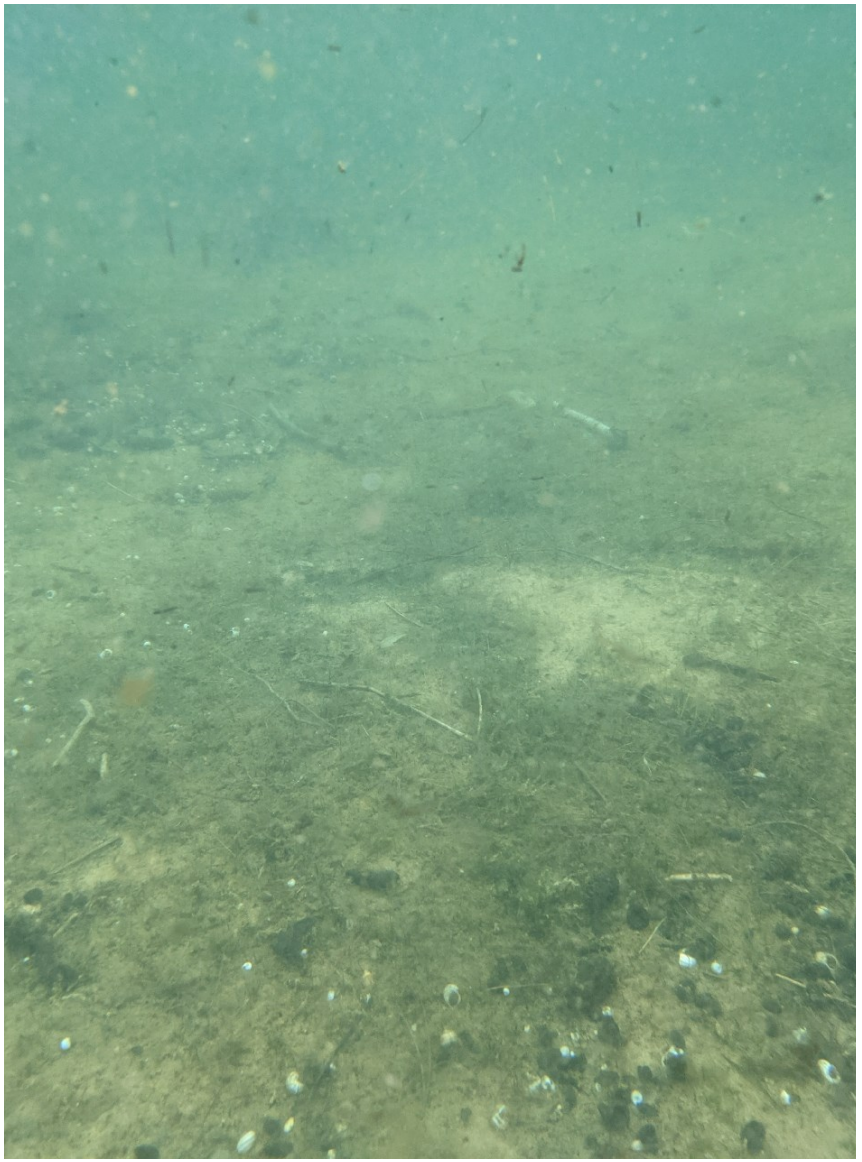

Photo 10. Photo Point 5, view towards shore

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Photo 11. Photo Point 6, view toward deeper water

Photo 12. Photo Point 6, view towards shore

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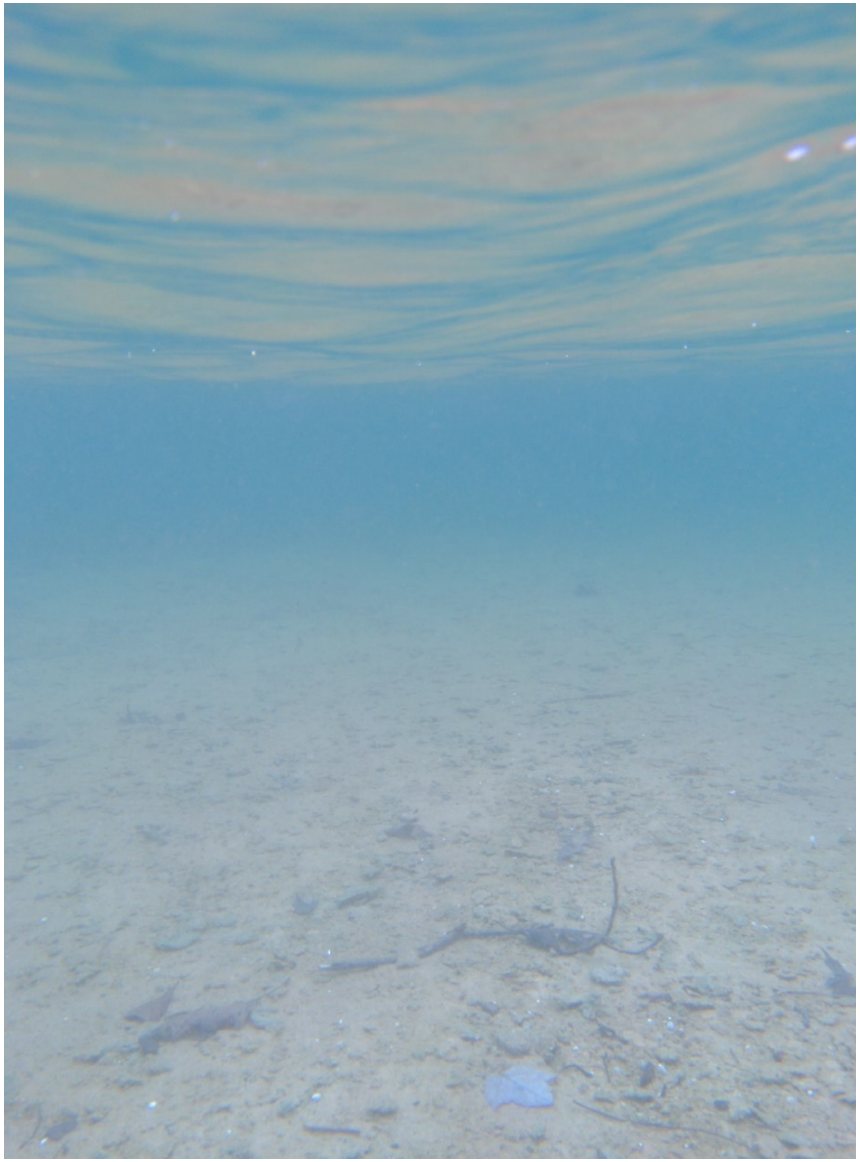

Photo 13. Photo Point 7, view toward deeper water

Photo 14. Photo Point 7, view towards shore

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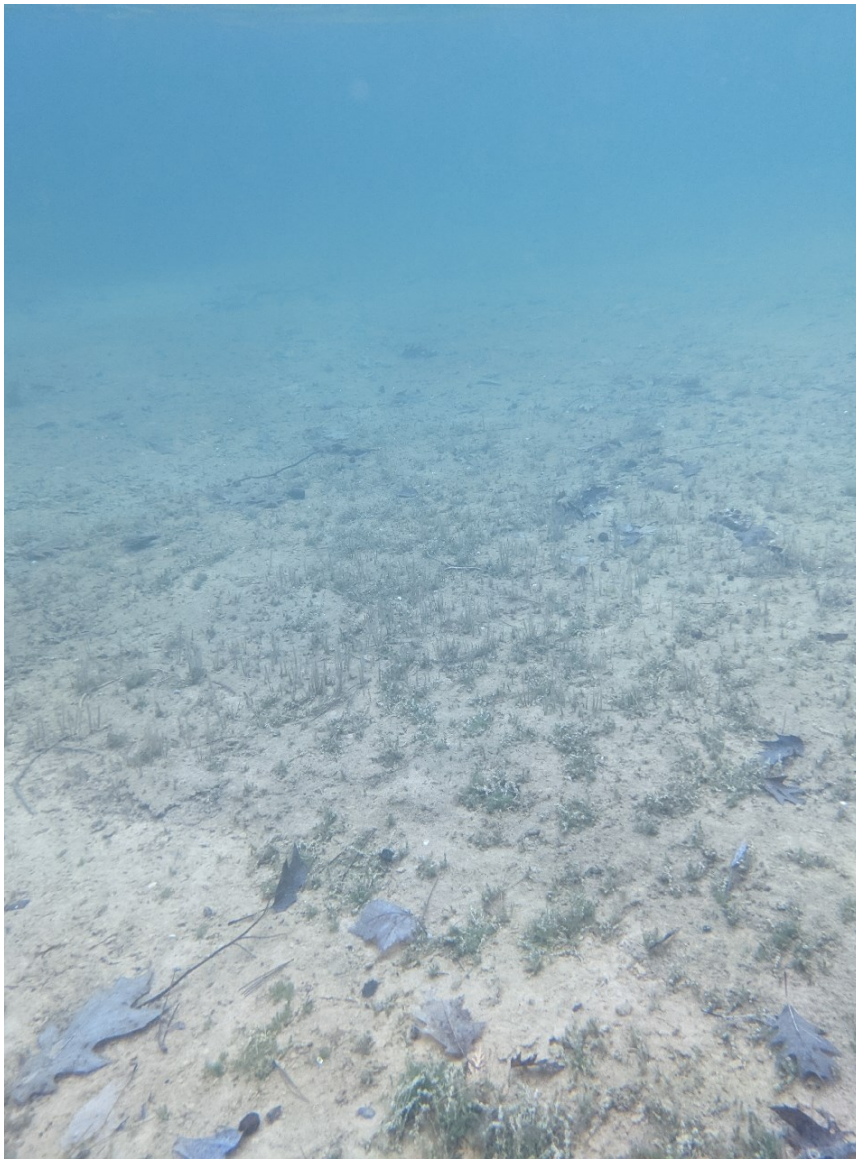

Photo 15. Photo Point 8, view north up site

Photo 16. Photo Point 8, view towards shore

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Photo 17. Photo Point 9, view northeast of shoreline

Photo 18. Photo Point 10, view southeast of shoreline

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