CRYSTAL LAKE & WATERSHED ASSOCIATION
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MONITORING CRYSTAL LAKE SHORELINE WITH AERIAL DRONE AND CHEMICAL ANALYSIS

The CLWA is employing a combination of techniques to monitor the health of the shoreline ("littoral zone") of Crystal Lake. In 2019 an aerial drone surveyed the entire shoreline to identify potential problem areas, such as unusual growth of aquatic plants. Analysis of water samples from these areas is used to detect the presence of *enterococcus* bacteria in the water, contamination that can stimulate excessive plant growth. We are using quantitative polymerase chain reaction (qPCR) analysis, a specialized DNA identification technique.

Along with numerous springs, the lake has five significant tributaries that supply water to the lake. They can potentially deposit unwanted contaminants and nutrient pollution into the vulnerable littoral zone. ("Nutrient pollution" is the process where *too many* nutrients, mainly nitrogen and phosphorus, enter the water and can act like fertilizer, causing excessive growth of algae.)

One tributary enters the lake alongside Harris Road at the junction of Crystal Drive. It is a small creek whose flow volume varies with seasonal rainfall. The drone survey of the confluence detected what was suspected to be unusual algal growth in the littoral zone. The Benzie Conservation District examined the zone (outlined in blue on Figure 1) and verified that it was dense algal growth.

Over a seven-week span in the summer of 2022, the CLWA took water samples at the confluence and used qPCR to analyze them for general *enterococcus* bacteria and HF183 bacteria. General *enterococcus* can originate in either animal or human waste. HF183 is specific to human bacteria and can be associated with failing septic systems. Samples were also analyzed for *E. coli* using a culture technique that detects live bacteria.

Results: The data from the 2022 qPCR analyses indicated high levels of enteric bacteria during three of the seven weeks, July 14 to August 10. These levels would normally prompt a warning to limit human water contact. In addition, the week of June 1 showed the definite identification of HF183. *E. coli* was detected in all seven weeks; however June 1 and August 24 showed *E. coli* at a high enough range to prompt restrictions on continuous bodily contact. We conclude that the dense algal growth at Harris Creek is likely due to the high bacterial concentrations flowing from the creek. High nutrient level may also contribute to the algal growth.

CLWA will continue to employ these two methods to monitor the health of the littoral zone. We will repeat the aerial survey in 2023 and continue bacterial analysis to identify areas of concern. We will be adding nutrient analysis to obtain more comprehensive data.

The complete analytical study, involving other lake tributaries including Cold Creek watershed, is being peer-reviewed and will be externally published by Freshwater Solutions, the laboratory CLWA contracted to perform the study.

—Water Quality Committee, February 2023

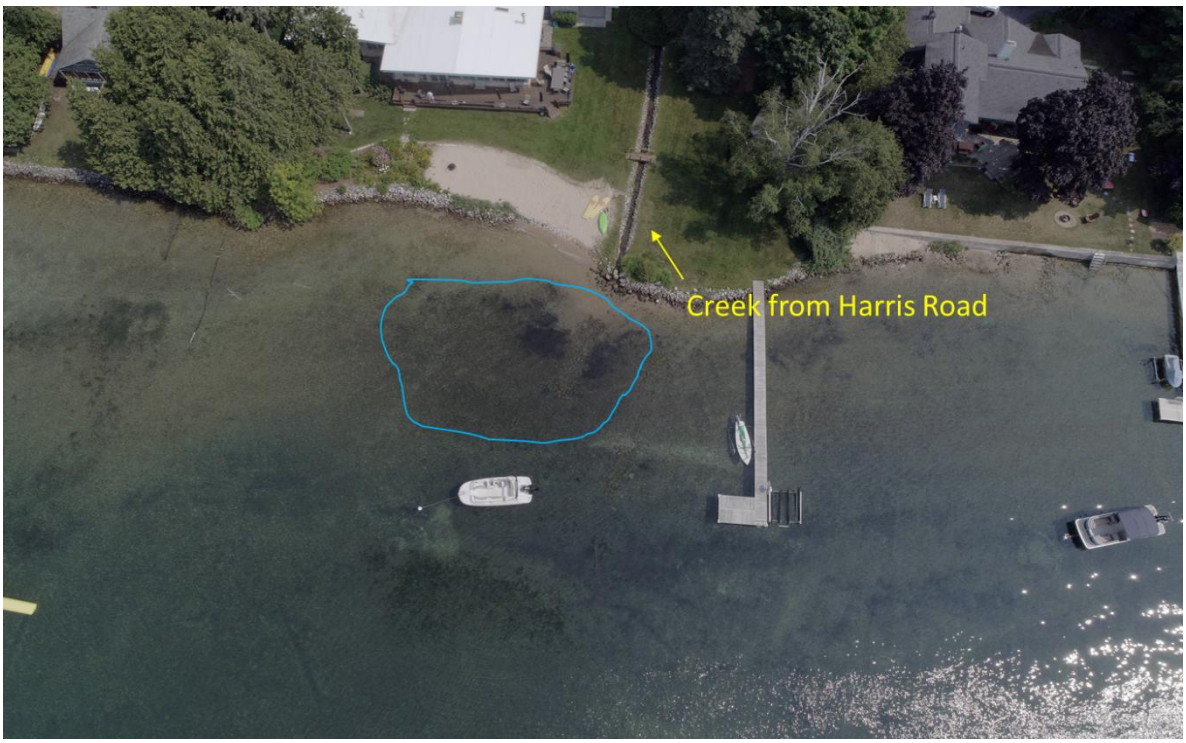

Figure 1: Aerial drone detection of potential algal growth at the mouth of Harris Road Creek