CRYSTAL WHITECAPS

The Newsletter of the Crystal Lake & Watershed Association

Protecting Crystal Lake Now for Generations to Come.

Vol. 18, No. 1 Spring 2023

CRYSTAL LAKE: WE HAVE A PROBLEM

Around Crystal Lake and other lakes in Michigan, large year-round homes are replacing simple summer "cottages." As the residences grow, so do statewide concerns about the effects of their septic systems on our inland waters.

Septic systems are private onsite wastewater treatment installations commonly used in areas without centralized sewer systems. Malfunctioning systems introduce pollutants into drinking water, lakes and streams. Viruses and bacteria such as E. coli may cause disease and make lakes unsafe for swimming. These events can have a devastating effect on an outdoor recreation-based economy. Exact numbers are hard to find, but Michigan State University estimates that about one-quarter of the state's septic systems are failing.

Benzie County has about 25,000 septic systems. They are the predominant way to dispose of household wastewater in this rural area.

Beach closings – due to E. coli exceeding safe levels – became a regular occurrence at Beulah and Bellows beaches over the last decade, raising the concerns of the CLWA. In 2020 we began testing the waters around Cold Creek to seek answers about the source of the problem. This monitoring is continuing and has expanded to other lake tributaries. Analysis has repeatedly detected enteric bacteria, including the human marker HF183. [See "Monitoring Crystal Lake Shoreline," p. 7.]

CLWA's survey of aquatic plants (2016-2018) found healthy growth of invasive Eurasian watermilfoil (EWM) and the native cladophora algae. The densest EWM infestation is located at the east end, around the mouth of Cold Creek: the CLWA began treatment for control in 2021. Small amounts of cladophora naturally occur in northern Michigan lakes but dense growth can indicate high concentration of phosphorus, a sign of malfunctioning septic systems, lawn fertilizer, erosion, shoreline or wetland destruction.

In 2019 the CLWA carried out a drone-assisted full-lake shoreline survey that identified locations of algae growth and other evidence for pollution entering the lake. While we do not yet have sufficient data to pinpoint the source as inadequate septic systems, this vegetative growth also suggests that excessive nutrients are entering Crystal Lake.

The CLWA is providing substantial matching support for Beulah's current "Remediation and Stormwater Water Reduction Project," which is addressing the problems of runoff from streets and storm drains within the Village. (See *Crystal Whitecaps* 17.2, Fall 2022.)

This recent work and the CLWA's expanding plans (which include the services of a Lake Biologist) reflect the threats we see to our environment and the serious concern that the CLWA has for the health of Crystal Lake, on which so much of the economy of Benzie County depends.

Continued on pages 4 and 5

Where will the household sewage go?

YOU CAN ASSIST THE CLWA'S SWIMMER'S ITCH RESEARCH AND CONTROL PROGRAM BY REPORTING CASES OF SWIMMER'S ITCH. YOU WILL FIND THE LINK ON CLWA'S HOME PAGE, WWW.CRYSTALLAKEWATERSHED.ORG.

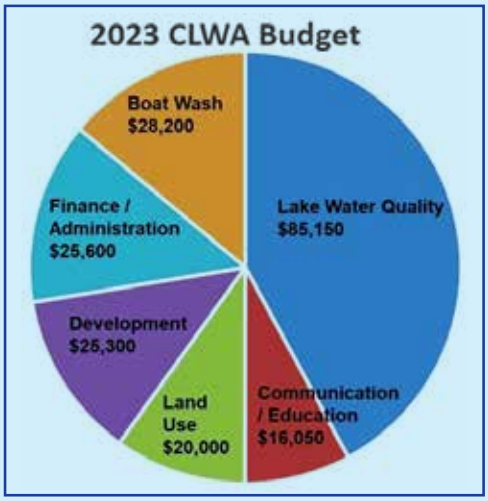
PRESIDENT'S MESSAGE

Since the last newsletter a major concern has been the development of shoreline property off Mollineaux Road, just west of the DNR boat launch in Benzonia township.

Last spring a huge scar appeared on the slope where the land had been cleared for construction. Since then, a year of public meeting attendance, meetings with government officials, FOIA requests, and legal consultation has led the CLWA to conclude that the builder has violated zoning ordinances and acted without permits that are designed to protect the lake from erosion, runoff, and septic pollution. The CLWA will continue to keep its members informed as this situation evolves. Our aim now is to seek remediation of the damage that has been done at the site. The CLWA is not opposed to development, but we insist that it be protective of the lake's unique needs, in accord with local ordinances.

In April the CLWA board of directors approved a challenging 2023 budget that expands our monitoring and protection of water quality. Foremost was the decision to employ a part-time professional Lake Biologist. We are very excited that John Ransom was available to work with us.

One of John's new tasks will be collaborating with environmental engineer Dr Ray Canale to perform a complete shoreline and tributary survey. The water quality data from this survey, along with all CLWA's historical and future data, will be entered into a new data base for Crystal Lake developed by Dr Canale. This new tool will enable us to perform trend analysis and provide an ongoing assessment of lake health.



The CLWA is continuing to control invasive Eurasian watermilfoil as effectively as possible, with sensitivity to riparians and the ecosystem. A drone-assisted treatment will take place in late June, followed by an assessment later in the summer to determine whether a second treatment is necessary (last summer a second one was not). Notices will be posted when treatments are scheduled to occur.

Another major project in this year's budget is a transition to a new Association Management System. Not only will this handle all of the CLWA's membership data, but it will also enable us to send targeted emails, deliver the newsletter and other communications digitally (if requested), and better serve our members and potential members. Look for changes in the fall!

Without your loyal support none of this would be possible. We hope to see you at the Annual Meeting on July 22, and at the Keep Crystal Clear event on July 29.

Sue Brown, *CLWA President*

WELCOME JOHN!

The CLWA is happy to announce that John Ransom has joined our team as part-time Lake Biologist. He is already well known from his eight years of work with the Benzie Conservation District (where he will be continuing as well), and he has collaborated with CLWA for several years on water monitoring and the Walkabout. As the CLWA's scientific work expands, our need for John's expertise has grown.

A native of northwest Michigan, John holds Bachelor's and Master's degrees in fisheries, wildlife and water sciences. We hope that his new duties for CLWA will still leave him time to play guitar with his rock band, Jack Pine.

THE FUTURE OF SWIMMER'S ITCH

With highly pathogenic avian influenza continuing to flourish in Michigan, it was no surprise when Department of Natural Resources (DNR) representatives informed the CLWA in March that the ban on merganser relocation would continue into the summer of 2023.

The CLWA is actively exploring alternative approaches going forward, but for this summer we urge the public to observe the following:

- When swimming, follow the precautions advised on our website and in our swimmer's itch brochure.
- Report cases of swimmer's itch to the CLWA website to assist our data collection.
- If you observe merganser nesting behavior (birds entering elevated holes in trees), report it to the CLWA.

Fortunately the final results from summer 2022 showed a continuing low level of swimmer's itch infection. Cases reported to the website were the lowest in five years, and the CSA waterfront reported the lowest number of cases since it began keeping records in 2013, a rate of 0.04% of swims. The majority of CSA cases occurred on only three days, virtually all when winds blew onshore from the north, northwest, or northeast.

The chart on this page displays the comprehensive results of snail analysis performed by Swimmer's Itch Solutions for the CLWA since the relocation program began in 2017. In each year they collected 2,000 snails and tested them for infection by the SI parasite. (See *Crystal Whitecaps* 17.2, Fall 2022.) In 2022 SIS carried out two collections, the second one in September in order to include infections developed late in the summer. The final analysis revealed the lowest rate of snail infection found in the testing.

This was good news, but we don't understand the behavior of SI well enough to predict what this year will bring. CLWA will repeat the late season snail collection and testing for infection, and also do another late season bird count of all wildfowl on the lake.

The CLWA has not given up hope of resuming merganser relocation in the future, as this has proven to be a highly effective method of reducing swimmer's itch. And we will continue to make the case that control of SI is essential to the water-centric economy of our area.

	Pre-program Baseline	Common Merganser Broods Trapped and Relocated (Our program started in 2017)		No Brood Relocation due to avian flu	
Control Program	Year 0	Year 2	Year 4	Year 6	
Location	2016 July 20	2018 July 12-13	2020 July 6	2022 July 13	2022 September 8
River Outlet (L11)	1.0% (200)	0.0% (199)	0.0% (220)	0.67% (300)	0.0% (162)
Onkeonwe Rd (J11)	2.5% (200)	0.0% (200)	0.0% (212)	0.0% (250)	0.0% (270)
CBCA (G7)	1.0% (200)	0.0% (228)	0.0% (230)	0.0% (250)	0.0% (194)
CSA (A6)	0.5% (200)	0.46% (216)	0.0% (212)	0.0% (185)	0.0% (187)
Marquette Ct (A5)	3.5% (200)	0.46% (216)	0.0% (230)	0.0% (198)	0.0% (219)
Yacht Club (A3)	0.0% (200)	0.0% (216)	0.0% (220)	0.0% (197)	0.0% (260)
M6 Hotspot (M6)	1.0% (200)	1.38% (217)	0.0% (212)	0.45% (224)	0.0% (151)
Nichols Rd (O7)	0.0% (200)	0.0% (216)	0.0% (226)	0.0% (218)	0.0% (268)
Orchard Hill (R9)	0.50% (200)	0.0% (204)	0.0% (220)	0.0% (3)	0.0% (164)
Beulah Beach (Q13)	0.50% (200)	0.5% (200)	0.44% (229)	0.0% (204)	0.0% (165)
Lake-wide	1.05% (2000)	0.28% (2112)	< 0.05% (2211)	0.15% (2029)	<0.01% (2042)

SWIMMER'S ITCH CONTROL ON CRYSTAL LAKE (2017-2022)

Table 1. The percentage of *Stagnicola emarginata* snails infected with swimmer's itch at ten different locations on Crystal Lake (Benzie County, MI) in 2016, 2018, 2020, and 2022. Data from July 2016 serve as a pre-program baseline, as the CLWA initiated swimmer's itch control efforts in 2017. The number in parenthesis indicates the total number of snails examined. Color of cell indicates infection level. (■ = Ideal (<0.24%), ■ = Tolerable (0.25-0.49%), ■ = Moderate (0.5-0.9%), ■ = Severe (1.0-1.9%), ■ = Epidemic (>2.0%))*

Snail infection rate in Crystal Lake

CLWA swimmer's itch brochure

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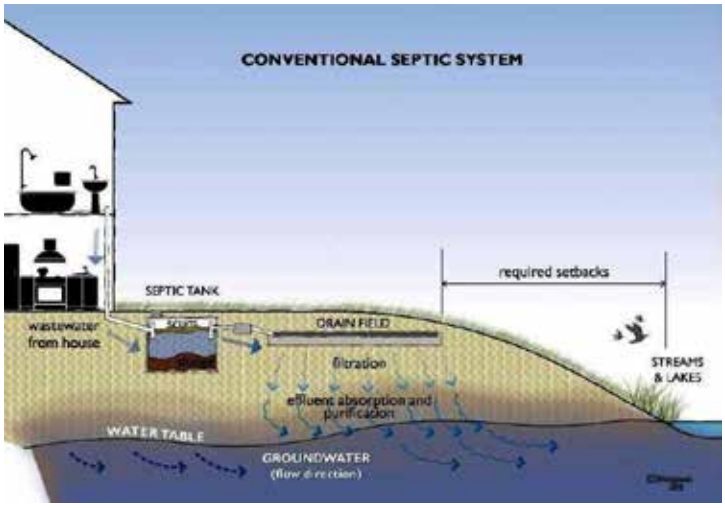
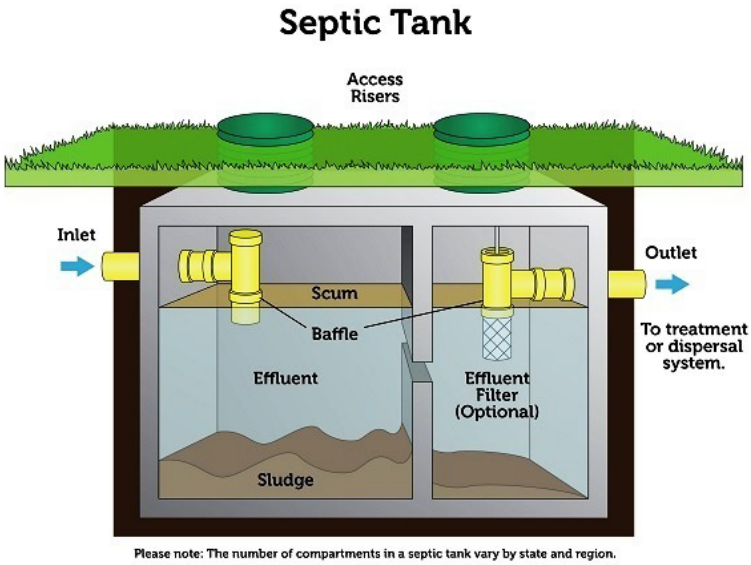


Graphic by S. Kirk



How septic systems work. Basic septic systems consist of a drain pipe, a holding tank and a drain field. Though relatively simple, they need proper installation and maintenance to function effectively. Costs can range from about $10,000 on up.

Wastewater from the home drains into the tank where solid waste or "sludge" settles out. Bacteria and other micro-organisms consume most of these solids. The sludge remains in the tank and needs to be pumped out periodically.

The remaining liquid waste then flows into a distribution system, usually a drain field where it disperses into the soil. Here the waste is further transformed by the micro-organisms and chemical reactions in the soil.

After treatment, the wastewater passes through soil and enters the groundwater, then ultimately lakes, streams, and wetlands. If the system has malfunctioned, it may be leaking human waste-carrying pathogens. Leaking often goes undetected for years.

Regulations. The state of Michigan is widely criticized as the only state in the U.S. with no uniform code for septic systems. Despite that blot on the "Water Wonderland's" reputation, Crystal Lake is fortunate to lie in one of the 12 counties of Michigan's 83 that have septic regulations.

In 1989 Benzie County adopted a precedent-setting ordinance requiring upgrading of septic systems, and inspection prior to sale. Its purpose was "…to protect public health and to prevent or minimize the degradation of ground water or surface water by improper or malfunctioning sewage disposal systems…through the regulation of the transfer or sale of the property or premises" [Sect. 2.90].

Under the jurisdiction of the County Health Department, the ordinance stated requirements for the components and installation of the system, such as size, materials, setbacks from water supplies and buildings, soil composition and location for the drain field. Under this system, known as "POS" (Point of Sale), the septic systems of properties to be sold or transferred must be inspected to determine that they meet the regulation standards; if not, the shortcomings must be corrected.

This system provides valuable information for the both the seller and especially the buyer, who in Benzie County may be relocating from an area where septic systems are not familiar. According to Eric Johnston of the Health Department, the number of systems that now fail inspection is only 3%-4%, a sign that the regulations are working.

Another aspect of the regulations – important in a rapidly developing area like the Crystal Lake Watershed – is that new constructions must provide a detailed septic plan for approval by the Health Department before construction can begin. (Unfortunately, some unprincipled builders choose to cut corners and circumvent the rules.)

Six months ago, on January 27, 2023, the [now] Benzie-Leelanau District Health Department (BLDHD) adopted a new District Sanitary Code which

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is now in force. The most significant aspect of this change is that the Code includes Leelanau County, another lake-rich area that had been without any septic regulation. For Benzie, the updates mainly provide strengthened setbacks and clarifications.

If you'd like to check on the septic records for your *own* property, the BLDHD now has a user-friendly new website with a wealth of information: www.bldhd.org. Click "Environmental Services" to find regulations, forms for making complaints or reporting violations, lists of qualified installers and repair contractors, sources of financial assistance for repairs, and much else. You can check the age and location of your system, if you don't know it.

Meanwhile, the State continues to debate the septic issue. All agree regulations are needed, but can't agree on an approach. Currently bills have been introduced in both the State House and Senate, and the CLWA will watch their progress.

Basic maintenance. A system correctly located and designed, professionally installed and properly maintained is safe and effective for treating household waste. It should provide no threat to human health or the surrounding ecosystem.

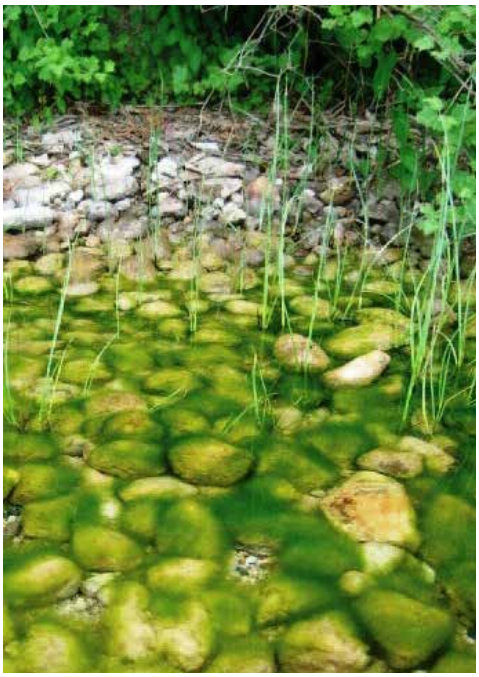
Nevertheless age, usage, and maintenance also influence whether the system continues to function without contributing to water pollution. Signs of possible malfunction include wet areas in yard, toilets backing up or slow drainage, foul smells, increased plant and algae growth along the shoreline.

The cost of replacing an entire system should provide a strong incentive for properly maintaining it! Some basic guidelines:

- Pump out tank regularly depending on usage, usually every 3-5 years
- Never flush anything besides toilet paper
- No fats, grease or solids down the sink drains
- Conserve water
- Protect drain field: keep tree roots off, never drive, build, or pave over
- Short-term rentals often over-burden a system

Drain field under construction

Lawn with failing septic system



Algae growth along shoreline

Learn more: talk by Beth Clawson, MSU Extension,
August 14, 10:30 a.m. at Congregational Asembly. Open to all.

STUDENTS STUDY THE THREAT OF SALT IN CRYSTAL LAKE

Salt, primarily in the form of sodium chloride, plays a crucial role in de-icing roads during winter. While it melts ice effectively and ensures safer travel conditions, the unintended consequences of excessive salt usage have become evident in recent years. As snow and ice melt, the salt-laden runoff finds its way into nearby water bodies, including Crystal Lake.

Elevated salt levels in fresh water can harm aquatic life, disrupt the delicate balance of ecosystems and degrade water quality.

To mark Earth Day 2023, the CLWA welcomed high school students from Frankfort High School to participate in a public service day organized by the Interact Club. CLWA provided the group with an opportunity to explore the Crystal Lake watershed and to investigate the possibility of salt contamination entering the lake.

Eight students and science teacher Tim Reznich joined CLWA Lake Biologist John Ransom at Bellows Beach on May 3, a cold windy day. Their goal was to test for salt at the locations of the eight major tributaries and stormwater outflows entering the lake. To collect and record the data, they used Salt Watch kits provided by the Izaak Walton League of America (https://www.iwla.org/water/stream-monitoring/salt-watch).

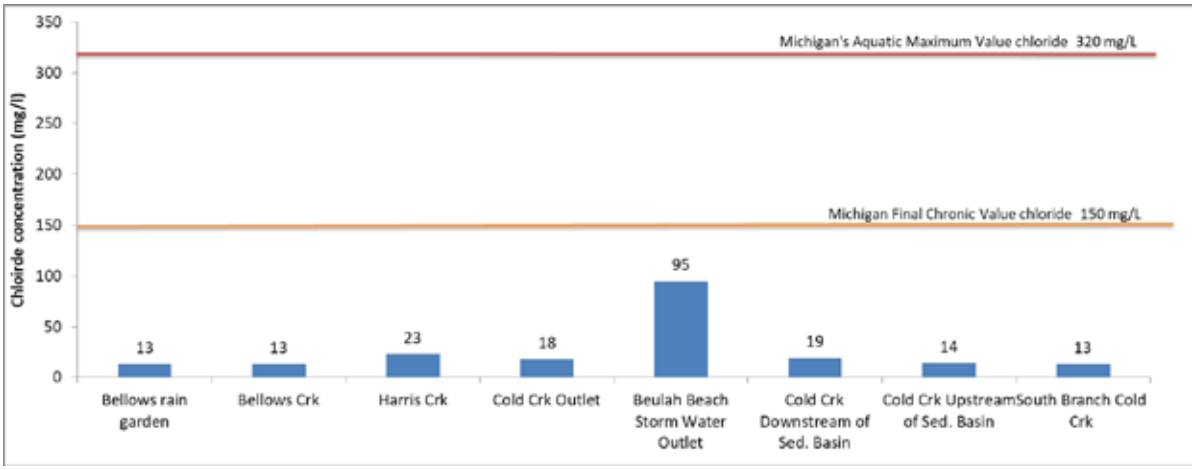
While visiting the sites in the watershed, they also learned about the threat increased salt poses to the lake and discussed ways to reduce the use of salt in the winter.

The results showed that the salt, measured in chloride concentration, was safely below the maximum state standards for surface waters. However, the Beulah storm water outlet had **2-3 times** the chloride concentrations as the other sites. This means that salt is entering Crystal Lake and that runoff from our roads and sidewalks is the leading source.

This information is a first step toward finding sustainable solutions to excessive salt usage. The students can now bring this awareness back to their community.

The CLWA has begun an expanded chloride monitoring program throughout the Crystal Lake watershed to increase our understanding of the impact of salt on it. By working together, we hope to strike a balance between safety and environmental stewardship for the benefit of present and future generations.

John Ransom, *CLWA Lake Biologist*



Chloride concentrations from the Frankfort High School study on 5/3/23. The orange line represents the state standard for chronic chloride levels and the red line represents the standard for one time choride concentration.

Map of salt testing sites

Students testing at Harris Creek

J. Ransom and students testing at Beulah beach stormwater outlet

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 the photo) and verified that it was dense algal growth.

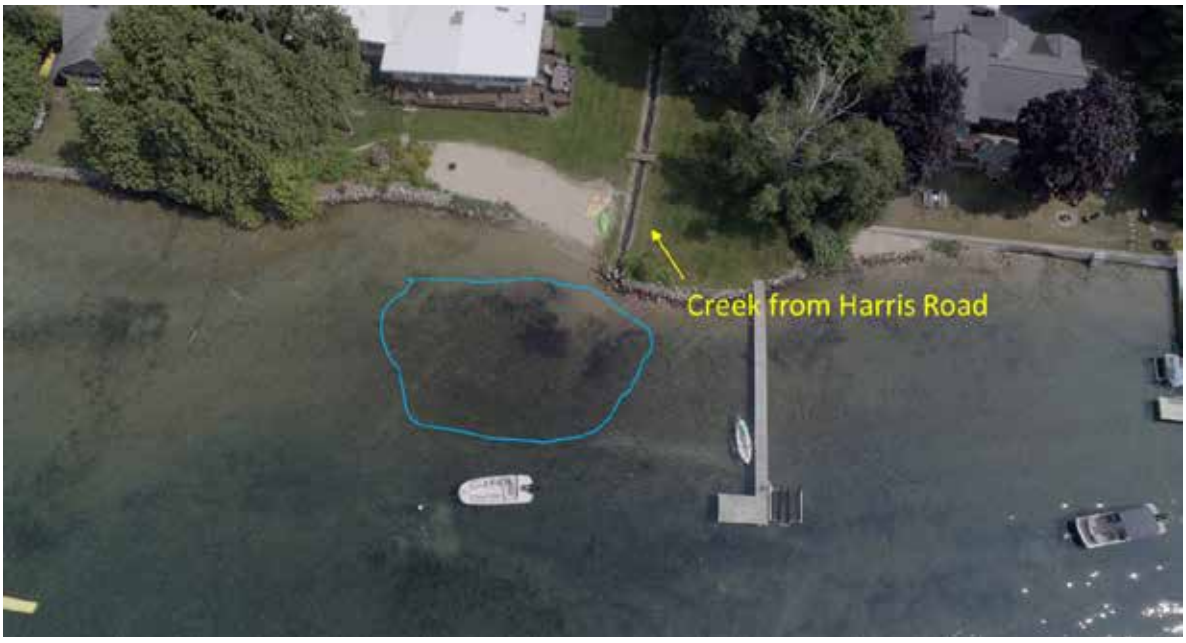
Over a seven-week span in the summer of 2022, the CLWA took water samples at the confluence and used qPCR to analyze them for general *enterococcus* bacteria and HF183 bacteria. General *enterococcus* can originate in either animal or human waste. HF183 is specific to human bacteria and can be associated 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 2024 and continue bacterial analysis to identify areas of concern. We will be adding nutrient analysis to obtain more comprehensive data.

Freshwater Solutions, the laboratory CLWA contracted to perform the study, is preparing the complete analytical study – involving other Crystal Lake tributaries including Cold Creek watershed – for publication.

Bruce Gerhart,
CLWA Water Quality Committee



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

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crystallakewatershed.org/education/newsletter

MEET THE CLWA 2023!

The CLWA will be participating in these local events during the summer of 2023. Please visit our booth and say hello! Let us know what's on your mind. We have free information on how to protect our watershed. CLWA hats and shirts will be for sale.

JULY 1 10 am-2 pm	"LANDING BLITZ" Boat Washing Event at the Beulah Beach Boat Launch Co-sponsored with Benzie Conservation District
JULY 26 9:30 am – 3:00 pm	CONGREGATIONAL SUMMER ASSEMBLY ARTS AND CRAFTS FAIR
JULY 29 5-8 pm	KEEP CRYSTAL CLEAR fundraiser Stormcloud Parkview Taproom, Frankfort
AUGUST 14 10:30 am	"DO YOUR PART – BE SEPTIC SMART" Talk by Beth Clawson, MSU Extension co-sponsored with Women's Association of the Congregational Summer Assembly,
AUGUST 5 10 am-4 pm	BEULAH SIDEWALK SALE
AUGUST 18, 1-7 pm and AUGUST 19, 10 am-4 pm	FRANKFORT ART FAIR Market Square Park

CLWA ANNUAL MEETING 2023

All are welcome to come and hear updates on invasive species control, swimmer's itch, water quality testing, and other CLWA projects.

SATURDAY
JULY 22 AT 9:30 A.M.
MILLS COMUNITY HOUSE
BENZONIA

Zoom Access Will Also Be Available – Check CLWA Website For Details