CRYSTAL WHITECAPS

The Newsletter of the Crystal Lake & Watershed Association

Protecting Crystal Lake Now for Generations to Come.

Vol. 14, No. 2 Fall 2018

KEEPING WATCH ON CRYSTAL'S WATER

*The CLWA and its predecessor organizations have been conducting comprehensive water quality monitoring for almost 50 years. This represents the core mission of the organization, providing oversight so that the CLWA can "Protect Crystal Lake Now for Generations to Come." As a participant in the Michigan Cooperative Lakes Monitoring program, CLWA currently provides the equipment and contracts with the Benzie Conservation District to carry out the regular testing program, which has been performed by **John Ransom**, Conservation Specialist, since 2015.*

The Crystal Lake water quality database that I have been developing for the CLWA – like all good databases – holds the answers to a plethora of scientific questions as well as curiosities. But the main reason to monitor here is to provide early warning of possible threats or changes in the watershed that could adversely affect water quality and the living creatures that depend upon it. Crystal Lake is particularly vulnerable because it has such a long retention time: water stays in the lake 30-60 years before being replaced.

What are we measuring and how are we measuring it?

Once a month from spring ice out until December (and at least once while ice is on the lake), we measure a suite of water quality parameters: temperature, dissolved oxygen, pH, and specific conductivity. Measurements are taken every ten feet from zero to 160 feet with a Hydrolab multi-probe meter. Additionally we measure water clarity by lowering a black and white disk, called a secchi disk, until it is no longer visible. We also monitor total phosphorus (an essential nutrient for plant and algae growth) twice a year and chlorophyll a (green photosynthetic pigment which is an indicator for algae growth in the lake) four times a year, through the Michigan Cooperative Lakes Monitoring Program (CLMP). These two parameters along with the water clarity help measure trophic status, a classification based on a lake's level of biologic activity. Crystal Lake is oligotrophic, the lowest trophic state.

Continued on page 5

Mike Jones with Hydrolab multi-probe unit

Crystal Lake profiles are taken in 162 feet of water at 44°40'07.0"N 86°11'10.0"W

Secchi disk measuring water clarity through the ice (February 2018)

PRESIDENT'S MESSAGE

As I write this, change is in the air and fall has definitely arrived. Leaves have begun to change, the nights are bracingly cool, the salmon are in the pool below the Outlet and the whitecaps on Crystal Lake are being driven by alternating south then north winds. Memories of a great summer are still fresh in mind though.

Your Crystal Lake & Watershed Association (CLWA) had a very productive summer including a second year of merganser trapping and relocation, the completion of our Jim Hamp-driven, drone-assisted three-year aquatic plant survey, increased water quality testing, and a very successful and well-attended Annual Meeting. You will read more on these elsewhere in this issue.

A very significant change is also taking place within our organization: on November 4 Ted Fisher is stepping down from his day-to-day efforts to address the scourge we know as swimmer's itch. For the last 10 years Ted – with the patience and technical support of wife Barbara – has spent countless hours on phone calls, in meetings and working on the Lake to improve the quality of our experiences in the water.

Inspired by the trauma of a severe case of swimmer's itch contracted by his 3-year old granddaughter, Ted co-founded the Crystal Lake Swimmer's Itch Partnership (CLSIP) in 2009 with Jana Way Zinser and Ed Hoogterp. As the CLSIP required funding for SI research and control, it turned to the Crystal Lake & Watershed Association for assistance. In 2013 the CLSIP and CLWA began working together.

Ted Fisher discussing swimmer's itch research at Congregational Assembly beach 2016

In 2014, Jim Vondale of Higgins Lake contacted Joel Buzzell, then president of the CLWA, to determine our interest in joining several other lake associations to form the Michigan Swimmer's Itch Partnership (MISIP). Recognizing that there is strength in numbers especially with advocacy efforts, we became charter members joining twelve other lakes including Glen Lake, Lime Lake, and Lake Leelanau.

As the MISIP grew to its current total of 31 NW Michigan lakes, Ted has continued to serve as the CLWA liaison, as a member of the Steering Committee and as Co-Chair of the MISIP. His efforts helped secure state funding for swimmer's itch research and control to the tune of over $500,000 so far. They also led the Department of Natural Resources to establish a merganser control permit process that allows the CLWA to conduct the merganser trapping and removal that has taken place over the last 2 years.

The results of Ted's efforts are being seen in the dramatic reduction in both incidences and severity of SI reported in 2018. We all owe Ted a tremendous debt of gratitude for making things better for all of us.

We are fortunate to have so many qualified and committed individuals working on our behalf. Please contact us if you would like to volunteer to "Protect Crystal Lake Now For Generations to Come."

A final note on swimmer's itch: control and maintenance will be ongoing efforts that will continue to consume both volunteer hours and significant financial resources. If you were pleased with the improvement of your Lake experience this summer, then please consider making a year-end donation to support our SI initiatives.

Dave Wynne, *CLWA President*

THE LOCH CRYSTAL MONSTER?

The CLWA's concern for invasive species appearing in Crystal Lake is well known among our riparian neighbors. So, when your children discover the creature pictured below while swimming, whom else would you email to report this shocking intruder?

Mudpuppy from Crystal Lake, July 2018 (photo Chris Kiely)

Fortunately the CLWA has expertise that it can call upon, so we contacted John Ransom, Conservation Specialist at the Benzie Conservation District, who could identify the creature and explain the good news that it brings to our lake.

According to John, the animal is a mudpuppy, Michigan's largest, fully aquatic salamander. It's an amphibian, and there is a healthy population of them in Crystal Lake. They grow up to a foot in length and live at the bottom of the lake, usually around rocks (not really in the "mud," as they need well-oxygenated water to live).

Most important, they are often known as a "bio-indicator," since they are sensitive to pollutants and water quality. This means that that their presence is a sign of the good quality of Crystal Lake water. They are also a positive part of the food chain, with a diet that includes snails and invasive round gobies.

Michigan DNR identifies mudpuppies as a Species of Greatest Conservation Need, so if you catch one, please put it back!

SWIMMERS RECLAIM CRYSTAL LAKE BEACHES

"We have our lake back!"

More than ten years of effort by CLWA and its partners began to show success during the summer of 2018, as cases of swimmer's itch decreased significantly all around the lake. Many swimmers – some who had not dared to enter the water for years out of fear of the allergic reaction – reported that they were once again enjoying the clear waters of Crystal Lake. While scattered cases still occurred, even those were said to be more mild and less "itchy."

It seems that this breakthrough can be attributed to the merganser trap and relocate program that the CLWA began last summer. Swimmer's Itch Solutions LLC (SIS), under contract to CLWA, carried out the complete removal of all newly hatched common merganser broods in 2017 and 2018 (see *Crystal Whitecaps* 13:2, Fall 2017, p. 4). Sixteen broods (13 hens and 130 ducklings) were transported to new homes at sites approved by the Michigan Department of Natural Resources that do not harbor the swimmer's itch parasite. The removal of these birds should result in the continued reduction of swimmer's itch in 2019.

A few trapped adult female mergansers were fitted with GPS tracking devices, part of a long-term research project to learn more about their behavior.

Throughout the summer the Crystal Lake community was actively engaged in reporting brood sightings to the CLWA website, Facebook page, email and phone lines. This assistance was crucial to the success of the trapping program, contributing to the efficiency of the SIS team.

Curt Blankespoor (SIS), Tom Thorr, and Tim Reznich clipping wings of merganser hen

The 2018 swimmer's itch program also included a limited study of 2,000 snails in order to compare their rate of infection to the full assessment of more than 10,000 snails that was done in 2016 (see *Crystal Whitecaps* 12:2, Fall 2016, p. 4). These results confirmed a significant reduction in the infection rate, declining from 1/100 in 2016 to 1/350 this year.

Two local teachers, Tim Reznich and Tom Thorr, joined SIS as trainees during the summer's work. They are now ready to assume responsibility for trapping and relocating merganser broods when the program continues in 2019, a development that the CLWA expects will lower future costs. The CLWA now holds its own permit from the MDNR to carry out common merganser trapping and relocation.

Costs for this program have been high – $120,000 total for 2016 through summer of 2018. But for continued success CLWA's efforts must be maintained.

CLWA continues its important collaboration with the Michigan Swimmer's Itch Partnership, a coalition of 31 lake associations which leads state-level advocacy and fosters the ongoing research that is still needed to undergird future swimmer's itch control – and reach the ultimate goal of permanently eradicating this blight from Michigan's lakes.

CLWA THANKS ITS MEMBERS AND THE CRYSTAL LAKE COMMUNITY FOR YOUR ONGOING SUPPORT OF SWIMMER'S ITCH CONTROL!

Locations of merganser broods trapped 2018 (Swimmer's Itch Solutions LLC)

GPS transmitter attached to merganser hen

Curt Blankespoor, Swimmer's Itch Solutions LLC, examining snails for swimmer's itch parasite

AQUATIC PLANT SURVEY SHOWS THE STATE OF THE LAKE

In August the CLWA team of volunteers, led by board member Jim Hamp, completed the final phase of the comprehensive aquatic plant survey of Crystal Lake. As in 2017, it used the "point intercept" survey method (using a rake tossed from a surface operated boat), combined with aerial drone photography by Zero Gravity Aerial to check the data, observe deeper areas, and accurately define the square footage of the invasive plants.

The purpose of the three-year survey was to document the established native plant species and assess the extent and types of invasive plants. Fortunately the results have shown that aquatic invasives in Crystal Lake are still relatively limited in comparison to many other Michigan Lakes.

As found in previous years, the principal invasive aquatic plant in Crystal Lake is Eurasian watermilfoil (*Myriophyllum spicatum*), which usually occurs in depths of 9-11 feet. Total infestation is estimated at five acres, mostly located at the east end of the lake with beds extending westward on the south and north shores. This plant is most commonly introduced into lakes via boats and trailers that carry fragments or seeds.

Eurasian watermilfoil

The most common plant in Crystal Lake is native *Chara*, which is a beneficial component of the freshwater ecosystem and food chain.

A final report on the survey, with recommendations for future remediating action, will appear in spring 2019. Unless controlled, invasive plants can easily out-compete and dominate native species of plants, radically changing the health of the lake. Eurasian watermilfoil can form large mats of floating vegetation that block light from native aquatic plants and impede recreational activities.

Control methods used at other lakes have been complex and expensive, highlighting the importance of responding quickly to infestations and taking steps to discourage rapid growth, such as reducing the nutrients entering the lake. To monitor future growth, survey should be repeated in three to five years, a task that can be streamlined by drone assistance.

The best scenario is to prevent the introduction of invasive plants into the lake in the first place – by careful boat washing, for example. Higgins Lake provides a warning, with the recent discovery of Starry Stonewort (*Nitellopsis obtusa*) there. This invasive is related to the *Chara* common in Crystal, and is the worst invader present in this region: it spreads very fast and can occur in very deep water where it is hard to detect at an early stage.

The CLWA Aquatic Plant Survey was conducted under the auspices of the Michigan Cooperative Lakes Monitoring Program. The identification and control of invasive species has been a long-time concern of the CLWA, leading to the construction of the boat washing station at the Mollineaux Road launch site in 2013.

DNR boat launch at Mollineaux Road, with E. watermilfoil growing at end of each dock, August 2018 (Zero Gravity Aerial)

Dennis Wiand, Zero Gravity Aerial, flying drone

KEEPING WATCH ON CRYSTAL'S WATER

Continued from Page 1

Crystal Lake's latest data report from the CLMP can be found on the CLWA website (CrystalLakeWatershed.org/water-quality/water-quality-monitoring). These records show that it continues to be a relatively stable, healthy lake.

Water quality data in the current database goes back to 2011 and the secchi disk readings date back to 1976 (with a few gaps). Past lake monitors include Stacy Daniels, Bill Decker, Paul Murphy, and Mike Jones, with nearly all the monitoring now being done through the Benzie Conservation District. The database also includes information on what is flowing into Crystal Lake from Cold Creek (nutrients, suspended solids, *E. coli*).

Some observations from the data:

Figure 1 shows changes in water clarity: Crystal Lake has gotten clearer! In 1976 the average secchi depth reading was 18.6 feet. In the 1980s and '90s secchi depth averaged 20.5 feet and from 2004 -2018 the average secchi reading was 28.8 feet, over ten feet deeper than the 1976 average. Why the change? Although it's hard to say for certain, I am confident zebra mussels played a role in clearing up Crystal Lake. The Benzie County point-of-sale septic system ordinance (which has helped reduce the number of out-dated and leaking septic systems around the lake) and improved awareness of best practices for water quality may also have contributed to the increased clarity.

John Ransom, graphing the secchi disk readings on Crystal Lake

Figure 2 shows a typical summer lake profile of the temperature and dissolved oxygen readings. In the summer Crystal Lake undergoes thermal stratification, reflected in the temperature profile (red squares). This is when three distinct water layers form, separated by differences in temperature and density. The upper layer of warmer, "lighter" water, called the **epilimnion** (top 30 feet of water), sits on top of a cooler denser layer of water called the **hypolimnion** (bottom 100 feet). The **thermocline** is the dividing layer between the warm surface waters and the cold, dark hypolimnion.

Because of the vast difference in water density, there is almost no mixing between these layers. This is evident from the dissolved oxygen (DO) profile (yellow triangles). The two main sources of dissolved oxygen in lakes are the atmosphere and aquatic plants and algae. Since both of these sources are near the surface of the lake, the epilimnion is typically at or above 100% oxygen saturation. Moving down in the water column we see a spike in DO around 50 feet at the thermocline. This is caused by a layer of photosynthetic phytoplankton that have settled on top of the dense hypolimnion layer. From there we see a steady decline in DO saturation until the bottom of the lake.

This is called a positive heterograde oxygen profile. Unlike Platte or Lower Herring Lake, Crystal Lake holds enough oxygen in the hypolimnion to support cold water fish like lake trout, whitefish, and burbot.

These are just some examples of the fascinating information the database provides. I hope to cover more aspects in a future issue.

If you have any questions regarding the water quality of Crystal Lake or if you would like a copy of the Crystal Lake database, please send me an email at john@benziecd.org.

John Ransom
Benzie Conservation District

FIGURE 1 *Crystal Lake secchi disk readings and trend line 1976 – 2018*

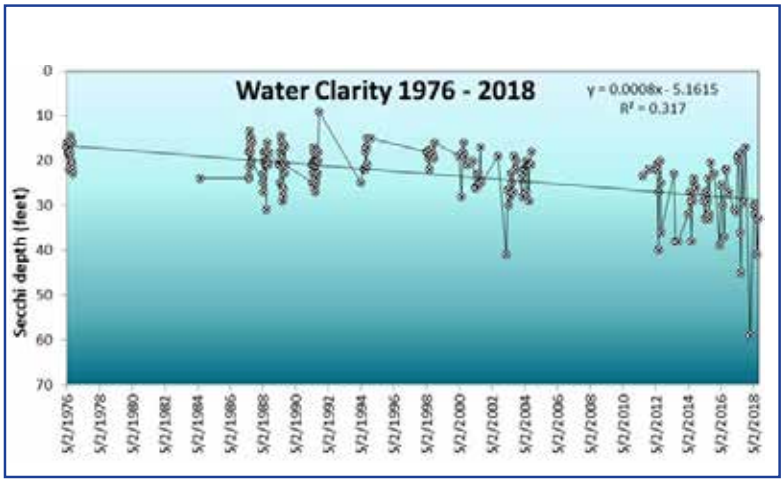
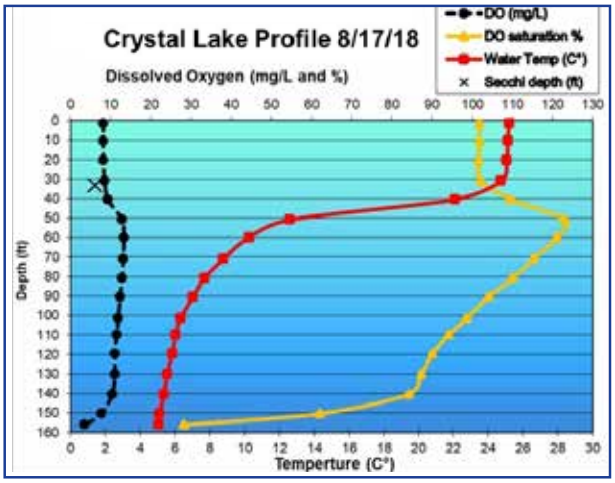


FIGURE 2 *Crystal Lake temperature and oxygen profile on 8/17/18*



WATER WOES IN BEULAH

The last week of August was a rainy one in Benzie County. A Michigan State University weather station in Benzonia Township recorded 1.59 inches of rain on Monday, August 27, and another 1.95 inches on Tuesday, August 28.

Stormwater the color of strong coffee filled the banks of Cold Creek as it flowed out of the Trapp Farm Nature Preserve and into Crystal Lake at the Village of Beulah. Within the village, water gushed from roofs and paved roads and manicured lawns, overloading storm sewers and washing dirt and animal waste directly into the lake.

So, it was no surprise when routine sampling on August 29 found the Crystal Lake Beach at Beulah contaminated with *E. coli* bacteria. In what has become a dismal post-rain routine, the District Health Department issued an advisory, and a sign went up warning against swimming at what is normally Crystal Lake's busiest public beach.

For Beulah Beach – where the lake water is safe and inviting except after rainstorms – the August health advisory was the second in the summer of 2018, and the ninth since weekly sampling began in 2013.

A group of partners including the Village, Benzonia Township, the Benzie Conservation District, CLWA and the Benzie County Drain Commissioner are seeking ways to address the problem. It's a long, costly process that likely will require funding from outside sources.

Engineers working for the village under a state grant program began taking measurements this fall to create a map that will show where water enters and exits the storm sewers and help determine how much the system can carry.

(Storm sewers carry only rainfall and runoff from the landscape. Wastewater from sinks, toilets and showers is handled by the village's sanitary sewer system, which runs in separate pipes and is pumped to treatment ponds in Benzonia Township.)

The Betsie River/Crystal Lake Watershed Management Plan, approved in 2016, cited the impact of stormwater on Beulah Beach as one of the area's most critical pollution problems. Heavy rains wash in nutrients that feed an offshore bed of invasive weeds, in addition to the *E. coli* that causes periodic closing of the beach.

Rainfall and snowmelt sometimes saturate the former agricultural fields in the Trapp Farm Nature Preserve, filling Cold Creek

Continued on Page 7

Health warning at Beulah public beach

Popular Beulah beach on Crystal Lake

Invasive Eurasian watermilfoil near Beulah fishing pier and public boat launch, July 2018 (Zero Gravity Aerial)

WATER WOES IN BEULAH

Continued from Page 6

with tons of black muck and creating a dark plume at the creek mouth on Crystal Lake. Stormwater runoff also causes flooding at some businesses along US 31 at the eastern edge of the village.

Sampling by the Michigan Department of Environmental Quality (MDEQ) during rainstorms in 2014 found high levels of *E. coli* in Cold Creek and in storm sewer outlets on Beulah Beach. High levels were again detected in Cold Creek this summer in samples drawn by the Benzie Conservation District as part of the CLWA monitoring program.

Solving the complex problems will require multiple approaches.

In 2017, the Conservation District applied unsuccessfully for a MDEQ grant to reconfigure segments of the creek and install a network of rain gardens, infiltration trenches and other strategies for controlling stormwater. That proposal included financial commitments from CLWA and local governments. It fell short largely because there was no engineering data to show the size and specific location of needed infrastructure.

The work being done this fall by Beulah's consulting engineers, Gosling-Czubak Inc., may provide that needed data. The MDEQ has encouraged the partners to resubmit the grant proposal in 2019. The state also performed additional sampling of fish and invertebrate populations in the stream, which may strengthen future applications.

Stormwater management and beach contamination are important issues for water quality in Crystal Lake and the regional economy. CLWA is committed to finding a solution. With support from CLWA and the other partners, the Conservation District is preparing to resubmit a grant proposal next summer, when the new engineering data is expected to be available.

Beulah residents, meanwhile, are also dealing with a completely different water issue. Village streets were disrupted this summer and fall by a $4 million project that includes a new water tower and new water mains under many village streets. The blue water tower, tucked into a stand of trees behind the Benzie County Sheriff's office on US 31, is sure to become a community landmark.

Ed Hoogterp

Beulah intersection of Spring Valley St, Crystal Ave and Benzie Blvd, August 2018

New water tower, fall 2018

CLWA HONORS ED HOOGTERP

At its 2018 annual meeting the CLWA presented its Crystal Circle Award to Edward Hoogterp for his years of service and leadership. A board member from 2007 to 2012, and President 2008-2012, he played a prominent role in guiding the organization through the establishment of its boat washing station and the formation of the Michigan Swimmer's Itch Partnership. He was responsible for writing and assembling the Betsie River/Crystal Lake Watershed Management Plan, which was completed in 2016.

Ed's commitment to public service and enhancing the quality of life in northern Michigan is reflected in his run for a seat in the Michigan House of Representatives in 2018 to represent the 101st District. His unsuccessful campaign was a loss for the State of Michigan, but a benefit to Benzie County whom Ed continues to serve as Country Drain Commissioner.

Ed Hoogterp with Crystal Circle Award, July 2018

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CRYSTAL WHITECAPS is published twice a year and is a benefit of membership in the Crystal Lake & Watershed Association. Back issues and membership information are available on the CLWA website: **crystallakewatershed.org/education/newsletter**

CALL FOR NOMINATIONS TO THE CLWA BOARD OF DIRECTORS

The CLWA is an all-volunteer organization and welcomes new members to its board and committees. It looks for individuals from throughout the watershed area – special skills are helpful, but most important are enthusiasm and willingness to pitch in for the many tasks that help the CLWA preserve and protect crystal lake.

If you would like to recommend yourself or someone you know, please contact Bruce Gerhart, at bvgerhart@gmail.com. For information on terms and duties, see the bylaws posted on the CLWA website **www.crystallakewatershed.org.** If you are interested in a committee, contact information for the chairs is also available on the CLWA website.

CLWA ANNUAL MEETING 2018

The annual members meeting of the CLWA was held on Saturday, July 21, from 9:30 to 11:00 a.m. at the Congregational Summer Assembly Community Building, with about 120 members and other interested persons attending. President Dave Wynne surveyed the association's current programs and accomplishments. Treasurer Ron Ahrns described the allocation of its financial resources. The Crystal Circle Award was presented to Edward Hoogterp, past CLWA president, for his years of service and leadership. Jim Hamp, CLWA board member, and Dennis Wiand, Zero Gravity Aerial, provided information on the CLWA aquatic plant survey of Crystal Lake, which was completed this year. Dr. Randall DeJong of Swimmer's Itch Solutions LLC described the work of merganser trapping and relocation that his company is conducting and presented preliminary results showing considerable success. A full report on this project will be posted on the CLWA website.

The following officers and board members were elected:
Re-elected President: David Wynne (2018-2020)
Re-elected Secretary: Ellen Herscher (2018-2020)
New board members: Susan Kirkpatrick, Kristin Tebo (2018-2021)
Re-elected board members: Catherine (Tassie) Bosher, Barbara Leonard, Tim Reznich (2018-2021)

Full minutes of the meeting are available on the CLWA website **CrystalLakeWatershed.org.**

CLWA thanks the Assembly for the use of its facility!