CRYSTAL WHITECAPS

The Newsletter of the Crystal Lake & Watershed Association

Protecting Crystal Lake Now for Generations to Come.

Vol. 21, No. 2 Fall/Winter 2025

BEULAH: WHY SHOULD WE CARE?

Why has the Beulah public beach frequently been closed to swimmers? Why were the streets and park of the Village torn up last fall? Why are the sewer bills of Beulah residents slated to more than double? This article looks at the special status of the only incorporated community in the Crystal Lake watershed.

History

The village of Beulah owes its existence to Archibald Jones's now legendary lowering of Crystal Lake in 1873. Archie's legacy was a mixed one: a thriving town with lakefront houses grew up quickly, but those living there today confront substantial challenges due to their watery origins.

Around most of Crystal Lake, where the glaciers left high bluffs and hills, the new water level created a narrow sandy border. But out to the east stretched lowlands forming a cedar swamp that deposited organic materials into the shallow water. Once drained, this area became an expanse of muck, rich with nutrients from decaying vegetation.

By 1890 the railroad had arrived and visitors flocked to this newly created lakeshore. Beulah ("Crystal City") grew up quickly. It got its first hotel in 1893. By 1900 cottages lined the southeast shore.

Crystal Lake watershed

Though damaging to the ecosystem, the draining of the wetlands of Crystal Lake's eastern watershed created land ideal for "muck farming," a system popular with Dutch farmers who were used to draining swamps. The high levels of nitrogen in the soil were highly productive for growing vegetables such as celery and onions. By 1915 Martin Trapp had established a farm on the northeast side of Beulah that flourished for decades growing celery and other produce.

Springs feeding Crystal Lake from the east continued flowing through the muck, eventually forming three streams that became branches of what is now Cold Creek. [For more on Cold Creek, see *Crystal Whitecaps*, Fall 2019.] Of course Cold Creek carried muck with it as it emptied into Crystal Lake. Complaints from swimmers – who emerged from the lake needing to wash off the muck – led Trapp to create a settling basin in the Creek to try to collect the excess sediment.

However, eventually intensive muck farming agriculture uses up the nutrients until the land becomes infertile. A later turkey farm and a fox ranch added more contamination to the soil. By 1981 agricultural land use

Continued on page 4

Beulah in 1890, railroad tracks in foreground (Benzie Area Historical Society)

Beulah, south east shore with cottages, 1910 (Benzie Area Historical Society)

PRESIDENT'S MESSAGE

At Crystal Lake we had the best fall in recent memory – warm temperatures and plenty of sunshine and precipitation. During the fall and winter the CLWA enters a slower-paced mode as we lay the groundwork for 2026 and beyond.

Our CLWA community was saddened to hear of the passing of the CLWA's first president, Bob Appleford. His enlightened leadership set the CLWA on a path for growth and success. His dedication to the protection of the Crystal Lake Watershed continues to guide all that we do. Our sincere condolences go out to Bob's family.

Our litigation regarding a development on the south shore has continued much longer than we had hoped, but the CLWA is still working toward a resolution that will protect the water quality of Crystal Lake.

Protecting this beautiful lake is the job of everyone. Local voices, whether full-time or summer residents, are key to supporting our mission. The CLWA is thankful for all those who have joined us.

Sue Brown, *CLWA President*

Past CLWA Presidents Bob Appleford and Ed Hoogterp explaining boat washing, September 2015

CRYSTAL LAKE WALKABOUT TURNS 30

Another generation of Benzie County students explored the Crystal Lake watershed during the 30th annual Walkabout field day on May 28, 2025. Sponsored by the CLWA, this enduring event adds hands-on outdoor experience to the science objectives of the Middle School curriculum. The CLWA's goal is to educate and inspire future stewards for this precious resource that surrounds them.

School buses brought the 115 6th grade students to two different lakeshore locations where they shuttled among stations focusing on various environmental topics. Local experts led the activities.

At Bellows ("7th Street") Beach the students learned how the Lake Biologist regularly tests Crystal Lake's water for various chemicals and pollutants to assess the state of its health. They saw how the lake water impacts the micro and macro aquatic creatures that live there. A major feature of Bellows Beach are the extensive rain gardens, which enabled the students to trace how these installations filter and clean contaminated run-off from the surrounding road and woods.

At the DNR boat launch off Mollineaux Road, the focus was on aquatic invasive species. There the CLWA boat wash is available for cleaning watercraft before they enter the lake. A CLWA volunteer and fishing enthusiast showed the students how to thoroughly clean fishing gear so it doesn't bring hitchhiking aliens into Crystal. A drone from Zero Gravity Aerial demonstrated how this technology aids early detection of invasive species and can monitor land use around the shoreline.

For the 4th year CLWA member Debbie Smith led the event. She continues to develop the Walkabout Field Notebook as a dynamic teaching tool that serves as a permanent record of the day's lessons for the students.

The CLWA is grateful for the collaboration of the Benzie Conservation District, Zero Gravity Aerial, and Designs in Bloom, as well as support from Bayside Printing. CLWA members and Benzie Sunrise Rotary members volunteered to help make the day a success.

Students studying macro invertebrate creatures from Crystal Lake.

Students measuring water clarity with a turbidity tube.

WATER QUALITY MONITORING: 2025 RESULTS

CLWA began an expanded water quality testing program in 2023. It includes regular nutrient testing in the lake and tributaries, pathogen (*E. coli*) testing, and measuring physical water parameters like temperature and dissolved oxygen. As we get a better understanding of the dynamics within the lake, a few things stood out in 2025.

The water clarity in Crystal Lake reached new record highs for a single reading and the annual average. On a calm and sunny day in April a few weeks after the final remnants of ice melted, I measured a water clarity reading (Secchi Depth) of 67.5 ft. Previous high readings were taken through the ice in 2018 (59 ft) and 2019 (50ft). This year's average clarity reading of 40.5 feet was 2 feet deeper than the previous high mark in 2018. It is clear the recent invasion of quagga mussels is having an impact on the lake.

The nutrient levels in the lake remain steady and at healthy levels. Phosphorus and Nitrogen are the primary nutrients that limit algae and plant growth in the lake. Both are measured at the surface, middle (80 ft), and bottom (~155ft) of the lake. Total phosphorus averaged 4.66 µg/L (micrograms per liter) in 2025, which was just below the long-term average of 4.95 µg/L. Total nitrogen averaged 32.8 this year, around average for the lake.

In the tributaries the nutrient levels remain relatively high, with total phosphorus values above 20 µg/L in all the stream sites and nitrogen inputs above 1000 µg/L in Glen Rhoda, Bellows Creek, and Shadko Creek. The nitrogen in Glen Rhoda could be from the legacy of agriculture in the headwaters of the stream. Shadko Creek flows through the residential area on the Northeast corner of the lake and was high in both nutrients. This might suggest runoff from lawn fertilizers and poor riparian buffers along the creek.

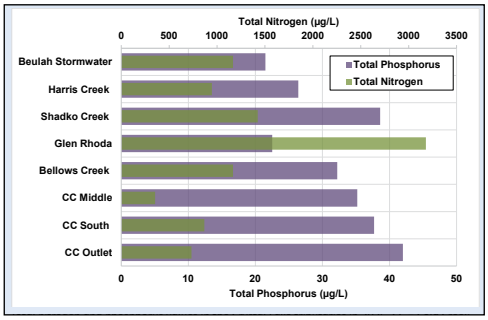
Although these tributaries are small and don't represent a substantial amount of water compared to the volume of Crystal Lake, they can tell us a lot about the overall health of the sub watersheds they drain and overall health of the Crystal Lake Watershed. Nutrients coming into the lake from these small streams can cause localized algae growth along the shoreline and are important sources of cold water year round to support the cold-water fish species in the lake.

Finally, I want to mention another notable discovery in the lake this summer. During our underwater drone scouting for quagga mussels in the deep basin of the lake we discovered the bottom was covered in freshwater shrimp! *Mysis diluviana*, also known as Mysis or opossum shrimp, can grow up to an inch long and are an important food source in the Great Lakes. They are light sensitive, living in deep water during the day and migrating into the water column at night to feed on zooplankton. There is not a lot known about the abundance of this shrimp in inland lakes and it's unclear if they have ever been reported in Crystal Lake before.

John Ransom, *CLWA Lake Biologist*

Water clarity readings measured with a Secchi disk for Crystal Lake in 2025.

Crystal Lake's total phosphorus values in 2025. Peak surface values in July could have been caused by erosion along the lake shore after high winds in June.



Total nitrogen and phosphorus values in the Crystal Lake tributaries in 2025. CC = Cold Creek.

Mysis shrimp observed in deep basin of Crystal Lake 2005

Mysis shrimp

BEULAH: WHY SHOULD WE CARE?

Continued from page 1

was winding down. Much of Trapp Farm is now a nature preserve owned by the Grand Traverse Regional Land Conservancy, which is allowing it to return to its natural state of swamp land.

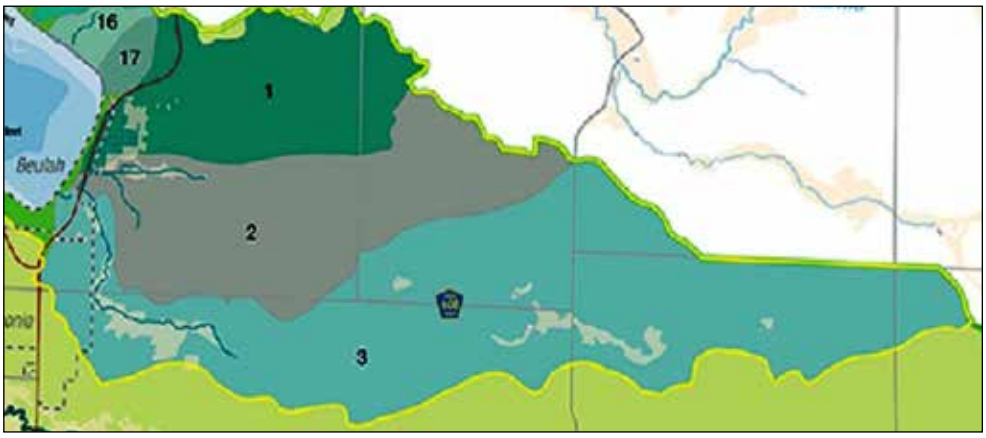
This background accounts for many of the problems Beulah Village is facing today.

Cold Creek water testing since 2020

Water entering Crystal Lake from Cold Creek continues to be a problem, as CLWA's water quality testing has shown. In addition to several feet of muck deposit, the Creek now drains through two golf courses whose maintenance may also impact nutrients in the soil.

Since 2020 the phosphorus levels at the Cold Creek outlet have steadily increased to around 38 µg/L (micrograms per liter) now, about eight times the deep basin of the lake. This pattern could be driven by an increase in total phosphorus coming from the South Branch of Cold Creek.

Between 2017 and 2022 total phosphorus in the South Branch averaged 12.15 ug/L and was only measured above 30 µg/L once during a storm. In 2025 the South Branch averaged 37.7 µg/L, with a minimum reading of 31 µg/L. Agricultural fertilizer, manure and sewage can produce excessive phosphorus runoff like this. When it enters water bodies, phosphorus causes algae blooms, depletes dissolved oxygen and harms aquatic life.



Watersheds of Cold Creek branches: 1 North, 2 Middle, 3 South

Since 2018 CLWA has tested for E. coli in Cold Creek and its branches. Of the 17 testing dates from 2020 to 2025, 12 of those in the Middle Branch detected E. coli values of more than 300 colonies/100ml, which is Michigan's "no body contact" limit. At the Crystal Avenue outlet, E. coli exceeded the limit on 9 of 17 days. Beulah stormwater outlet, Cold Creek outlet and CC South Branch all had some days with excess E. coli levels.

Sediment basin

Martin Trapp was the first to construct a settling basin in Beulah to decrease the muck washing into Crystal Lake from his extensive farm. Following a redesign in the 1970s, the Village continues to maintain a sediment basin for reducing the bacteria and nutrient-laden muck flowing through Cold Creek. In order to be effective, the pond must be dredged every 4-5 years: when a brownish plume starts emerging from Cold Creek after a rain, it's time to dredge again. The

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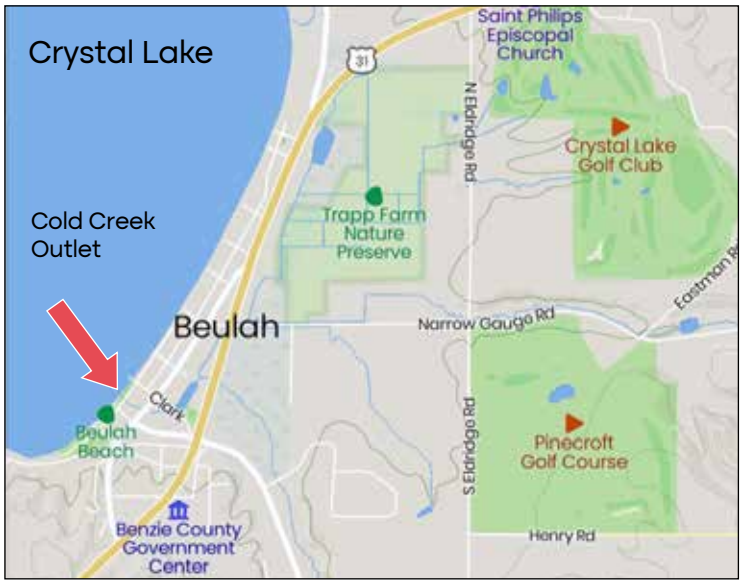
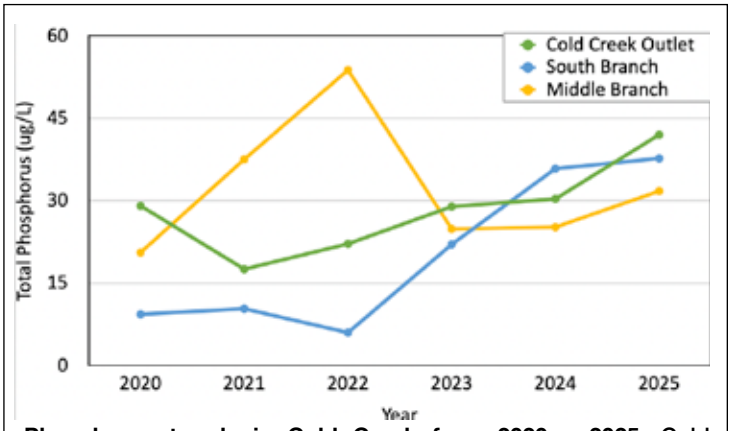


Map of Beulah



Phosphorus trends in Cold Creek from 2020 – 2025. Cold Creek outlet sampled at the Lake Street Bridge; South Branch sampled above confluence with the Middle Branch, upstream of the sediment basin; "Middle Branch" = average of the north and middle branches upstream of intersection of US-31 and Narrow Gauge Road.

BEULAH: WHY SHOULD WE CARE?

Continued from page 4

basin annually collects about 1,000 cubic yards of sediment which would otherwise free flow into Crystal Lake. And it is the small village of Beulah and Benzonia township that bear the cost of each dredging – even though this maintenance is necessary to protect the lake's water quality for the benefit of all. Even after dredging some muck still flows into Crystal, contributing to weed growth and high E. coli levels that close Beulah Beach.

The sediment basin (downstream of the monitoring sites on the South and Middle Branches) was last dredged in 2021, when the cost was $103, 595. The next dredging is scheduled for Fall 2026. Where will the money come from?

Beulah officials stress that Crystal Lake is a key component of the economy of *all* Benzie County and needs to have a support base beyond the Village of Beulah and Benzonia Township in order to protect it.

Invasive Eurasian watermilfoil

The CLWA's aquatic plant survey of 2016-2018 recorded a well established and extensive infestation of invasive Eurasian watermilfoil (EWM) at the east end of the lake, in the area of Beulah Beach and its public boat launch. Traveling watercraft frequently carry such plants from other water bodies. They will flourish when fed by excessive nutrients such as phosphorus in the water.

Since 2021 the CLWA has carried out annual chemical treatments of this patch in order to prevent it from growing to the point that it would interfere with recreational activities. While smaller areas of growth have appeared elsewhere on the Lake – especially at locations where recreational boats are launched – five years of treatments have brought the Beulah infestation well under control. Intensive treatment of a particularly persistent area off 3rd Street by 2025 reduced the EWM to a small sprig surrounded by beneficial native plants.

CLWA continues to monitor all EWM growth in the Lake and will treat only as needed to maintain control.

Beulah Beach Remediation and Storm Water Reduction Project

Beulah Public Beach is a vital component of the Village's tourism economy. During the summer the Benzie-Leelanau District Heath Department tests the water there monthly for E. coli.

In addition to Cold Creek outflow, stormwater runoff from streets and yards deposits pollutants into the Beulah beach area. Monitoring has recorded high levels of E. coli – especially high after significant rain events – that have led to frequent beach closings.

After years of planning, a collaboration among Beulah Village, the CLWA, and the Benzie Conservation District secured a $500,000 "non point source pollution" grant from the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The State recognizes that reducing this type of pollution is crucial to maintaining safe water quality and supporting local tourism and businesses.

Continued on page 6

View of Beulah 1961, sediment basin at arrow, note agricultural fields (Benzie Area Historical Society)

The day after a major storm, organic sediments carried by Cold Creek meet the clear waters of Crystal Lake on Beulah Beach.

BEULAH: WHY SHOULD WE CARE?

Continued from page 5

The project was completed in November 2025. Infiltration chambers were installed under the Village Park and Crystal Avenue and along a section of the Betsie Valley Trail. These function by trapping water along with the soil and pollutants it contains, then allowing the water to drain out leaving the soil and pollutants behind. Their aim is to capture as much runoff as possible from Spring Valley Avenue and the adjacent hills. (Unfortunately an additional chamber planned to collect runoff from Benzie Street was dropped due to property owners' opposition.) Smaller filtration units were placed in several stormwater drain inlets on Main Street to filter stormwater carrying sand, salt and road grime flowing into Cold Creek. Finally, the plan calls for the creation of a rain garden where runoff from 2nd Street enters the Lake.

The EGLE grant required local matching funds of $170,000. The CLWA contributed $50,000, the Village of Beulah $90,000, each of the three townships around Crystal Lake gave $10,000 and the County $30,000.

This collaborative support demonstrates that the entire area recognizes the importance of Crystal Lake's health to all.

EGLE mandated sewer project

The post World War II development surge led Beulah to recognize the need for a collective wastewater management system. In the 1950s the Village installed a sewer system serving those within its limits. Because the area was beneath the water table (the old pre-Archie lake bed), wastewater was pumped up to a series of "lagoons" outside Benzonia south of M-115. Leaks were common and addressed by stopgap repairs. By 1986 the system was over capacity,

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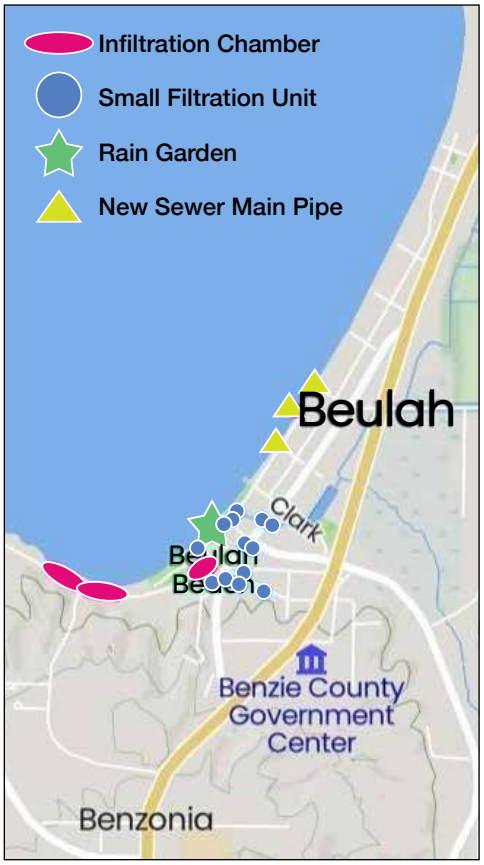

Map showing stormwater and sewage infrastructure installed fall 2025

Beulah Public Beach

BEULAH: WHY SHOULD WE CARE?

Continued from page 6

prompting more repairs and upgrades through the late 1990s. Nevertheless, during the first two decades of the 21st century EGLE issued numerous violations to the system, which mostly went unaddressed.

Leaking sewer lines in the Village allowed raw sewage to seep into the ground and pollute Cold Creek, area wetlands, and ultimately the Lake itself. The treatment provided by the current lagoons, which lie in the Betsie River watershed, does not reduce phosphorus and nitrogen to the State mandated levels.

In 2023 EGLE cracked down and presented an Administrative Consent Order to the Village of Beulah that required it to improve and expand the wastewater treatment facility. The Order compels the Village to obtain and maintain an approved groundwater discharge permit for the release of treated wastewater generated by its customers.

The costs to meet this standard have been estimated at more than $12 million. The Beulah system serves fewer than 400 residents and businesses.

Lagoons serving as treatment for Beulah's wastewater

The Village replaced or relined its sewer mains and service pipes during fall 2025, using $2 million available from an EGLE Substantial Public Health Risk grant. But the major cost will be the replacement of the treatment facility with a modern system.

A Michigan EPA Clean Water State Revolving Fund grant provided an additional $! million but the rest of the funding will come from a loan of $9,155,000 from the US Department of Agriculture (USDA). Sewer customers will repay the loan through increased rates over three years. A typical household's bill may more than double by January 2028.

Beulah continues to work with EGLE to finalize the details. Construction on the new wastewater treatment facility should begin in 2026.

Conclusion

It is clear that the east end of Crystal Lake faces numerous challenges. One small village is struggling to meet them. But the Lake's waters don't separate neatly along political boundaries. Beulah's problems impact *all* of Crystal Lake, so they are problems that we all must work to solve.

Thanks to John Ransom, Bruce Gerhart, Ed Hoogterp, Dan Hook, and the Benzie Area Historical Society for input to this article.

Stormwater remediation construction in Village Park, fall 2025

Stormwater remediation construction along Betsie Valley Trail, fall 2025

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crystallakewatershed.org/education/newsletter

CLWA INVITES YOU TO BECOME MORE INVOLVED WITH ITS WORK

We are grateful for all the support that the CLWA receives from its members and friends. But would you like some hands on involvement?

The CLWA is an all-volunteer organization and always welcomes more. Several busy committees enable you to explore your own interests and skills. Most important are enthusiasm and willingness to pitch in for the many tasks that help the CLWA preserve and protect Crystal Lake.

Have you filled out your on-line Member Profile? There is space there to indicate your interest in volunteering, and committees look there for recruits. Or you can contact committee chairs directly (information on the website and in annual Directory).

The **2026 Walkabout** is scheduled for May 27 and may still need volunteers. A great opportunity to learn more about the Lake with the kids! Contact us at **info@crystallakewatershed.org**

CLWA board member Coleman Schindler and Walkabout leader Debbie Smith, with watershed model showing how runoff affects water quality and the importance of soil filtration.

CLWA ANNUAL MEETING 2025

The annual members meeting of the CLWA was held on Saturday, July 19, at the Mills Community House in Benzonia. About 150 members and other interested persons attended. President Sue Brown surveyed the Association's current programs, accomplishments and future plans. Lake Biologist John Ransom reported on the work he has been doing "trouble shooting Crystal's shoreline." Treasurer Bruce Gerhart reviewed the organization's financial situation and reported that it was healthy.

The following officers and board members were elected by mail ballot:
Re-elected Vice President (2025-2027): Mark Walton
Elected Treasurer (2025-2027): Tim Davis
Re-elected board members (2025-2028): Jim Hamp, Dirk Nelson, Wanda Shreiner, Hugh Walton
Elected board members: Bruce Gerhart (2025-2028), Ginny Murphy (2025-2027), Ron Reagh (2025-2026)
Draft minutes are available on the CLWA website.