GLWQD Summer 2023 MCC Intern Report

Prepared by:

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Purpose

The purpose of this report is to summarize the work done by Gallatin Local Water Quality District (GLWQD) MCC (Montana Conservation Corps) Summer Intern, Chase Ackerman. This report will be cumulative to the tasks and responsibilities taken on by this position and will share any relevant data found.

Objectives

Several objectives were laid out for this position before it began in June 2023. These objectives included several tasks and responsibilities focused around the establishment of a recreational waters monitoring program to track risks to human health by the proliferation of *E. Coli* bacteria and Harmful Algal Bloom (HAB) toxins. This program would need both a routine monitoring schedule as well as the development and distribution of educational and outreach materials about the work being done through social media and updates to the Local Water Quality District's website.

The intern was also expected to learn standard procedures about the characterization of water quality which would include proper sample collection, preservation, transportation, and form completion. They were also expected to learn how to operate standard sampling equipment such a handheld water meter and FlowTracker2 (YSI Inc., Yellow Springs, OH) discharge meter, and how to interpret the results. For HAB testing, the intern was expected to learn how to perform ABRAXIS® dip strip tests to assay for Microcystins and Anatoxin-a.

The intern was expected to create a recreational waters health database that would ultimately lead to the creation of a technical report with relevant findings. The intern would use data analysis methods to show trends across the monitoring months of June through August. All information would be made publicly available through a variety of platforms.

To fulfill MCC responsibilities, the intern was required to fill out biweekly paperwork, hour logs, and site accomplishment forms. The intern was requested to attend at least one public volunteering event over the summer as well as one public meeting. The total contracted MCC hours for this position were 450.

Lastly, the intern was expected to assist with routine SWMN (Surface Water Monitoring Network) and GWMN (Ground Water Monitoring Network) programs, as well as with any other relevant programming done by the GLWQD.

Position Accomplishments

- Alongside the District Manager, the Intern wrote an updated version of the previously designed Sampling and Analysis Plan (SAP). Important new additions included *E. coli* and HAB sampling procedures, relevant data reporting guidelines, and quality assurance measurement methods.
- The intern was properly trained on relevant quality assurance methods when taking a water grab sample, a skill which would be used throughout the summer.
- The intern created a sampling calendar graphic which would be used as sampling template for *E. coli* and HAB sampling dates and locations throughout the summer. This graphic was also posted on the GLWQD website to let the public know when certain sites would receive testing.
- The intern assisted the hydrogeologist and water quality specialist with the routine sample collection for the Big Sky Nutrient Monitoring Project. There was a total of 17 sites visited and the intern assisted in setting up the groundwater pump, sample collection, deploying the handheld water meter, starting the generator and monitoring the pump, in addition to other requested tasks.
- A proposed budget was created for the *E. coli* sampling bottle costs for routine monitoring throughout the summer. This number resulted in around an $800 sampling season, which does not include the additional costs that were required for the ABRAXIS® test kits.
- As the summer progressed and sites were assessed for monitoring significance, three sites were deemed most important for the routine monitoring; they were Kendeda Lake at Gallatin County Regional Park, Bozeman Pond, and Meyers Lake. These sites showed high potential for recreational activity and were not being scheduled to be monitored by any other agencies or water quality groups.
- The intern assisted the water quality specialist with the GLWQD SWMN program. The intern assisted with this program two times, across 17 sites at 12 streams throughout the Gallatin Valley. Responsibilities for this monitoring network included sample collection, filling out site visit forms, deploying the handheld water quality meter and collecting and recording discharge using the FlowTracker2.
- The intern assisted the District Manager in a recreational waters monitoring demo for NBC Montana where sampling procedures were showcased, and goals of the summer program were discussed. The story can be found here: Link
- The intern attended the Gallatin Watershed Council Riparian Planting Volunteer event at Gallatin County Regional Park as a representative of MCC and the GLWQD.
- A required midterm MCC Site interview and evaluation was done by both the intern and GLWQD manager, as well as the intern and the MCC Program Manager.
- Required MCC biweekly paperwork, site accomplishments and hour logging were performed by the intern.

- The intern engaged in one macroinvertebrate sampling with the water quality specialist, where they went to four sites distributed across three rivers. The intern was involved in counting and collecting macroinvertebrate at each site – with a minimum 200 count as a necessity.
- The intern created a staff report that was submitted to Gallatin County, detailing appropriate responsibilities and accomplishments throughout the tern.
- The intern participated in a Zoom remote meeting with the rest of the Gallatin County Health Department, sharing some of the work that had been performed, as well as brainstorming what potential routes exist for publicly sharing monitoring results.
- The intern helped to establish an Instagram social media presence for the district and created several content pieces focusing GLWQD work (e.g., surface water monitoring, distributing Well Testing Kits, etc.).
- The intern maintained contact with the Gallatin City-County Health Department about getting *E. coli* sampling results uploaded to healthygallatin.org.
- The intern participated in the Gallatin Conservation District's Summer Stewards Program where a presentation was given about the flow of groundwater and the way that it moves through a system. This presentation was given to around 20 school children.
- The intern gave a demonstration of how to use ABRAXIS® test kits with representatives from the Health Department.
- At the August GLWQD Board meeting, the intern shared briefly about the project work done over the summer, and the relevance of some results that have been found.
- Throughout the season, the intern performed front-desk assistance duties which included occasional phone calls, greeting walk-ins and directing inquiries, and walking through well-testing kits with interested customers.
- The intern developed signage to post at sites where *E. coli* numbers exceeded EPA Recreational Standards. These signs were posted when needed.

Position Findings

- As summer monitoring progressed, *E. coli* numbers were noted to gradually increase over time at each of the three monitoring sites. This gradual uptick could be correlated to different factors. Water quality meter parameters that were routinely collected (pH, temperature, percent dissolved oxygen and dissolved oxygen concentration, mg/L) all showed mostly gradual upticks as the summer progressed.
- Of the three routinely monitored sites, Meyers Lake was the only one that surpassed EPA recreational water body standards for *E. coli* numbers. This water body had high numbers of water fowl living in it – assumably due to the high volumes of food received from residents who walked the park. Recreation advisory signage was posted mid-July at the site informing them of findings.
- Throughout the summer, *E. coli* MPN (Most Probable Number) data yielded low results at both Kendeda Lake and Bozeman Pond. The highest recorded *E. coli* count was 186 MPN at Kendeda Lake, and 95.9 MPN at Bozeman Pond.
- Of locations monitored for HABs, which included Meyers Lake, Valley Grove Pond, Regional Park Dog Park Pond, and Elk Grove Pond, only one detection of HAB toxins was observed (> 5 -10 ppb at Elk Grove Pond).
- *E. coli* counts were noted to have progressively raised in each monitoring location as the summer continued.
- When sending in samples, the Recreational Waters Monitoring Program received recorded total coliform counts (MPN Coliform/100mL), which were also observed to gradually uptick as the summer months progressed in both Kendeda Lake and the Bozeman Mall Pond. Notably, total coliform numbers were consistently recorded as above the countable number of greater than 2149.6 MPN during each sampling event of Meyers Lake throughout the summer.
- For each summer sampling event, a blank was taken for QA/QC purposes and always resulted in a non-detect.
- It was noted that when producing content for the Instagram social media page, outreach was increased three-fold when posting reels related to the work being done. General posts to the home page would normally only reach around 40 accounts.

Discussion

Results indicate that the gradual increase of *E. coli* across monitoring sites throughout the summer months are potentially correlated with factors such as temperature, pH, and dissolved oxygen concentrations. The gradual increase of *E. coli* MPN counts in these water bodies is representative of seasonal trends observed in waters across the United States during the summertime– as factors such as temperature and the presence of waterfowl both increased.

The increase in total coliform counts across sites suggests that there was an increase in water usage from warm-blooded animals such as waterfowl and possibly recreationalists. In the case of Meyers Lake, total coliform numbers suggested that the lake received abnormally large amounts of fecal waste input, which was supported by site form documentation of prolific waterfowl counts.

While a total of six HAB sampling events were performed, only one of the 12 tests performed yielded a positive result for the presence of a HAB toxin. In consideration of the high cost of these test kits alongside of the relatively ephemeral nature of HAB toxins, the GLWQD discussed potentially moving the responsibility of purchasing and performing HAB testing to any HOA's with community waterbodies that contain recreational waterbodies. In this scenario, the GLWQD would coordinate an educational testing kit walkthrough with appointed HOA testing representatives, to ensure that they had received training on using test kits. This model would allow for more agency of the HOA's over their own waterbodies, as well as allowing for more possible HABs to be identified and tested accordingly.

As signage for sites was created and posted relative to the yielded *E. coli* counts, there was some difficulty in developing a message that was both cautionary and non-regulatory. At Meyers Lake, signage was posted in several renditions. In the future, signage should continue to be posted wherever sampling results pass thresholds, and social media should be used appropriately in tandem.

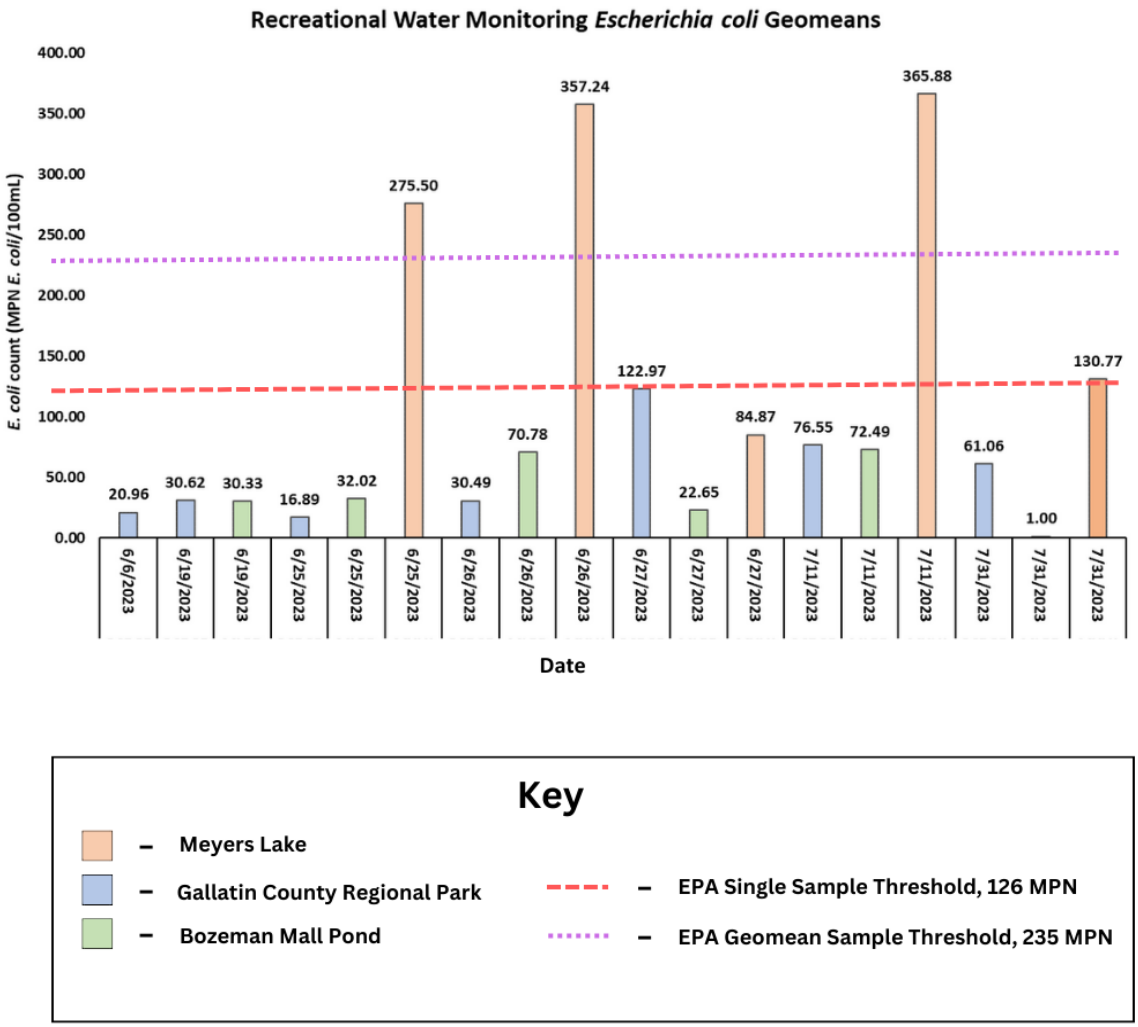

Fig 1. Sampling geometric mean MPN counts by date and site as related to the EPA Geometric Mean and EPA Single Sample Thresholds

The above figure shows recorded geometric means for each site on its respective sampling date. Clear trends of very high MPN counts are observed at Meyers Lake – which, on three occasions, passed both single sample and geometric mean sample thresholds for colony counts.

Conclusion

The first rendition of the new GLWQD Summer Recreational Waters Program was successful and warrants the continuation and development of this program in the future. This program filled a niche that was highly relevant to Gallatin County residents who wished to recreate in any these waterbodies. Results from the first round of monitoring indicate that public/city recreational waterbodies consistently yielded numbers below EPA health thresholds, though privately owned waterbodies, such as Meyers Lake, yielded vastly different conditions. As such, more time should be taken to centralize the GLWQD's role in monitoring select waterbodies for these conditions – and any agency that can be given to a community over monitoring the health of its waterbodies – namely teaching communities how to do their own *E. coli* and HAB monitoring –is a tenable research and monitoring endeavor that will protect human health.