**Summer 2023 *E. coli* in Beach Water Data Report**

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**Beaches on Lakes in Newaygo and Lake Counties**

*(see attached Excel Spreadsheet: Beach Monitoring Mini-Report)*

During **Summer 2023**, the Shimadzu Core Lab (SCL) at Ferris State University **weekly tested six (6) beaches on six (6) lakes in Newaygo County (Hardy Dam Pond, Croton Dam Pond, Hess Lake, Fremont Lake, Diamond Lake, and Pettibone Lake) and three (3) lakes in Lake County (Wolf Lake, Idlewood Lake, and Big Star Lake)** for *E. coli*. Sampling was performed from the first week of June to the second week of September. The first three weeks in June used the mColiBlue method, while all remaining weeks used the Colilert system. It should be noted that Hardy Dam Pond, because of its size, had two sampling sites; all other lakes had one sampling point. **At each sampling location, three samples were taken (left, center, right) and composited.** All samples from each sampling date across the 15 weeks of summer 2023 **had *E. coli* concentrations well below regulatory limits** (300 colony forming units/100 mL beach water) for beach closure. Additionally, for each sampling location on each sampling date, **sanitary surveys were performed** that recorded, among other things, water pH, water and air temperature, water conductivity and dissolved oxygen, wind direction, rain fall events, animal sign (feathers, footprints, scat, etc.) and human activity at the beach site. All **data was uploaded to Michigan EGLE’s Beachguard** database, E. coli levels during the summer and sanitary survey data more recently.

**Beaches on Lakes in Manistee County**

*(see attached Spreadsheets: Beach Monitoring Mini-Report & Bear and Portage Lake MST Data-Organized)*

The SCL also **performed weekly *E. coli* assays for six (6) sampling locations on Bear Lake and six (6) sampling locations on Portage Lake** during summer 2023. All Bear Lake samples were beaches. Four (4) of the six (6) sites for Portage Lake were beaches and two (2) were streams (Schimke Creek and Stream 9 or M-22 and Easy Street). These two streams, per a conversation with Mr. Fournier of DHD10, have historically had elevated *E. coli* levels. On each date at sampling location, left, center, and right samples were collected, **composited, and subjected to *U.S. EPA Draft Method C*** *(Method C)*, a qPCR-based method for quantifying *E. coli* levels. In addition to the samples collected by Ferris State personnel, Matt Fournier of District Health Department #10 (DHD10) collected beach water samples every other week from all locations on Bear Lake and Portage Lake, plus an additional four (4) sampling sites on Portage Lake. These samples was analyzed by Colilert at the DHD10 lab but were not composited. **Sanitary surveys were also done for each site on every sampling day.**

**Results showed that nearly all sampling sites from beaches directly on Bear Lake and Portage Lake had *E. coli* concentrations below codified beach closure levels, based on *Method C or Colilert***. The exception to this was Ardmore Drive Road-end Beach on June 15, 2023, which showed high *E. coli* levels by *Method C* but low levels by Colilert analysis. However, **Schimke Creek and Stream 9 (M22 at Easy St.), as in the past (personal communication with Matt Fournier), showed elevated *E. coli* that were often near to or exceeding codified limits as determined by *Method C* and sometimes Colilert**.

**Microbial source tracking (MST) was performed each week for the site on Portage Lake and also on Bear Lake that had the highest *E. coli* levels as well as any site that exceeded the beach closure notification value of 1.863 log10 copies/100 mL beach water.** On Bear Lake proper, the **only notable case** was a greatly **elevated human signal (~2,770,000 counts per 100 mL) at Hopkins Park in the Village of Bear Lake** on the **July 4th weekend**. However, Method C showed no elevated *E. coli*. A possible source of this contamination is the septic system of the RV Park in Hopkins Park on the shores of Bear Lake. The Village of Bear Lake has no sewer system. There was a combined sewer system between the Bear Lake and Portage Lake communities planned, but it was halted last spring because of concerns of year-round community residents (personal communication with Don Raif, president of the Bear Lake Home Owners Association). In addition to the RV park, the Village of Bear Lake has a town celebration on July 4th weekends that may have potentially contributed to excess overflow of the septic system.

There also appeared to be a **persistent and slightly elevated porcine signal in Bear Lake**. However, a local township official says there are no wild or domesticated pigs in the area. This may suggest the porcine marker may be cross-reacting with another species, such as racoons. **Schimke Creek** that empties into Portage Lake **had persistent slightly elevated signals for humans, canines, ruminants, and cows but low pig signal**. Conversely, **stream 9 (M-22 at Easy Street) had persistently and slightly elevated signals from ruminants, including cows**. There was also a **slightly elevated and persistent signal for porcine**, especially the last half of the summer. All **data was reported to *Beachguard***, although the sanitary survey data for both Bear Lake and Portage Lake was not uploaded until recently.

**Future Work in the 2024 Beach Season**

* Current Grant Amendment
  + The present 10 sites on the nine (9) lakes in Newaygo and Lake Counties will be substituted to assay 10 other untested lakes in DHD10 to be tested weekly for *E. coli* by Colilert.
  + The sampling plan for the sites on Bear Lake and Portage Lake will be modified to take samples only after rain events of one (1) inch or more and on the Memorial Day, July 4th, and Labor Day weekends.
    - For these sampling days, Colilert will assess in composited samples from each site to determine *E. coli* levels.
    - For sites with elevated levels, MST will be performed for human, ruminant, cow, and pig markers.
* An additional grant is planned to test 10 to 15 more lakes in Mecosta and Newaygo counties by Colilert.