



E. coli and DNA Source Tracking in the Black River Watershed

[Month XX, 20XX through Month XX, 2023]

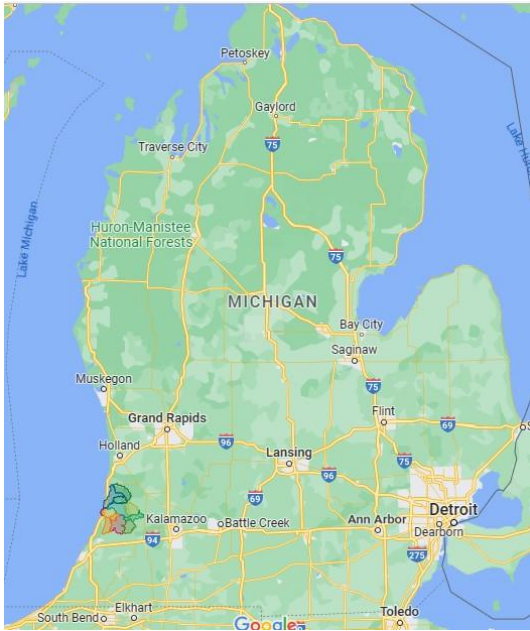


Figure 1 Black River Watershed

Two Rivers Coalition
Paw Paw, MI

Funded by:
EGLE Nonpoint Source Program
Watershed Council Grant
Tracking Code #2021-0245

Key Partners:

- Van Buren Conservation District
- EGLE
- Pokagon Band of Potawatomi
- New Age Laboratories, South Haven, MI
- Annis Water Resources Institute, GVSU

Grant Amount:
\$17,360

PROJECT DESCRIPTION:

The Black River Watershed (BRW) drains 287 square miles of Van Buren and Allegan counties before emptying into Lake Michigan at South Haven. The project goals were to determine the source of consistently high levels of E. coli in the BRW measured by Two Rivers Coalition (TRC) since 2017 and determine whether the source was primarily human, cow, or a combination.

In Part 1 of the study, TRC collected water samples for 5 consecutive weeks in May and June of 2022 from six sites located on the South, Middle, and North Branches of the Black River (BRW-1 through 6). Results of the E. coli testing showed that four of these sites had a 30-day geometric mean greater than 300 cfu. Water samples were also collected during wet events and dry events (base flow) from these sites and from sites on Cedar Creek (BRW-7) and Eastman Creek (BRW-8). Samples were tested for E. coli



Figure 2 Two Rivers Coalition Sampling the River

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and microbial source tracking (MST) using DNA testing (specifically ddPCR) analyzing for human, cow, and general ruminant fecal markers. Test results showed that half the sample sites had high levels (>300 cfu) of E. coli at base flow. All sites had high levels of E. coli after the rain event. Also, all sites had detectable levels of human fecal marker and general ruminant fecal marker after the rain event.

In Part 2, E. coli and DNA results from Part 1 were used to prioritize sub watersheds for additional testing, source tracking, and potential remediation. Eastman Creek and Cedar Creek were chosen for follow-up testing. In October of 2022, 6 sites on Eastman Creek and 7 sites on Cedar Creek underwent E. coli testing and MST analysis on a wet event/dry event basis. Specifically, ddPCR analysis looking for human, cow, and general ruminant fecal markers were performed on duplicate samples from all sites where the E. coli levels were close to or above 300 cfu. At base flow, more than half the sites had high levels of E. coli and detectable levels of both human and general ruminant fecal markers. After the rain event, 12 out of 13 sites had very high E. coli levels (>1000 cfu) and those 12 sites all had detectable levels of both human and general ruminant fecal markers.

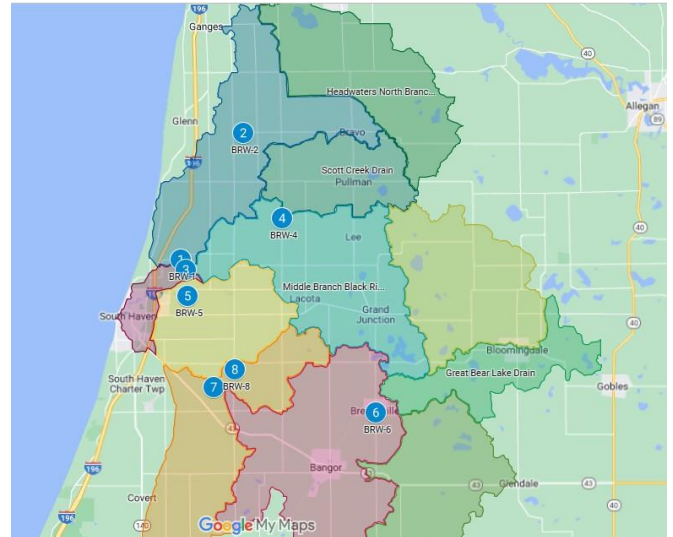


Figure 3 Black River Watershed with Sample Sites (Part 1)

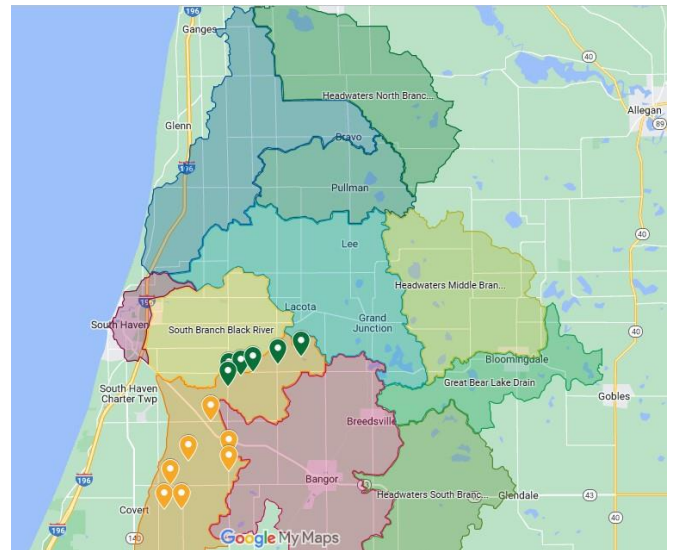


Figure 4 Black River Watershed with Sample Sites (Part 2)

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Grant Products:

- Information and Education – project results were shared at annual public meeting and in a series of working group meetings with partners
- Geographic Information Systems – GIS maps and models were created to help pinpoint potential E. coli sources in the Eastman Creek sub watershed
- Environmental Monitoring – water quality data was collected, shared with partners, and communicated to the public
- Ordinance Development – data could help support water quality ordinances involving septic tank inspection and maintenance
- Capacity Building Product(s) – working with EGLE improved TRC’s overall water quality testing methodology, thereby adding to its capacity for future water quality testing efforts

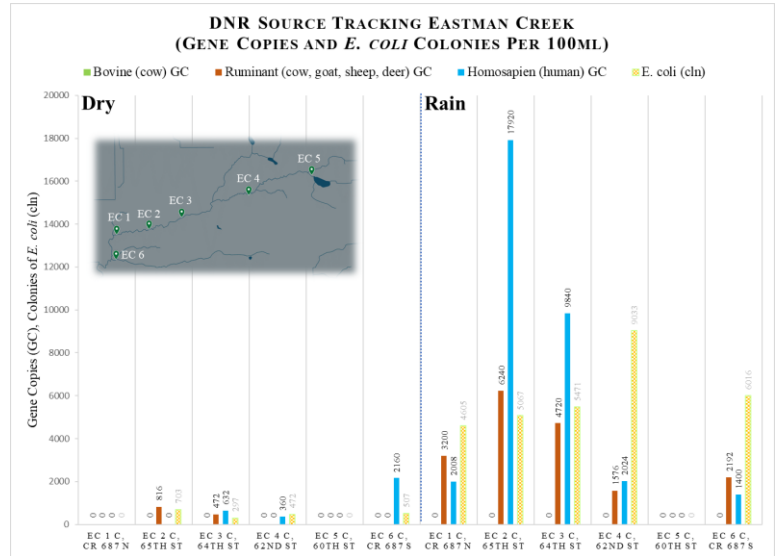
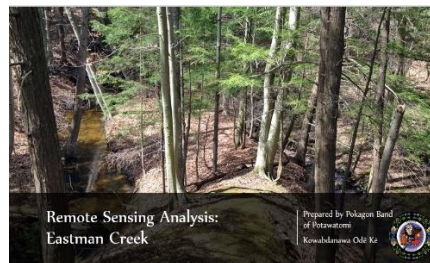


Figure 5 Eastman Creek Follow up Analysis (Pokagon Band of Potawatomi)



WATERSHED AND COMMUNITY IMPACT:

Two Rivers Coalition is a local, citizen-based environmental group working to protect the health and overall water quality of the Black River and Paw Paw River watersheds through conservation, education, and advocacy. Working with regional partners, TRC is chartered to help implement the watershed management plans for both the Black River and Paw Paw Rivers. Partial and total body contact designated uses in the BRW are threatened due to bacteria/pathogens. Funding of this project has helped us better understand this threatened status and to confirm that one of the primary sources of E. coli contamination throughout the watershed is human fecal material. Follow up GIS work in hot spot areas along Eastman Creek may help show the precise mechanism of contamination in at least one small stream. Project outcomes may lead to solutions to reduce this pollutant from the watershed and improve water quality. The community impact thus far has been to facilitate more public discussion and interest around water quality and the potential sources of E. coli in the watershed, including failing septic systems.



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EGLE Nonpoint Source Program

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