

Two *E. coli* Sources Cleaned up in Stony Creek

Success Story

Project Abstract:

The Michigan Department of Environment, Great Lakes and Energy (EGLE) found that recreational uses of Stony Creek were impaired by *E. coli* bacteria in 2012. Elevated levels of *E. coli* raise the risk of illness in humans upon contact or accidental ingestion, and the presence of *E. coli* is often associated with additional pathogens and bacteria that can cause illness. Typical sources include livestock, pets, wildlife and untreated human sewage. Water quality standards for *E. coli* limit the risk to humans by setting a goal amount (or maximum) for the pathogen allowed in a waterbody. Monitoring in 2017 and 2018 identified two sources of *E. coli* in the Stony Creek watershed – a leaky manure storage facility and a failing onsite waste disposal system. Removing the sources allowed the creek to meet water quality standards 80 percent of the time. Although the recreational uses are still impaired, this effort represents significant progress towards the removal of the creek from the Clean Water Act (CWA) Section 303(d) list of impaired waters.

Water Quality Challenge:

Stony Creek flows through mid-Michigan in rural Clinton County and drains an area of more than 25,000 acres. According to the 2019 National Land Cover Database, agricultural land use makes up 75 percent of the watershed. The creek is part of the Grand River watershed and flows 20 miles to the Maple River (Figure 1).

WATER BODY IMPROVED

Stony Creek (AUID number 040500050403-01) is in the Maple River sub-watershed within the Grand River watershed located in Clinton County, Michigan. Stony Creek is listed on the federal Clean Water Act Section 303(d) list of impaired waters for Total and Partial Body Contact Recreation Designated Use Impairments due to *E. coli*.

Grants Reporting and Tracking System (GRTS) numbers: 98502312, 98502317, 98502321

Partners and Funding:

EGLE used a USEPA Performance Partnership Grant to conduct monitoring and pursue manure and septic system resolutions with landowners. The Mid-Michigan District Health Department provided sampling and inspection of a failing septic system. Landowners conducted land application of manure and corrected a failing septic system.



Figure 1. Stony Creek runs through agriculture fields before entering the Maple River.

A statewide total maximum daily load (TMDL) describes the water quality standards for *E. coli*, helping the state monitor and address sources of the pathogen. The TMDL outlays two sets of standards, one for total body contact (going underwater, swimming) and one for partial body contact (activities that involve wading up to the waist). The standard total body contact (TBC) is a daily maximum geometric mean of 300 *E. coli* colony-forming units (CFU) per 100 milliliters (mL) and a 30-day geometric mean of 130 *E. coli* that applies May 1 to October 31. The standard for partial body contact (PBC) is a daily maximum geometric mean of 1,000 *E. coli* per 100 mL that applies year-round. Any *E. coli* concentrations that exceed the results are in violation of water quality standards. The PBC standard was met during all sampling events for both pre- and post-project sampling.

In 2012, *E. coli* monitoring found the upper half of Stony Creek did not meet monthly TBC standards, with a 30-day geomean of 211 *E. coli* per 100 mL. Looking farther upstream for sources, the 2017 monitoring of three sites consisted of five weeks of three grab samples (Figure 2). The Lowell Road site exceeded the PBC water quality standards on all five monitoring events and had a 30-day geometric mean of 1,240 *E. coli* per 100 mL (Figure 3). Upstream sites had 30-day geometric means of 731 and 170 *E. coli* per 100 mL for sites 5 and 6, respectively. Additional sampling of sites 1 and 4 found two tributaries with elevated levels of 2,300 *E. coli* per 100 mL and 550 *E. coli* per 100 mL, marking them for further investigation by EGLE staff (**Figures 3 and 4**). This monitoring data prompted Michigan to add a portion of the creek to its CWA Section 303(d) list of impaired waters.

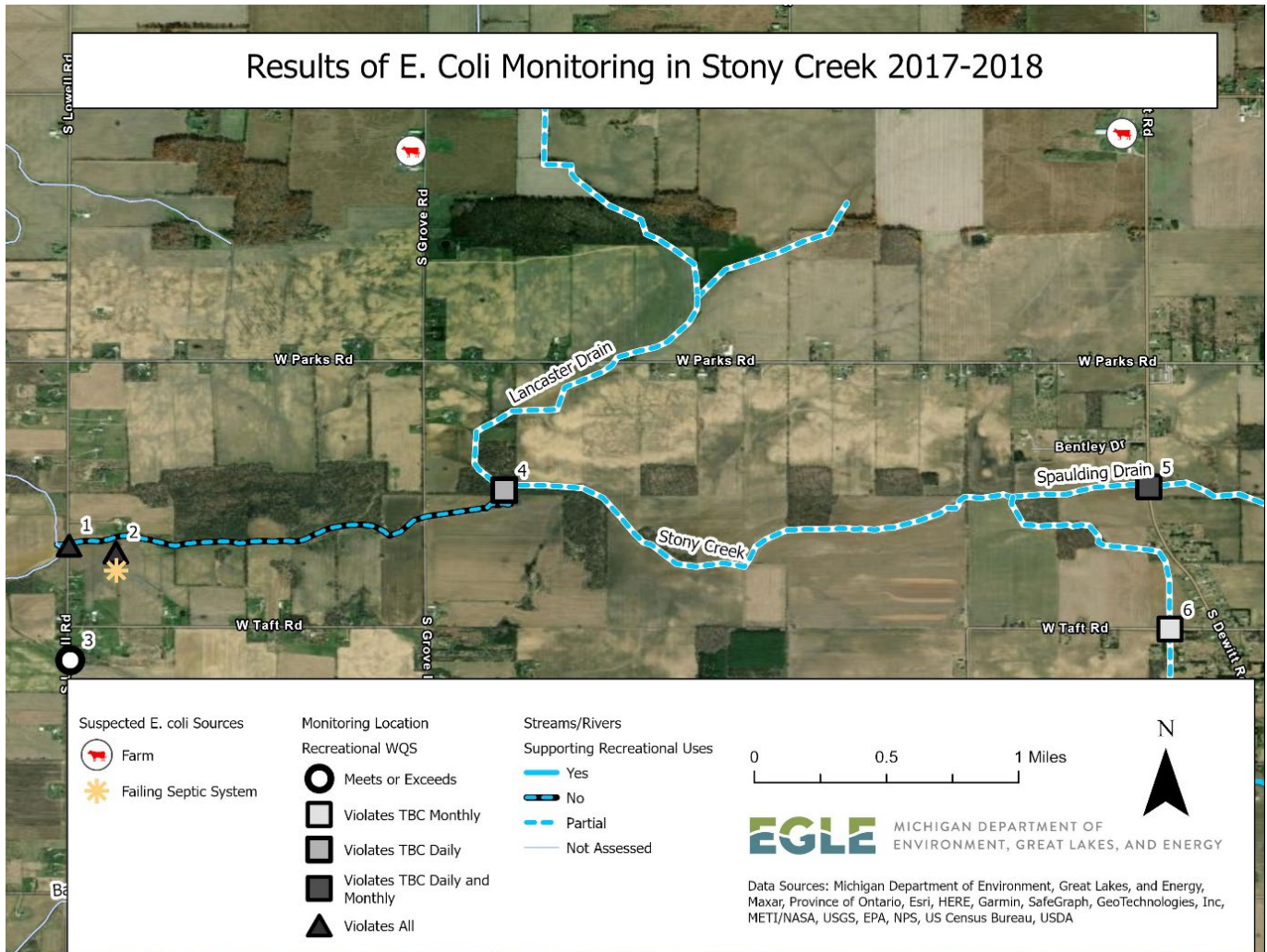


Figure 2. Sampling conducted on Stony Creek focused on six sites in the Stony Creek watershed, leading EGLE to believe that *E. coli* sources were coming from tributaries at site 2 and site 4.

The graph in Figure 3 indicates that the daily geometric mean (DGM, yellow dots) at each sampling event on Stony Creek exceeded safe levels for both TBC (blue dotted line) and PBC (black dashed line) recreation uses. The 30-day geometric mean for the site (yellow dashed line) exceeded the 30-day geometric mean for the TBC standard (blue dashed line), indicating that water was unsafe for recreation.

As shown in Figure 4, 2018 sampling occurring in May and October at three sites on Stony Creek exceeded water quality standards. The daily geometric mean for October 18 (DGM, yellow dots) at site 1 exceeded safe levels for total body contact. The DGM for site 2 exceeded both TBC (dotted line) and PBC levels (dashed line). Site 4 had the lowest amount of *E. coli*. Only one sample was collected in May, rather than the required triplicates needed for a daily geometric mean. While the May samples cannot be compared to water quality standards, they are displayed for reference.

Nonpoint Source Success Story

Stony Creek

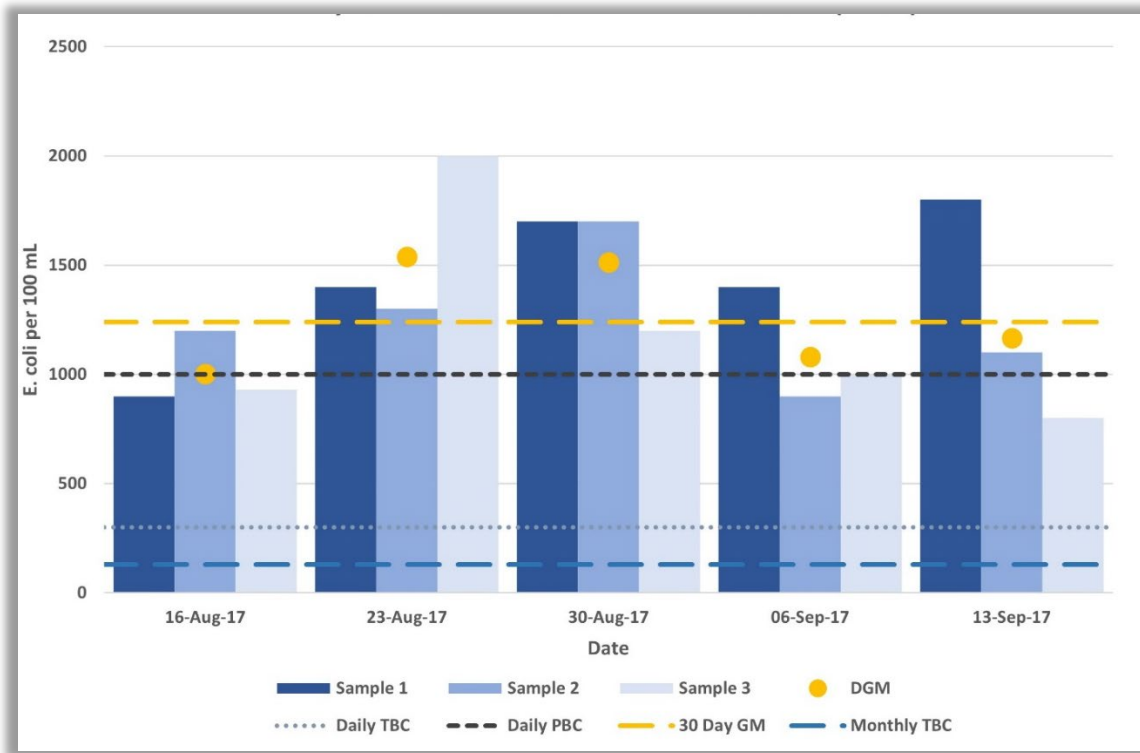


Figure 3. Stony Creek at Lowell Rd., 2017 *E. coli* Results (Site 1)

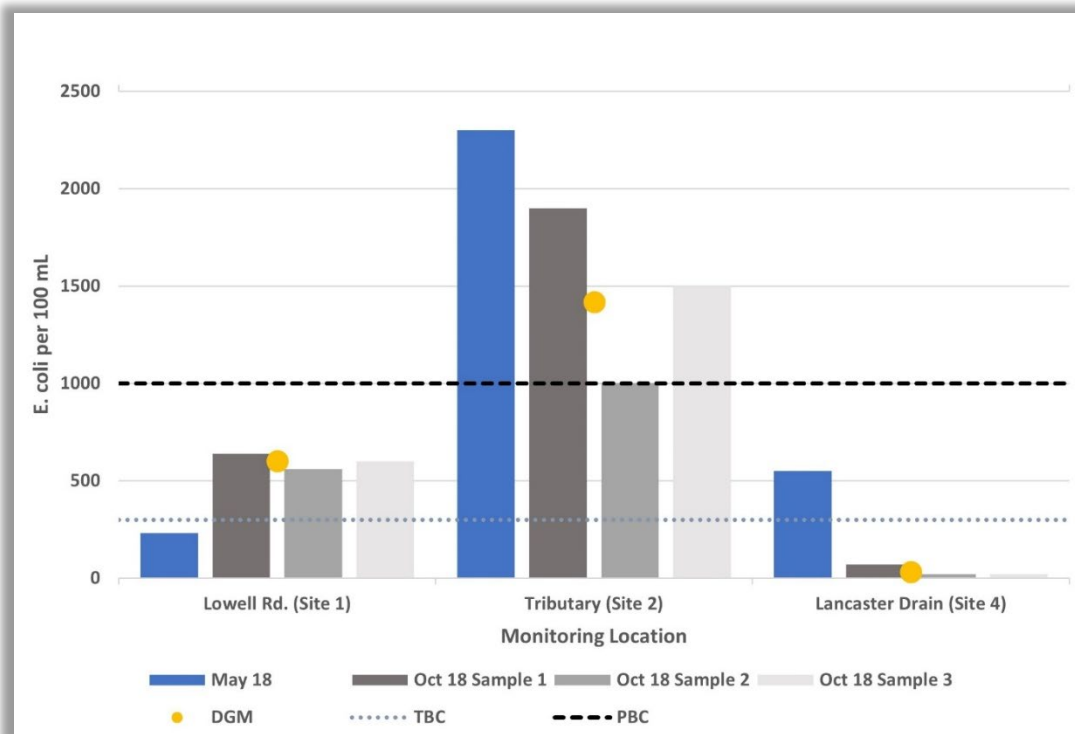


Figure 4. 2018 Stony Creek Tributary Monitoring

Project Highlights:

The Upper Maple River Watershed Management Plan, approved by USEPA in 2010, lists pathogens and bacteria as the third-most significant pollutant in the watershed, caused by livestock, septic systems, and waterfowl. A U.S. Environmental Protection Agency (USEPA) Performance Partnership Grant helped landowners implement manure and septic system management practices and supported monitoring to meet watershed management plan objectives. EGLE staff worked with the Mid-Michigan District Health Department to find a failing septic system and seek corrections from the landowner from 2018 to 2020. Improper manure and silage storage at a farm was resolved in 2018 by removing manure from a leaking storage facility and using it for land application.

Results:

Follow-up water quality sampling was conducted in 2022 after the removal of the two sources of *E. coli* in Stony Creek. A rain event occurred on the first monitoring event, likely causing surface runoff to carry *E. coli* into Stony Creek. The result was *E. coli* levels that did not meet TBC or PBC recreational requirements. However, all other monitoring events in Stony Creek met the daily recreational standards. *E. coli* levels in Stony Creek decreased from a high 30-day geometric mean of 1,240 *E. coli* per 100 mL in 2017 to 376 *E. coli* per 100 mL in 2022. The 60% reduction in *E. coli* resulted in Stony Creek supporting recreational uses during dry weather, showing significant progress toward safer recreation (**Figures 5, 6 and 7**).

E. coli results were compared to relative water levels to discern any correlation between surface runoff from rainfall and *E. coli* levels. *E. coli* levels during low water levels were high in 2017, likely due to the continuous sources of the failing septic system and confined animal feeding operation. After removing the sources, monitoring in 2022 showed that *E. coli* increased during high water levels. This correlation shows that the remaining sources of *E. coli* are related to contaminated surface runoff and continue to make the creek unsafe for recreation during rain events.

Figure 5 shows that monitoring conducted after the known *E. coli* sources were removed from Stony Creek met water quality standards for all recreational uses, except for the monthly total body contact standard (lowest dashed blue line). High *E. coli* results at the first monitoring event occurred after 0.44” of rain and were likely due to runoff sources.

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Stony Creek

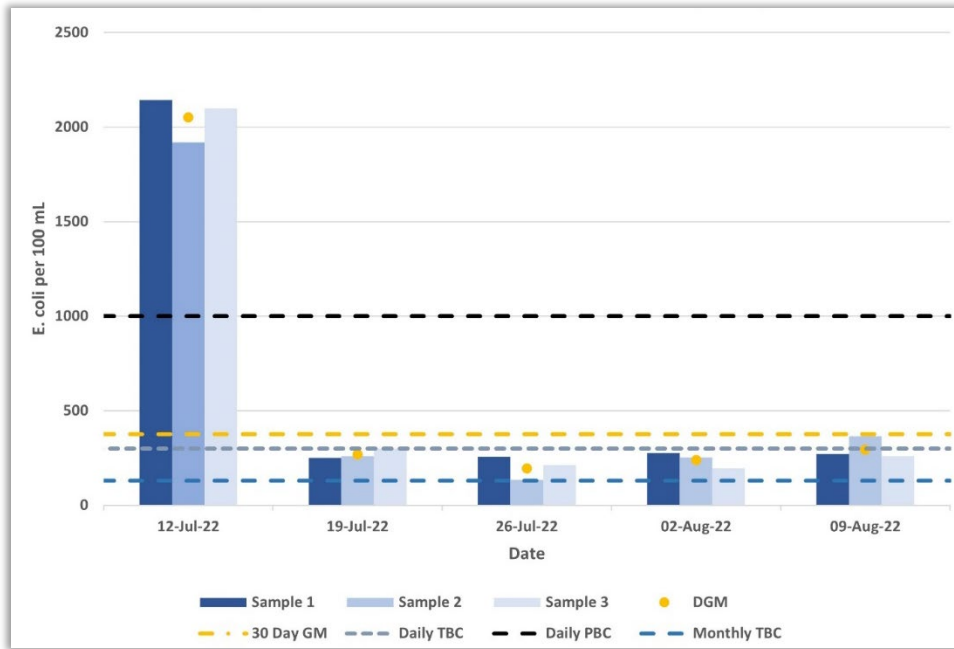


Figure 5. Stony Creek at Lowell Rd., 2022 *E. coli* Results (Site 1)

Figure 6 shows that the monitoring conducted after the known *E. coli* sources were removed showed daily PBC and TBC water quality standards were met, increasing recreational uses to a section of Stony Creek.



Figure 6. Results of *E. coli* Monitoring in Stony Creek after removal of pollution Source 2022

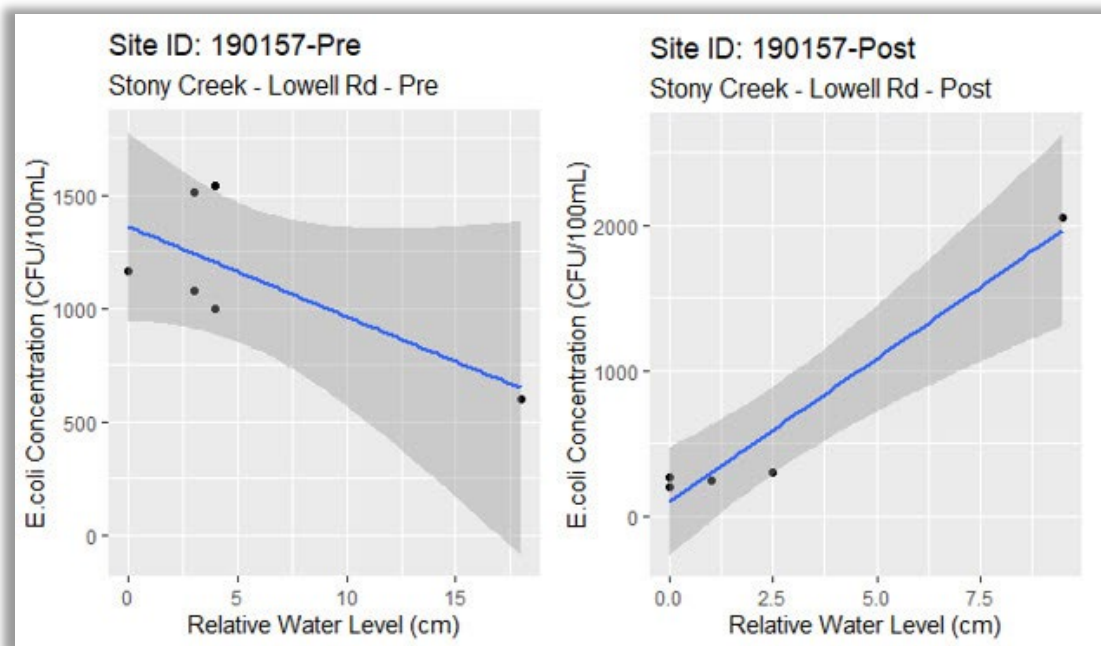


Figure 7. When compared to relative water level, *E. coli* results increased during low water (indicative of dry weather, or constant sources) in 2017 and increased during high water in 2022 (indicative of wet weather sources). The blue line indicates the relationship between both parameters.

Contact Information:

Caroline Keson, Monitoring Coordinator
Nonpoint Source Unit

Great Lakes Watersheds Assessment, Restoration, and Management Section
Water Resources Division

517-512-0892 | KesonC1@Michigan.gov

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