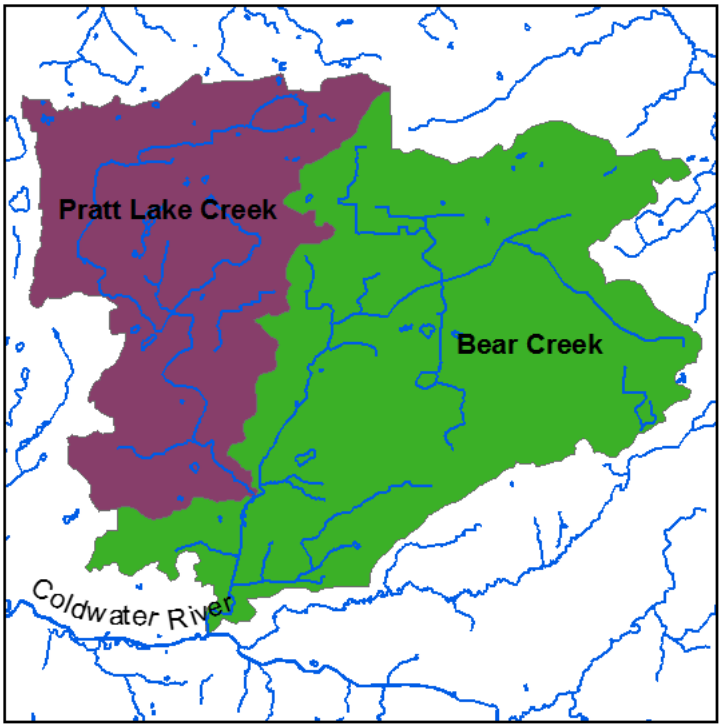
E. coli Success Stories

Tyler Creek: Incremental Steps to Improvement

While meeting the water quality standard is the ultimate goal of most of Michigan's water quality restoration projects, success cannot only be defined in simple terms, particularly when there are multiple sources and the problem has a large magnitude. Tyler Creek (also known as Bear Creek) is a large tributary of the Coldwater River, both tributaries of the Thornapple River, which are located in Kent, Ionia, and Barry Counties, Michigan. Tyler Creek is locally important for its natural beauty and value as a coldwater fishery. It also has highly agricultural portions, with a large livestock population and with many areas relying on septic systems (Figure 2). It was first listed as impaired by *E. coli* in the 1998 Integrated Report. The TMDL (approved by the USEPA in 2005) identifies agricultural nonpoint sources and failing septic systems as the main contributor of *E. coli*, along with a Dairy Concentrated Animal Feeding Operation (CAFO). In 2004, 30-day geometric mean *E. coli* concentrations ranged from 69 to 814 *E. coli* per 100 ml. Since that time, the MDEQ has administered several grants intended to further identify and reduce sources of *E. coli* in Tyler Creek.

The Coldwater River has an MDEQ and USEPA approved Watershed Management Plan, which was written in 2004 and updated to meet the USEPA's Clean Water Act Section 319 nine required elements in 2009. To meet the goals of the WMP, Timberland Resource Conservation and Development and other partners used a detailed stream inventory to identify sources and causes of pollution, implementing physical best management practices (BMPs) at 14 sites (Timberland Resource Conservation and Development 2013). This project included an education and outreach program, and used *E. coli* monitoring to pinpoint specific sources and locations for future implementation of BMPs. Partners included Coldwater River Watershed Council, Tyler Creek Golf Course Swisslane Farms (CAFO), and Trout Unlimited Chapters.



Name:	*Pratt Lake Creek*	*Bear Creek*
HUC-12 (subwatershed):	*040500070305*	*040500070306*
Size:	*18 sq. mi.*	*30 sq. mi.*
Agricultural Landcover:	*72%*	*78%*
Developed Landcover:	*8%*	*6%*
Wetland Loss since Presettlement:	*28%*	*44%*
Estimated Land with Manure Spreading:	*6%*	*10%*
Human Population:	*1000*	*2050*
Estimated Number of Septic Systems:	*270*	*810*

Figure 2. Subwatershed characteristics for Bear and Pratt Lake Creeks, in the Tyler Creek watershed.

This project monitored Tyler Creek at 11 sites, 9 tile outlets, and several groundwater sites, and found instream *E. coli* values as high as 6,612 per 100 mls. Several tiles that were monitored only during wet weather were found to be in excess of the upper reporting limits (2,400 cfu/100 mls), with one as high as 24,000 per 100 mls after dilution. Flow and discharge monitoring enabled the calculation of *E. coli* loads at each site.

Like many streams in the Lower Peninsula of Michigan, large portions of Tyler Creek are a maintained drain. It has therefore lost much of its vegetated riparian buffers to drain maintenance activity. In addition, in many areas, the stream is hydrologically isolated from its floodplain, or simply has no floodplain, as a result of dredging and a berm created by the spoils from dredging activities. In some cases, wetlands have formed upslope of the berm, which can filter *E. coli* and other pollutants from the agricultural runoff as long as the capacity of the wetland isn't exceeded. However, when the storage capacity of these wetlands is exceeded, as it often is during heavy rains in saturated conditions, the water overflows the berm and creates an erosion issue by forming a gully. As part of the Tyler Creek Implementation project, a formerly degraded wetland was modified to repair the breach in the dredge spoil berm, the capacity of the wetland was increased, and a controlled outlet was constructed. Surface runoff from 40 acres of land (20 of which are agricultural) is now diverted via a constructed vegetated swale into the improved wetland, as opposed to direct outlet to the stream (Figure 3). The wetland was recently planted with a native seed mix. Storage volume was increased by about seven times. In another portion of this project, a wetland was constructed on the Tyler Creek Golf Course to increase infiltration from an agricultural tile drain. Monitoring found that *E. coli* levels were 58 percent lower at the outfall of a constructed wetland flowing into Pratt Lake Creek as compared to the *E. coli* levels of the agricultural drain flowing into the wetland. These results are based on limited data, but they are promising.

In 2015, human bacterial source tracking, flow, suspended solids, and *E. coli* load calculation work was conducted through a Clean Michigan Initiative – Clean Water Fund grant, by Timberland Resource Conservation and Development (Streamside Ecological Services 2015). During this study, one direct illicit discharge of untreated sewage was found, reported to the local health department, and promptly remedied. Another detection of human sewage was reported to the local health department. They found that the septic system had recently been

replaced, but a sink cross connection still existed. In one other instance, the source was not identified. From instream monitoring, *E. coli* loading was found to be correlated with suspended solids loading, and several locations with elevated runoff were identified for future projects. Bear Creek contributed more flow and a higher *E. coli* load than Pratt Lake Drain. In 2014, all sites continued to exceed the total body contact water quality standard. However, the ongoing work allows incremental progress in determining and eliminating sources in this complex agricultural watershed, and provides a basis for future targeted work.

Figure 3. Before (top-8/5/2009) and after (bottom-7/15/2015) the capacity of a streamside wetland was increased.

References:

Streamside Ecological Services (2015). Tyler Creek Monitoring Project. CMI #2013-0516., Timberland Resource Conservation and Development.

Timberland Resource Conservation and Development (2013). "Final Project Report (2011-0017): Tyler Creek E. coli Reduction Project."