

December 17, 2018

ECCSCM's monitoring project results for 7.17.18, attached*. Results in bold on the attached worksheet exceed either Michigan's water quality standards, or EPA-recommended maximum levels as shown.

PROJECT SUMMARY

ECCSCM conducts two different types of water monitoring, at 49 different sites in 21 townships, within a 24 x 24 mile (roughly 576 square miles) test bed that stretches from eastern Hillsdale County to mid-Lenawee County and from the Jackson/Hillsdale/Lenawee county lines at the north to the Ohio state line at the south. One type of sampling is traditional stream study sampling, where sites are sampled to see what is happening at that particular location at that particular time. The other type of sampling is edge-of-tile-pipe, edge-of-field sampling that is done to identify sources and amounts coming from a specific manure application field, and this is done to identify possible violations of the Clean Water Act under the NPDES CAFO permit or violations of other State and Federal statutes.

This particular project was a stream study that took place on 7.17.2018, as the second year of a 3-year stream study we began during 2017 in the Raisin watershed. Our goal was to check E. coli and nutrient levels within known CAFO-livestock-housed areas, to see if cyanobacteria and/or microcystin were present in tributary waters (Raisin in 2017 and Bean/Tiffin in 2018) and to identify DNA from livestock sources. We are limited by funds, so we plan to do sites of secondary concern in both the Raisin and Bean/Tiffin watersheds here next year. In the future, we plan to continue our targeted DNA analysis.

Sites tested in 2018 were in Michigan's portion of the Bean Creek (Tiffin River in Ohio)/Lake Erie watershed. The sites chosen for this round were based on their potential impact from CAFO waste, located immediately downstream from or adjacent to the farms themselves or their nearby manure application fields. Often, these streams originate on CAFO-owned fields, or where their manure is applied. Michigan NPDES CAFO-permitted farms either located in, or applying manure, in this project area include Hudson and Medina Dairies, Bleich Dairy, Legend Dairy, which are all NPDES-permitted dairy CAFOs, and White and State Line Farms, both NPDES-permitted hog CAFOs. Satellite barns and CAFO feeder facilities are also located in this area. One or more MAEAP best management practices are used at the majority of the manure application fields, in addition to the setbacks and other conservation practices required in the Michigan NPDES CAFO permit.

Method - E. coli samples are collected as clean grab samples, and are delivered on ice to the MDEQ drinking water lab in Lansing for analysis (Counts 10 - 1,000,000) within 6 hours after collection. Hach test strips are used to test for nutrients. Normally, a YSI DO meter, calibrated before each use, is used to record dissolved oxygen levels and water temperature, but due to equipment malfunction it was unavailable. Samples for DNA/cyanobacteria/microcystin analysis are collected as clean grab samples and sent to Helix BioLab per their directions.

Of note:

DNA - ECCSCM began DNA testing at one site (Lime Lake) in 2015, after residents spotted "green slime" in this lake, which is immediately downstream from both a dairy and a swine CAFO. DNA testing for cattle, swine, and human DNA markers continued through 2016 and for cattle and swine in 2017 in Lime Lake. One positive note in 2018 was that Lime Lake

did not experience an algae bloom. ECCSCM noticed a distinct change in manure application on two fields immediately upstream from Lime Lake's main inlet (Hudson Dairy). It appeared that stormwater may have been used for field irrigation on those fields, instead of water with a higher manure content. It also seemed that far less irrigation took place on those fields.

As stated earlier, our objective for this project in 2017 and following years is to test for the presence or absence of cyanobacteria and microcystin, and for the presence or absence of CAFO-livestock-housed DNA. Since there were no hog CAFOs in the Raisin region tested in 2017, we did not check for other species, and therefore did not do a comparative analysis. Cattle DNA and cyanobacteria were found in the samples at all of the 7 sites tested, and microcystin was found at 3 sites, during the 2017 round in the Raisin. The Wolf Creek watershed, where 2 of the positive cyanobacteria and microcystin samples were found in 2017, is the source for Lake Adrian, the City of Adrian's drinking water reservoir.

In 2018, since the region tested includes hog CAFOs, we expanded our DNA testing to include two types of cyanobacteria (microcystin and Planktothrix), microcystin, and both cattle and hog DNA.

Two sites (No. 9 Lime Lake Inlet and No. 29 tributary to St. Joseph Creek) contained cyanobacteria-microcystis DNA. Three sites (No. 9 Lime Lake Inlet, No. 14 Medina Drain, and No. 45 Carter Drain) contained cyanobacteria-Planktothrix DNA. No. 9 Lime Lake Inlet contained both cyanobacteria-microcystis and cyanobacteria-Planktothrix DNA. Two sites (No. 46 tributary to Lime Creek and No. 38 Silver Creek) contained unidentified cyanobacteria (not microcystis or Planktothrix). Four sites (No. 14 Medina Drain, No. 38 Silver Creek, No. 9 Lime Lake Inlet, and No. 29 tributary to St. Joseph Creek) contained the algal toxin - microcystin DNA.

Despite the presence of two hog CAFOs and their manure application fields in the area, no swine DNA was found in any of the samples tested. Cattle DNA was found in four samples (No. 14 Medina Drain, No. 46 tributary to Lime Creek, No. 38 Silver Creek, and No. 29 tributary to St. Joseph Creek).

E. coli – One of the sites tested, No. 9 Lime Lake Inlet, is located within the Lime Lake/Prattville Drain 2003 E. coli TMDL reach of reach of 130/100 mL (30-day av.), 300/100mL (daily) from May 1, through October 31 (attached). Unfortunately, on 7.17.2018, E. coli continued to be far in excess of this TMDL at 5300/100mL. All but one site (No. 45 Carter Drain) contained dangerously high E. coli levels far in excess of the PBC limit, with the highest at No. 46, the tributary to Lime Creek, at 21,000/100mL.

Nitrates/nitrites – We did not find excessive nitrates or nitrites at any of these sites. We have observed stable/slightly decreasing levels of nitrates over the past several years, with occasional spikes.

Orthophosphate – Orthophosphate results at all sites once again are high, as they have been for years in both the Raisin and Bean/Tiffin portions of Michigan's WLEB. They have continued to rise or stay at the same high levels, all across the board, with no decrease. Orthophosphate, which comes from sewage and fertilizer, is the phosphate most bioavailable to cyanobacteria, which is harmful algae that led to the Lake Erie-Toledo water crisis in 2014. While total phosphorus has gone down in our portion of the WLEB, the orthophosphate which is actually used by cyanobacteria has continued to rise. For orthophosphate, the level in natural streams varies, but eutrophication starts when levels exceed .005 mg/L. Our levels continue to be alarmingly high.

Using the Hach test strip for orthophosphate (PO₄) and converting to phosphorus (*.3262), Total phosphorus results range from 4.893 ppm at No. 14 Medina Drain and No. 38 Silver Creek, to 9.786 ppm at all the rest. As a group, the total phosphorus results in the Bean/Tiffin were higher than last year's readings in the Raisin. As you can see on the information about key sampling parameters on the attached spreadsheet, total levels in natural streams are between .05 and .10 mg/L; levels above .10 are of concern, where fish kill can start to happen. Michigan has no standards for nutrients from non-point sources, but the standard for total phosphorus from point source (i.e., wastewater treatment plant) discharge is 1.0 mg/L. In comparison, our results far exceed that standard. (ppm = mg/L)

Ammonia – We found high levels of ammonia at all sites, with 1.0 mg/L at Site No. 46, the tributary to Lime Creek (Bean/Tiffin) on Ingall Hwy. Ammonia in natural streams, with normal aquatic life, does not usually exceed .10 mg/L; anything above that indicates additional input besides normal aquatic life, and may cause fish kill.

Observations: The sample from Site No. 46, tributary to Lime Creek, was discolored (green and brown) but clear, with a slight odor of manure, and there was duckweed in the stream itself. E. coli in this sample was 21,000/100mL. Both microcystin and cattle DNA were found in this sample.

*ECCSCM's test results and reports can be found at <http://nocafos.org>

Attachments:

ECCSCM 2018 results spreadsheet
2003 E. coli TMDL – Prattville Drain/Lime Lake 2003 E. coli TMDL
MDEQ E. coli results
Helix BioLab DNA report
ECCSCM 2017 Monitoring Report

Weather: 70 deg. F (avg), mostly sunny, few clouds, low humidity		Samples collected by: Gross, Taylor			ENVIRONMENTALLY CONCERNED CITIZENS OF SOUTH CENTRAL MICHIGAN			Parameter										DNA				
Date	Site #	Stream	Location	Watershed	Township	Temperature (deg. F)	Dissolved Oxygen	E. coli. /100ml	Nitrate (ppm)	Nitrite (ppm)	Phosphate (PO4) (ppm)	Convert PO4 to P (°.3262)	Ammonia (ppm)	Cyanobacteria - Microcystis	Cyanobacteria - Planktothrix	Cyanobacteria - Other	Microcystin	Cattle	Swine			
7.17.2018 7:37 am	14	Medina Drain	Ingall Hwy./Medina & Canandaigua Rds.	Bean Cr./Tiffin	Medina	--	--	1900	10	0	15	4.893	0.25	-	+	-	+	+	-			
7.17.2018 7:58 am	46	trib. to Lime Cr.	Ingall Hwy./Canandaigua & Packard Rds.	Bean Cr./Tiffin	Medina	--	--	21000	0	0	30	9.786	1	-	-	+	-	+	-			
7.17.2018 8:19 am	38	Silver Cr.	Mulberry Rd./Fay & Seneca	Bean Cr./Tiffin	Seneca	--	--	1400	5	0	15	4.893	0.25	-	-	+	+	+	-			
7.17.2018 8:26 am	45	Carter Dr.	Mulberry Rd./M156 & Fay	Bean Cr./Tiffin	Seneca	--	--	380	2	0	30	9.786	0.25	-	+	-	-	-	-			
7.17.2018 8:53 am	9	Lime Lake Inlet	Lime Lake Rd.	Bean Cr./Tiffin	Wright	--	--	5300	1	0	30	9.786	0.25	+	+	-	+	-	-			
7.17.2018 9:25 am	29	trib. St. Joseph Cr	Culbert Rd./Somerset & U. S. 127	Bean Cr./Tiffin	Pittsford	--	--	18000	5	0	30	9.786	0.25	+	-	-	+	+	-			
			nutrients using Hach test strips; DNA by Helix BioLab, Wayne State University, unless indicated																			
Key Sampling Parameters:																						
Parameter	In Natural Streams	Of Concern	MI Water Quality Standard																			
Ammonia (NH3-N)	0.01-0.10/mg/L	above 0.10 mg/L	-----																			
Phosphorus	0.05-0.10mg/L	above .10 mg/L	1 mg/L or less (max. monthly avg.) for point source discharges																			
Orthophosphate (DRP)	varies	above .005 mg/L	-----																			
Nitrate	varies	above 10 mg/L	10 mg/L or less (drinking water)																			
BOD5	4-10 mg/L	above 15.0mg/L																				
DO	5-13 mg/L	below 5 mg/L	5.0 mg/L or higher (warmwater streams) 7.0 mg/L or higher (coldwater streams)																			
Fecal Coliform	varies	above 2,000 mg/L	-----																			
E. coli	varies	above 1,000/100ml	1,000/100 mg/L or less (partial body contact) 130/100 mg/L or less (total body contact) 0 mg/L (drinking water)																			
adapted from "Key Sampling Parameters" fact sheet, Ohio EPA; Michigan Water Standards (Administrative Rules Part , P. O. 51, Natural Resources and Environmental Protection Act), and from http://www.epa.gov/safewater/mcl.html																						
Note: mg/L is approximately, but not exactly, equivalent to ppm																						