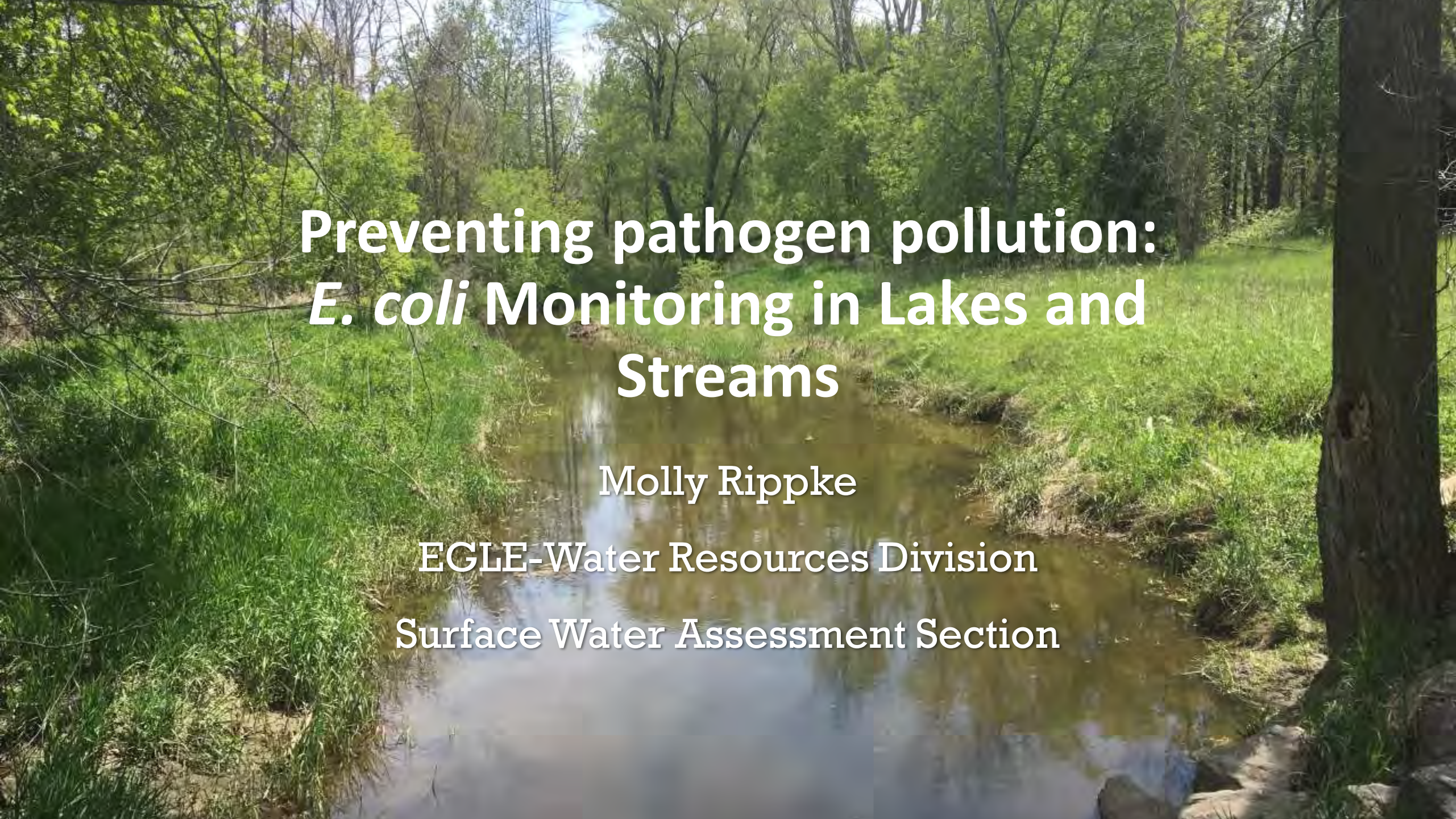


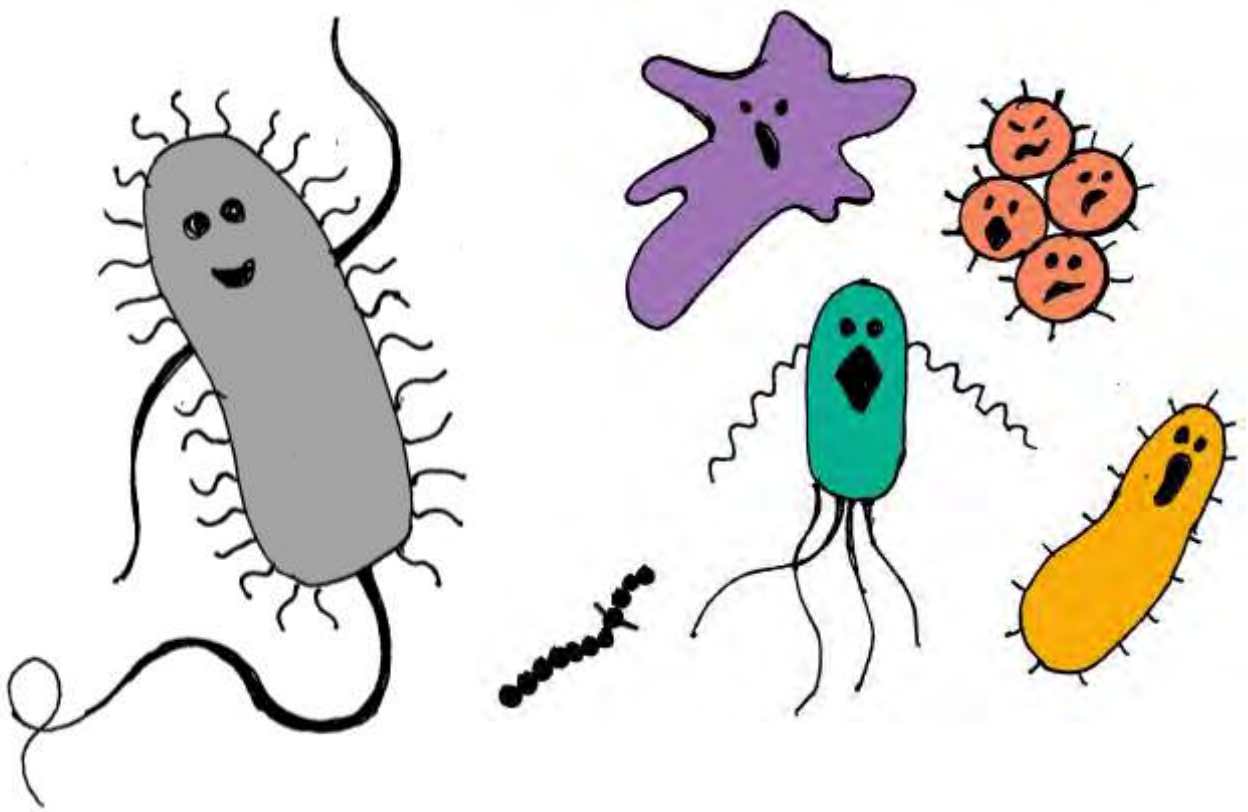
Preventing pathogen pollution: *E. coli* Monitoring in Lakes and Streams

Molly Rippke

EGLE-Water Resources Division

Surface Water Assessment Section

What is E. coli?



- E. coli is a disease-causing microscopic bacteria (it's a pathogen) that lives in our digestive system
- E. coli tends to bring gross and dangerous friends to the party (viruses, parasites, protozoa and other microbes)

E. COLI CAN RUIN YOUR DAY

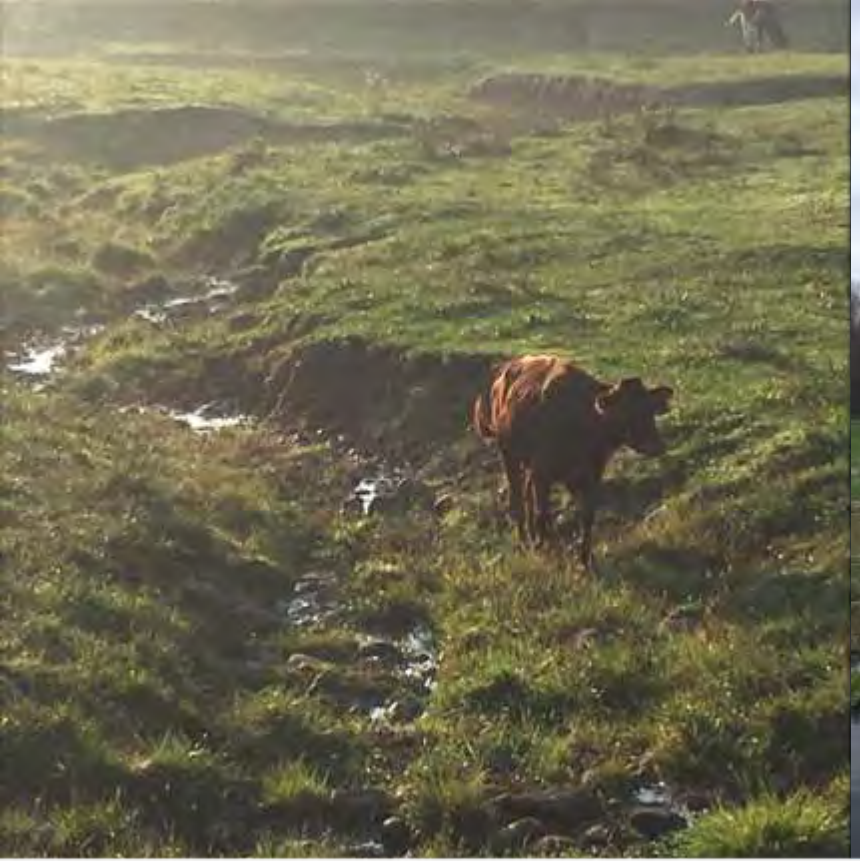
- These guys are part of the natural ecosystem and are all over the place.
- If ingested, or they enter the body any other way, they can make you sick, or worse.
- Too much E. coli in the water and beaches can be closed for your safety.
- People and pets can get sick.

WHERE DOES E. COLI COME FROM?

- Poop! Feces.



MANURE LAND-APPLICATION



LIVESTOCK AGRICULTURE (FEEDLOTS, PASTURES, RUNOFF)

• Nuisance Wildlife

Pets

Failing Septics

Poor location (soils, lot size, high water tables, etc)

Old systems

Maintenance issues

WASTEWATER TREATMENT PLANTS DISINFECT THE HUMAN WASTE, BUT:

Combined Sewers

Sanitary and Storm water go to treatment plant

Separate Sewers

Sanitary goes to treatment plant

Storm water goes directly to rivers/lakes

WHEN IT RAINS…

- Combined systems get overwhelmed with storm water and overflow untreated sewage
- Even in separate stormwater systems rain causes fecal pollution (and E. coli) to go WAY UP

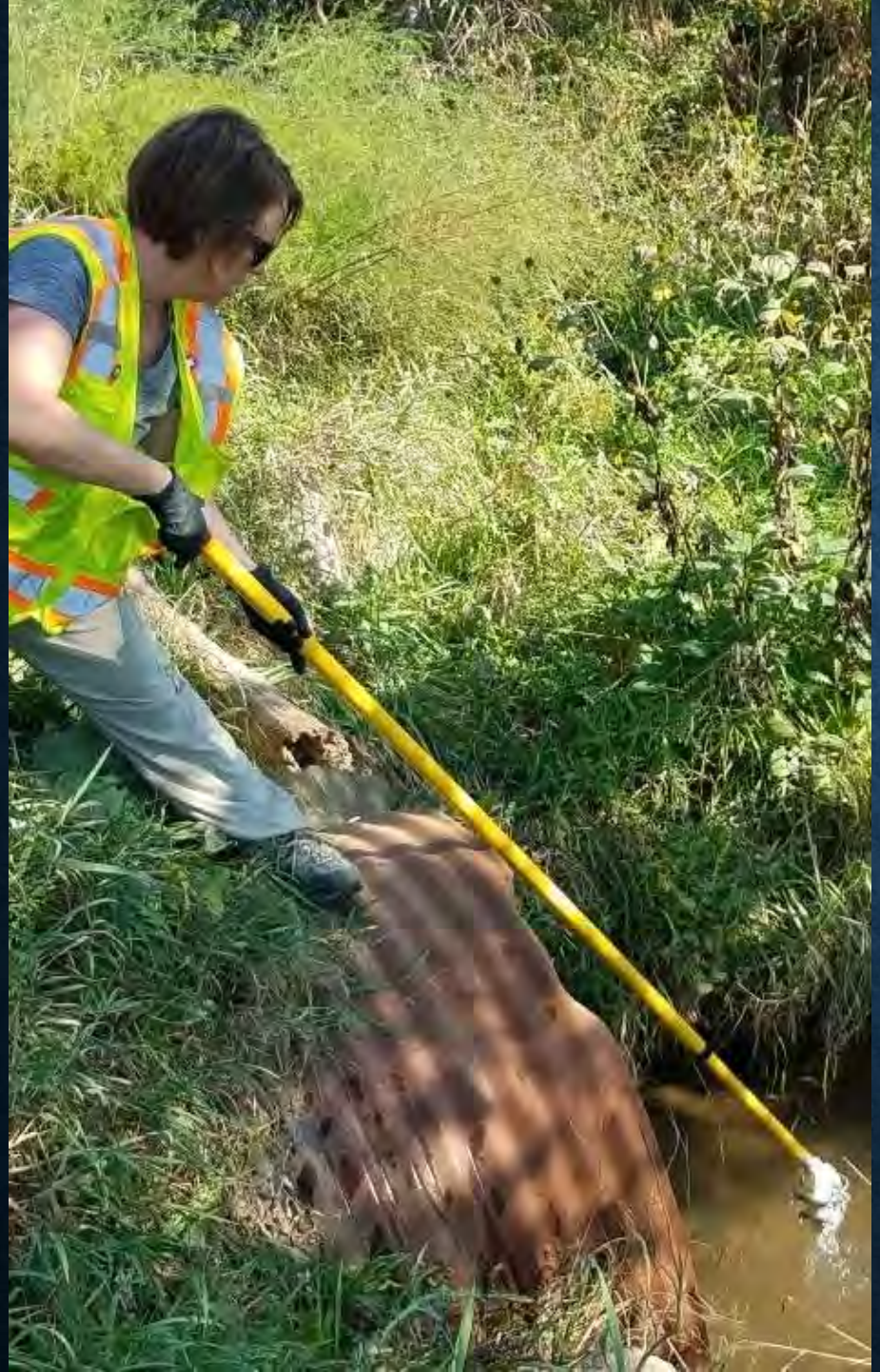
Photo: Flooding in metro Detroit.

ILLEGAL SOURCES – Agricultural

Barn wash-water and milkhouse waste



ILLEGAL SOURCES: RAW SEWAGE



E. coli monitoring components

- Targeted monitoring is guided by input from the public and prioritized by staff using pre-selected criteria.
- Probabilistic (random) monitoring of rivers
- Beaches may be monitored by local health departments (EGLE does not monitor beaches directly)

Beach Guard for Beach Closings www.egle.state.mi.us/beach/

Current closures and advisories are displayed above

Michigan Beaches

1235 Public Beaches

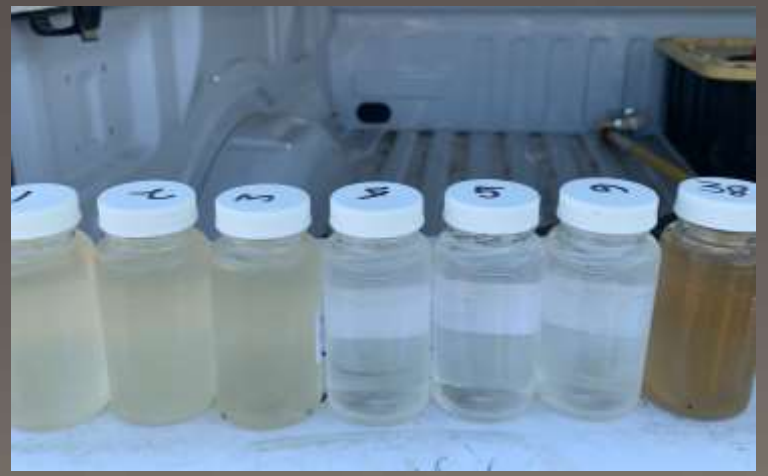
575 Private Beaches

13 Closures and Advisories

Waterbody and Location Name	County
Lake St. Clair - St. Clair Shores Memorial Park Beach	Macomb
Lake Superior - Porcupine Mountains State Park-Union Bay	Ontonagon
Lake Superior - Ontonagon Township Park and Campground	Ontonagon
Lake Superior - Ontonagon Lakeshore park, Public Shoreline Beach	Ontonagon
Sylvan Lake - Ferndale	Oakland
Crooked Lake - Independence Oaks County Park	Oakland
St. Mary's River - Sugar Island Township Park	Chippewa
Lake Michigan - Grand Beach	Berrien
Lake Michigan - Warren Dunes Beach	Berrien
Lake Michigan - Weko Beach	Berrien
Lake Michigan - Rocky Gap	Berrien
Independence Lake - Independence Lake County Park	Washtenaw
Lake St. Helen - Richfield Township Public Fishing Site	Roscommon

E. coli Monitoring

- Stated Goals:
  - Assess the status of the total and partial body contact recreation (Is it safe?)
  - Find sources of *E. coli* in areas where it is not safe.
  - Measure success where sources have been found and fixed.



E. coli Water Quality Standard

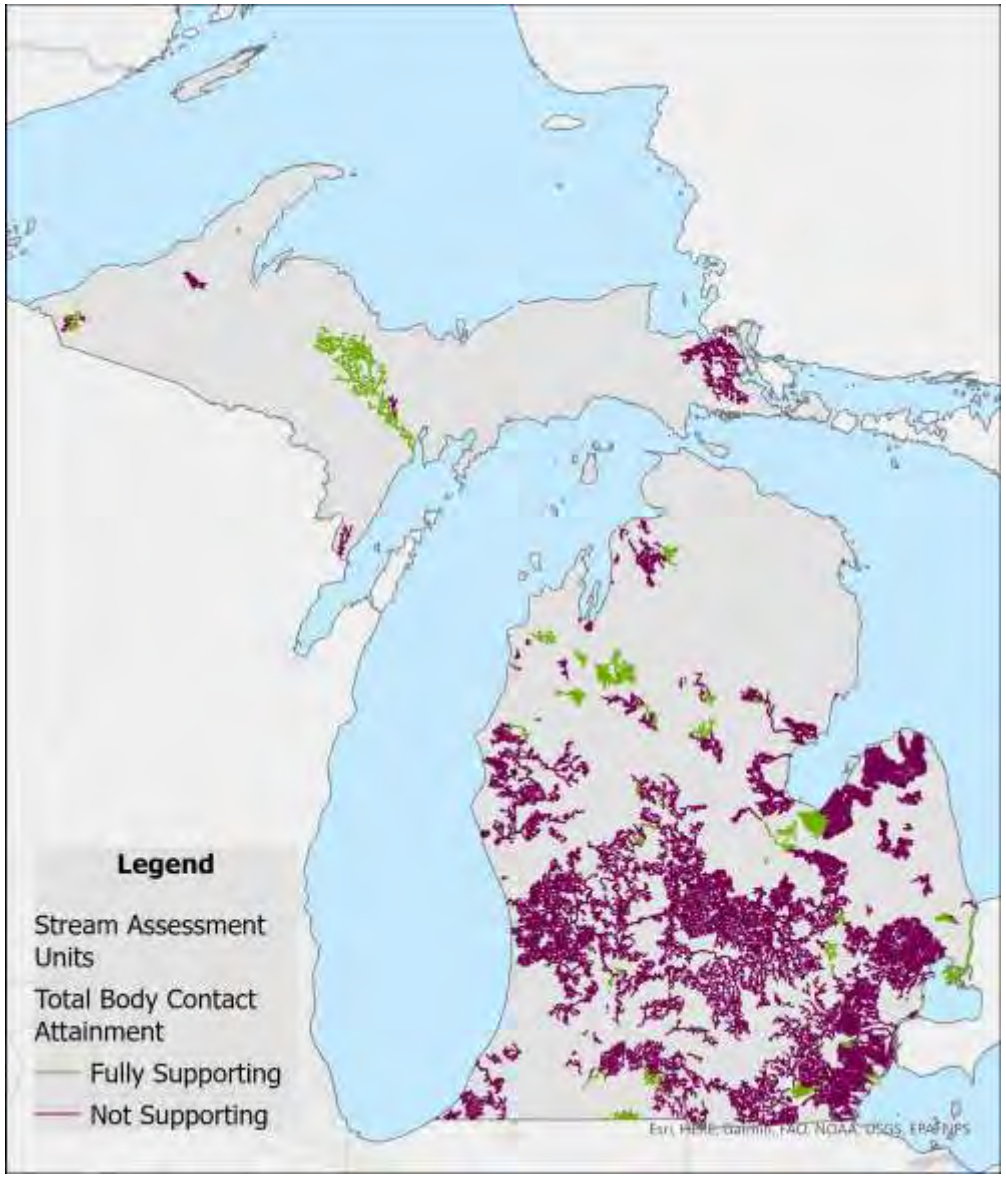
- Partial body contact – year-round
  - **1,000 *E.coli* per 100mL**
- Total body contact – May 1-October 31
  - **300 *E.coli* per 100mL as a daily max.**
  - **130 *E.coli* per 100mL as a 30-day geometric mean**

DAILY GEOMETRIC MEAN

Three samples minimum needed, no matter how small the stream

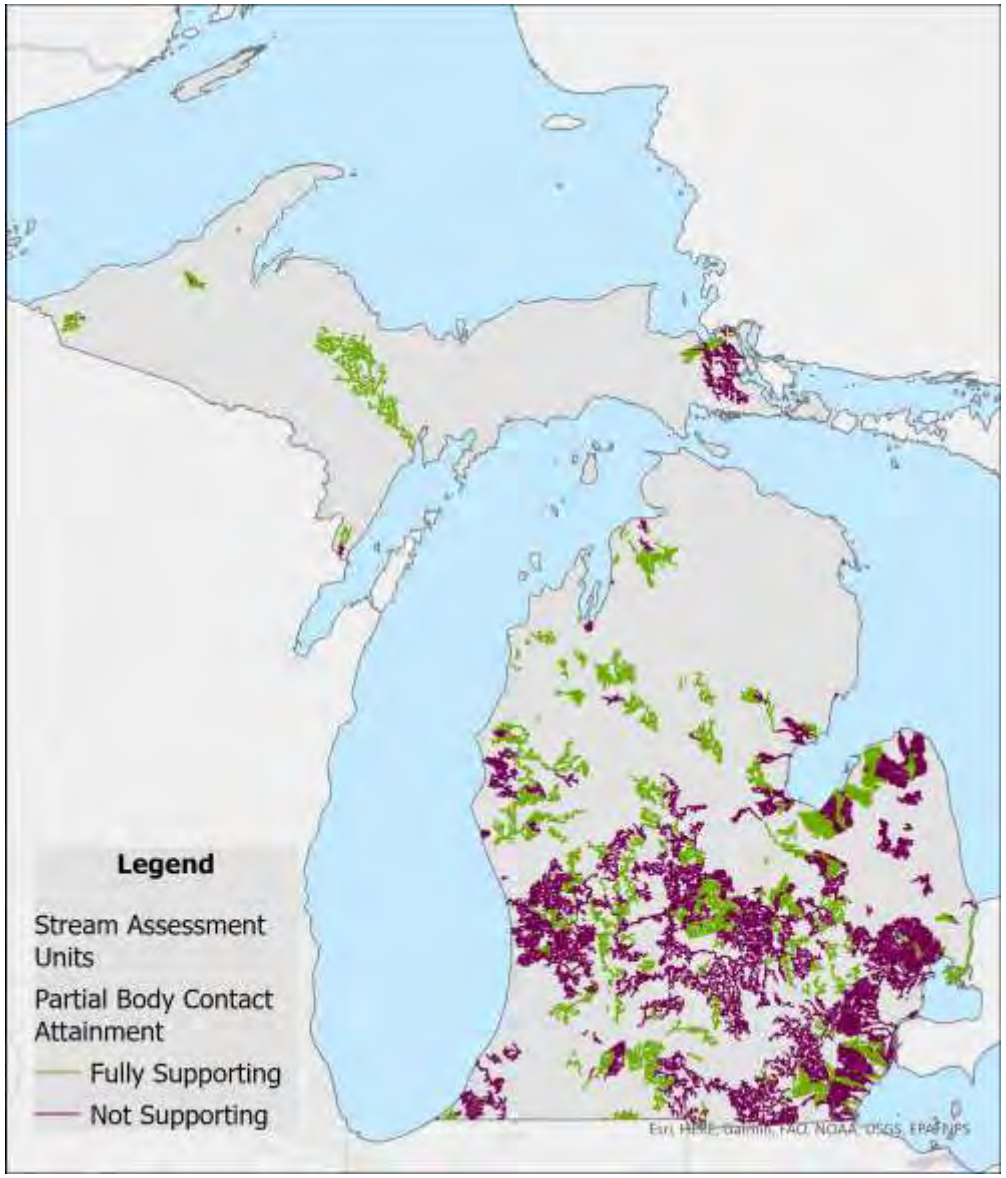
Total Body Contact Impaired Waters

- "Bad"
- While many waters are impaired by E. coli, looking at "how bad" is the next logical step
- Do they exceed the daily standard of 300?
- Do they exceed only the 30-day standard of 130?
- Do they exceed the standard only during wet weather?



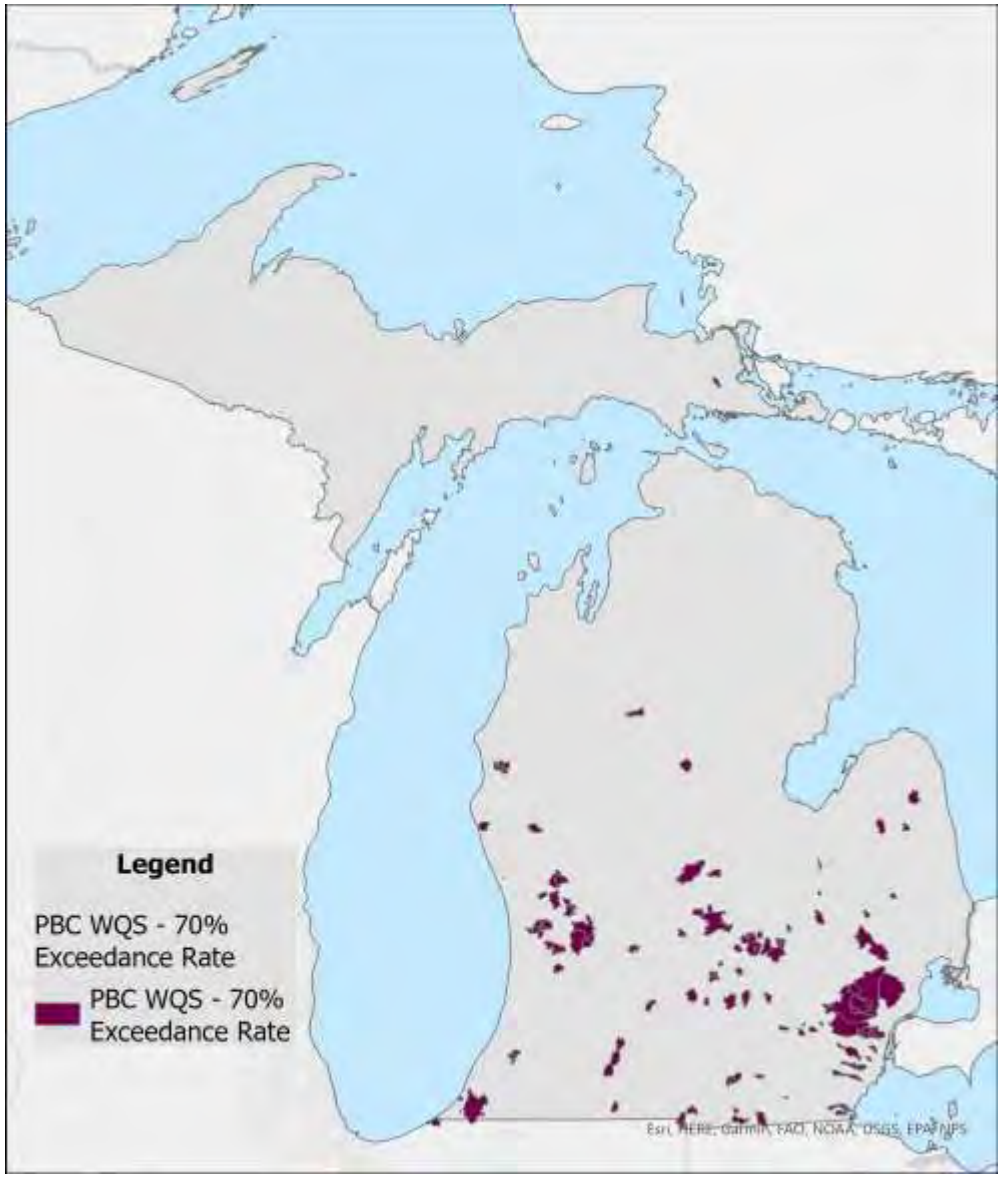
Partial Body Contact Impaired Waters

- "Very Bad"
- Many fewer waters are impaired for Partial Body Contact (E coli above 1,000 per 100mL)
- Of these… how bad are they?
- Do they exceed 1000 all the time?
- Are they 1,200 or 12,000?



Partial Body Contact Priority Waters

- "Super Bad"
- We have chosen a 70% exceedance rate to focus on for prioritization purposes.
- Some of these have already had additional monitoring
- Some will get more monitoring by EGLE, including DNA/qPCR analysis
- Some have grants ($$) focusing on fixing them
- Some are due to regulated point sources or illegal discharges (EGLE is responsible for these issues)



E. coli in and Around Lakes

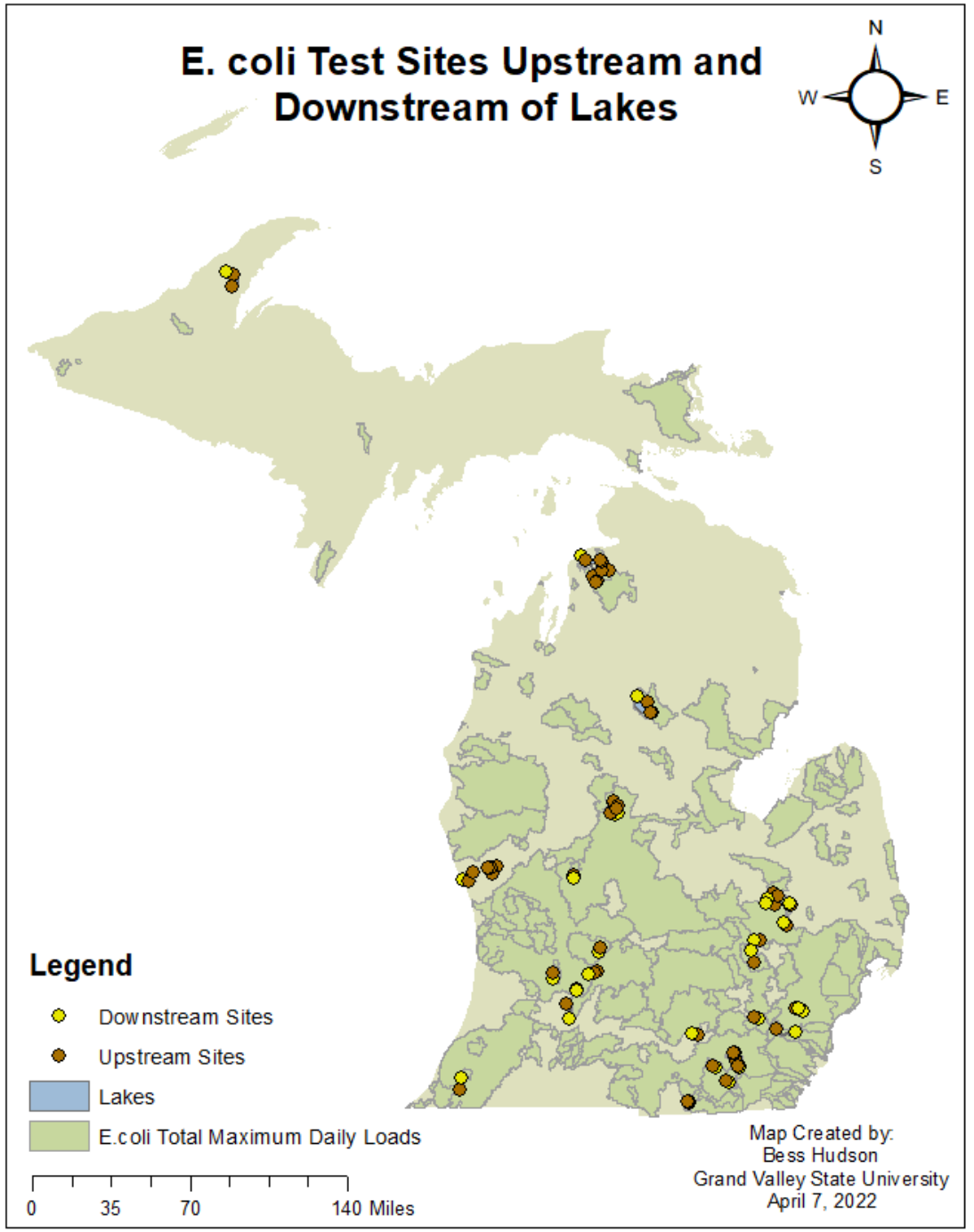
- These bad, really bad, and super bad rivers and streams enter lakes and ultimately the great lakes
- They cause beach closures and carry a higher risk of illness

Study of E. coli concentrations up- and downstream of lakes

Bess Hudson

Grand Valley State University

GIS/Mapping and Statistics Project



It's all in the data

of lakes studied

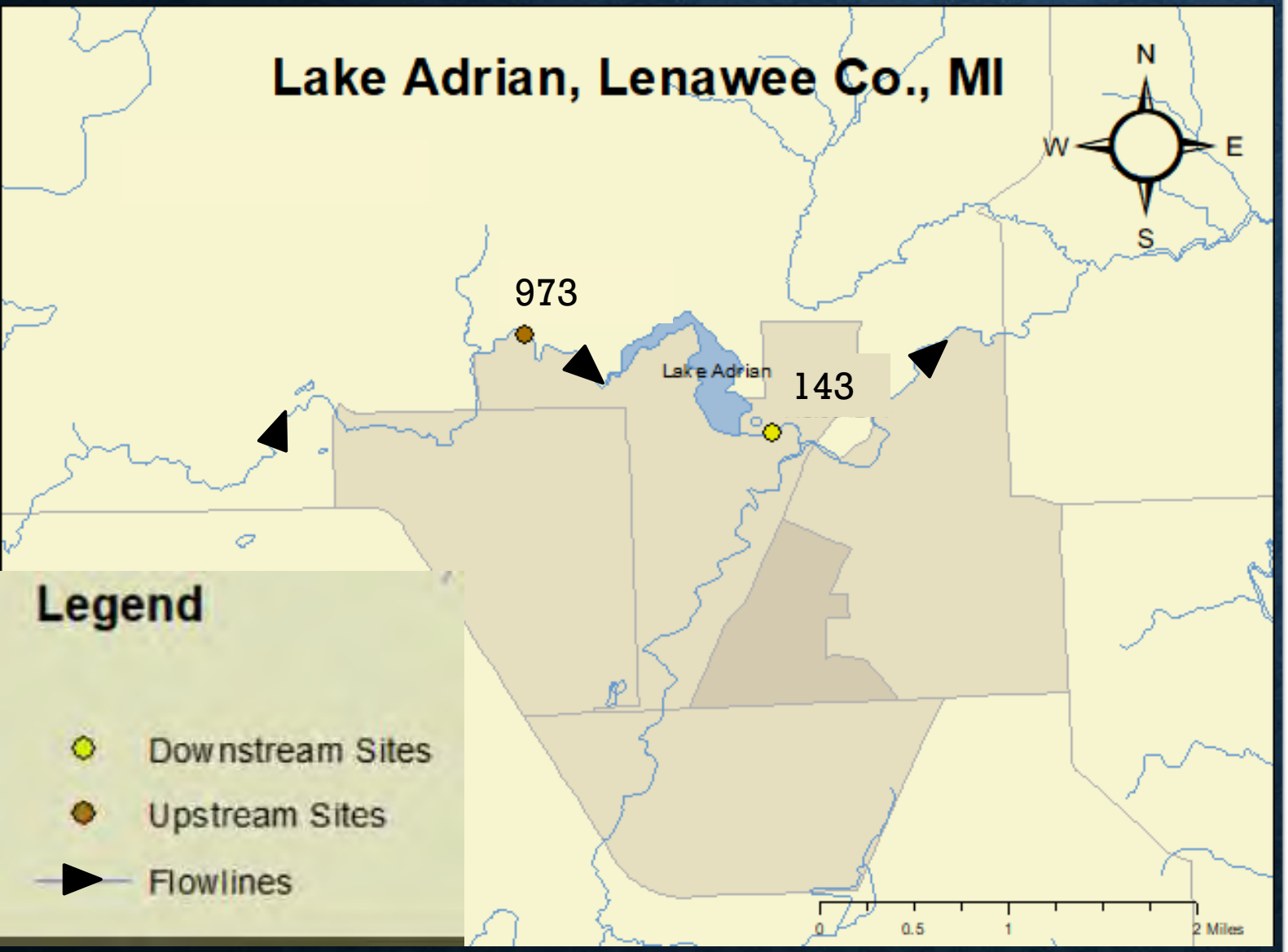
Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Upstream	741.1512	32	887.76444	156.93606
	Downstream	96.2504	32	142.95943	25.27190

Paired Samples Test

		Paired Differences							
					99.9% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Upstream - Downstream	644.90074	862.56243	152.48094	90.86792	1198.93357	4.229	31	000

Average difference between inlets and outlets

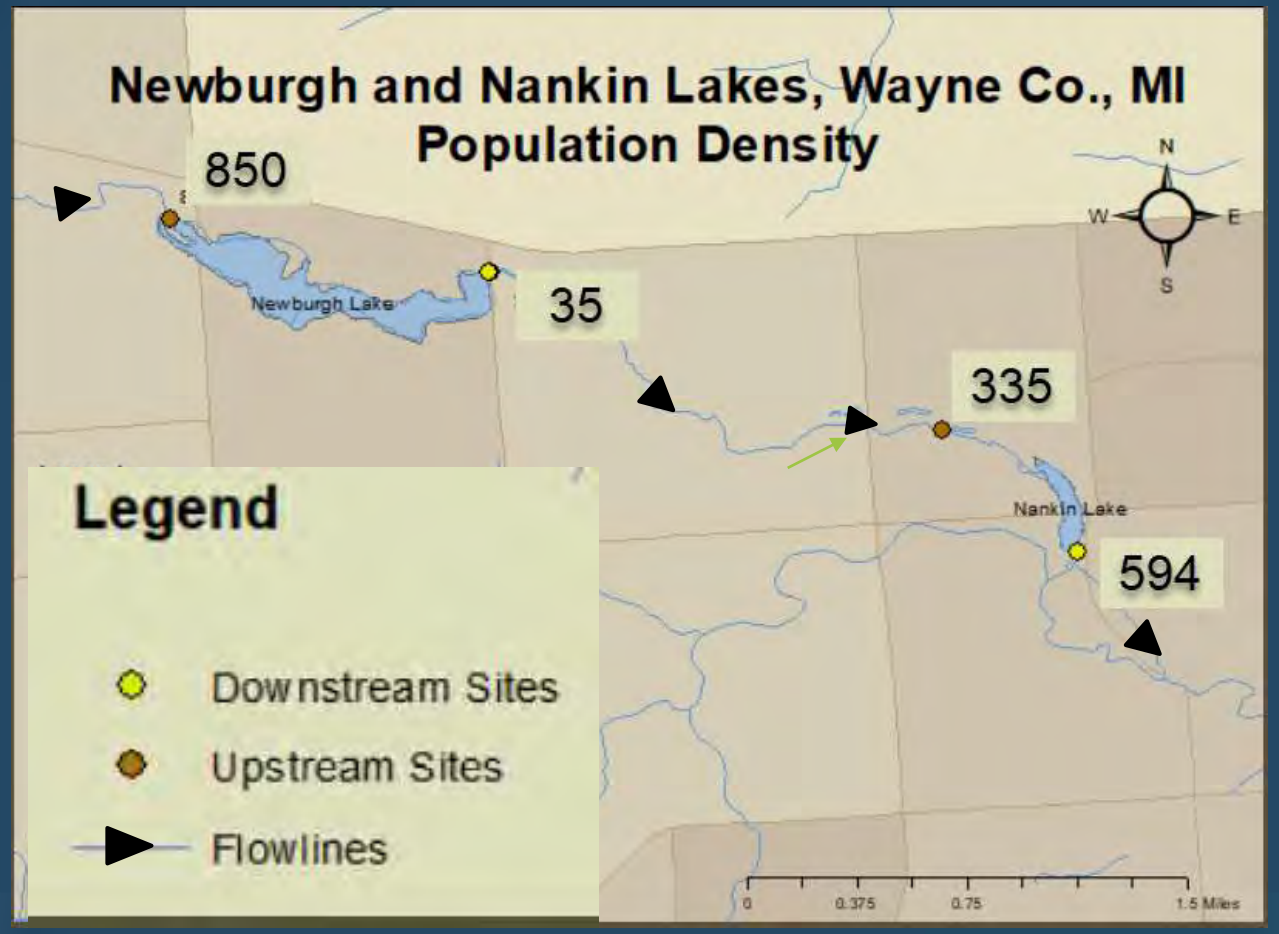


LAKE ADRIAN, LENAWEE

- Inlet E. coli : 973
- Outlet E. coli : 143

MONTEREY LAKE, ALLEGAN

- Inlet E. coli : 971
- Outlet E. coli : 146



EXCEPTIONS TO THAT RULE:

Nankin Lake, small narrow urban impoundment of the Rouge River (less than 8 acres)

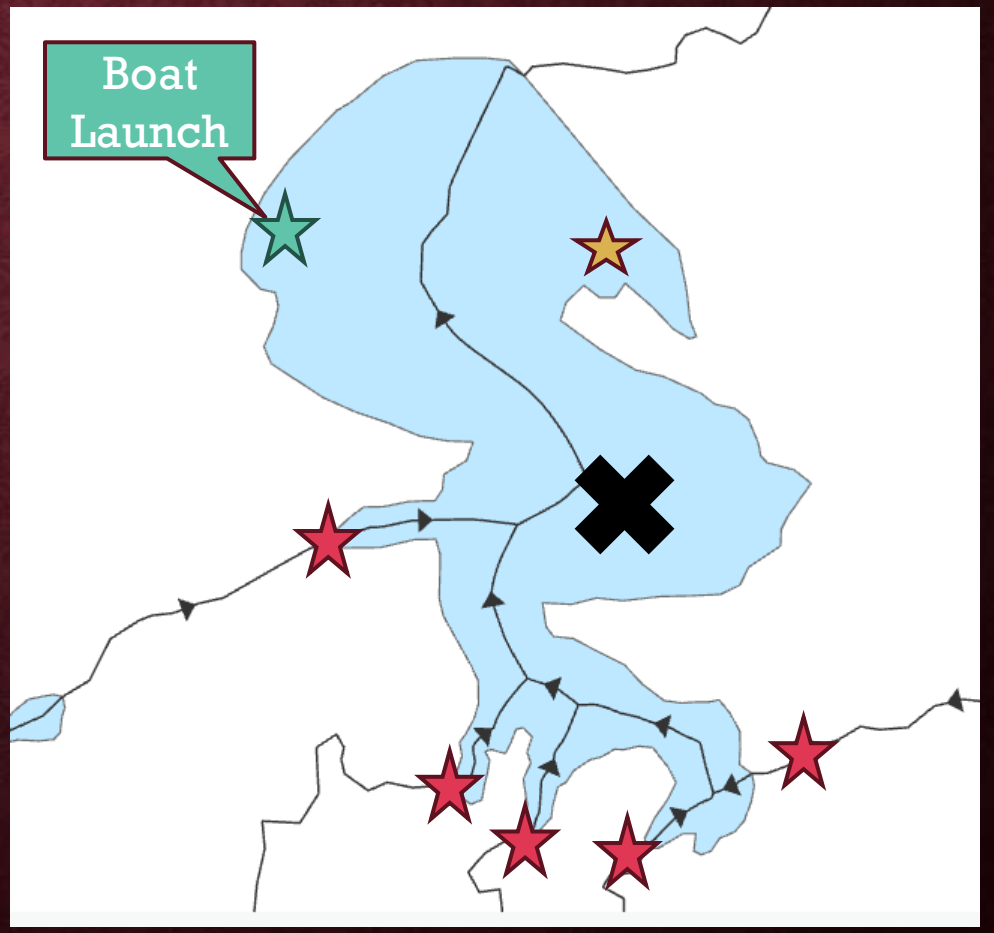
E. coli in and Around Lakes

- In addition to inlets, sources directly around the lake also contribute.
  - Failing septics (high water tables!) lakes are generally a terrible place for a septic system.
  - Adjacent landuse.
  - Nuisance wildlife.
  - Pet Waste.

View the *E. coli* EnviroMINUTE video

IF I WERE TO SAMPLE A LAKE, WHERE WOULD I DO IT?

- Near or in the inlets
- Embayments where stuff gets trapped (but only if people recreate there).
- Where people recreate (choose a few docks, or maybe an installed diving platform/raft if there is one).
- Avoid sampling the center of the lake.
- Remember that public bathing beaches are the realm of the local health department.



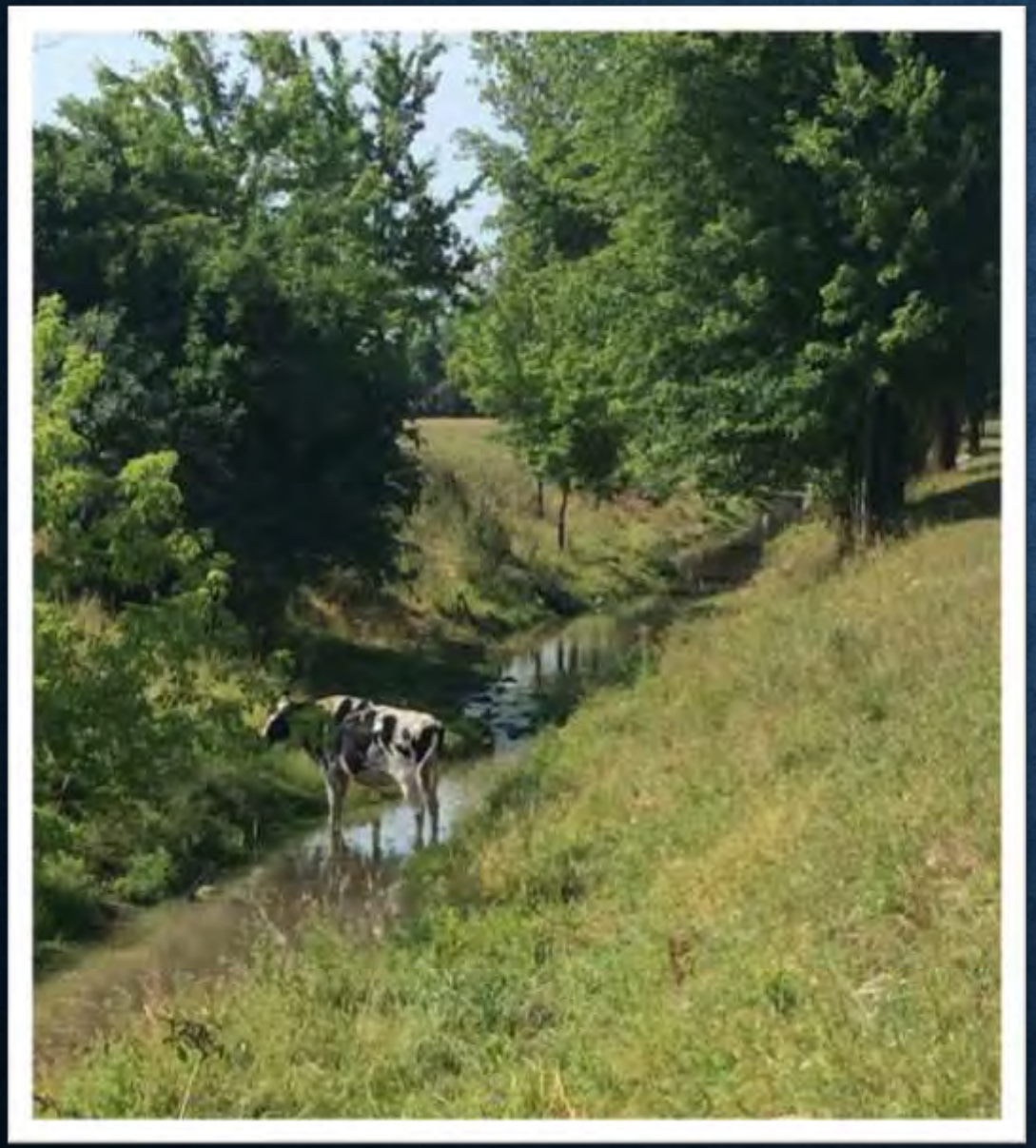

There is no poop fairy
yourself!!
Please clean up after yo og
DOG WASTE ATTRACTS RATS AND TRANSMITS DISEASE.

Report Illicit Discharges

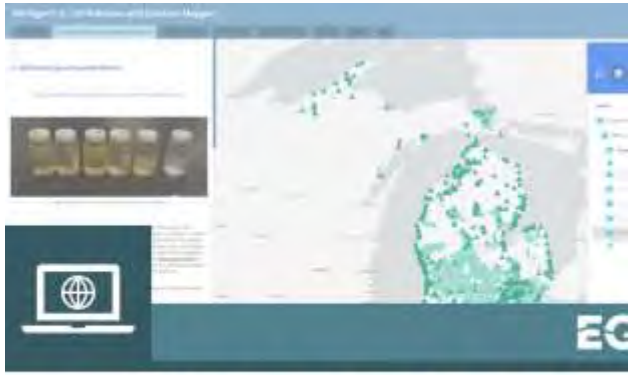
- Raw sewage is a SERIOUS human health concern
- Report anonymously!
- Call PEAS 800-292-4706 for 24-hour response

miwaters.deq.state.mi.us

Keep Livestock out of waterways!
Call 877-632-1783 or
email MDA-Right-To-Farm@michigan.gov




Fence



WEB APP

QUESTIONS, RESOURCES AND CONTACT INFORMATION

- Information on impaired waters: www.Michigan.gov/EcoliTmdl
- Interactive map of monitoring sites and sources:www.Michigan.gov/EcoliTmdl
- General *E. coli* information and resources: www.Michigan.gov/EgleEcoli
- Molly Rippke, Aquatic Biology Specialist (non-beach *E. coli*)
  - Email me: rippkem@michigan.gov