Statewide Efforts to Reduce

*E. coli* in Surface Waters

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MICHIGAN WATER QUALITY STANDARDS FOR *E. coli*

- *E. coli* is our indicator of fecal pollution
- Designed to protect human health
- Partial body contact – year-round
  - 1000 *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
What are the sources of *E. coli*?

- **Point sources** – regulated by NPDES permit
- **Nonpoint sources** – not regulated by NPDES permit
Regulated (CAFO) and unregulated
Surface water and storm sewers
Regulated and unregulated
Normal effluent (disinfected)
Biosolids (treated)
CSOs must be controlled
SSOs (illegal)
Protect our Beaches,
Protect me!
"All rivers lead to the beach"
The DEQ estimates that about 50% of Michigan rivers are impaired (extrapolated from random sites).
Study Design

• Methods
  • Completely random site selection done by the USEPA with the goal of making statewide conclusions on water quality
  • 50 sites per year - 2009, 2011, 2012 or 2013
  • Each site monitored 4 times (May, July, September, and November)
What watershed characteristics were correlated with HIGHER E. coli?

- Agricultural land cover ($r=0.59$)
What watershed characteristics were correlated with HIGHER *E. coli*?

- Low Density Developed land ($r=0.37$)
- All Dev. Land Combined? ($r=0.29$)
What watershed characteristics were correlated with HIGHER E. coli?

- Population Density ($r=0.53$)
What watershed characteristics were correlated with LOWER E. coli?

- Forested Land  
  \( r = -0.63 \)
Cannot solve the problem if we do not know what is causing it.

Options:

• Canine Scent Tracking for human sewage
• DNA/qPCR
Maple River
Courtesy of Clinton County Conservation District – CMI Funded Project
Upper Looking Glass
Courtesy of Shiawassee County Conservation District –
Project Funded by a SAW Grant
Misteguay

Courtesy of Shiawassee County Conservation District – Project Funded by a SAW Grant
DNA/QPCR
qPCR results for E. coli are a better predictor of illness than the culture method.
But...we don’t have a ‘target’ for qPCR yet (because the units are different than the culture method)
DNA/qPCR for Source Tracking

- Compares DNA (dead or alive) of sample to a library of known samples
- Very good at telling us what the cause is... not very good at telling us what the cause IS NOT
HUMAN, RUMINANT, BOVINE, GOOSE AND SWINE

Human at all Sites
HUMAN, RUMINANT, BOVINE, GOOSE AND SWINE
HUMAN, RUMINANT, BOVINE, GOOSE AND SWINE
HUMAN, RUMINANT, BOVINE, GOOSE AND SWINE
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Reasons that DNA may not show up:

• It can decompose
• Dead DNA is harder to detect than ‘living’ (culturing living bacteria prior to DNA analysis can amplify the signal.... Not so for dead stuff)
• Maybe it settles out with the sediment
• Maybe it didn’t end up in your sample jar
• Maybe it was never there and isn’t a source (You won’t know unless you sample more)
What is the DEQ doing about this problem?
Investing in solving it!
What is the DEQ doing about this problem?

qPCR:
• Ten labs statewide now use DEQ-provided equipment to test surface water using the qPCR method
• Making progress on real time beach monitoring right now...eventually, this equipment can be used in more advanced source tracking techniques
In 2016 we are developing a Statewide *E. coli* Total Maximum Daily Load
A Total Maximum Daily Load

- List potential sources
- Summarizes data
- Informs everyone what we are doing about each type of source
- Makes recommendations
- Provides info. on resources
Statewide *E. coli* TMDL

- A statewide approach will speed up needed pollutant reductions in POINT SOURCE (NPDES permits) by decades
- Open up the discussion to find statewide solutions and approaches to tackle major issues
Source Assessment

- Describe each source type spatially across the state
- Describe conditions which lead to problems (proper vs. improper practices)
Reasonable Assurance

- Describe all regulations and voluntary programs that may help fix the problem
- May include special NPDES permit requirements to control the pollutant
559 Septic Systems
Resources for Fixing Problems

Water and Waste Disposal Loans/Grants (USDA)

Stormwater, Asset Management, and Wastewater (SAW) Program
www.Michigan.gov (search for “SAW Grant”)

Clean Water Act Section 319 Grants
www.Michigan.gov/nps

Search the Federal Database of Grant/Loan opportunities here:
https://ofmpub.epa.gov/apex/watershedfunding/f?p=fedfund:1

Links to other funding sources can be found on www.Michigan.gov/nps
ARE WE DOING ALL WE CAN DO?
Go to www.Michigan.gov
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