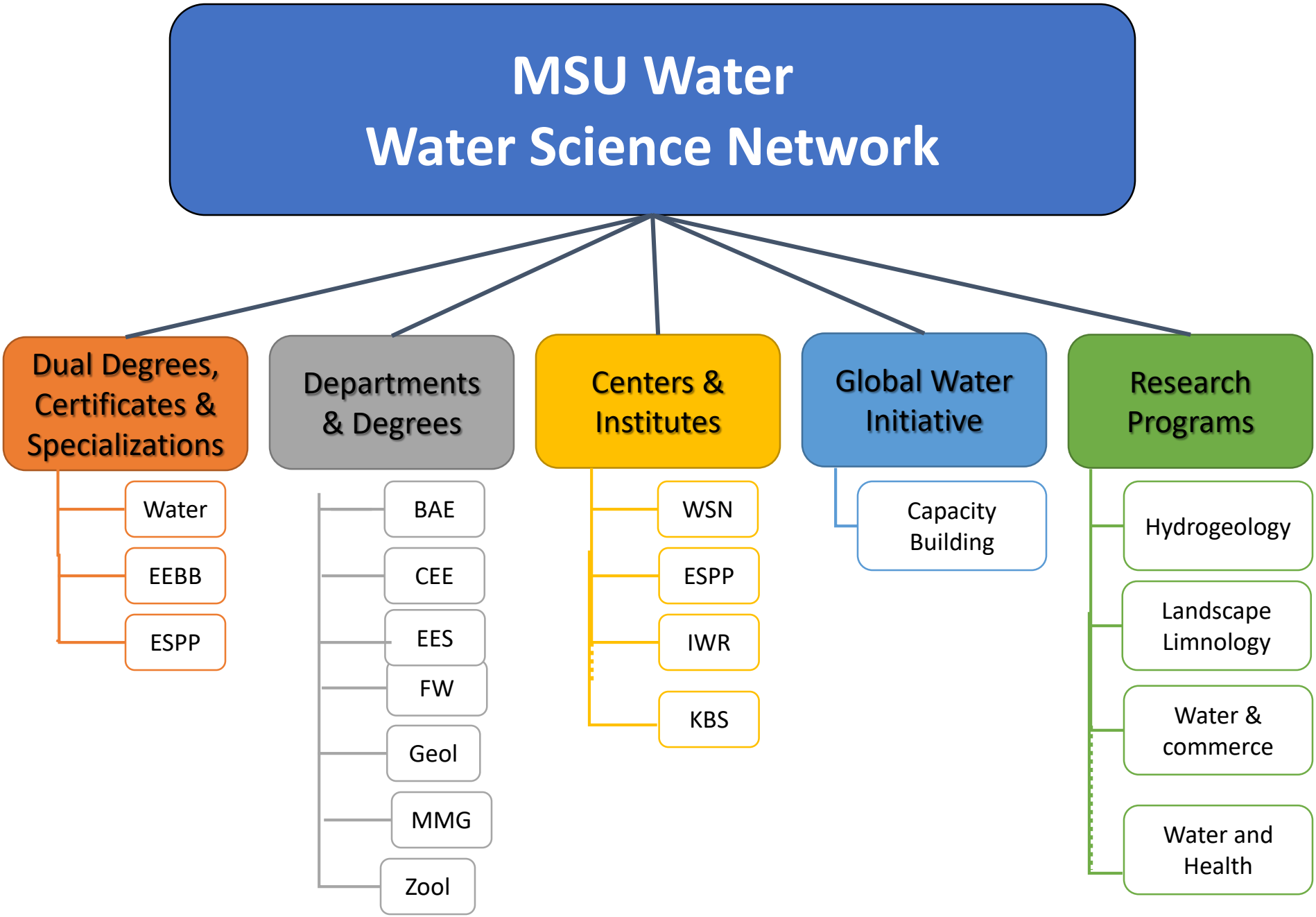
MSU Water

Promoting Science, Technology, Education and Collaboration


MSU Water
Water Science Network
Dual Degrees, Certificates & Specializations
Water
EEBB
ESPP
Departments & Degrees
BAE
CEE
EES
FW
Geol
MMG
Zool
Centers & Institutes
WSN
ESPP
IWR
KBS
Global Water Initiative
Capacity Building
Research Programs
Hydrogeology
Landscape Limnology
Water & commerce
Water and Health

Creating MSU Water : A Graduate Curriculum

- Interest in a water curriculum by faculty began back in 2013
- Goal: Attract high quality students & advance water science
- Doctoral dual major degree

Potential Cross- and Sub-Themes

Water Security

Water Science

Water Technology

Water Diplomacy

Water Use – Climate Change – Resource Management

KEY AREAS of Excellence

- Nature and People
- Water and Health (pollutants, stormwater, animal health, invasive species, beaches)
- Water Training and Teaching Laboratories.
- Ecosystem Services (wetlands, groundwater-surface water, shoreline)
- Clean-Smart Water Technologies (water testing, water treatment, waste water, animal waste)
- Precision Ag


People and Nature
Changing attitudes to better the environment and human health
Janice Albers, Aimee Baier, Halil Dertli, Nicole Watson

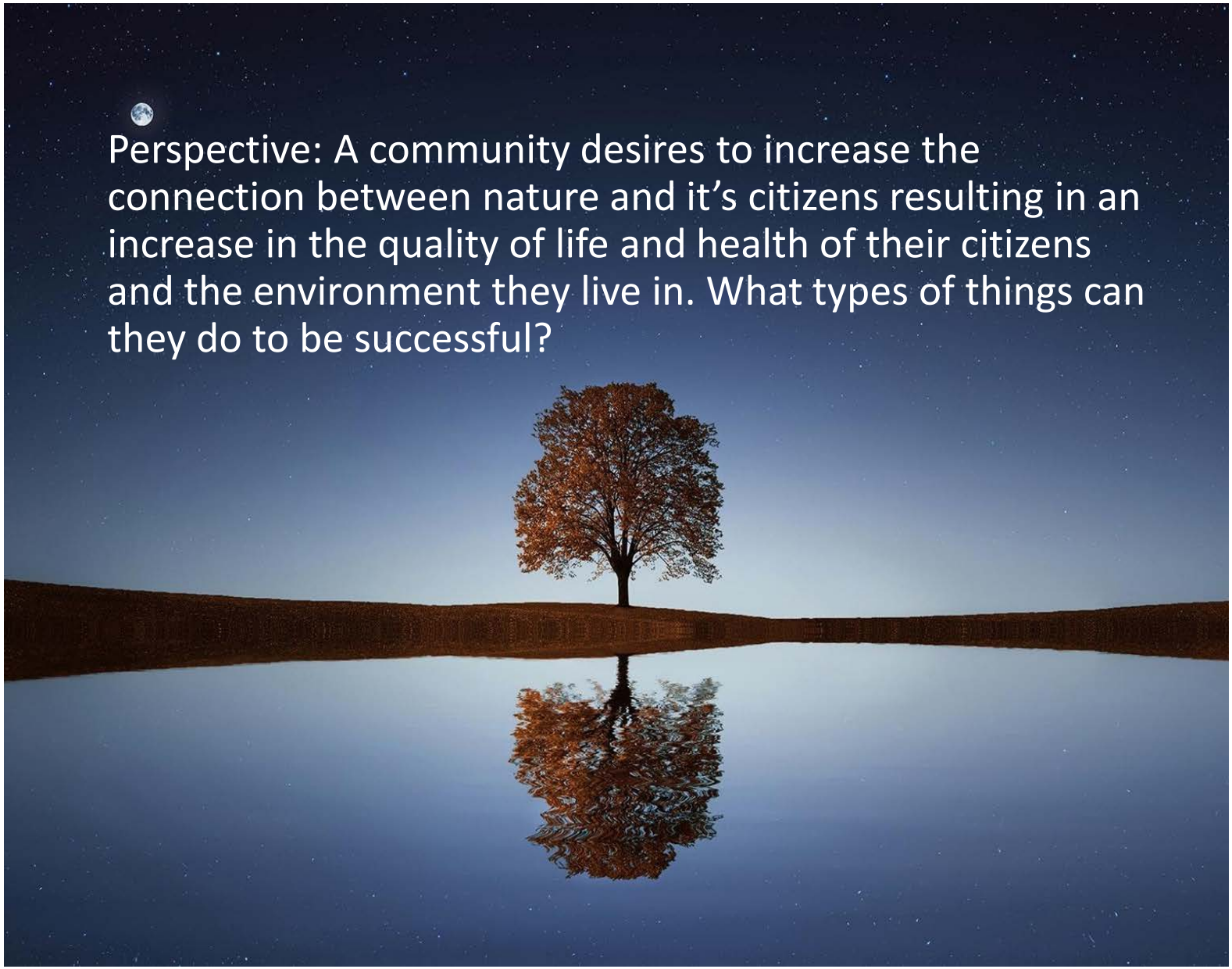
Positive relationships with nature

- Psychology
- Healthy functioning

- cognitive, affective and social

- Precursors for physical human health
- Objective measures of human health

Kuo 2013; Twohig-Bennett 2018; Kaplan and Kaplan 2011


Perspective: A community desires to increase the connection between nature and it’s citizens resulting in an increase in the quality of life and health of their citizens and the environment they live in. What types of things can they do to be successful?

Nature-Based Solutions

for sustainable ecosystems and water resource management, addressing socio-environmental challenges.

Sustainable science for managing aquatic, coastal or wetlands systems to tackle issues such as disasters (e.g., floods), water pollution, water and food security, or ecological & human health.

NEED:

- >50% of world pop near a major river or coastline.
- Amongst the various ecosystems, coastal systems and wetlands are under the greatest threat.
- Wetlands are disappearing at alarming rate, putting wildlife, fisheries and humans at risk from floods and pollution.
- UN World Water Development report emphasis on nature-based solutionsr.


Risks & Health Issues

WQP MAGAZINE PRODUCTS STOREFRONTS DEALERS COMMERCIAL

NOV 26, 2018

ELEVATED LEAD LEVELS FOUND IN BENTON HARBOR, MICH.

10 homes have found lead levels double the federal action level in drinking water

Elevated lead levels discovered in drinking water

Elevated lead levels in drinking water have been found in Benton Harbor, Mich. While the city was put under an advisory for its drinking water results in October, additional homes have detected lead above the federal action level of 15 ppb.

An additional 27 out of 159 homes tested found lead levels above the federal action level, with 10 of those homes reporting lead more than double the action level.

News

Disturbing Discoveries In Toronto's Waters Indicate Why E. Coli Levels Are Still So High

The water pollution in the Toronto Harbour is worse than ever.

to require water testing in schools passes committee

contaminants

hemical contaminants into
er investigation.

an Industrial Pretreatment

Act that show that 16 of
rial sources of

THE HILL

US water security falls short

BY SERA YOUNG, OPINION CONTRIBUTOR — 11/18/18 03:00 PM EST
THE VIEWS EXPRESSED BY CONTRIBUTORS ARE THEIR OWN AND NOT THE VIEW OF THE HILL

29 SHARES

SHARE

Homeless People Dying Of Hepatitis A

EMAIL FACEBOOK LINKEDIN TWITTER

By *Alex Berezow* — *November 2, 2018*

Credit: Storyblocks

The homelessness crisis in several major cities across the United States is a national embarrassment. And the news keeps getting worse.

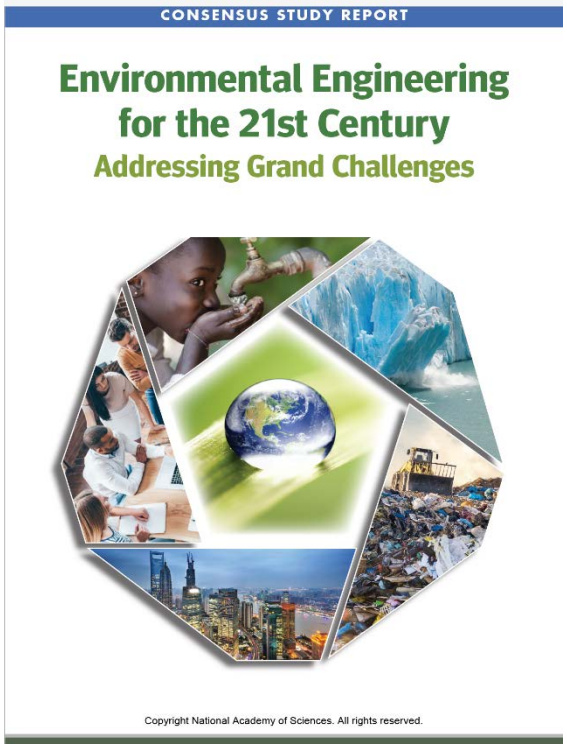
Beginning in November 2016, the homeless population in San Diego underwent an outbreak of hepatitis A that just now ended, according to the *San Diego Union-Tribune*. During that two-year-long nightmare, more than 600 people got sick and 20 died.

Hepatitis A Outbreaks Hit Four U.S. States, Killing 41

CDC reports that four states in 2017 (California, Michigan, Utah, and Kentucky) experienced outbreaks of hepatitis A, 1,521 people got sick and 41 died. (All of the deaths occurred in California and Michigan).

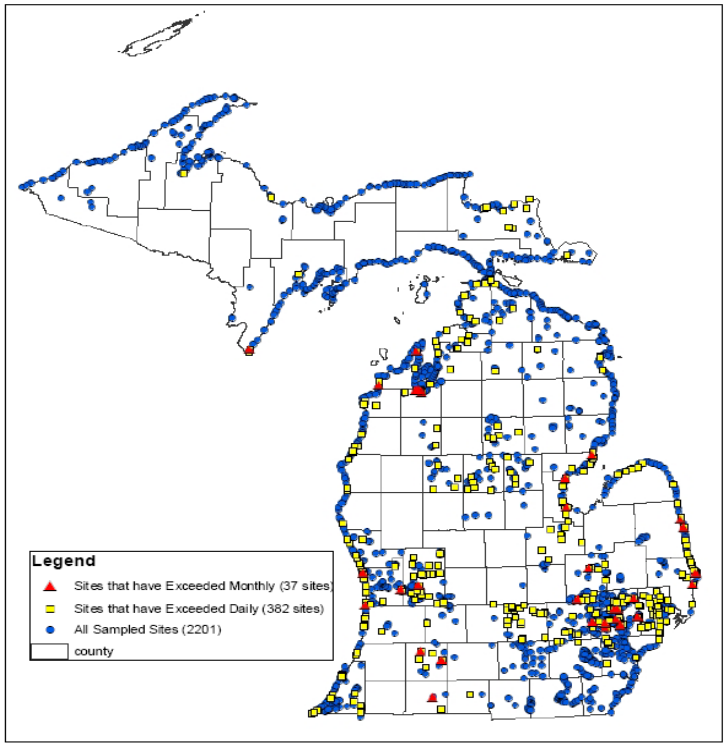
Explosion of Discovery

- 30 States have now found PFAS in their drinking water
- The Global Horizon Scanning Project (GHSP) is an innovative initiative that aims to identify important global environmental quality research needs
  - Antibiotic resistance
  - Toxic algal blooms
- NAE Grand Challenges
  - Design a future without pollution
    or waste
  - Water Infrastructure
- Michigan Water Rich- Data Poor

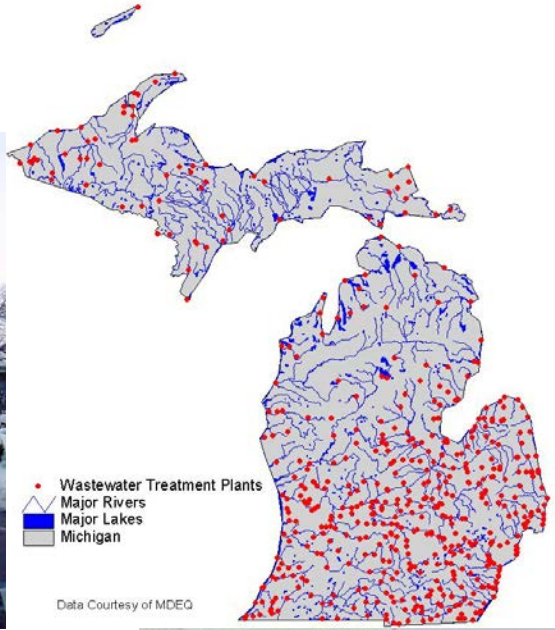


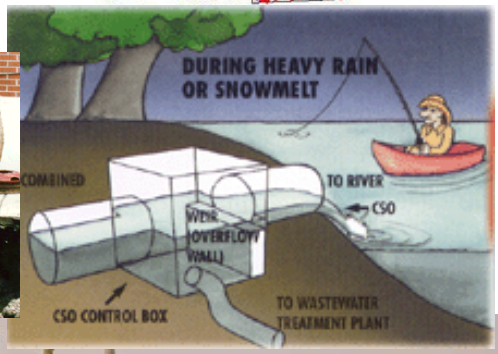
Michigan's challenges

Sites Exceeding *E.coli* Standard

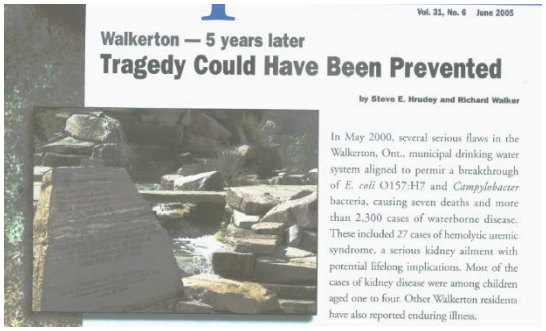


Wastewater Treatment Plants
vs.
Major Rivers and Lakes





Waterborne pathogens threaten human health in the Great Lakes region


Vol. 31, No. 6 June 2005

Walkerton — 5 years later

Tragedy Could Have Been Prevented

by Steve E. Hrudey and Richard Walker

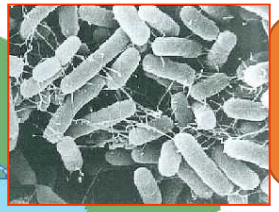
In May 2000, several serious flaws in the Walkerton, Ont., municipal drinking water system aligned to permit a breakthrough of *E. coli* O157:H7 and *Campylobacter* bacteria, causing seven deaths and more than 2,300 cases of waterborne disease. These included 27 cases of hemolytic uremic syndrome, a serious kidney ailment with potential lifelong implications. Most of the cases of kidney disease were among children aged one to four. Other Walkerton residents have also reported enduring illness.

Jul 22, 2010 **Norovirus Outbreak Sickens 100 and Closes Park in Michigan**

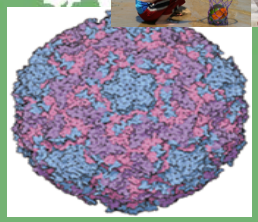
Grand Rapids, Michigan's Millennium Park closed early for cleaning Wednesday evening after an outbreak of Norovirus sickened about 100 people last weekend. The Kent County Health Department says test results received Wednesday confirmed that some of the park visitors suffered from Norovirus after visiting the park on Friday or Saturday. But tests indicated the park's water bacteria level measured safe. Health workers are still trying to ascertain the virus source.

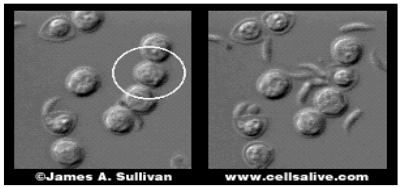
Kent County Millennium Park

Beach and Splashpad



E.Coli *0157H7 and* Campylobacter





Cryptosporidium

Norovirus

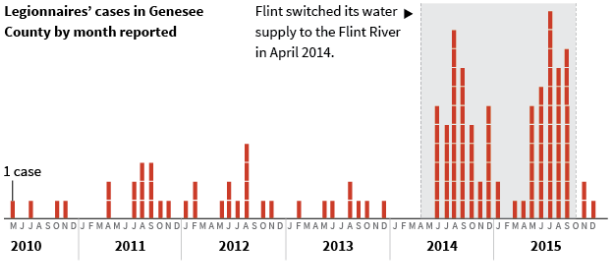
A sample glass of Lake Erie water is photographed near the Toledo water intake crib in Lake Erie. (Haraz N. Ghanbari/Associated Press)

No official link has yet been detected between the city's water supply switching to the Flint River and the uptick in cases, but dozens have been sickened since April 2014.

City's water supply was switched back to Lake Huron.

Legionnaires' cases in Genesee County by month reported

Flint switched its water supply to the Flint River in April 2014.



Note: Monthly case values are approximated for May/June 2015 and August/September 2015.

Legionella

Campylobacter, Arcobacter, Giardia

Toxic Algal blooms

Ohio blames groundwater for Lake Erie island outbreak

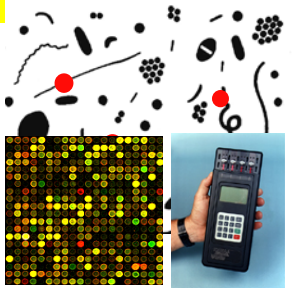
Tuesday, February 22, 2005

MICHIGAN STATE UNIVERSITY

Risk & Communication

- Risk assessment and management

Water quality diagnostics
Contaminant databases



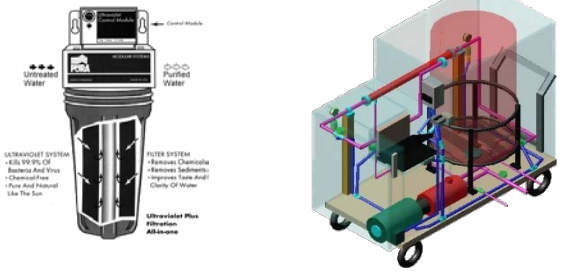
Target organisms
- Genetic variation
- Detection technologies

Water Safety

Environmental Sources and Fate

Surface water, groundwater, distribution system
- Disinfection/deactivation
- Modeling for decision support system

Innovative Technology



Flexible control technologies (physical and temporal scales)

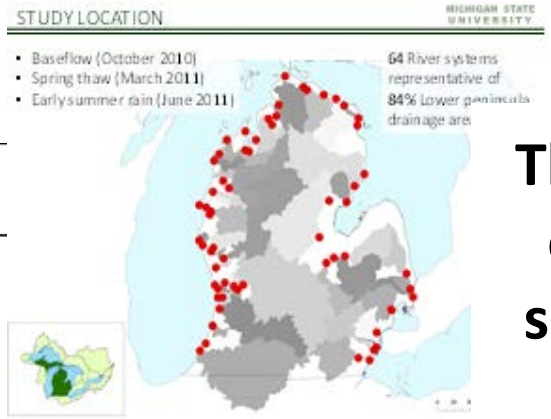
Risk Frameworks

Network of Michigan qPCR Labs

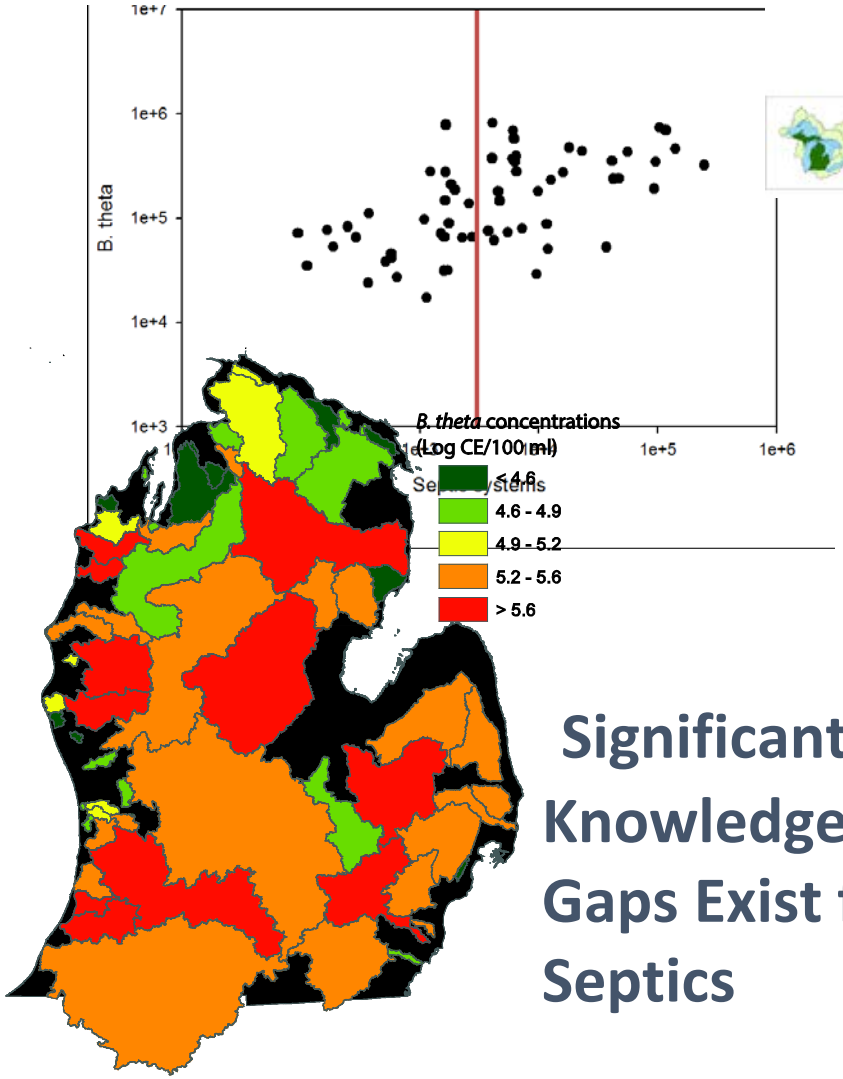
Dr. Shannon Briggs: DEQ-MSU partnership Water Quality Training and Teaching lab

Marquette Area Wastewater Treatment Plant
Lake Superior State University
Northwest Michigan Regional Lab
NPS- Sleeping Bear Dunes
Central Michigan Health District
Ferris State University
Saginaw County Dept of Public Health
Saginaw Valley State University
Grand Valley State University
Hope College
Kalamazoo County Health & Community Services
Michigan State University
USGS- Lansing
Oakland County Health Department
Oakland University

MICROBIAL SOURCE TRACKING



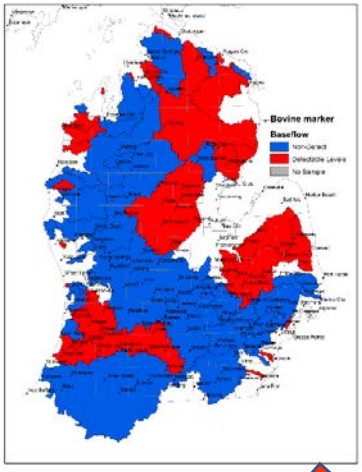
The distribution of the human sewage marker *Bacteroides*

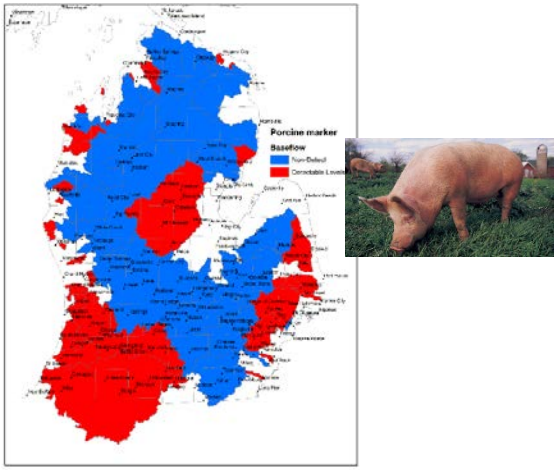


- Increasing *B. theta* related to more septic tanks

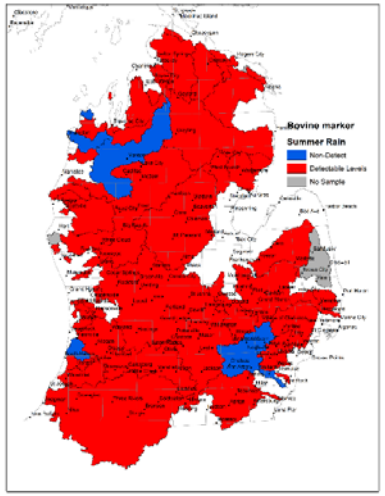
Significant Knowledge Gaps Exist for Septics

Transport of animal feacal source tracking markers during summer rains 64 watersheds

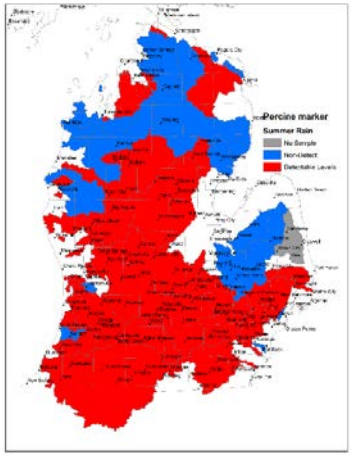




a) Base flow



b) Summer rain



Vision: What if?

We had more…

- Water Business R&D Centers
- Water Quality and Health Laboratories
- Advanced Water Technologies Test Beds
- 21st Century Farms
- Urban-Water Beautification and Green Centers
- Public Education Water Networks

Recommendations

- To achieve "Safe Water"
  - Continue to invest in the Advanced Water QualityDiagnostic Labs.
  - Use new water diagnostic tools such as molecular source tracking tools.
  - Promote and ensure community engaged research.
  - Build monitoring data bases, groundwater and distribution systems have been neglected.
  - Improve understanding of the impacts of septic tanks, blending wastewater facilities, and storm water on water quality.
  - Build Innovative pilot systems. Join the National Technology Testbed Network.
  - Use a Risk framework to develop better policies and move science into practice.

Acknowledgements:
W**ater Curriculum Committee**

- Kelly Millenbah, CANR
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- Meredith Gore, FW
- Dana Infante, FW
- Lifeng Luo, Geography, Environment, & Spatial Sciences
- Xiaobo Tan, Electrical & Computer Engineering
- Jay Zarnetske, Earth & Environmental Sciences

THANK YOU

Learning Outcomes

- Integrate concepts from multiple disciplines to address water-related issues and ideas
- Create appropriate inquiry protocols to investigate water-related issues and ideas
- Employ a systems perspective to understand the scale & scope of water-related issues and ideas
- Generate new insights & recommendations related to water issues and ideas
- Evaluate the disciplinary, cultural, and contextual uses and bias of data, methods, and solutions
- Analyze the purpose, role, & influence across a range of water-related organizations (e.g., governmental, non-profit, profit)
- Approach water-related issues, ideas and decision-making, including trade-offs, with an eye for power and equity
- Model conflict management and dialogue skills as means of engaging with diverse people & perspectives
- Design communications appropriate for academic, professional, lay, and student audiences & contexts
- Interpret common data related to water–related issues and ideas