



Civil & Environmental Consultants, Inc.

Toledo Water Crisis & Emergency Planning for Treatment Plants

**OWEA PLANT OPERATIONS AND LAB ANALYSIS
WORKSHOP**

OCTOBER 2015



PRESENTED BY:

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CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC)



Reference



 **wef** special publication



Civil & Environmental Consultants, Inc.

Purpose

- ▶ **Why Do Utilities Need An Emergency Response Plan?**
 - Minimize Risk
 - Minimize Disruption of Services
 - Protection of Public Health and the Environment
 - Enable a Better and Quicker Response
 - Minimize the Chaos

- ▶ **Remember – A Good Plan Today Is Better Than The Best Plan Tomorrow**



Types of Hazards

- ▶ **Industrial**
 - Fire
 - Chemical
 - Radiation
- ▶ **Electrical Outages**
- ▶ **Communication and Technology Failures**
- ▶ **Supply Chain**
- ▶ **Transportation Accidents**
- ▶ **Natural**
 - Biological (algae contamination)
 - Geophysical (earthquakes)
 - Hydrogeological (floods, landslides)
 - Meteorological (hurricanes)
 - Climate (drought)
 - Human related (terrorism, criminal activity)
- ▶ **Conveyance Failures**
- ▶ **Multiple Hazards**



Japanese Tsunami: flooding, fires, electrical outages.....

Utility can have its own emergency plan or be a part of an overall disaster plan

Four Phases

- ▶ **Mitigation**
- ▶ **Preparedness**
- ▶ **Response**
- ▶ **Recovery**



Mitigation

- ▶ Preventing Future Emergencies or Minimizing Their Effects
- ▶ Identify Risk
- ▶ Includes Any Activities That Prevent an Emergency, Reduce the Chance of an Emergency Happening, or Reduce the Damaging Effects of Unavoidable Emergencies
- ▶ Buying Flood and Fire Insurance for your Home is a Mitigation Activity
- ▶ Mitigation Activities Take Place Before and After Emergencies.



Risk Assessment

- ▶ Hazards
 - ▶ Exposure
 - ▶ Vulnerability
 - ▶ Consequences
-
- ▶ Implement Control Measures

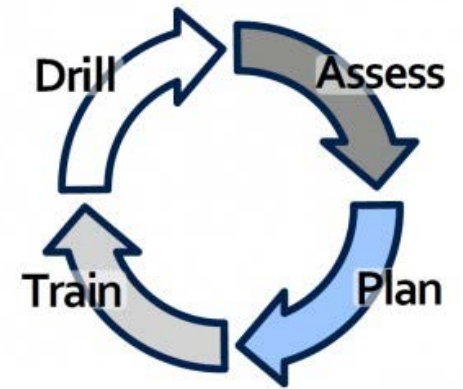


		Impact				
		Very Low 1	Low 2	Medium 4	High 8	Very High 16
Probability	Very High 5	5	10	20	40	80
	High 4	4	8	16	32	64
	Medium 3	3	6	12	24	48
	Low 2	2	4	8	16	32
	Very Low 1	1	2	4	8	16

Prepare

- ▶ **Develop Emergency Response Plan**
- ▶ **Connect With Emergency Management Agency**
- ▶ **Identify Response Roles and Responsibilities**
- ▶ **Allocate Resources**
- ▶ **Train And Practice Response and Recovery Plan**
- ▶ **Engage Public**

- ▶ **Effective response requires a good plan and knowing the plan**



Ohio Emergency Management Agency (EMA)

- ▶ **Focal Point for Emergency Planning and Response**
 - Federal and State Agencies
 - Ohio Environmental Protection Agency (EPA)
 - Ohio Department of Health
- ▶ **Conducts Review of County Plans Every Four Years**
- ▶ **Grants**
- ▶ **Training**
- ▶ **<http://ema.ohio.gov/>**



Water/Wastewater Agency Response Network (WARN)

- ▶ **Network of utilities helping other utilities to respond to and recover from emergencies**
- ▶ **Utilities can provide and receive emergency aid and assistance in the form of personnel, equipment, materials and other associated services as necessary from other water/wastewater utilities**
- ▶ **www.awwa.org/resources-tools/water-knowledge/emergency-preparedness/water-wastewater-agency-response-network.aspx**
- ▶ **OHWARN – WARNs Region V**
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Regulatory Requirements

Plan	Regulatory requirements
Facility Response Plan (FRP)	40 CFR 112.20
Spill Prevention Containment and Countermeasure Plan (SPCC)	40 CFR 112.3-12
State, Local, and Regional Oil Removal Contingency Plans	40 CFR 109.1-6
Stormwater Pollution Prevention Plan (SWPPP)	40 CFR 122.26
RCRA Contingency Plan	40 CFR 264.50-56
Risk Management Plan (RMP)	40 CFR 68.150-195
Process Safety Management (PSM) Plan	29 CFR 1910.119
OSHA Emergency Action Plan (EAP)	29 CFR 1910.38
OSHA Fire Prevention Plan	29 CFR 1910.39



Response

▶ Relentless Number of Decisions Have to be Made Early

▶ Incident Response Phases:

- Initial
 - Notification
 - Immediate Response
 - Unified Command Meeting
- Operational Planning Period
 - Tactics Meeting
 - Planning Meeting
 - Operational Brief
- Iterative Operational Planning
 - Execute
 - Assess
 - Begin Cycle Again



Congress Holds Hearing On Algae Contamination Of Lake Erie Drinking Water



WASHINGTON, D.C. - A Lake Erie algae outbreak this summer that rendered Toledo area tap water undrinkable spurred a U.S. House of Representatives subcommittee on Wednesday to examine what's being done to address problems.



Recovery – Key Functions

► Assessment

- Inspect Damage
- Policy and Procedure Development
- Code Compliance

► Provide Support

- Support Community as a Whole
- Temporary Repairs
- Updates

► Recovery and Coordination

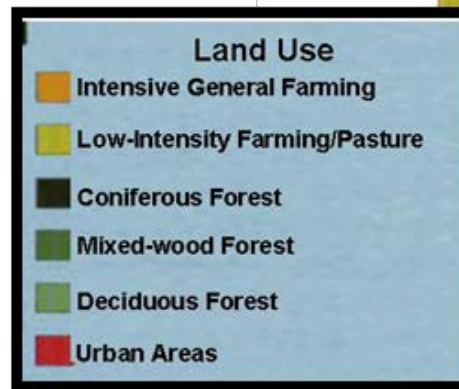
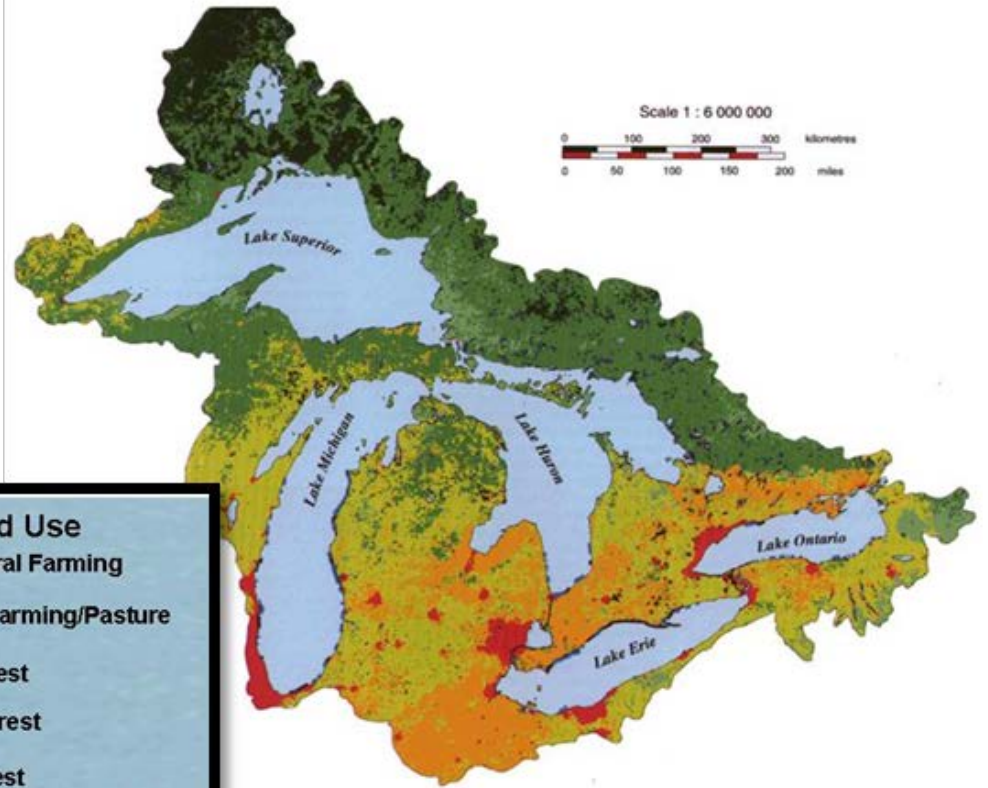
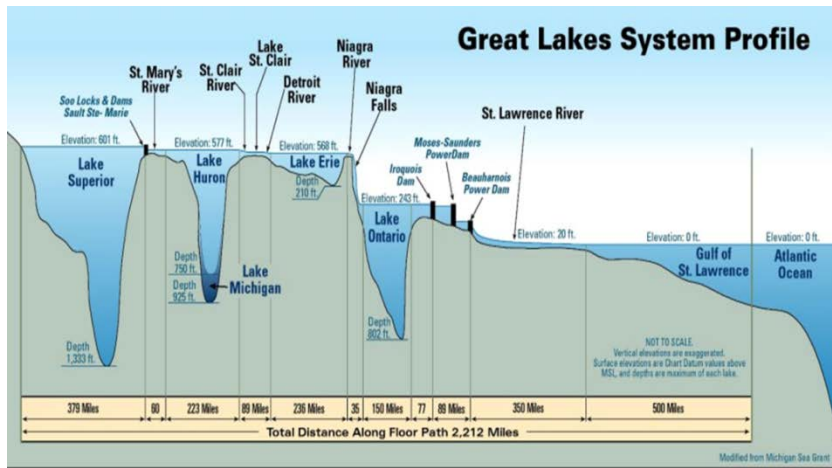
- Public–Private Partnerships Should be Considered
- Assign Dedicated Personnel





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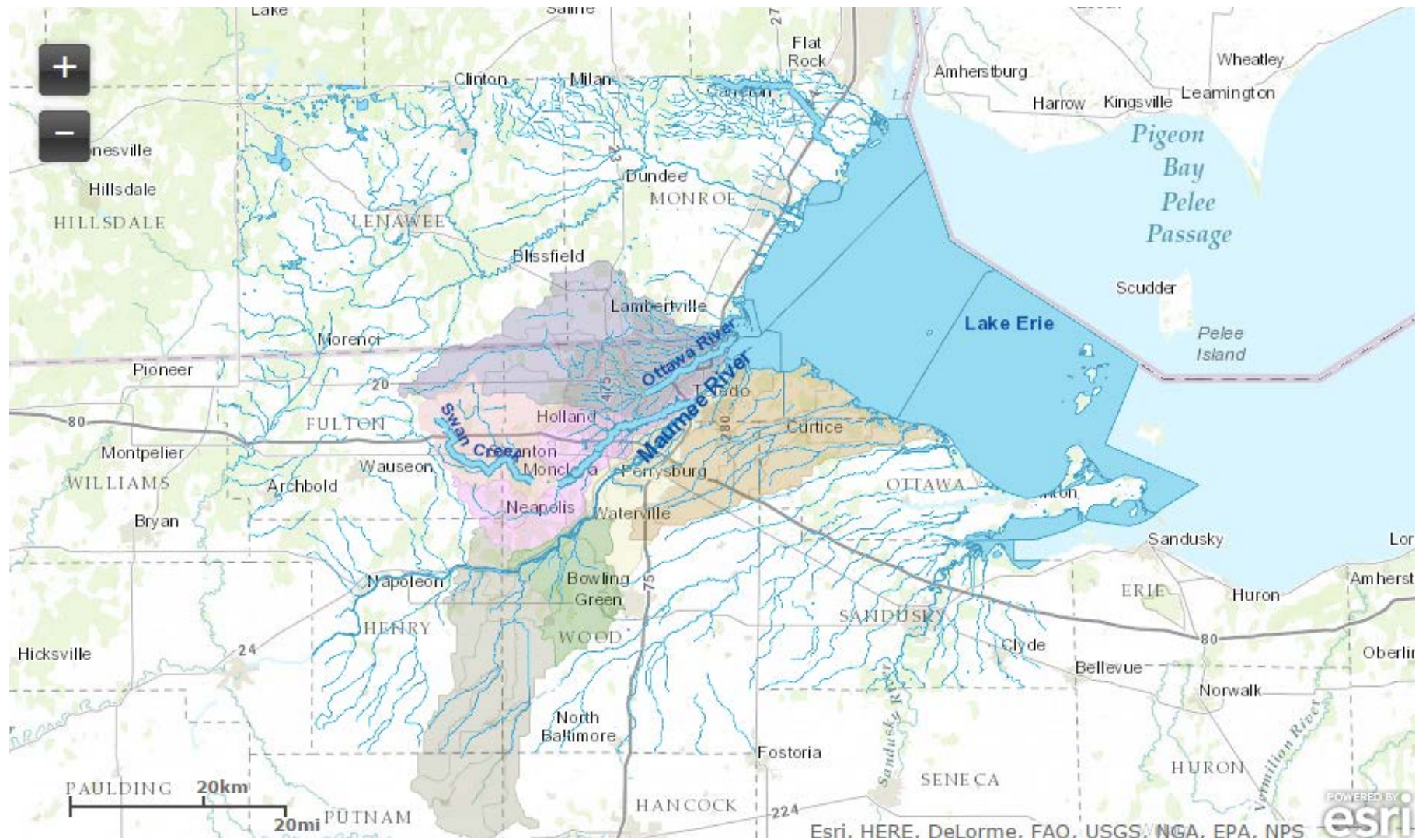
NW OHIO WATER SUPPLY



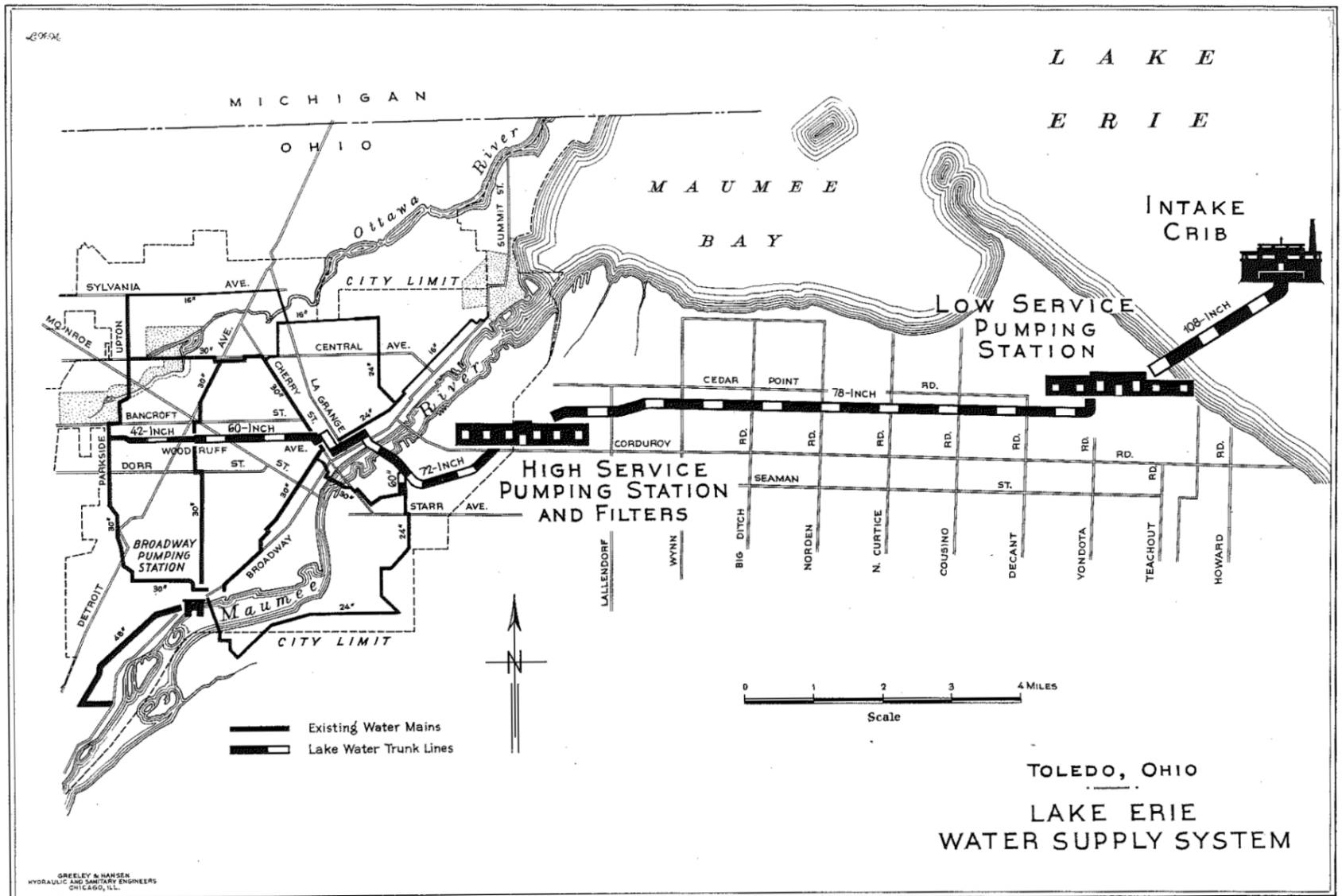
Lake Erie is the Shallowest & Warmest

Ohio Sea Grant and OSU Stone Laboratory

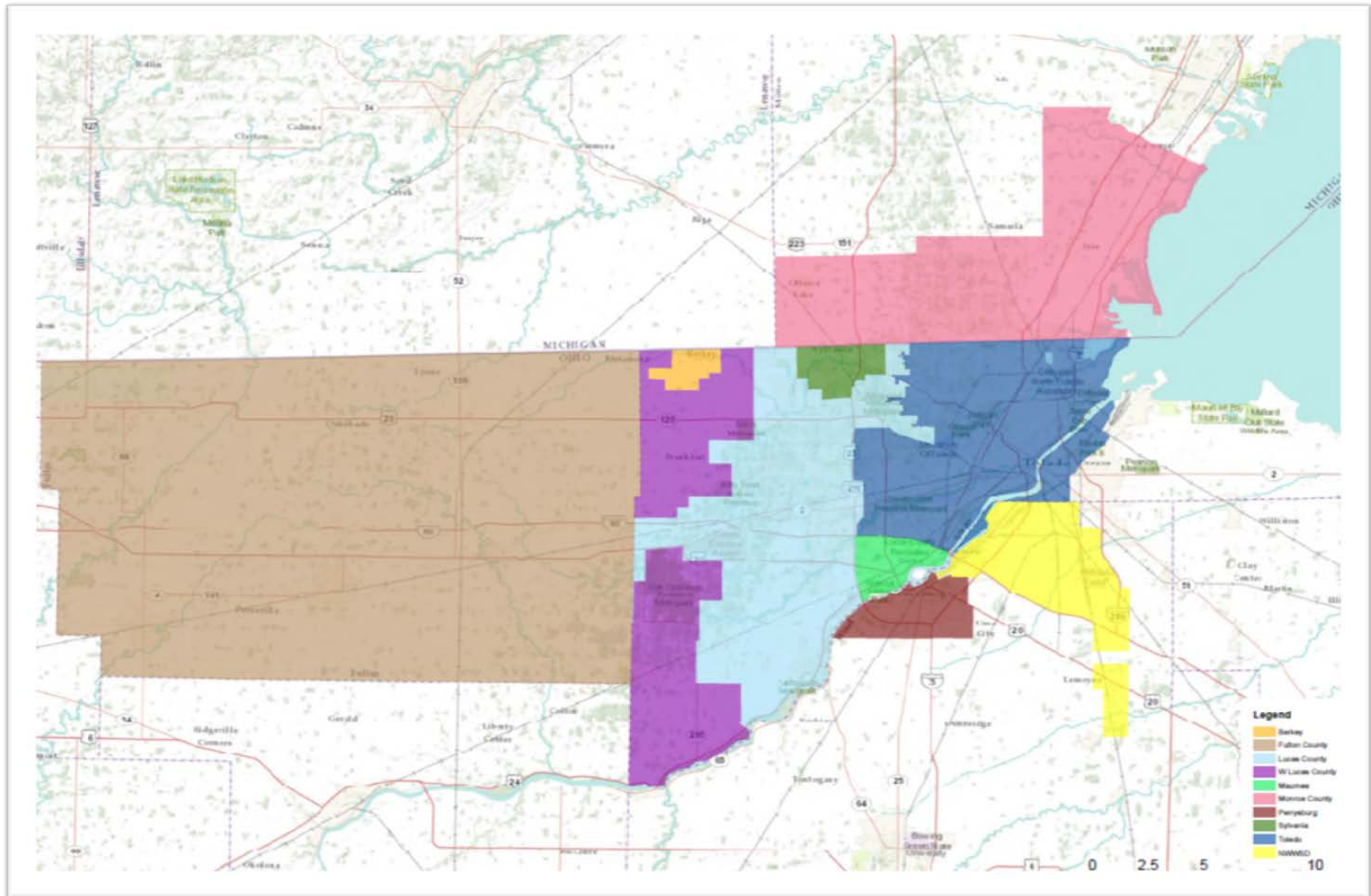
NW Ohio Watershed



Water Intake & Distribution



500,000 People Get Their Drinking Water From Collins Park



Clean Source Water

- ▶ **Regional/National issue**
- ▶ **Variety of contributing factors require variety of solutions**
- ▶ **Stakeholders must work together**





WHAT HAPPENED IN TOLEDO, AUGUST 2014



Bloom July 31, 2014

Bloom August 3, 2014

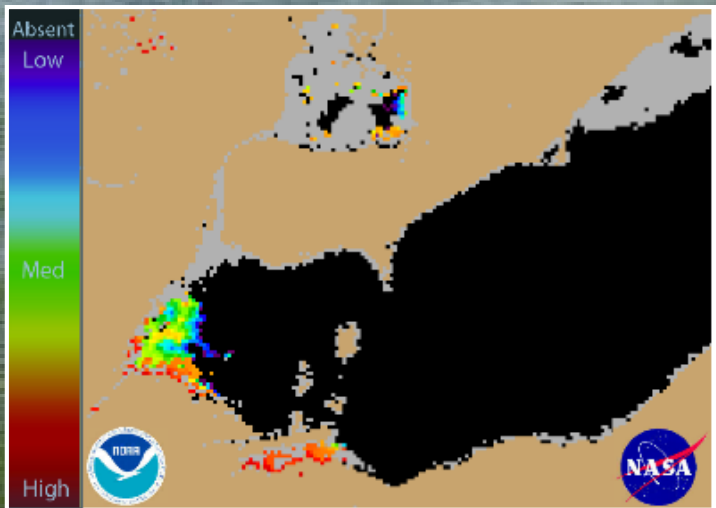


Figure 1. Cyanobacterial Index from NASA's MODIS-Aqua data collected 31 July 2014 at 2:30 pm. Grey indicates clouds or missing data. Black

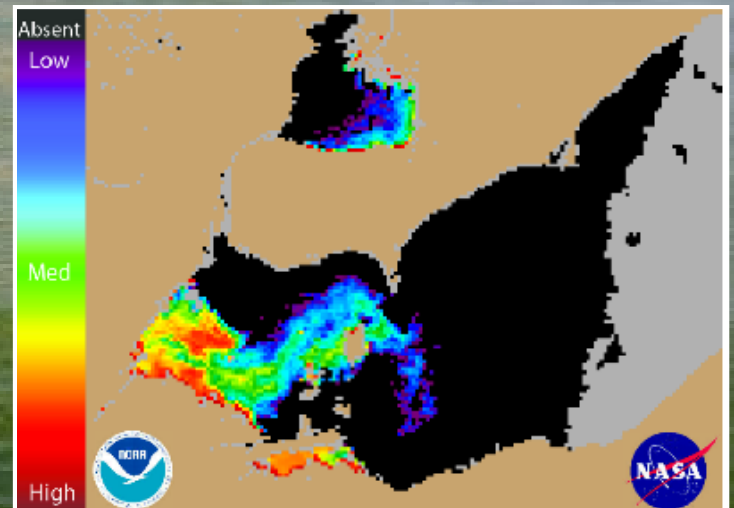


Figure 1. Cyanobacterial Index from NASA's MODIS-Aqua data collected 3 August 2014 at 1:10 pm. Grey indicates clouds or missing data. Black

Harmful Algal Bloom (HAB) Quickly Surrounds Toledo Intake Crib

The Nation Focuses on Toledo

- ▶ **Communication issues with early morning email notice of “Do Not Drink” event on August 2, 2014**
- ▶ **Nearly ½ million people affected for two days – do not drink, brush teeth, wash pets, nor boil, etc. – a story of international interest**
- ▶ **Medical procedures were rescheduled, food was destroyed, events were cancelled and emergency water supplies were provided to affected community members**



Toxin Release from Algae Bacteria

- ▶ **Toledo has voluntarily tested for Microcystin since 2011 – exceeds regulatory protocol**
- ▶ **Algae bloom directly over water intake**
- ▶ **Lacked early warning of changing water quality conditions**
- ▶ **Microcystin detected beyond recommended reportable levels**
- ▶ **Maximized chemical feed**
 - Powdered Activated Carbon
 - Liquid Alum
 - Chlorine
- ▶ **Uniform testing protocol designed “in the bunker” and validated by multiple laboratories**



Lessons Learned

- ▶ **Better Tools For Early Detection Needed**
- ▶ **Additional Chemical Feed Capacity Needed**
- ▶ **Improved Emergency Response Standard Operating Procedures (SOP)**
- ▶ **Federal Microcystin Standard, Based On Additional Scientific Research, is Needed**
- ▶ **Communication is Key**





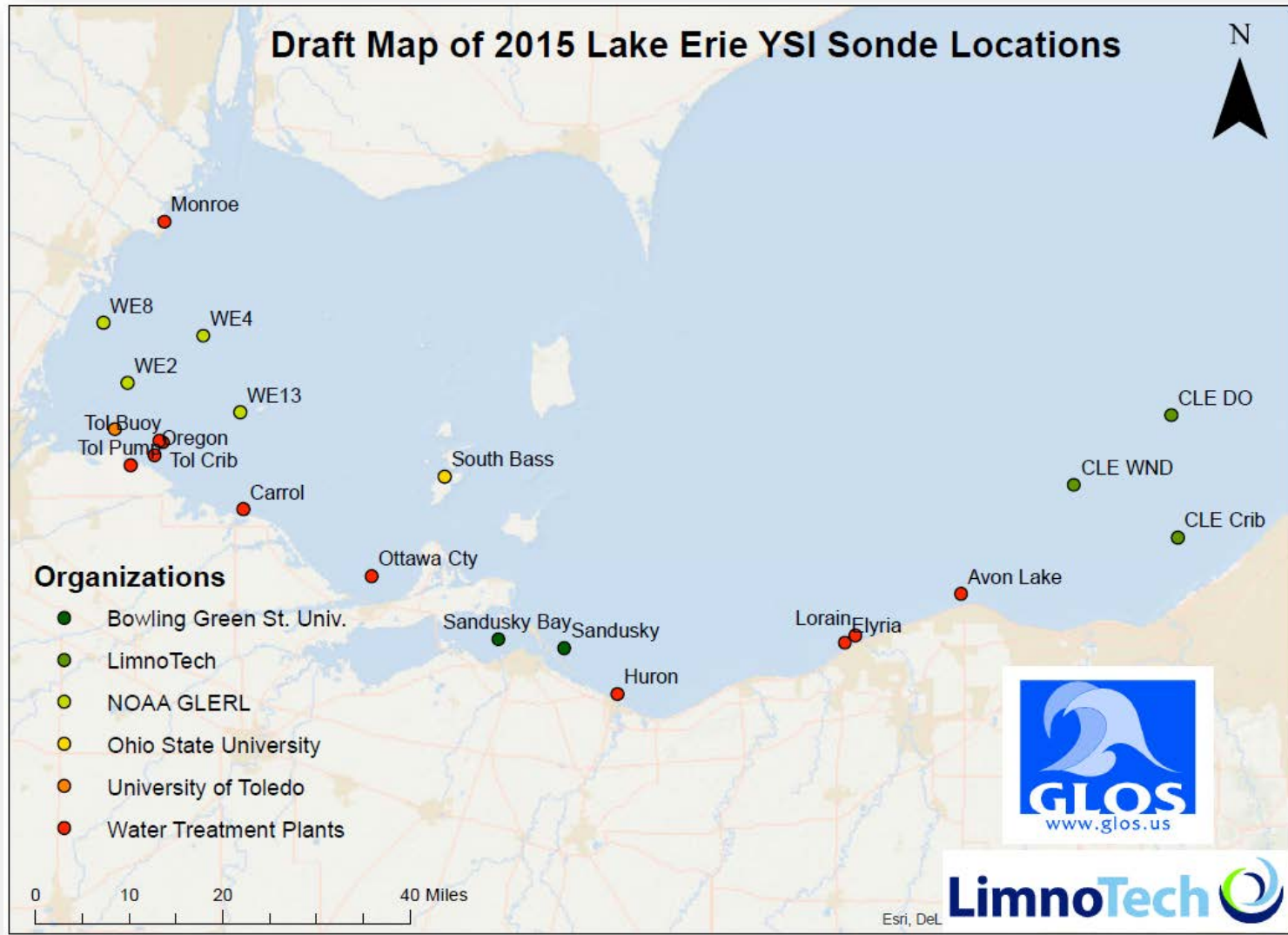
2015 HAB SEASON

- WHAT'S DIFFERENT

Early Warning

- ▶ **Sampling Buoy in Lake Erie**
- ▶ **Sampling Probe in Water Intake Crib**
 - 1.5 hour travel time from intake to low service pump station
- ▶ **Sampling Probe at Low Service Pumping Station (LSPS)**
 - 4 hour travel time from LSPS to Collins Park Treatment Plant
- ▶ **Test Parameters**
 - pH level
 - Presence of blue-green algae
 - Chlorophyll
- ▶ **Data Reported Every 20 Minutes**
 - Public website

Partner Monitoring Sondes





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WATER TREATMENT AND TESTING

Water Treatment Process

Water Intake

Water Pulled From
Lake (KMnO_4)

Low Service Pump Station

Pumped From
Onshore To Plant
(PAC)

Chemical Feed Room

Water Enters Plant
(Liquid Alum)

Flocculation & Sedimentation

Impurities Settle Out
(Lime & Soda Ash)

Filter Gallery

Filter Fine Impurities
(Fluoride)

Finished Water Clearwells

Stored For Pumping
Throughout System
(Chlorine)



Collins Park Water Treatment Plant

▶ **Water Treatment Adjusted Constantly**

- Soften and Clarify Water
- Improve Taste and Odor
- Reduce Toxins

▶ **Monitoring And Testing**

- 9 licensed chemists/bacteriologists
- Staffed 24/7/365
- 4 Labs
- More than 650 tests every day, year-round
- 180 tap water collection points

▶ Toledo Consistently Provides A Safe And High Quality Drinking Water



Additional Chemical Feed Capability

- ▶ **Quadruple Potassium Permanganate Feed Capacity At Intake Crib**
 - Lyse cyanobacteria to release Microcystin
- ▶ **Quadruple Activated Carbon Feed Capacity At Low Service Pump Station**
 - Adsorb toxin prior to the raw water reaching the treatment plant
- ▶ **New Activated Carbon Feed Facilities At Collins Park Water Treatment Plant**
 - Adsorb toxins released by any remaining cyanobacteria
- ▶ **Increased Settled Sludge Removal At Collins Park Water Treatment Plant**
 - Remove bacteria as soon as possible within process



Water Infrastructure Improvements

▶ **\$264 Million Program**

- \$134 million rehabilitation and modernization of equipment
- \$130 million water quality improvements and reserve capacity

▶ **Current 2015 Construction Projects**

- Low Service Pumping Station \$30.0 million
- Chlorination Facilities \$9.8 million completed in May 2015
- Plant Wide Power \$10.0 million
- SCADA & Telemetry \$6.9 million

▶ **HAB Improvements**

- PAC and KMnO₄ Feed Improvements \$5.1 million completed in July 2015

▶ **Completion in 2019**



Emergency Preparedness

▶ **New Operating Procedures**

- Indicators and Responses

▶ **Contingency Plan**

- HAB Response

▶ **Training, Workshop & Table Exercises**

- Toledo and Regional Emergency Response Staff

▶ **Emergency Communication Plan**

- Regional Communities and Media



Emergency Preparedness

- ▶ **Provided National Incident Management Training (NIMS) to all Department key staff members.**
- ▶ **Updated Emergency Operating Procedures.**
- ▶ **Hosted with Ohio EMA an Emergency Preparedness Workshop for regional water partners and emergency planning agencies.**
- ▶ **Toledo meets regularly with the Toledo-Lucas County Health Department, Hospital Council of Northwest Ohio, Lucas County EMA and State of Ohio EMA to prepare for emergencies. (Group helped with flyer)**



HAB Action Plan

Implemented June 30 - includes:

▶ **Tiered Action Levels**

- Lake Monitoring/Sampling

▶ **Treatment Operating Procedures**

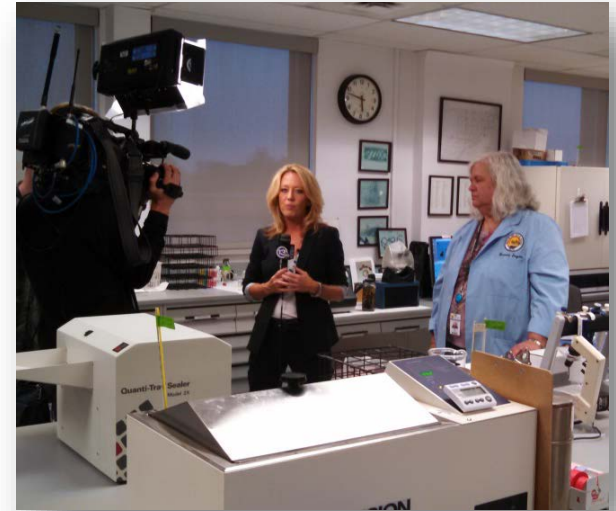
- Raw & Treated Water
- Filtration & Disinfection

▶ **Emergency Communication Plan**

- Regional Communities and Media

▶ **Toledo & Regional Emergency Response**

- Training, Workshop and Table Exercises





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LONG TERM HAB SOLUTIONS

Blue Ribbon Panel

▶ **Nine Member Panel To Study The HAB Issue**

- National Standing
- Members from Academia, Technical, Government and Regulatory Sectors

▶ **Best Practices In Water Treatment And The Effective Treatment Of Algae**

▶ **Primary Recommendations**

- Current Capital Improvement Plan funded by a 5-year water rate increase is a good plan.
- Ozonation recommended as additional treatment barrier for algal toxins - Implementation over the next 3 years (Est. \$40 million is not currently budgeted)



Research Collaboration

- ▶ **Ohio Colleges and Universities Have Committed Nearly \$2.1 million and the Board of Regents is Committing \$2 million**
 - University of Toledo (UT) Water Task Force
 - University of Cincinnati
 - Ohio State University
- ▶ **US EPA Treatment Pilot**
 - Parallel treatment comparison
- ▶ **Demonstration and Plant Process Pilot Testing**
 - Toxin removal
 - Chemical feed optimization
 - Filter media



Topics Currently Under Study at UT

- ▶ **Toxin Detection And Mapping**
- ▶ **Treatment Methods And Technologies**
- ▶ **Watershed And Nutrient Sourcing**
- ▶ **Health Effects Of Microcystin**



Recent Developments

- ▶ **Recently passed (HB 61 and SB 1)**
 - Restrictions on the timing of fertilizer application
 - Stricter rules for the disposal of dredged lake sediment
 - Creation of a new algae-management office
- ▶ **US EPA published Public Health Advisories for Microcystin in Drinking Water, May 11, 2015**
- ▶ **Ohio EPA published 2015 Public Water System HAB Response Strategy, July 16, 2015 with Microcystin levels based on US EPA Public Health Advisories:**
- ▶ **Drinking Water Levels Based Primarily on Age and a 10-day Exposure Period-**
 - 0.3 parts per billion for bottle fed infants and pre-school children (essentially ELISA detect)
 - 1.6 parts per billion for adults



Communication is Key

Objectives:

- ▶ **Develop method for early notification of potential drinking water advisories.**
- ▶ **Email notification and text alerts in place and working properly.**
- ▶ **Desire to maintain consistency in information shared with consumers and media from utilities, health departments, emergency agencies, and regulators.**
 - Work with Toledo-Lucas County Health Department and others in a team approach to answer FAQs and share key messages.
 - Will continue to refine detailed HAB communication plans as additional information is received from regulatory agency.
 - Partners willing to help get the word out.

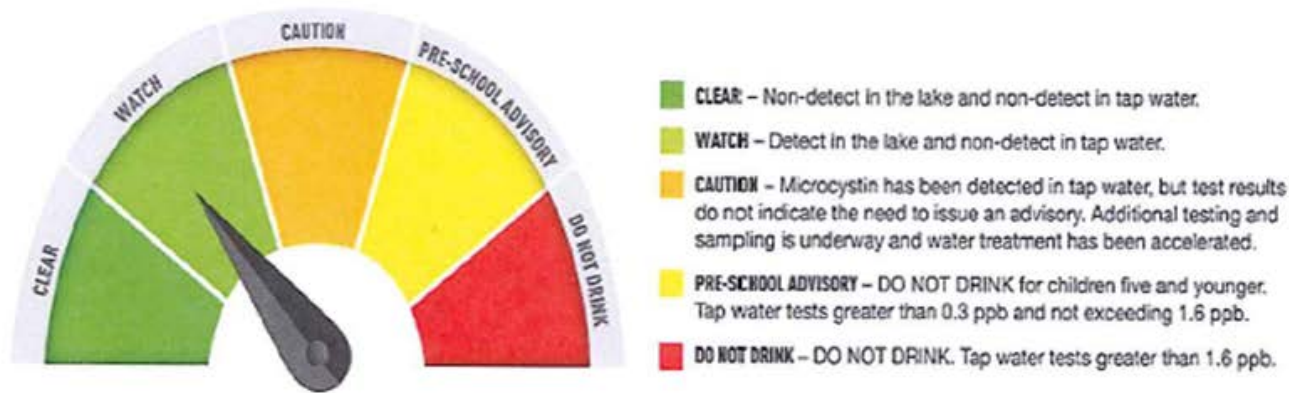


Toledo Water Quality Dashboard

Toledo Water Quality

Water Quality

Toledo tests raw and treated water regularly for the presence of toxins, including microcystin created by algae blooms. See scale below for the current status of drinking water quality according to Ohio EPA guidelines.



Our water is safe to drink. Microcystin is detected in the intake crib in Lake Erie, but not in the tap water. Our water treatment process is effectively removing the microcystin.

We have an advanced warning system for early detection we did not have in August 2014 with buoys and sondes that allows us to implement operational changes prior to the microcystin reaching the Collins Park Water Treatment Plant.

Raw water conditions are being monitored carefully with data collection sondes all located prior to the treatment plant: nearby the intake crib in Lake Erie, in the intake crib and at the Low Service Pump Station.



Website Data Transparency

[TO SIGN UP FOR TEXT MESSAGE AND E-MAIL ALERTS, CLICK HERE.](#)

[FOLLOW US ON TWITTER](#)

[LIKE US ON FACEBOOK](#)

[FREQUENTLY ASKED QUESTIONS](#)

[TOLEDO WATER TEST RESULTS](#)

[DATA FROM SONDES](#)

Currently, there are three water quality Sonde sensors that detect the water temperature, specific conductivity, pH, turbidity, chlorophyll and blue-green algae sponsored by the City of Toledo. There are 18 other Sonde sensors sponsored by partnering agencies, acting as an early warning system.



Source Water Protection Plan (SWPP)

A Regional Surface Source Water Protection Plan (SWPP) is Being Developed by Lucas County.

- ▶ **The City of Toledo is a Committed Partner**
- ▶ **The City of Oregon is a Committed Partner**
- ▶ **The SWPP is Expected to be Complete in the Spring of 2016**
- ▶ **Focused on Specific Contaminates of Concern:**
 - Phosphorus
 - Nitrates
 - Sediments
 - Bacteria





Questions & Discussion

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