



PROJECT **clarity**

Restoring the Macatawa Watershed



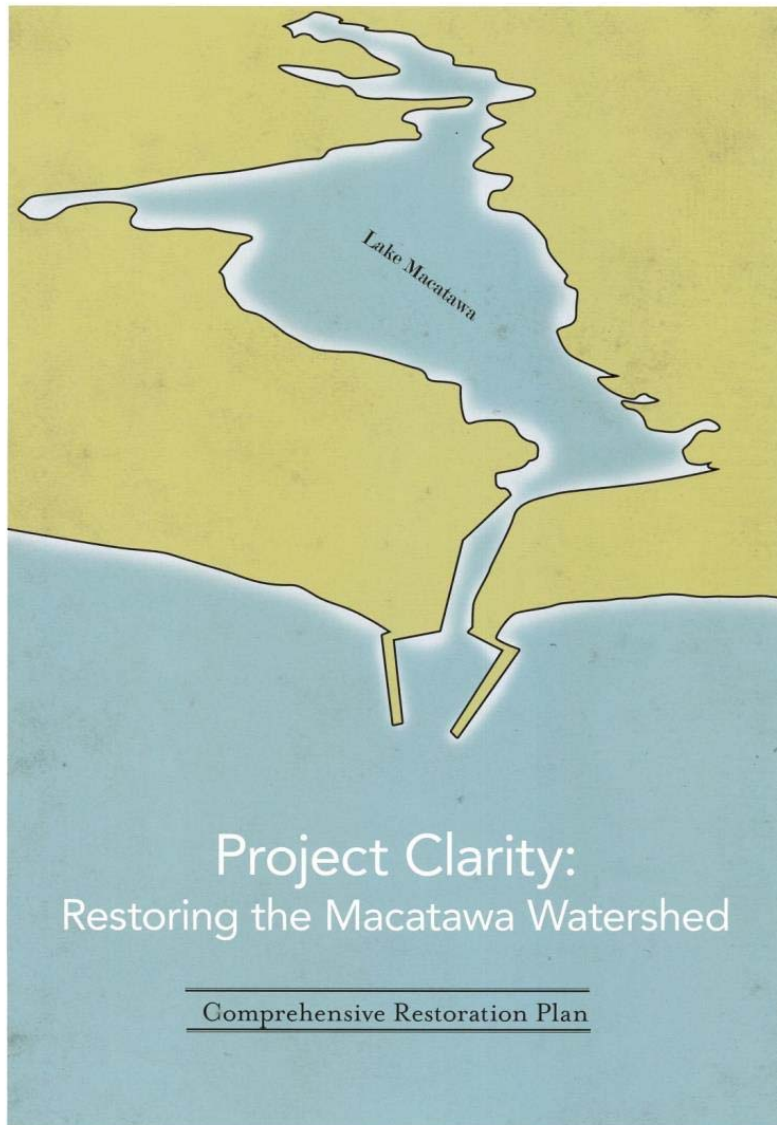
**Macatawa Area
Coordinating Council**

A Cooperative Effort Among Units of Government



Hope COLLEGE





Comprehensive Restoration Plan

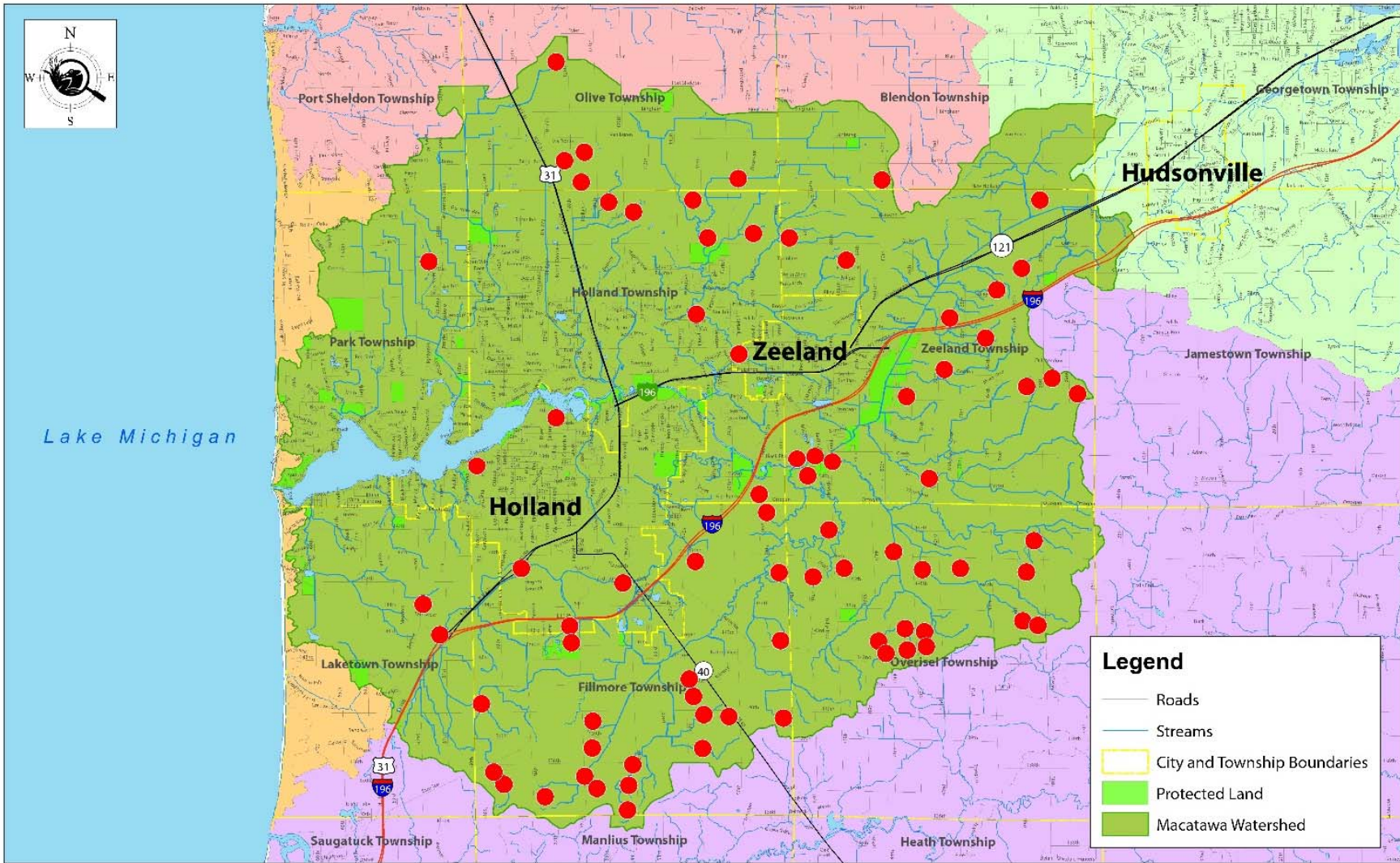
- ✓ Phase two: Implementation
- ✓ Restoration Team
- ✓ Investment of \$11,976,000
- ✓ Multi-faceted approach
 - ID & Secure Land
 - Restoration
 - Best Management Practices (BMP)
 - Education & Information
 - Maintenance







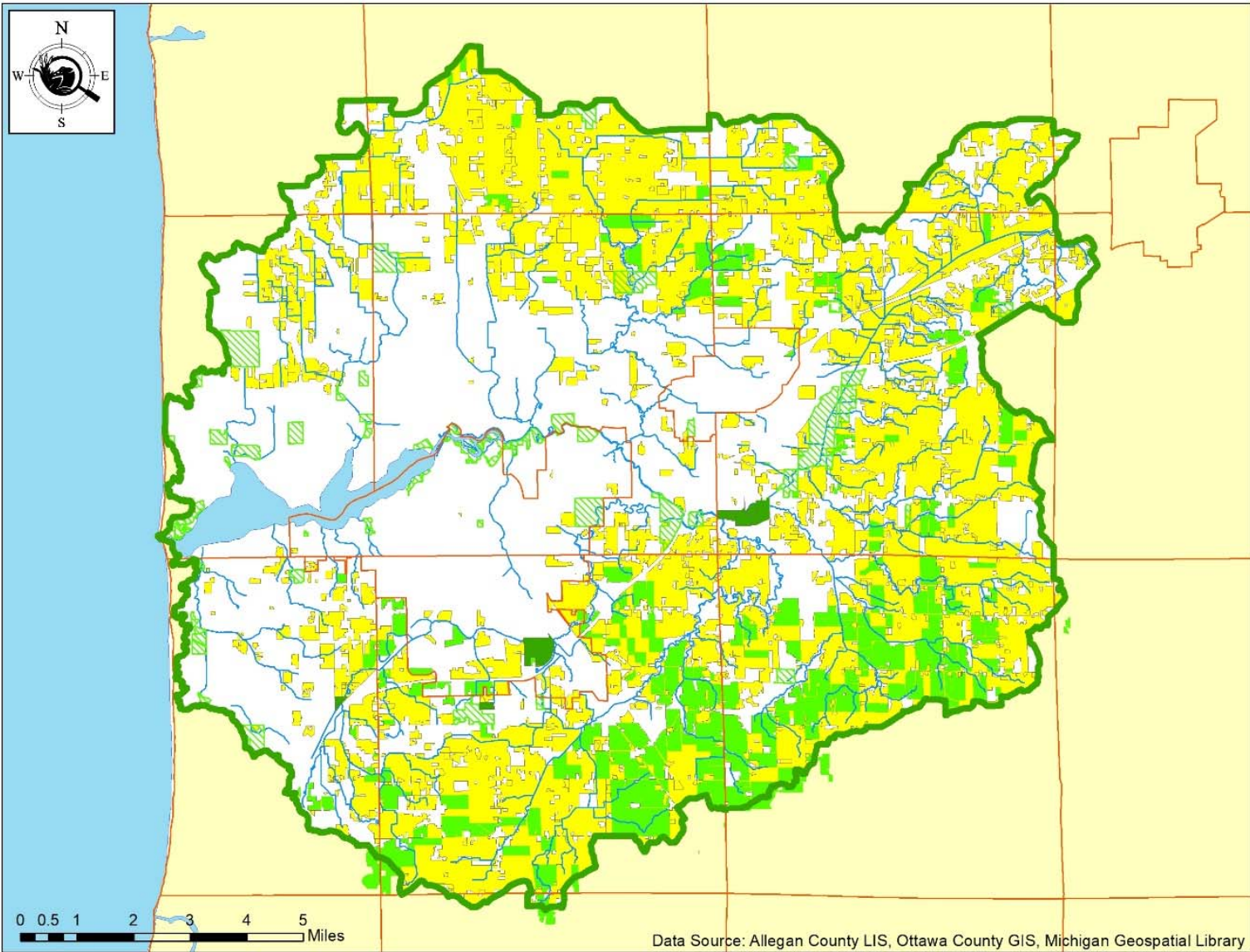




Data Source: Michigan Geographic Data Library, MDEQ



Project Clarity Projects



Data Source: Allegheny County LIS, Ottawa County GIS, Michigan Geospatial Library



Agricultural Projects

- 2018 projects included grassed waterways, cover crops, residue management, gypsum, and cover crop seeder
- 2200 acres of new cover crops funded through GLRI and PC
- Over 100 projects funded through Project Clarity's Agricultural Committee
- In total, over 24,000 acres of BMPs committed by project partners







Project Clarity

- 23 agricultural projects on 39 different farms
 - Gypsum
 - Cover Crops
 - Two-Stage Ditches
 - Grass Buffers
 - WAZCOB
- 81 farms have committed to over 8,000 acres of gypsum
- In total 11,400 acres of BMPs completed
- Available to government contractors
- Voluntary

410 THOMASTON ASSOCIATES
**Interseeding
Cover Crops**







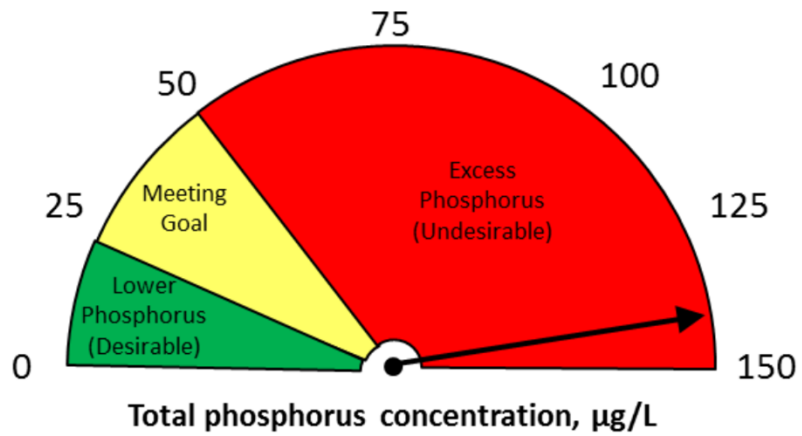






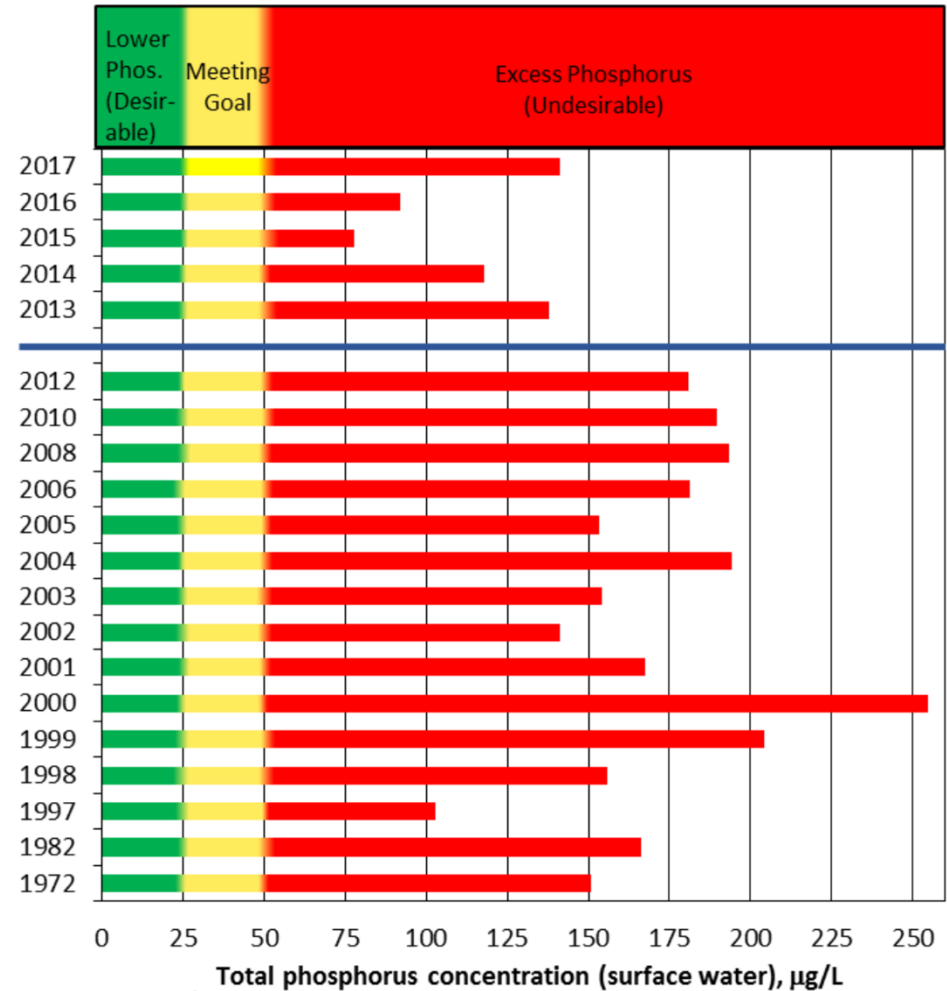


Current status (2017)



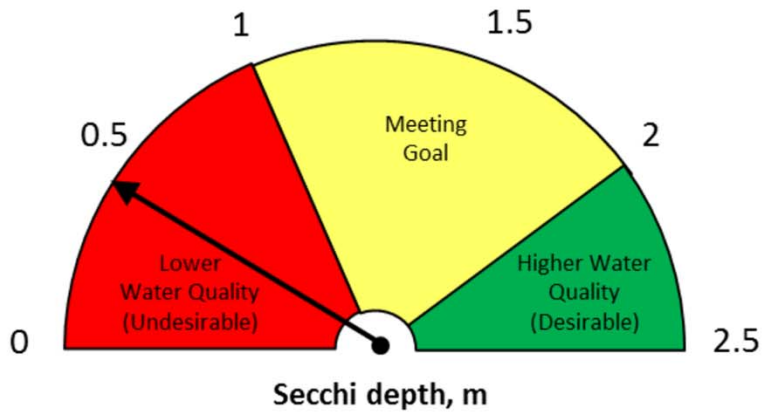
Phosphorus

Historical Status (1972*; 1982-2012[†]; 2013-2017[‡])



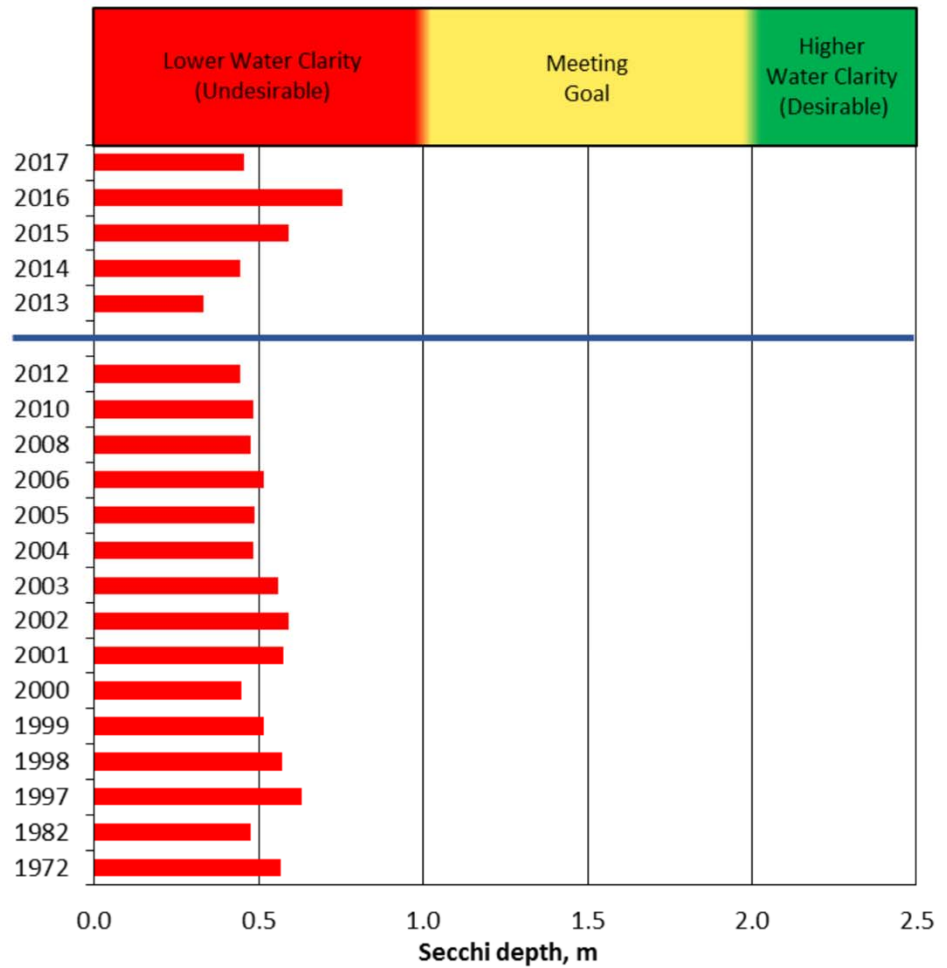
*U.S. EPA; [†]MDEQ; [‡]AWRI

Current status (2017)



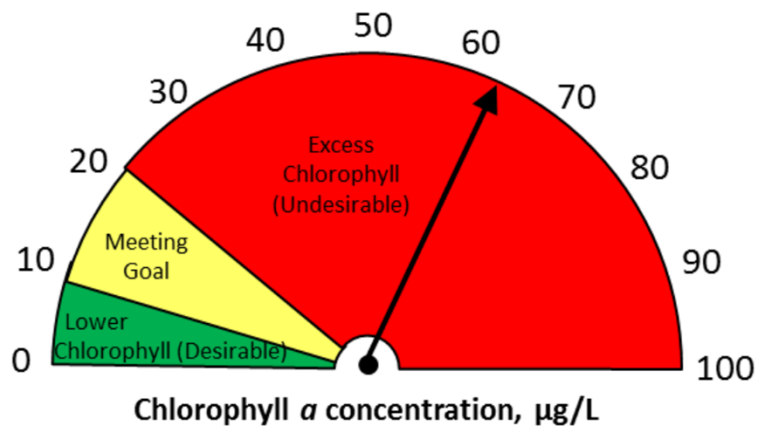
Water Clarity

Historical Status (1972*; 1982-2012[†]; 2013-2017[‡])

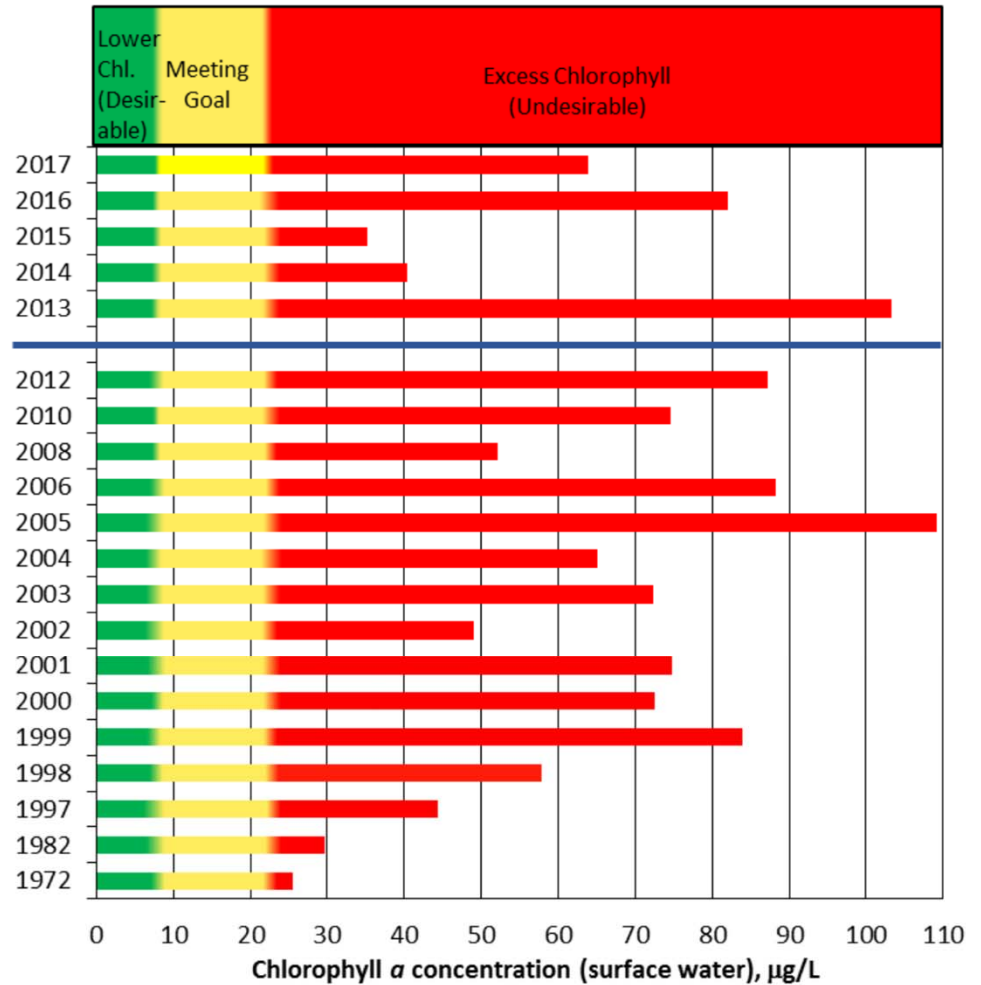


*U.S. EPA; [†]MDEQ; [‡]AWRI

Current status (2017)

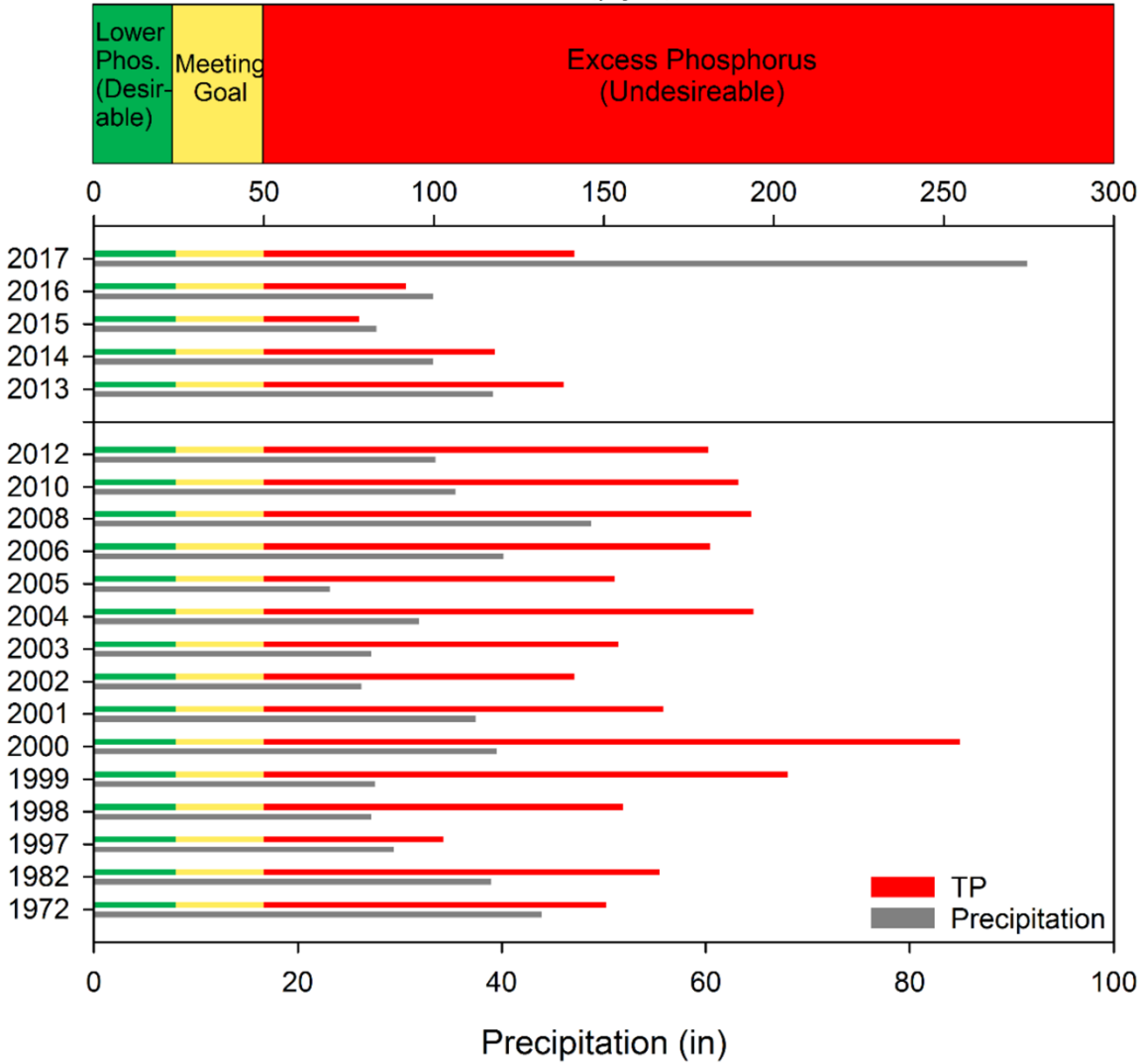


Historical Status (1972*; 1982-2012[†]; 2013-2017[‡])



*U.S. EPA; [†]MDEQ; [‡]AWRI

Lake Macatawa TP and Precipitation Dashboard



Turbidity Sensor Deployment

Maggie Oudsema



What is turbidity?

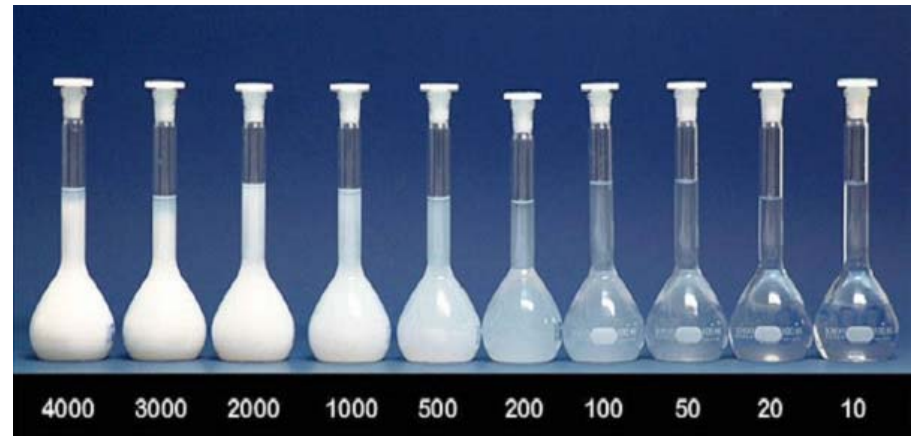
- Measure of water transparency
 - More particles → murkier water → higher turbidity

Photo credit: Project Clarity



What is Turbidity?

- Measured in Nephelometric Turbidity Units (NTU)
 - Measure of light scattered by particles 90 degrees to incident beam
- The WHO established drinking water
 - No more than 5 NTU
 - Ideally below 1 NTU



Source: BEHFA

YSI 6000MS V2 Optical Monitoring Sonde



Photo credit: Ryan Truer



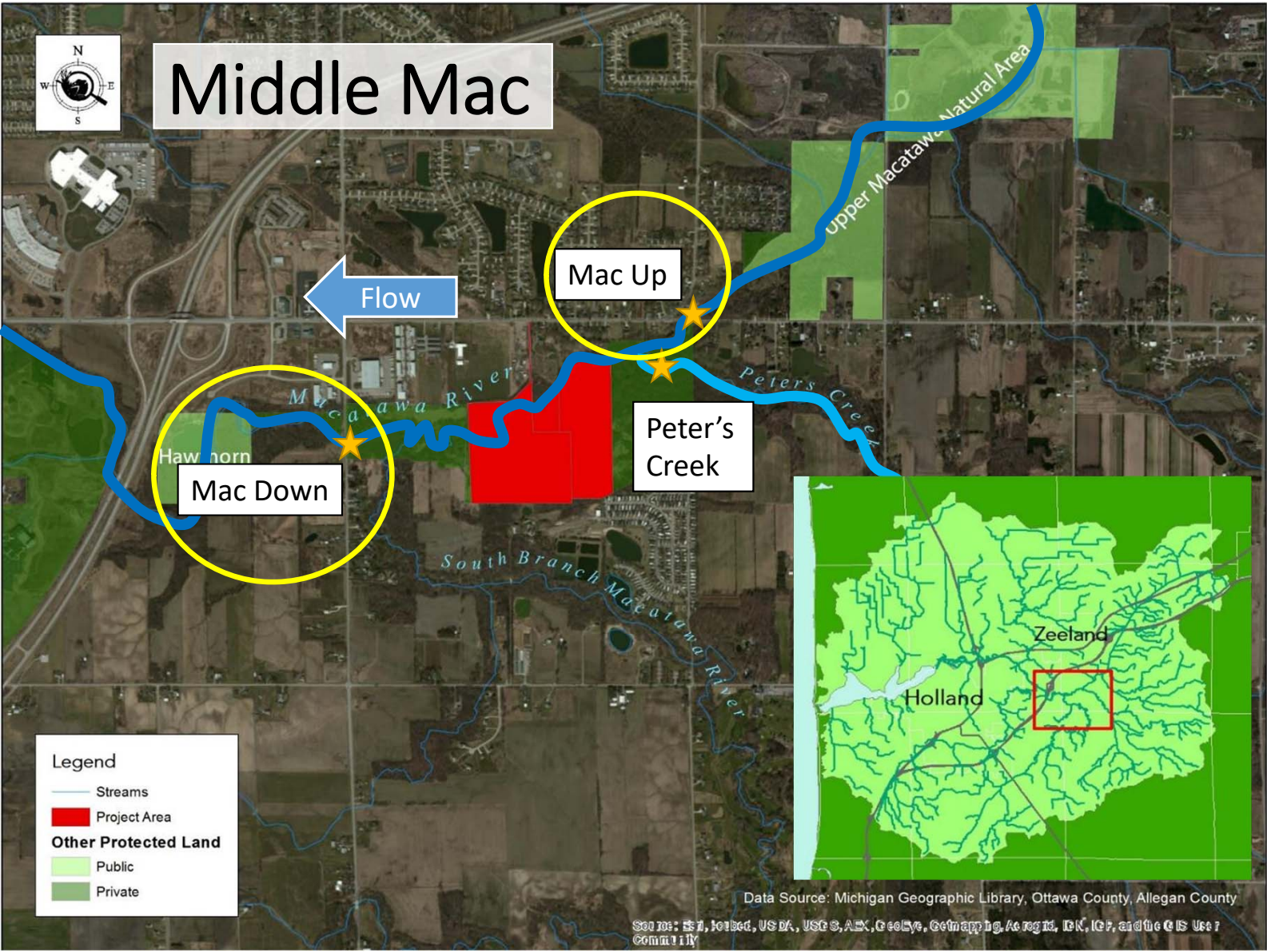
Photo credit: Fondirest Environmental, Inc.

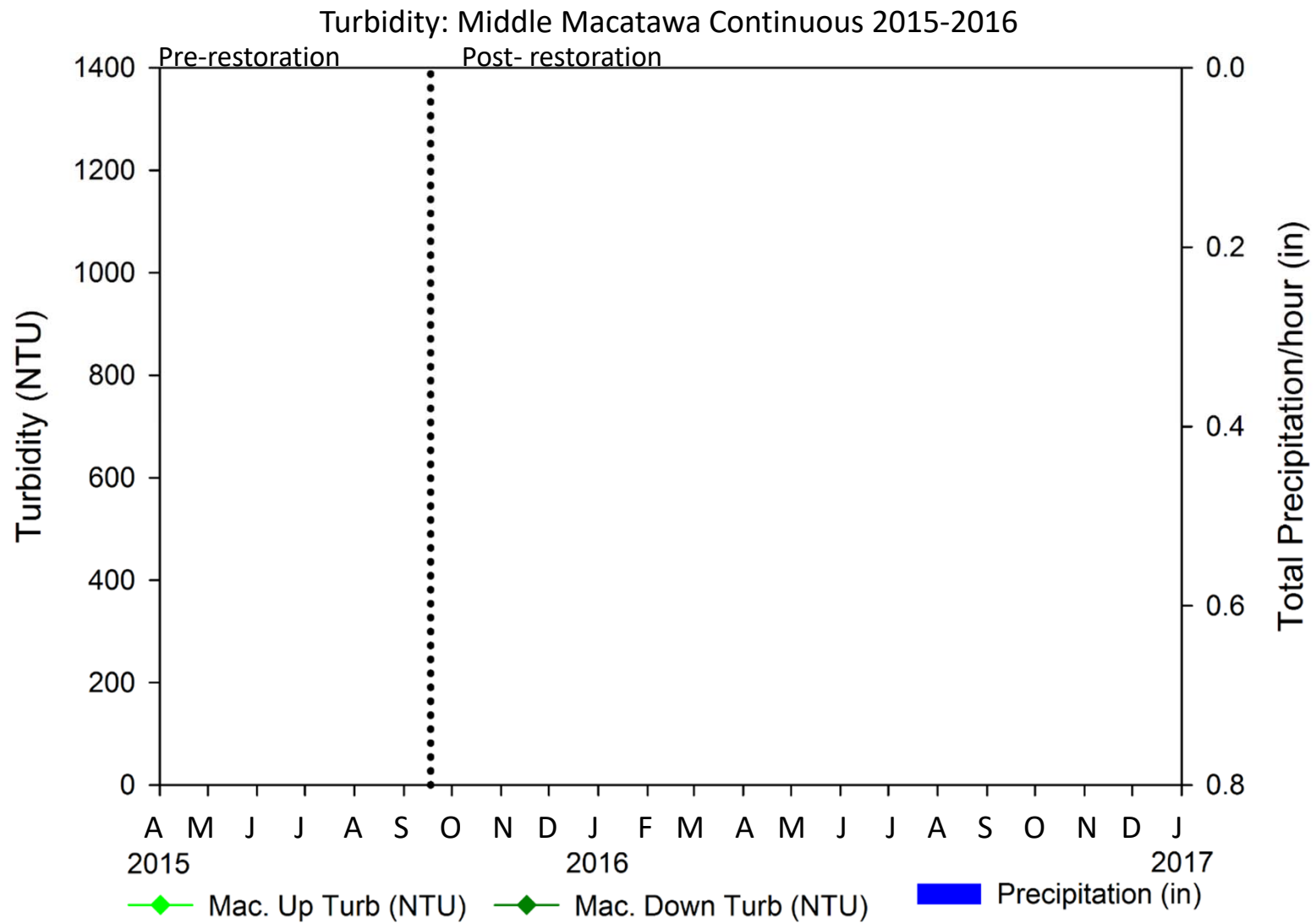
- Fits in 2-inch wells
- Perfect for long term deployment
 - Can sample unattended
 - Self-cleaning wiper
- Cost: ~\$5,000

YSI 600OMS V2 Optical Monitoring Sonde

- Records
 - Temperature
 - Conductivity
 - Turbidity
- Collects data every 30 minutes
- Data downloaded = monthly
- Calibrations = monthly
- Set out Spring-Fall since 2015

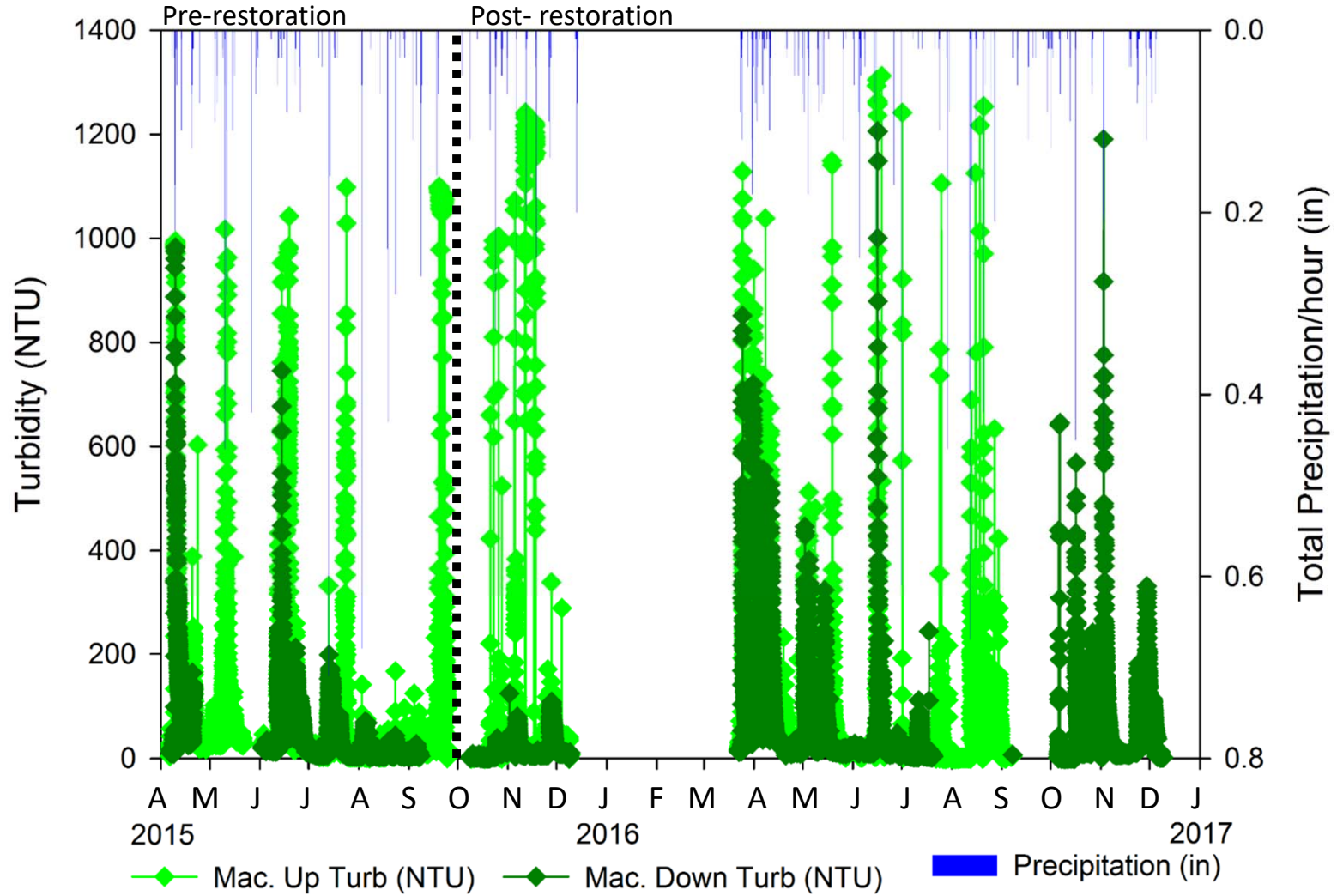






*Total rain/hour was collected from the National Climatic Data Center (NCDC)

Turbidity: Middle Macatawa Continuous 2015-2016



*Total rain/hour was collected from the National Climatic Data Center (NCDC)



Live data update



Wire along streambed



twisthink

Project Clarity

Twisthink IoT Update

Nov 19, 2018

General Update



- Installed 2 IoT Devices in the late summer
- Data from the YSI Sensor was collected and transmitted up to the SigFox cloud during that time
 - Without compromising existing data collection methods
- Cloud platform and dashboard is almost fully operational

IoT System



IoT Device

Battery, Processor, SigFox Transmitter
Elevated for Reception and to avoid
high water

Cable

Connected to the YSI Sensor and stacked
to the stream bed

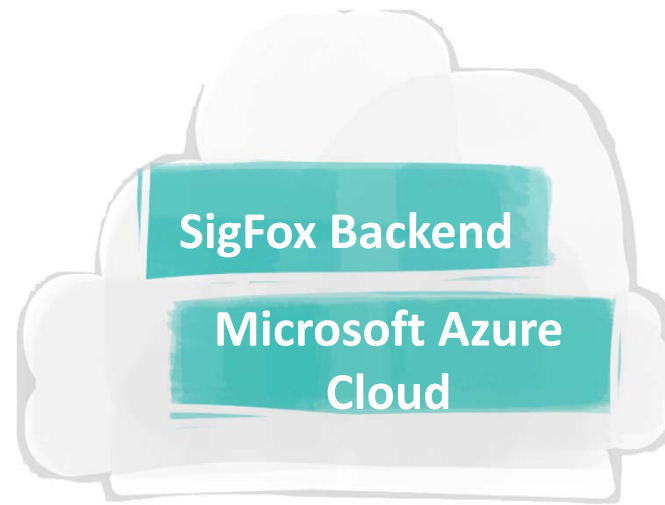
YSI Sensor

Configured to log data locally



SigFox Base Station

Receives IoT Device data up to 3
miles away



Cloud

Data is collected in the cloud

1. On SigFox Servers
2. Connected to Microsoft Azure Platform
- This also grabs rainfall and water
discharge



Dashboard

Data is presented on a
dashboard via a web browser

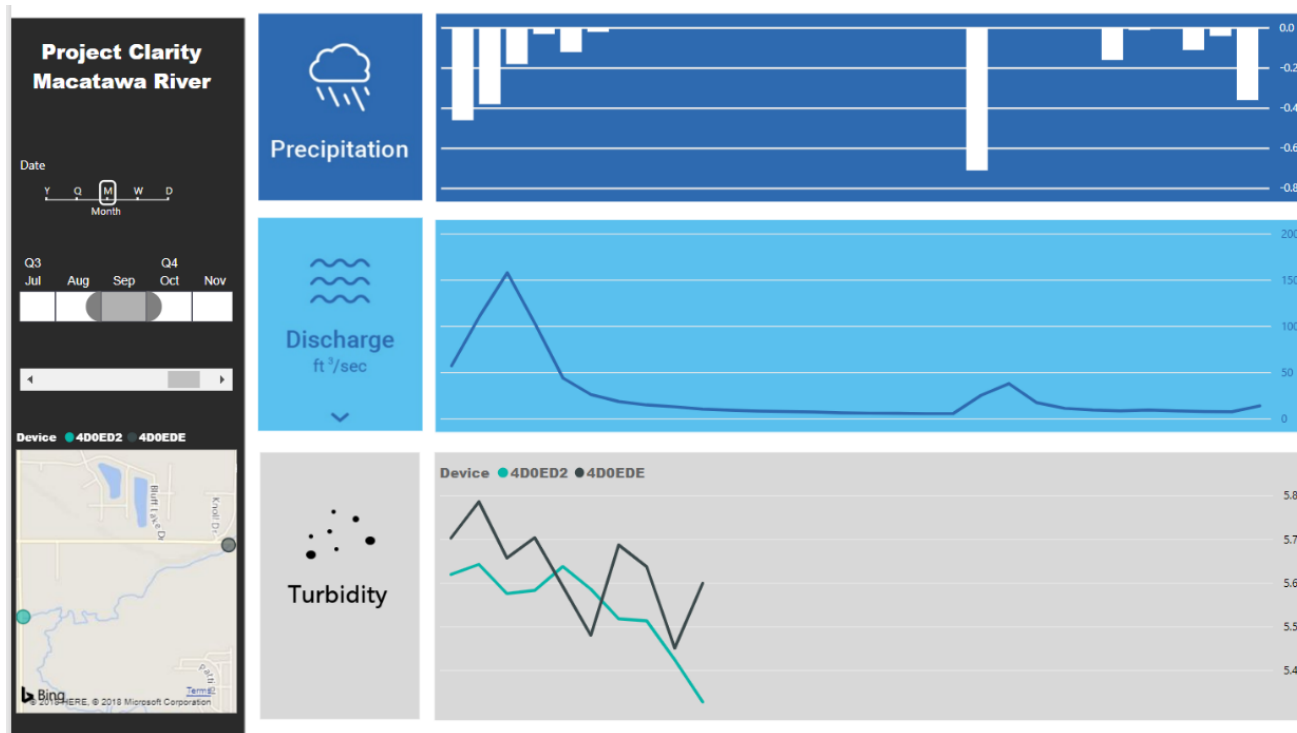
Dashboard Preview

Time Scale

Allows user to view data at different resolutions
Day, week, month, etc

Location

Provides a reference of where the devices are located



Data Graphs

Users can view Precipitation, Discharge and Water Turbidity at the selected sensor sites