

The East Fork Water Quality Monitoring Cooperative: An Inter-Agency Effort to Reduce Nutrient Runoff

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Soil & Water Conservation District

OWRC Annual Meeting
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East Fork Lake

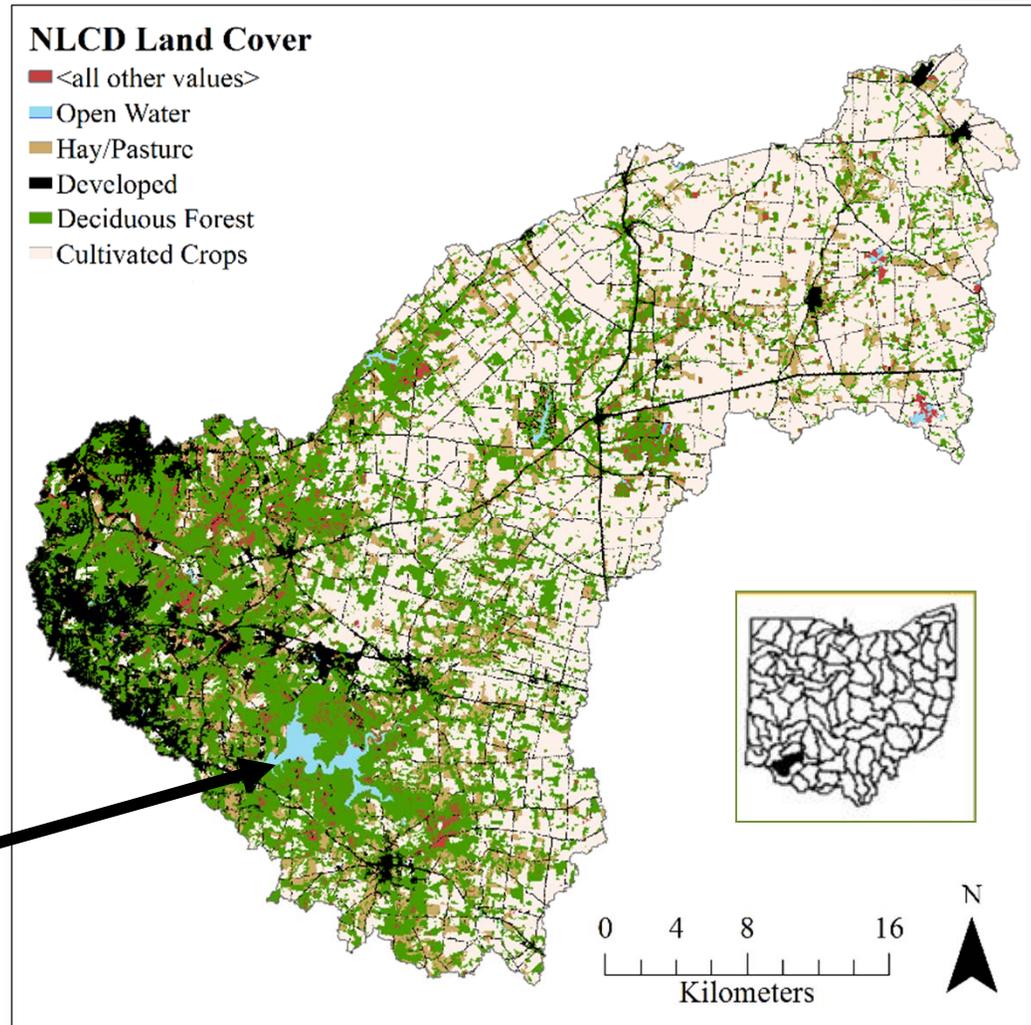
2000 acre water surface
345 mi² of upland drainage

- 64% agriculture
- 26% forest
- 1.5 % imperviousness

4 uses

- flood control
- drinking water source
- recreation (State Park, 2 beaches)
- downstream protection (min 30 cfs discharge)

20 MGD DWTP



East Fork Lake – HAB History

- HABs first samples/microcystin first detected in 2012
 - peak 4.5 ppb at main beach
- First advisory in 2013
 - peak microcystin 88 ppb
- 2014 – peak of 190 ppb
 - Regional swim meet moved
- 2015-16 – National Rowing Championships
 - Escaped a bloom in 2015, but 2016???



East Fork Watershed: Test bed for Watershed Management R&D since 2008

- Federal Partners



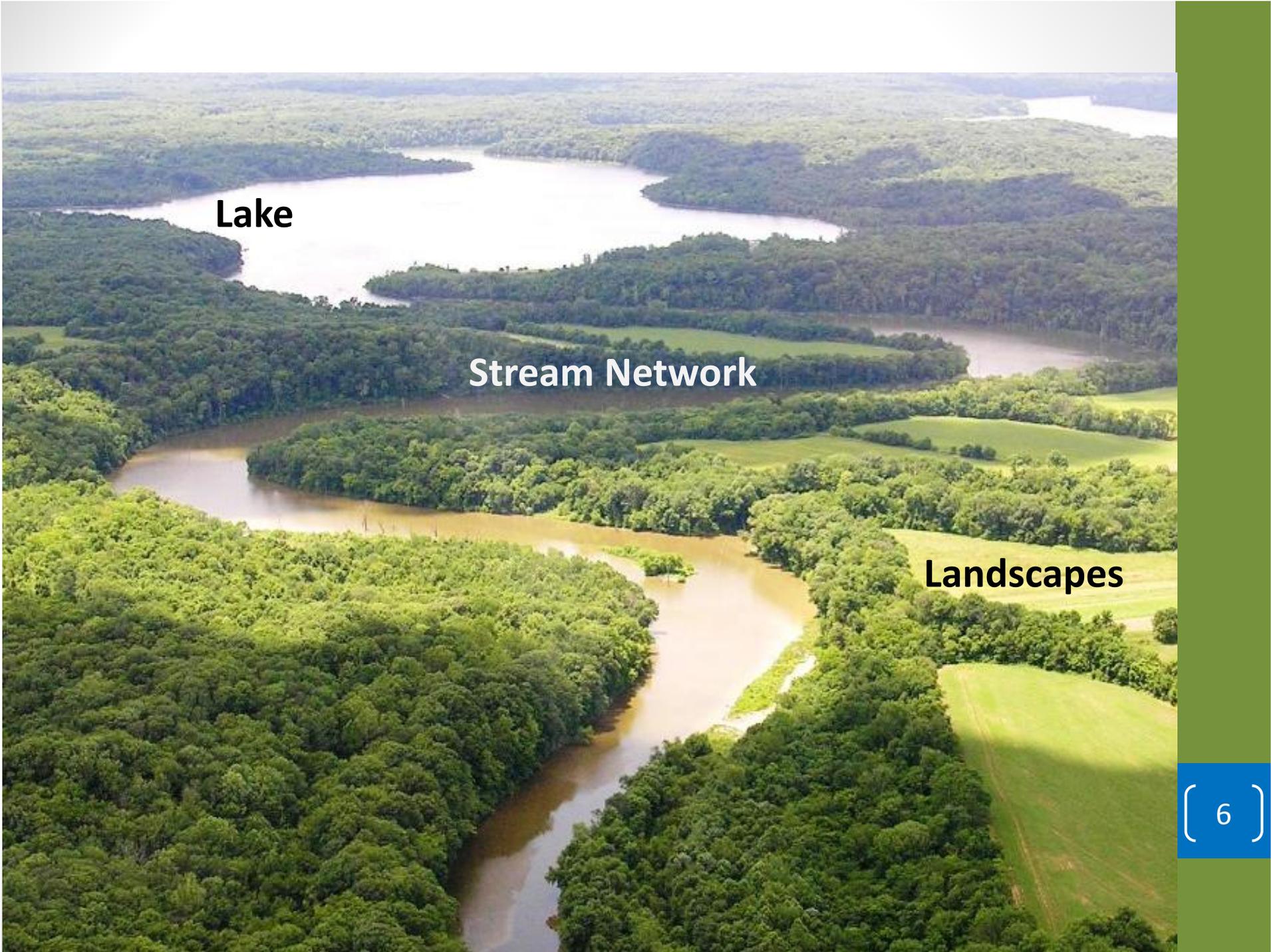
- State Partners



- Local Partners



Local Farmers



Lake

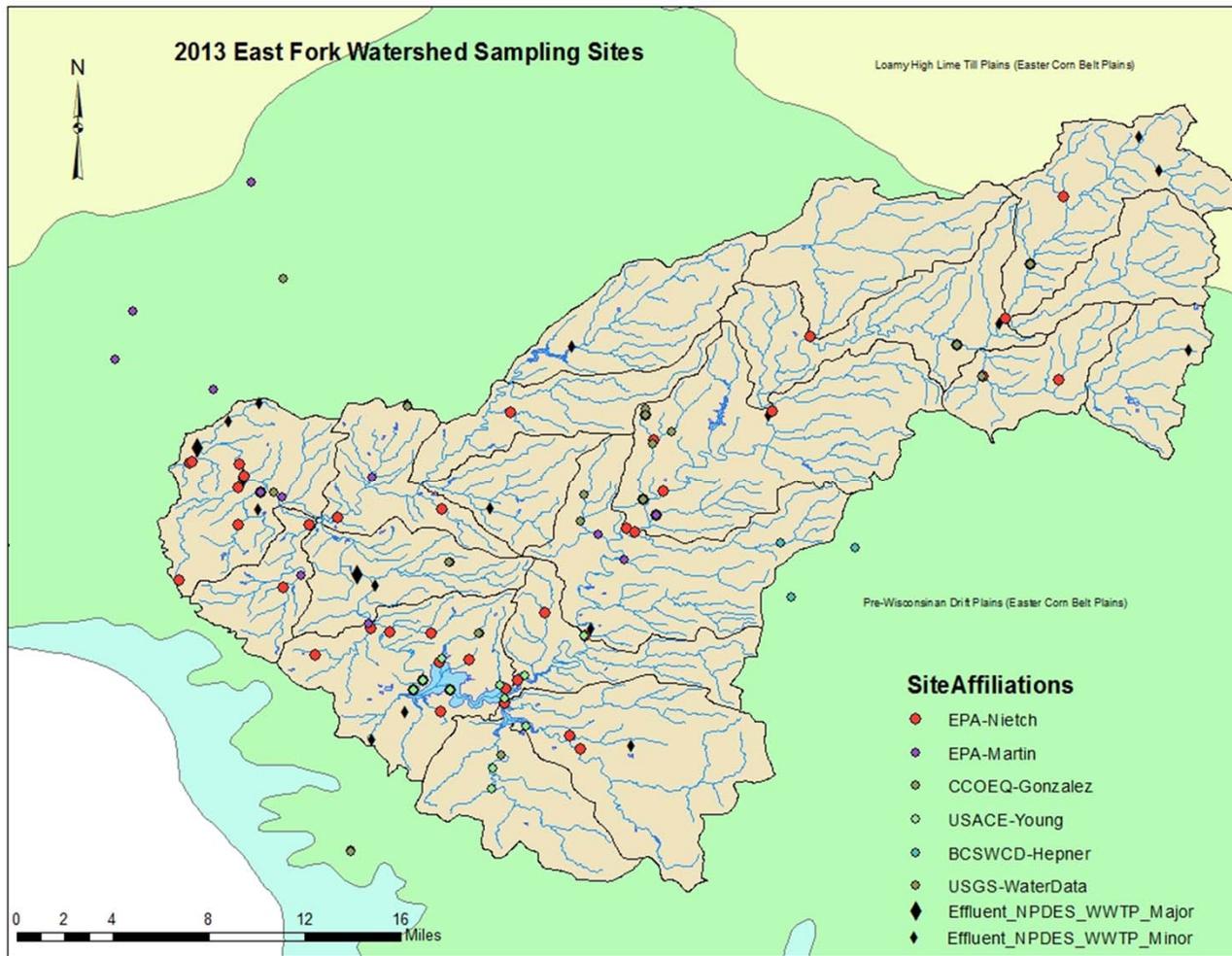
Stream Network

Landscapes

Sink-Harsha Lake

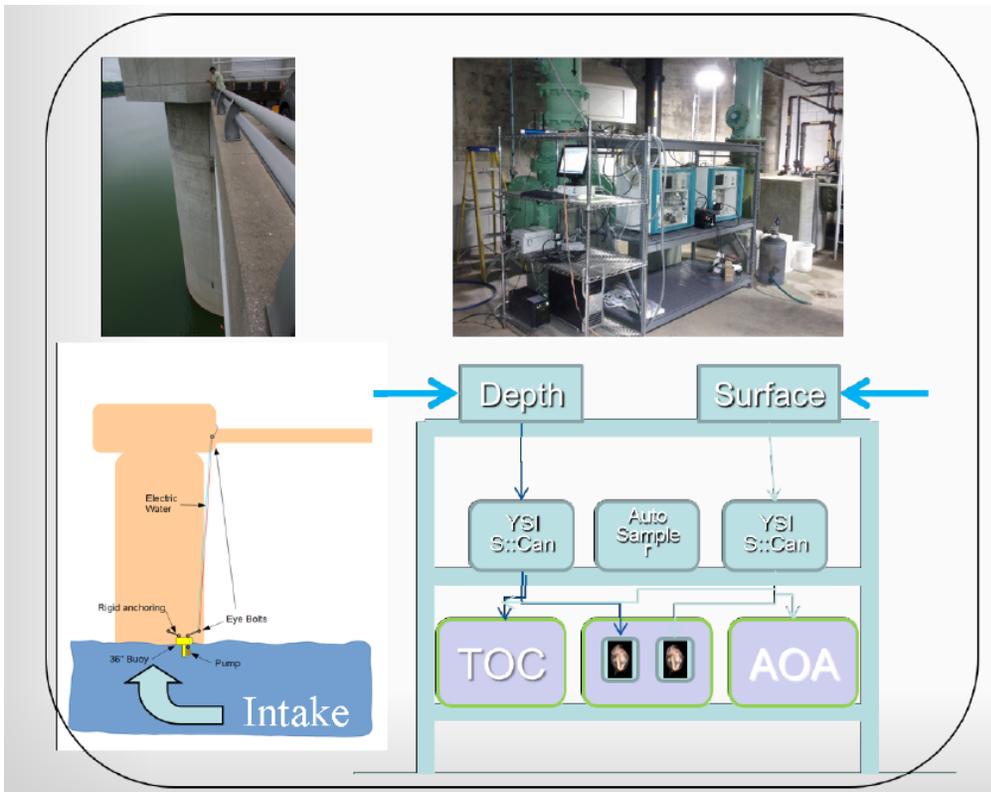


- Drinking sourcewater, Bob McEwan WTP
 - Oxygen deficiencies
 - Organic matter and DBP
 - 2012 brand new GAC contactors



| Program | Agency | # sites | Frequency | Stage | | Weather | Physical Parameters | | Nutrients | Pesticides | Algae | |
|------------------|----------|---------|-------------|----------|------------|---------|---------------------|------------|-----------|------------|----------|----------|
| | | | | Measured | Continuous | | Measured | Continuous | | | Taxonomy | BG/phyco |
| Intake Structure | USEPA | 1 | continuous | | X | | | X | | | X | X |
| Lake | USEPA | 7 | 3 weeks | X | | | X | X | X | | X | |
| Lake | USEPA | 2 | continuous | | X | X | | X | | | | X |
| Lake | USACOE | 12 | monthly | X | | | X | X | X | | X | |
| Stream | USEPA | 28 | weekly | X | | | X | X | X | | | |
| Stream | Clermont | 4 | monthly | X | | | X | X | X | | | |
| BMP | Clermont | 4 | wet weather | | X | X | | X | X | | | |
| EOF | Clermont | 2 | wet weather | | X | | | X | X | | | |

Intake Monitoring



Continuous:

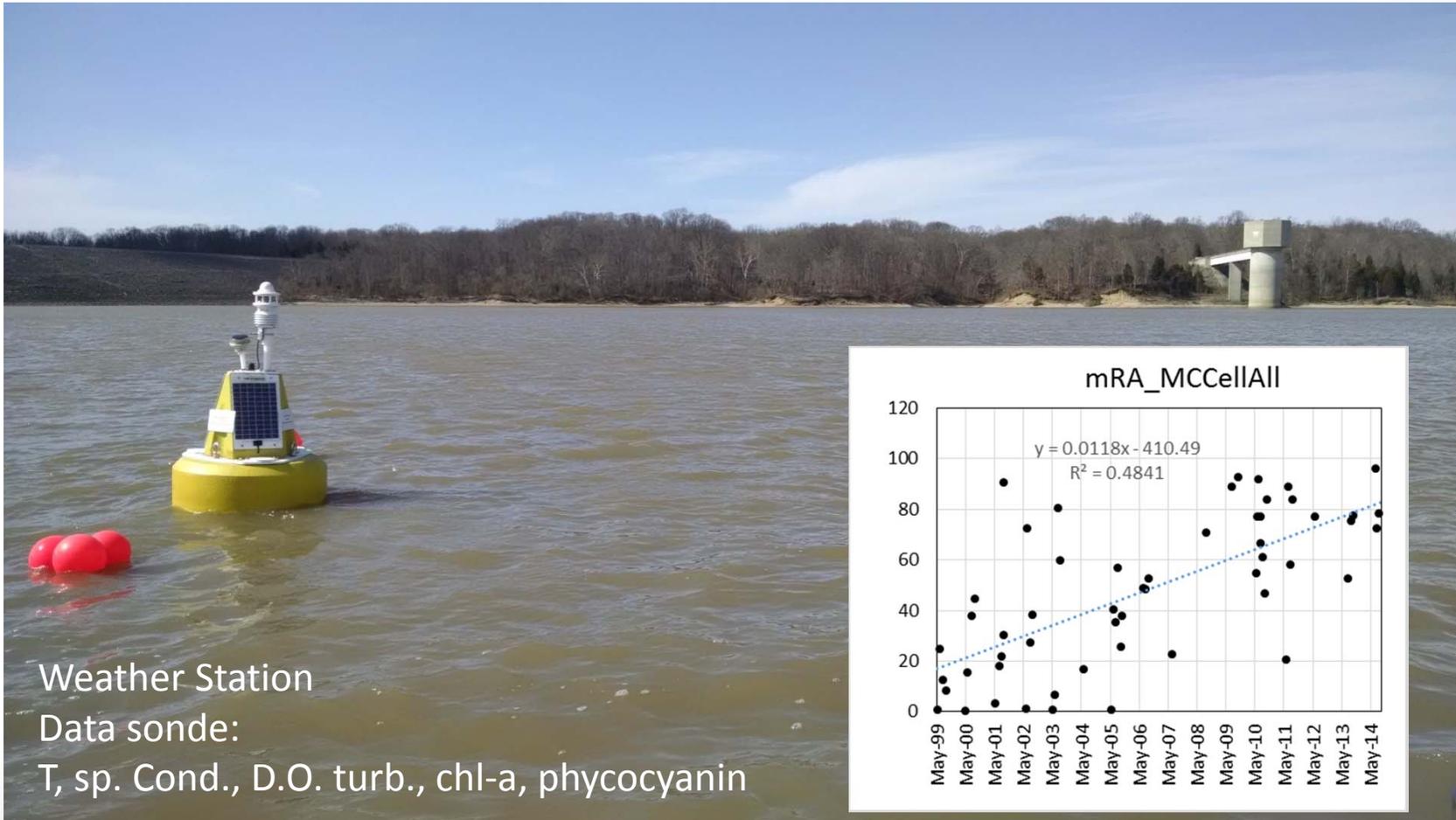
- S::can spectrolyser
 - UV254, TOC
- Algae Online Analyzer
- Datasonde

Discrete

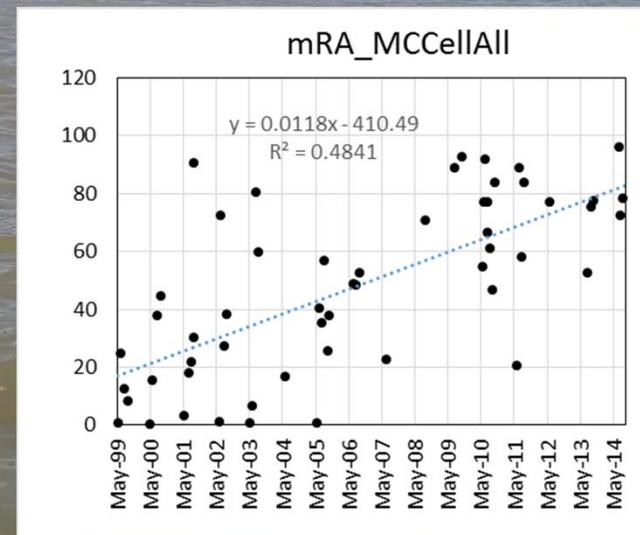
- Nutrients
- Algae
 - Taxonomy
 - Chl-a
- Cyanotoxins
 - Elisa
 - LC-MS/MS

Treatment Plant Operators use this information to make management decisions

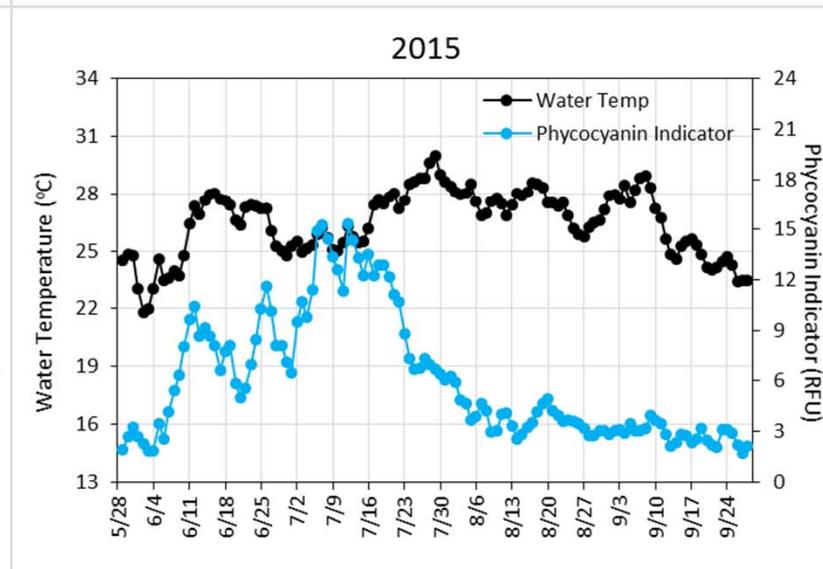
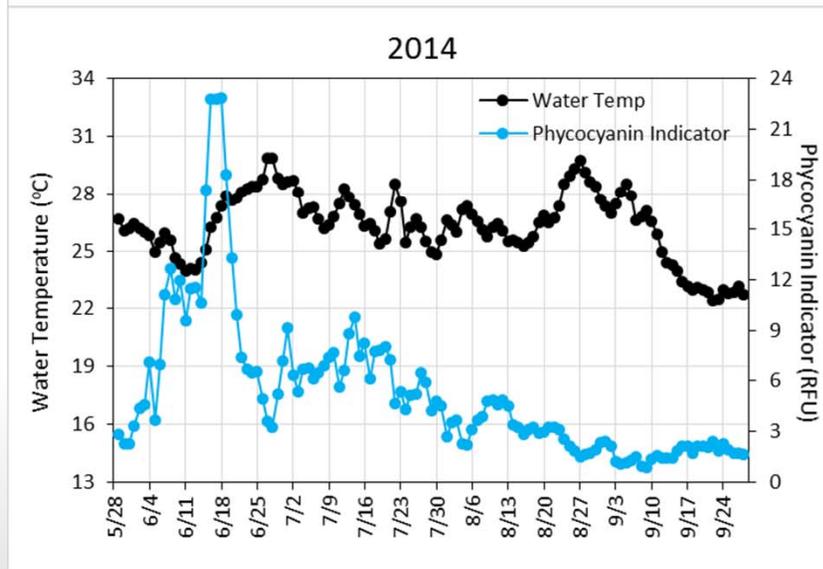
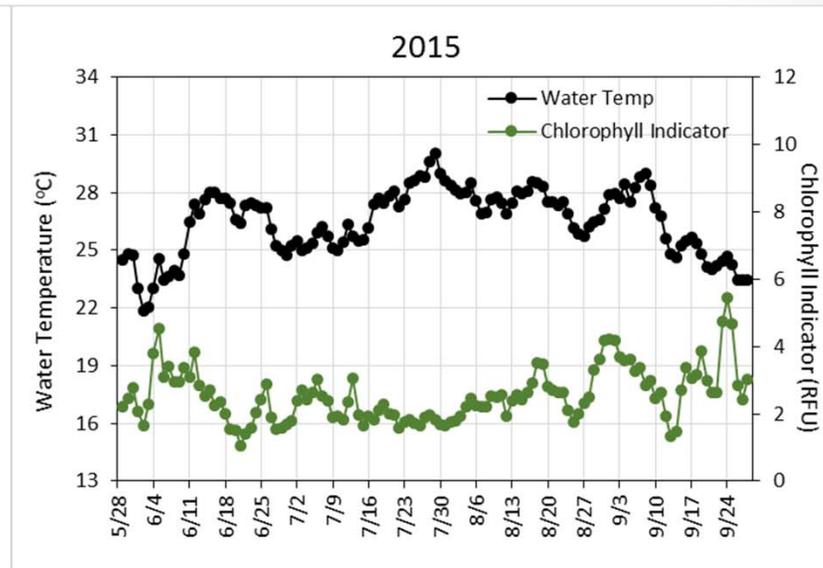
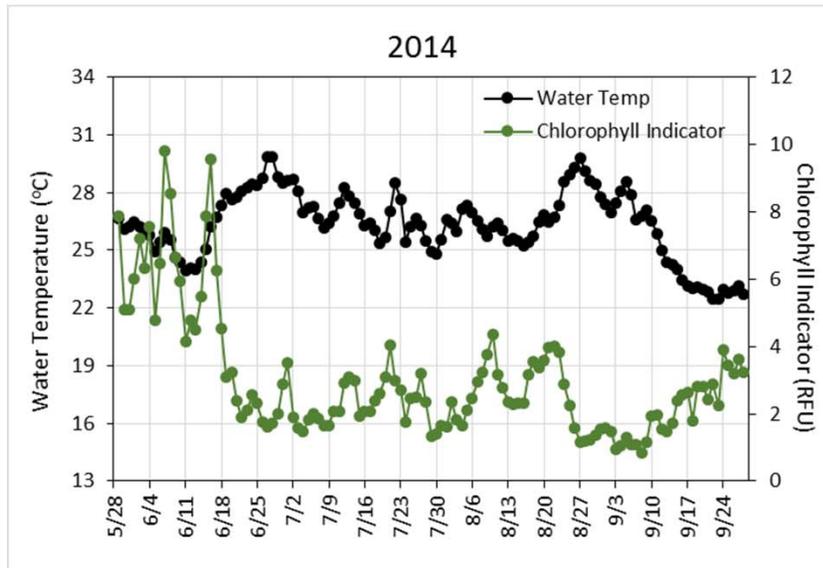
Lake Monitoring



Weather Station
Data sonde:
T, sp. Cond., D.O. turb., chl-a, phycocyanin



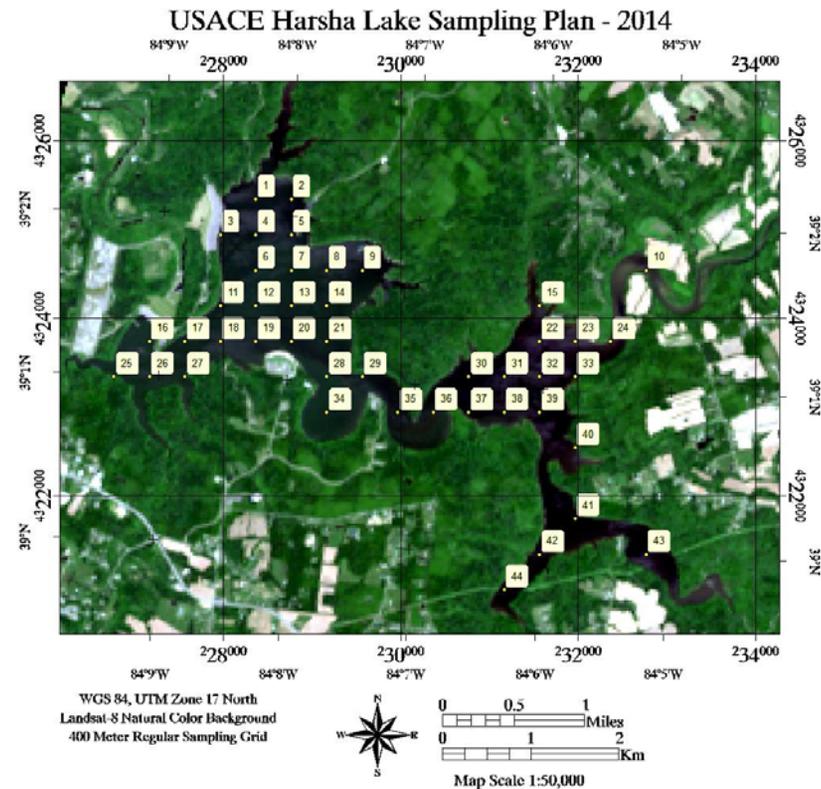
Chlorophyll-a vs. Phycocyanin



Flyover Study

USACE, U.C., USEPA, NOAA

- Ground truthed satellite data and hyperspectral aircraft imagery to develop and test Chl A bloom prediction algorithms
- Made recommendations about # of satellites necessary, types of satellites/ size lake, and which algorithms were most accurate for bloom prediction.

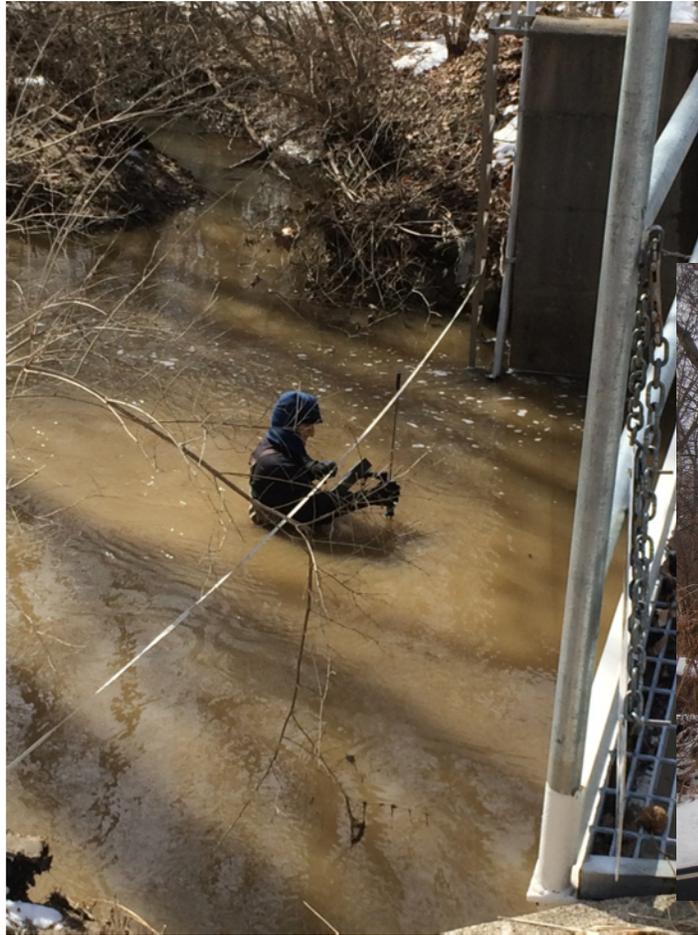


Stream Network

- Need to know what's influencing water quality in the lake?
- Coupled monitoring and modeling efforts
- Ambient grab samples and automatic samplers for event based monitoring
- Flow data for load calculations
 - Flow meters at automatic samplers, acoustic doppler flow meter for grab sampling
- Sampling locations
 - Large # of stations from headwater streams to East Fork at HUC boundaries. Frequency and parameters vary.
- Soil and Water Assessment Tool (SWAT) model developed by US EPA

Stream Network

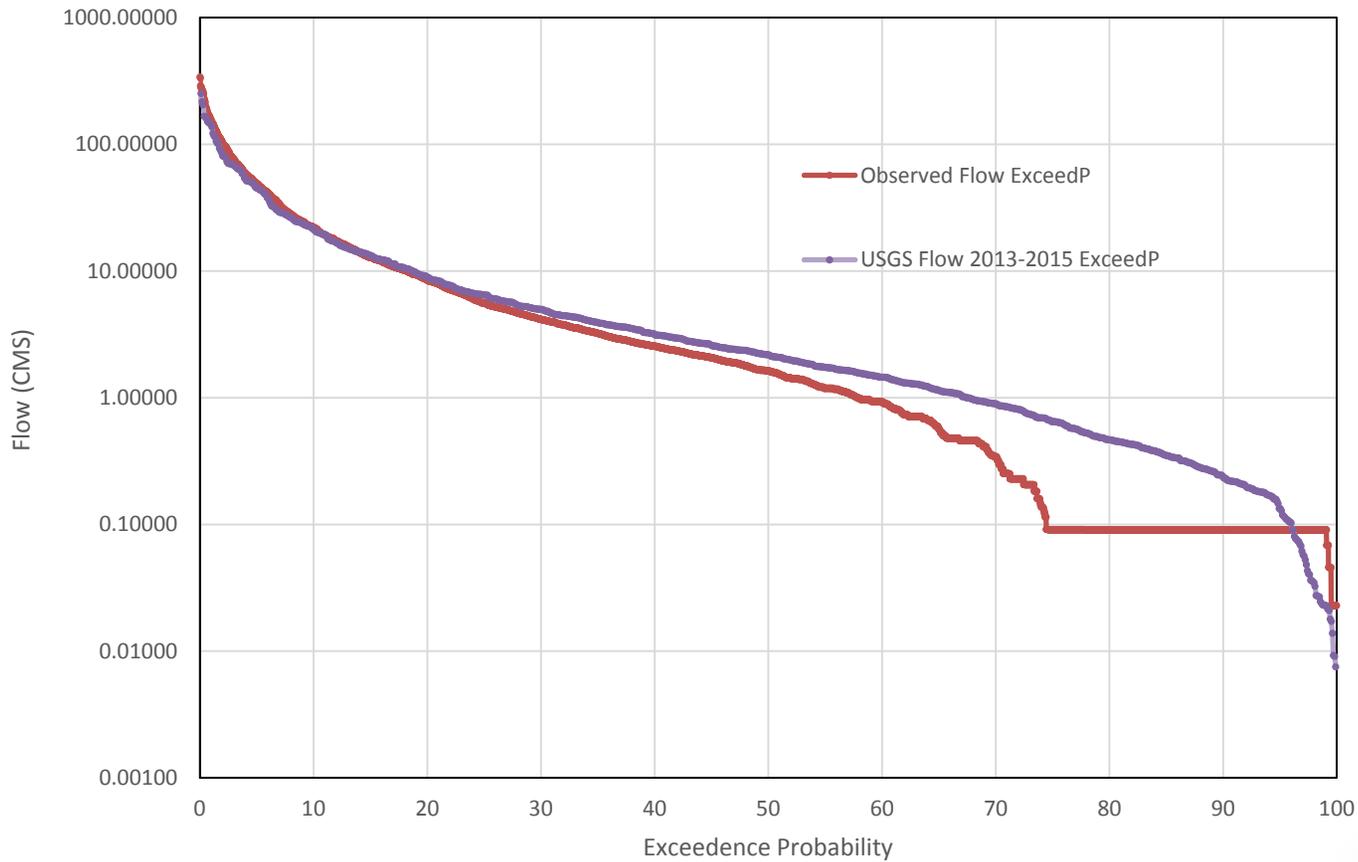




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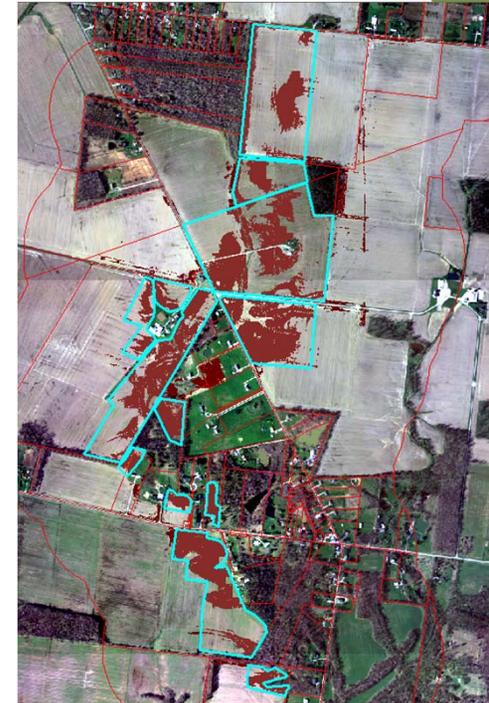


USGS Gaging Station added in 2013

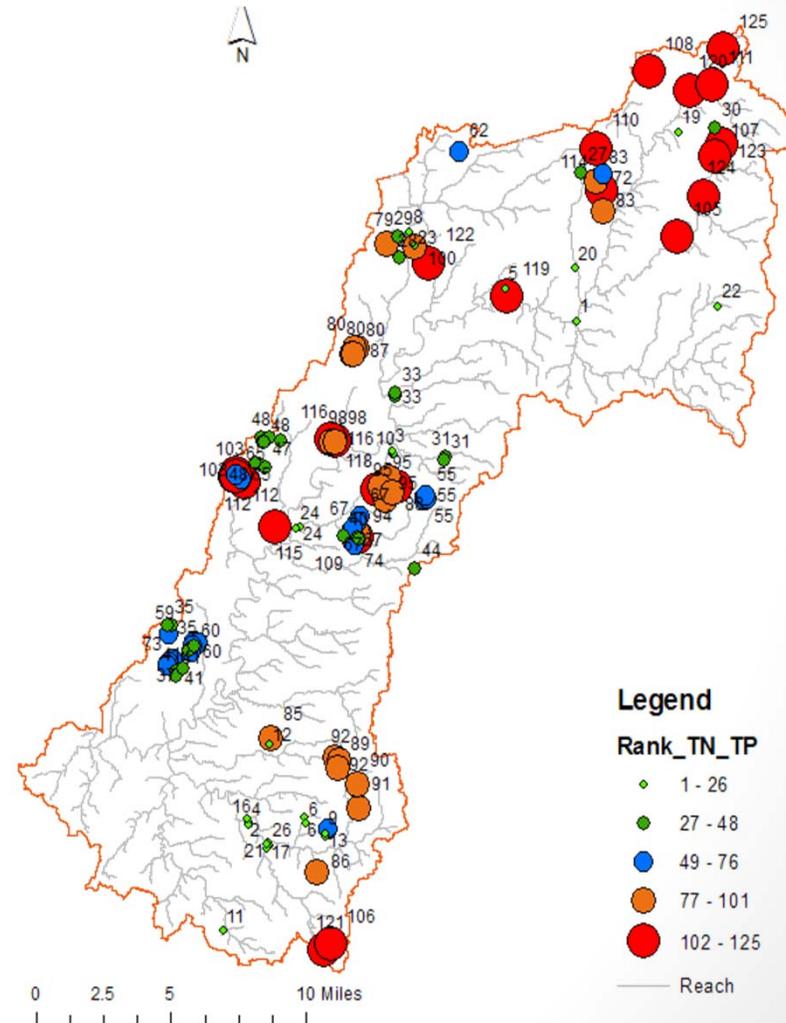
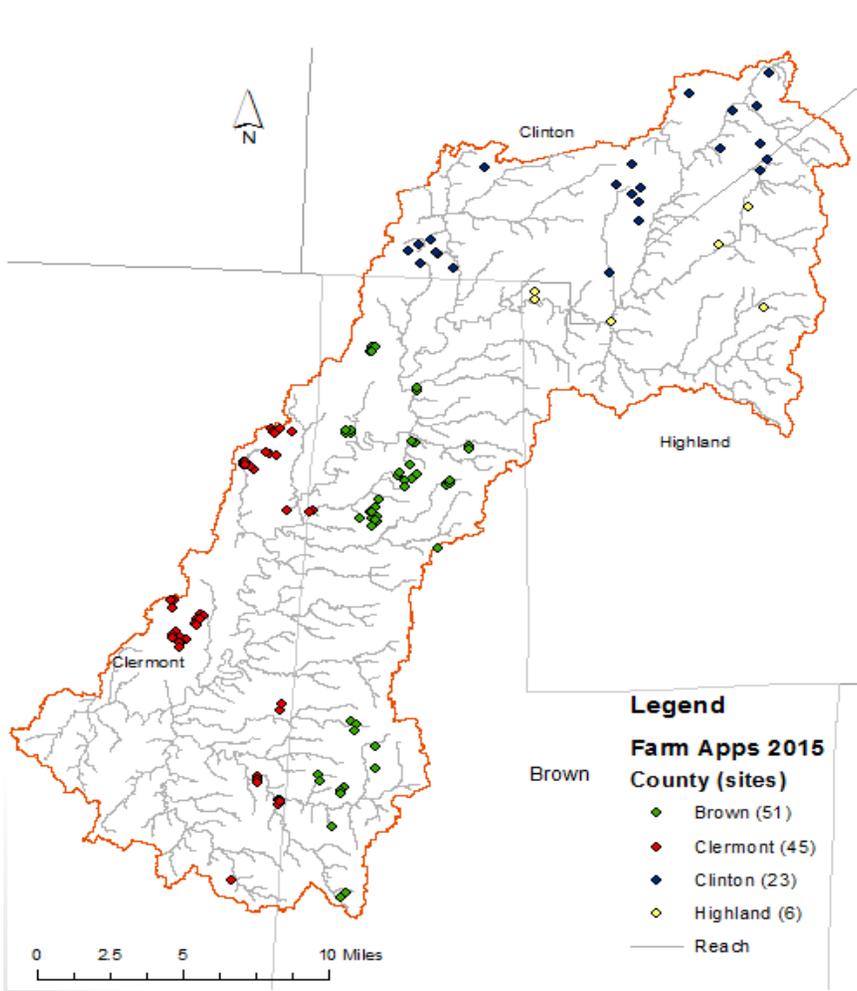


Landscapes: From Monitoring to Implementation

- Modeling of the watershed pinpointed the sectors contributing the highest loads to the lake
- SWAT modeling still needs validation data from nonpoint source loading and the impact of BMPs
- US EPA SWAT model used to project high areas of sediment yield (rust colored area)
- SWCD/NRCS/FSA, work with producers to put practices on the ground
 - Special EQIP – Five Mile Creek Watershed
 - Conservation Innovation Grant – cover crops & detention basin/vegetated bed system
 - Recently awarded RCPP grant
- County monitors practices



RCP: Regional Conservation Partnership Program

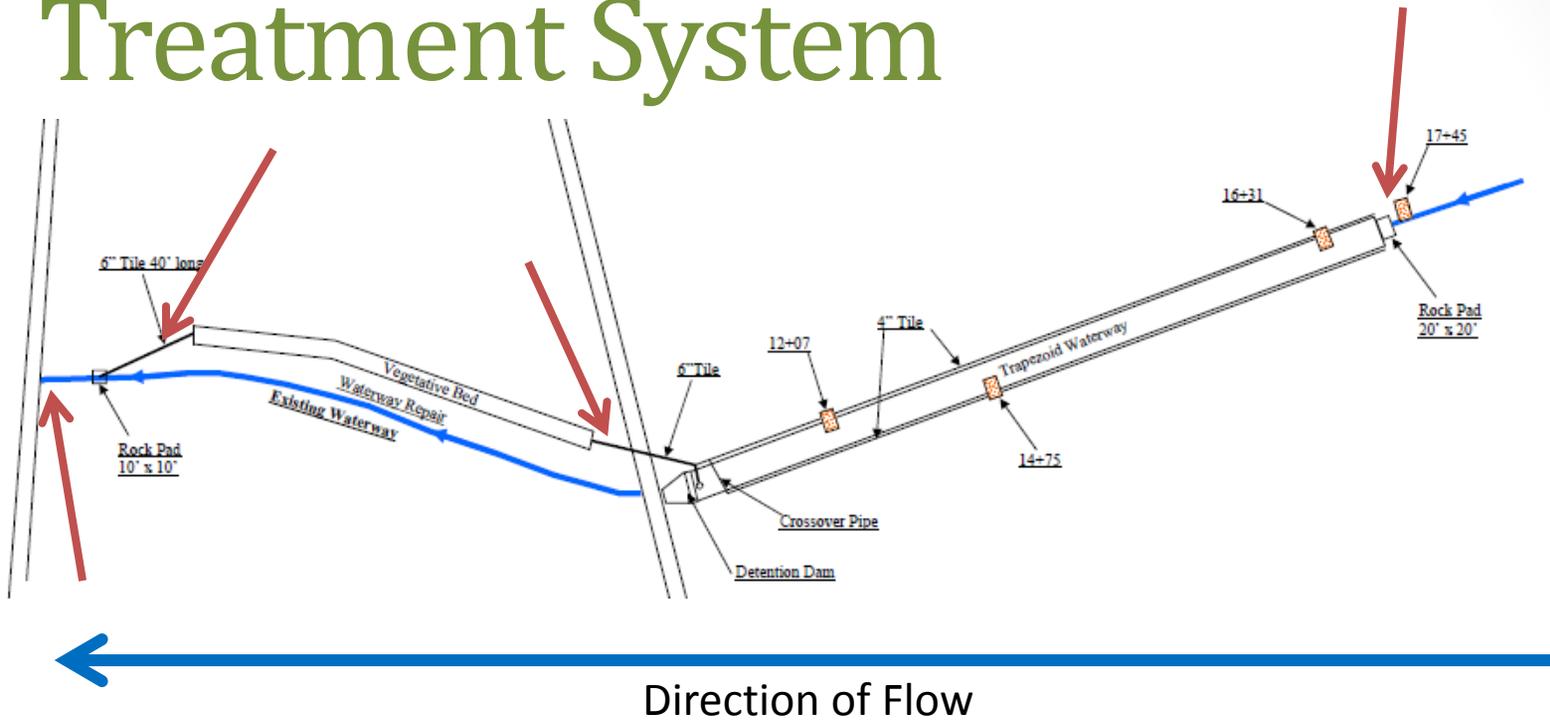


Conservation Innovation Grant

- 2011 secured USDA Grant to design, implement & monitor an innovative BMP to reduce nutrient runoff from farms
- Cooperative Effort
 - SWAT model helped secure the funding
 - SWCD & USEPA designed the system
 - Strong relationships with local farmers secured to BMP location



Design-Modified Stormwater Treatment System





- Composite nutrient sampling
- Flow monitoring
- System is working!
 - 49% nitrates
 - 27% organic N
 - 37% DRP
- Goal:
 - Removal efficiencies?
 - Cost effective
 - Get adopted as an EQIP approved practice.

Conclusions

- Partnerships allow for data sharing and better resource allocation
 - Documented historical changes in water quality and coincident shifts in algal communities.
 - Establish a water monitoring infrastructure that facilitates focused research studies & the development, testing, and validation of models .
 - Conducted outreach opportunities using an ‘Ambassador’ approach: increased BMP adoptions
- Projects of this scale are impossible without all the partners



Other Projects

- Stream Facility, US EPA Office of Research & Development: [Chris Nietch, nietch.christopher@epa.gov](mailto:nietch.christopher@epa.gov)
- USEPA: Reservoir methane emissions: [Jake Beaulieu, Beaulieu.Jake@epa.gov](mailto:Beaulieu.Jake@epa.gov)
- USGS: HAB predictor model: [Donna Francy, dsfrancy@usgs.gov](mailto:dsfrancy@usgs.gov)
- Flyover Study: [Dr. Richard Beck, richard.beck@uc.edu](mailto:richard.beck@uc.edu)
- USACE: Historical algae trends [Jade Young, Jade.L.Young@usace.army.mil](mailto:Jade.L.Young@usace.army.mil)
- USEPA: Evaluation of water quality trading programs / integration of economics [Matt Heberling, Heberling.Matt@epa.gov](mailto:Heberling.Matt@epa.gov)
- USEPA: Ecological Tipping Points: [Heather Golden, golden.heather@epa.gov](mailto:golden.heather@epa.gov)
- Cooperative: TMDL Support: [Chris Nietch, nietch.christopher@epa.gov](mailto:nietch.christopher@epa.gov)
- Clermont County: passive samplers at landfills [Hannah Lubbers, hlubbers@clermontcountyohio.gov](mailto:hlubbers@clermontcountyohio.gov)
- Clermont County: Nutrient Management and Fertilizer Management Phone Application: [John McManus, jmcmanus@clermontcountyohio.gov](mailto:jmcmanus@clermontcountyohio.gov)
- Clermont County: Agricultural BMP performance [Hannah Lubbers, hlubbers@clermontcountyohio.gov](mailto:hlubbers@clermontcountyohio.gov)
- USEPA: Urban Green Infrastructure (BMPs) [Joong Lee, jglee@ugiengineering.com](mailto:jglee@ugiengineering.com)