USACE KANSAS CITY DISTRICT
REGIONAL RESEARCH UPDATE

Great Plains and Midwest Harmful Algal Blooms Conference

4-6 February 2020

University of Kansas

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U.S. Army Corps of Engineers

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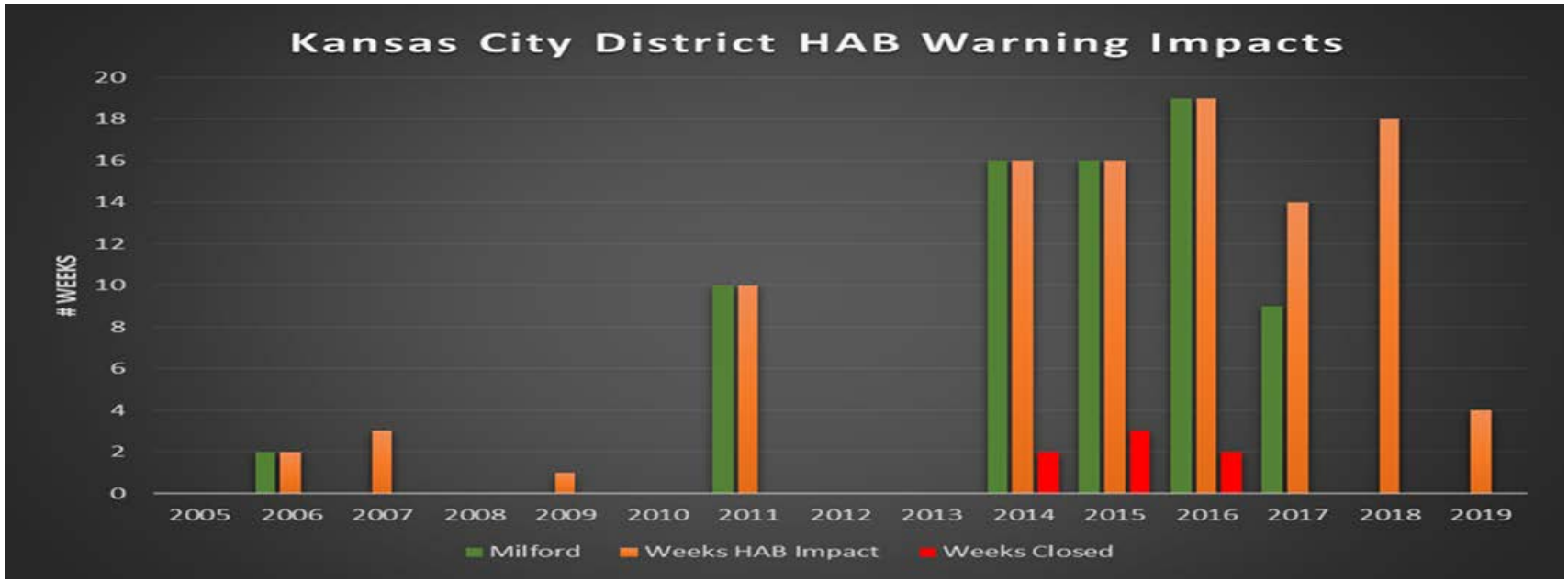
OVERVIEW

- ❖ Kansas City District WQ program
- ❖ HAB remediation efforts
- ❖ ERDC role in HAB research
- ❖ Next steps



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KANSAS CITY DISTRICT WQ PROGRAM

- Watershed Approach
  - Monthly samples April-Sept
  - Holistic understanding of WQ at Lake Projects
  - Nutrients, sediments, phyto and chlorophyll, herbicides, metals, physical conditions (temp., D.O, pH, turbidity, conductivity)
- Data sharing
  - Lake Project Management
  - Watershed conservation groups
  - TMDLs
  - Research
- Reporting/Web
  - WQ concerns & exceedances
  - Annual results vs 10-year trend

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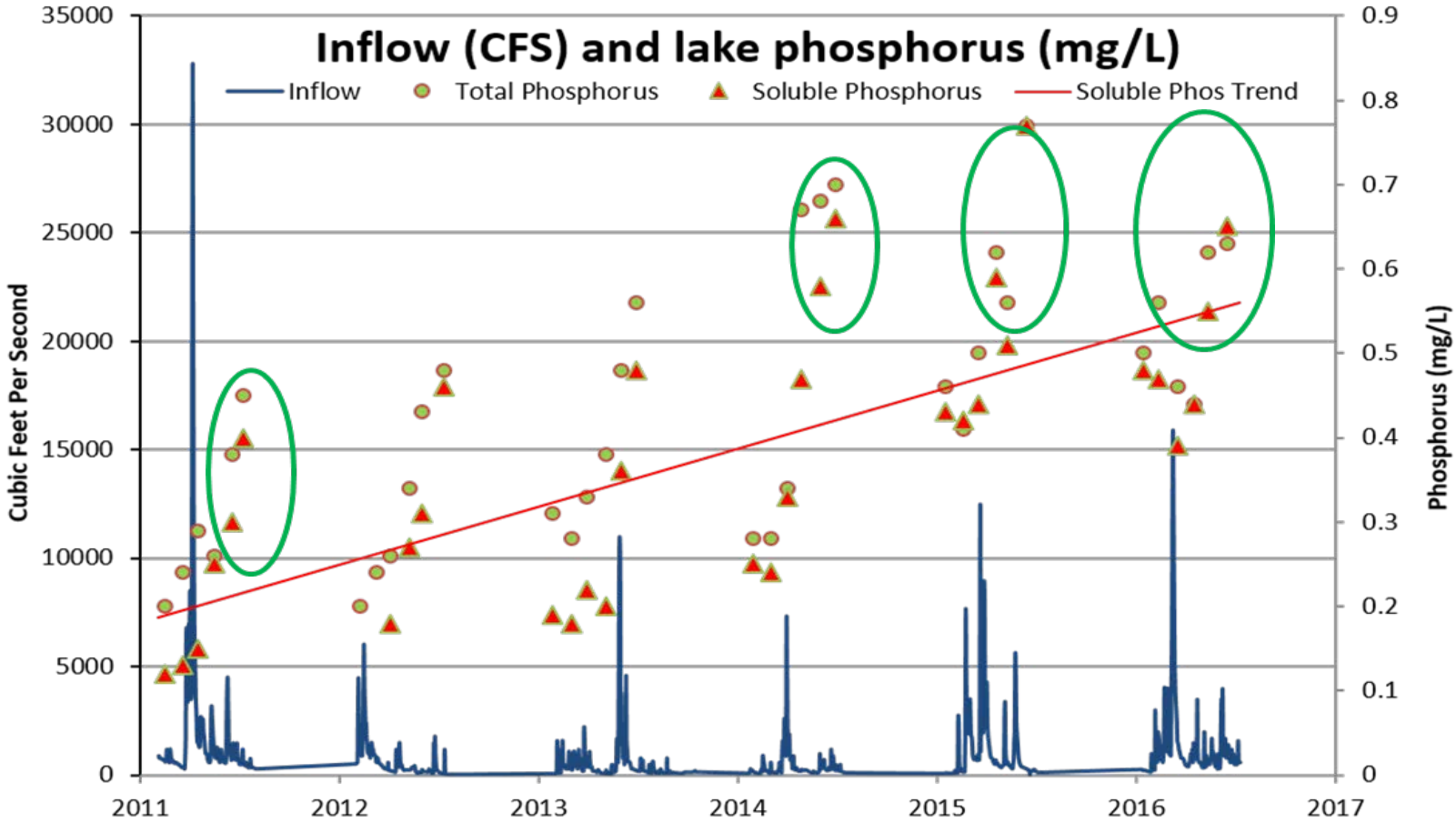
KANSAS CITY DISTRICT WQ PROGRAM

Milford Lake Water Quality



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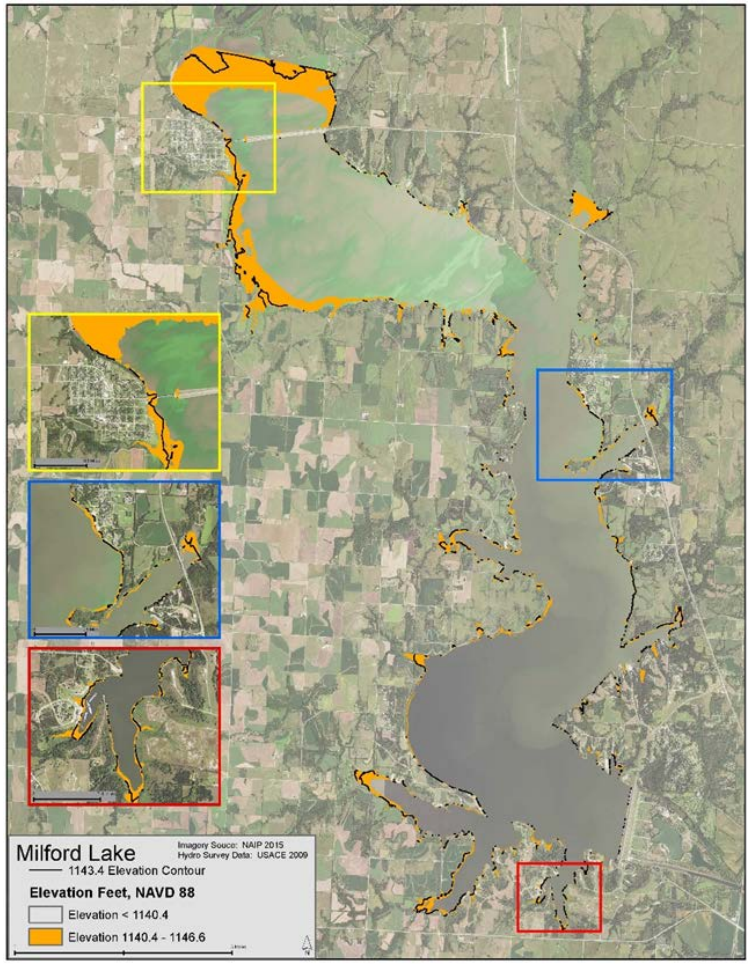
KANSAS CITY DISTRICT WQ PROGRAM

Lake Level Management Plan

- Planned a drawdown
- Expose lake bed sediment
- Consolidate loose sediment
- Reduce soluble phosphorus loading
- Reduce zebra mussels
- KDHE suggests spore reduction



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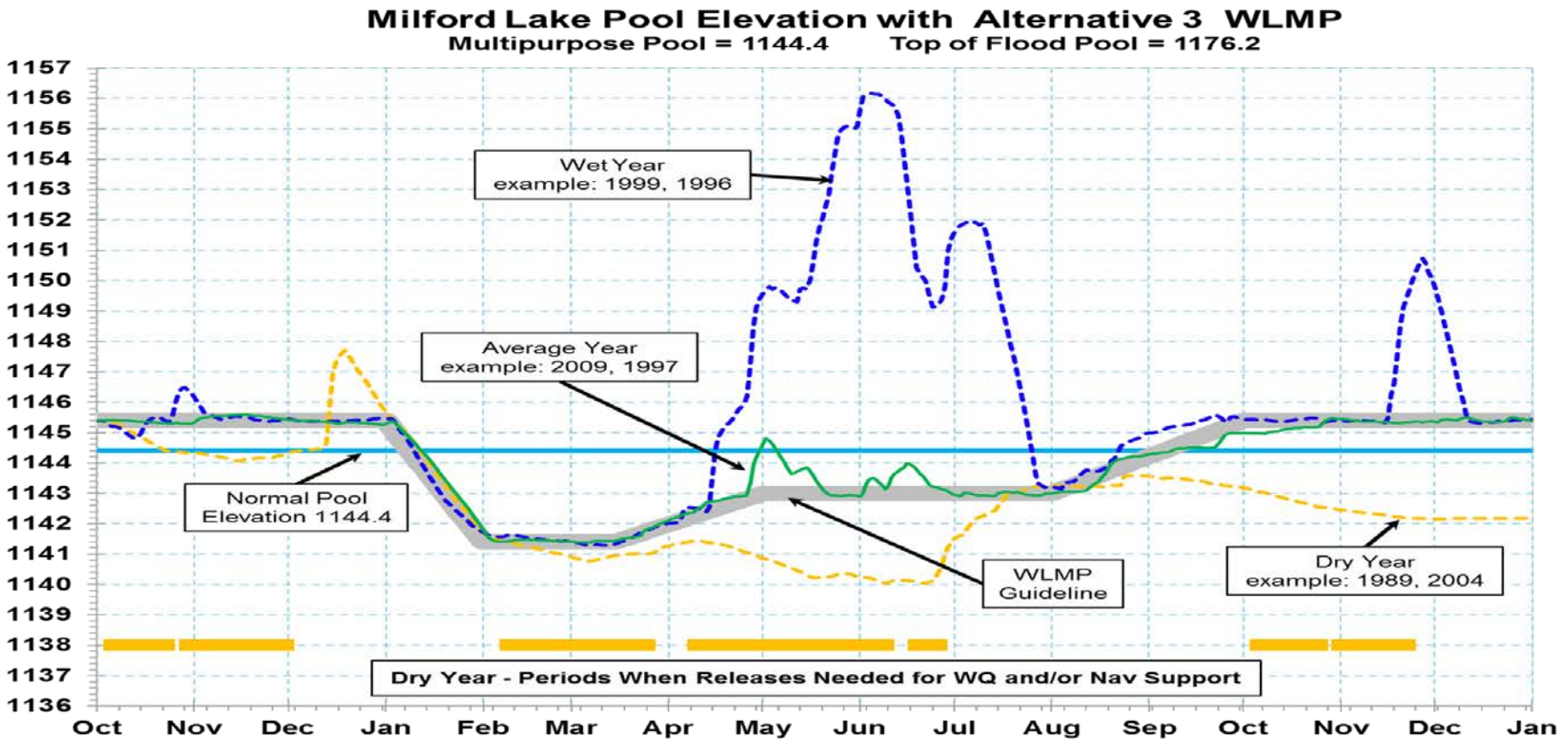
KANSAS CITY DISTRICT WQ PROGRAM

Lake Level Management Plan



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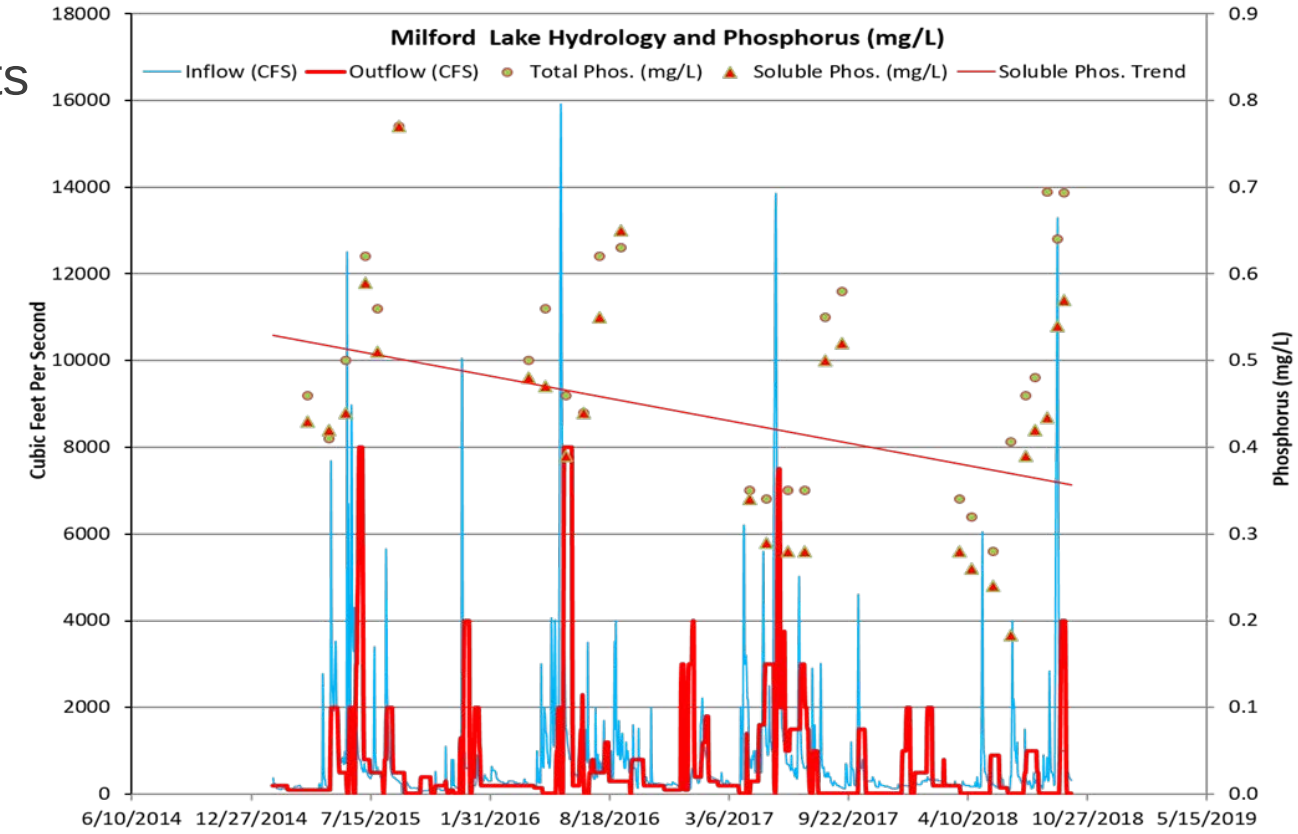
KANSAS CITY DISTRICT WQ PROGRAM

Horizontal Nutrient Flushing

- Negative trend
- Only 2 data points
- Drought effect??



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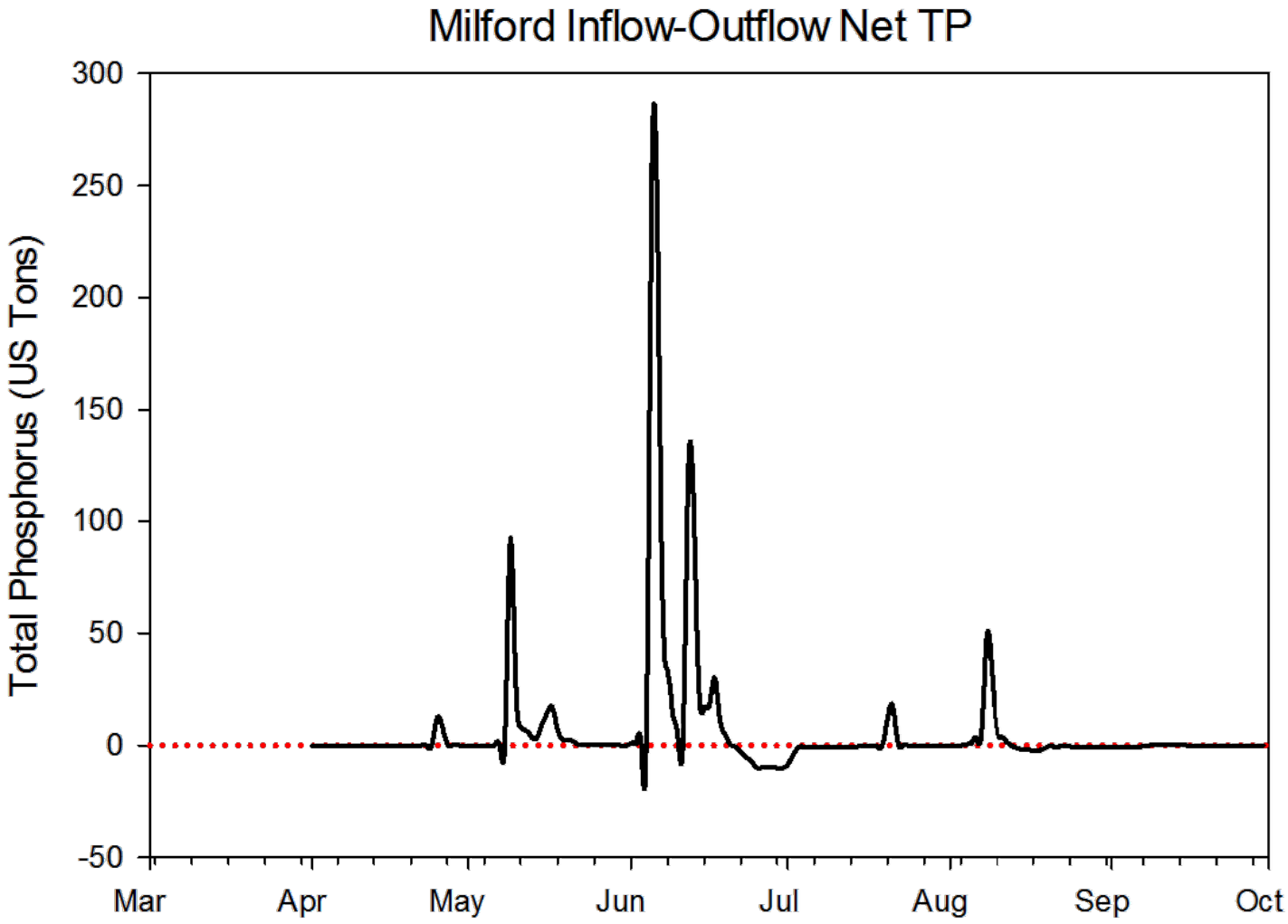
KANSAS CITY DISTRICT WQ PROGRAM



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HAB REMEDIATION EFFORTS

- Watershed conservation is cost effective 1st step
- Algae Barriers
- Draw-down
- Ultrasonic Vibration
- Superoxides and Cavitation
- TN:TP manipulations by adding nitrogen

HAB REMEDIATION EFFORTS

- **Watershed conservation** may not suffice in aging lakes with sediment deposition and large nutrient loads.
- **Algae Barriers** reduce wind impacts and concentrate algae with 50-year lifespan withstanding 50 mph winds. FEASIBLE to concentrate buoyant cells or limit toxin release downstream. (e.g. Iron Gate Res)
- **Draw down** can influence nutrient availability but confounded at Milford Lake. FEASIBLE with management limitations.
- **Ultrasonic vibration** is most effective for floating algae. NOT FEASIBLE at size and configuration tested. (e.g. Melvern River Pond)
- **Superoxides** and Ultrasonic Cavitation
  - Microcystin reduced 67%-97% from 550 ug/L . NOT FEASIBLE-size limitations. (ERDC research)
- **TN:TP manipulations** by adding nitrogen have shown promising results in small scale studies in eutrophic systems and whole lake treatments in mesotrophic lakes FEASIBLE in low inflow and mesotrophic or less (e.g. Dworshak Reservoir).

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ERDC ROLE IN HAB RESEARCH

The US Army Engineer Research and Development Center

Environmental Lab-Vicksburg, MS

- Aquatic Nuisance Species Research Program (ANSRP)
- Aquatic Plant Control Research Program (APCRP)
- Part of Interagency Workgroup of researchers working under HABHRCA (Harmful Algal Bloom and Hypoxia Research and Control Act)
- Increased national attention and funding for HABs research

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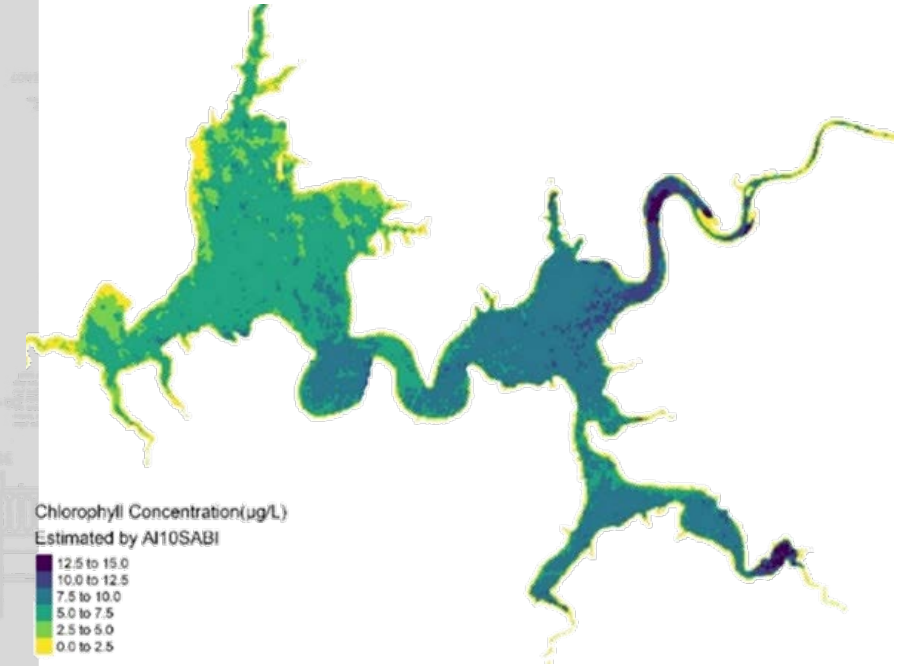
Prediction

Remote sensing-based software tools

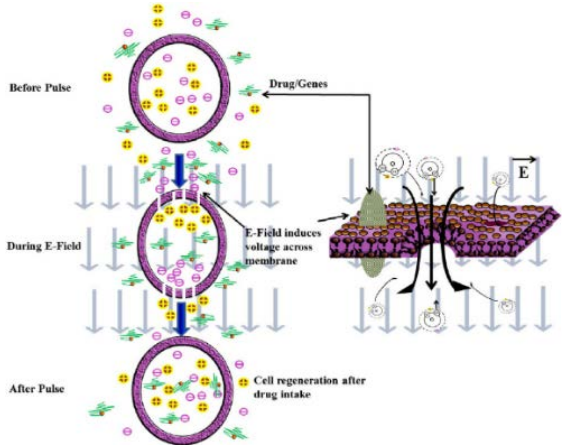


Ecological Modeling

Mitigation

Gene Silencing

Species specific cyanobacteria control



Peroxide based algaecides

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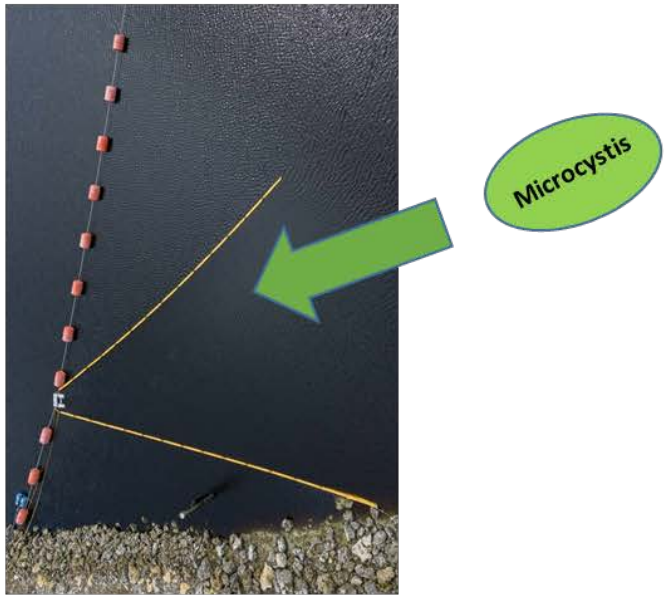
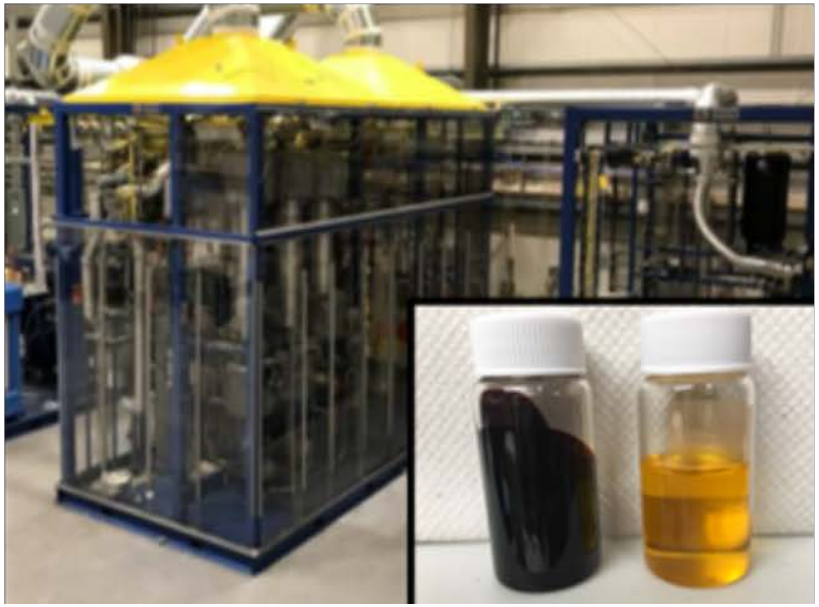
Dissolved air flotation for *treatment*

Boom skimmer for algae *interception*



Hydrothermal liquefaction lab studies for *transformation* of algae to fuel



Usages of Products

- Bio-Fuels
- Fertilizer
- Plastics
- Other Commercial Products

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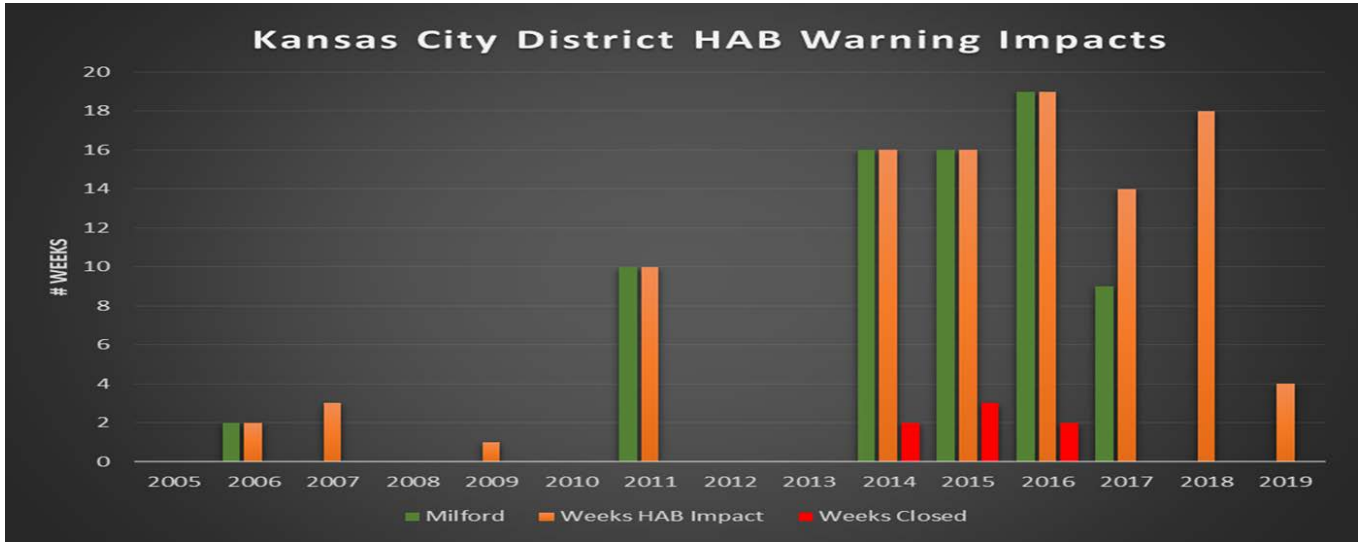
ERDC ROLE IN HAB RESEARCH

- Operational Strategies for HAB Management in Inland Reservoirs: Conduct systematic study of influence of USACE reservoir control options on HABs.
- Develop a modeling dashboard tool to test likely effects of operational changes and compare output against stakeholder limitations.
- Milford Lake is one of at least 3 study lakes.
- Project begins in 2020.
- Hope to build on lessons learned in 2018 and 2019.



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KANSAS CITY DISTRICT NEXT STEPS

- Work within authorities to research and manage HABs
  - Continue to maintain historic data set
  - Participate in “Operational Strategies” study of potential low cost HAB remediation benefiting authorized purposes of USACE Lake Projects
  - Continue to work with agencies/stakeholders as partners working for management solutions related to HAB forecasting, remediation, and public health alerts

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