IN-LAKE REMEDIATION EFFORTS TO REDUCE HARMFUL ALGAE BLOOM IMPACTS AT TWO KANSAS CITY DISTRICT USACE PROJECTS.

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U.S. Army Corps of Engineers

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- Overview of HABS in Kansas City District
- USACE Authorities related to project management and HABS
- Current Efforts
  - Lake level management plan
  - Ultrasonic remediation
- Next Steps

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WHAT CONDITIONS LEAD TO HABS?

- Complex within lake and watershed interactions
  - Water transparency- sunlight penetration for photosynthesis
  - High nutrient load with low N:P ratio favor toxin producing species
  - Interaction with biota
    - Examples, bacteria, zebra mussel, bottom feeding fish
- Kansas City District HABS
  - Aging reservoirs accumulate phosphorus bound sediment (sink phenomenon)
  - Nutrient ratio (N:P) decreases with age as stored P increases over time while N remains relatively stable
  - Zebra mussels have led to quick response by HABS as they increase transparency and add soluble phosphorus in their pseudo feces. (e.g. Milford, Perry, Melvern, and Pomona Lakes)

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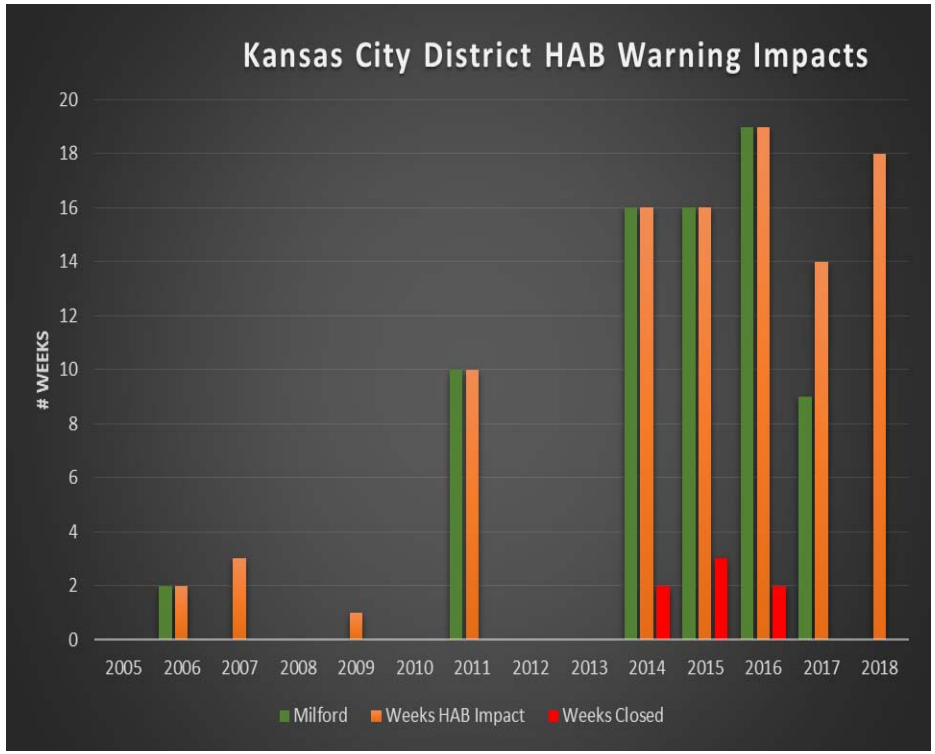
IMPACTS TO USACE PROJECTS

- Nationwide USACE Survey
  - 12 Districts reported HABs (FY15)
  - Reduction in resources for other programs(Corps' life jacket campaign, campground maintenance, etc)
- Kansas City District
  - Lake warnings/closures
    - Impacts to economy
    - Record 19 weeks in 2016 (Milford)
    - Frustrated public/business owners
    - Impacts to water supply customers
    - Decline in Milford Lake Impacts!



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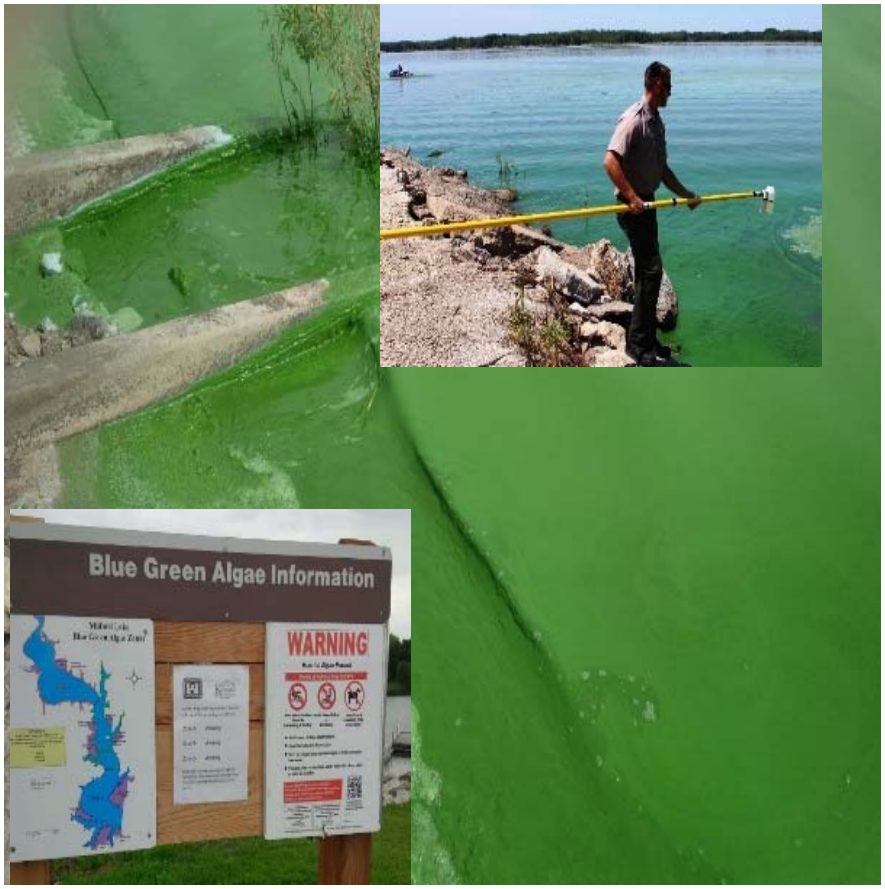
AUTHORITY AND COMPLIANCE – WHAT CAN USACE DO?

- Flood Control Act of 1954
- Clean Water Act-Section 304 (Draft- Rec. AWQC/Swimming Advisories for Cyanotoxins)
- Drinking Water Protection Act
- Existing authorities to address HABs are limited
  - No defined USACE authority to fund WQ improvement in lakes
  - No defined CoP to champion HAB issues nationally
  - Sec 1135, WRDA 86 (Ecosystem restoration) and Sec 22, WRDA 74 Planning Assistance to States (PAS) provide secondary WQ benefits



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AUTHORITY AND COMPLIANCE – WHAT CAN USACE DO?

- Authorized purposes from congressional funding set primary management to Flood Reduction based on Missouri River management at Waverly, MO USGS gage.
- Lake Level Management Plan-an opportunity to for stakeholders/agencies to plan lake levels for authorized purposes (i.e. fish and wildlife, recreation).
- Funds for recreational improvement are typically very small amounts from operational funds prioritized locally.

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CURRENT EFFORTS

- Proactive avoidance: sampling, educate, safety, closures, media
  - Monthly WQ Program Sampling
  - Field toxin test
  - Sampling/response plans
  - Coordinate with stakeholders
  - Post public health advisories
- Action Items to reduce/minimize
  - Lake Level Management Plan- nutrient/zebra mussel reduction effort
  - Ultrasonic remediation (2018)

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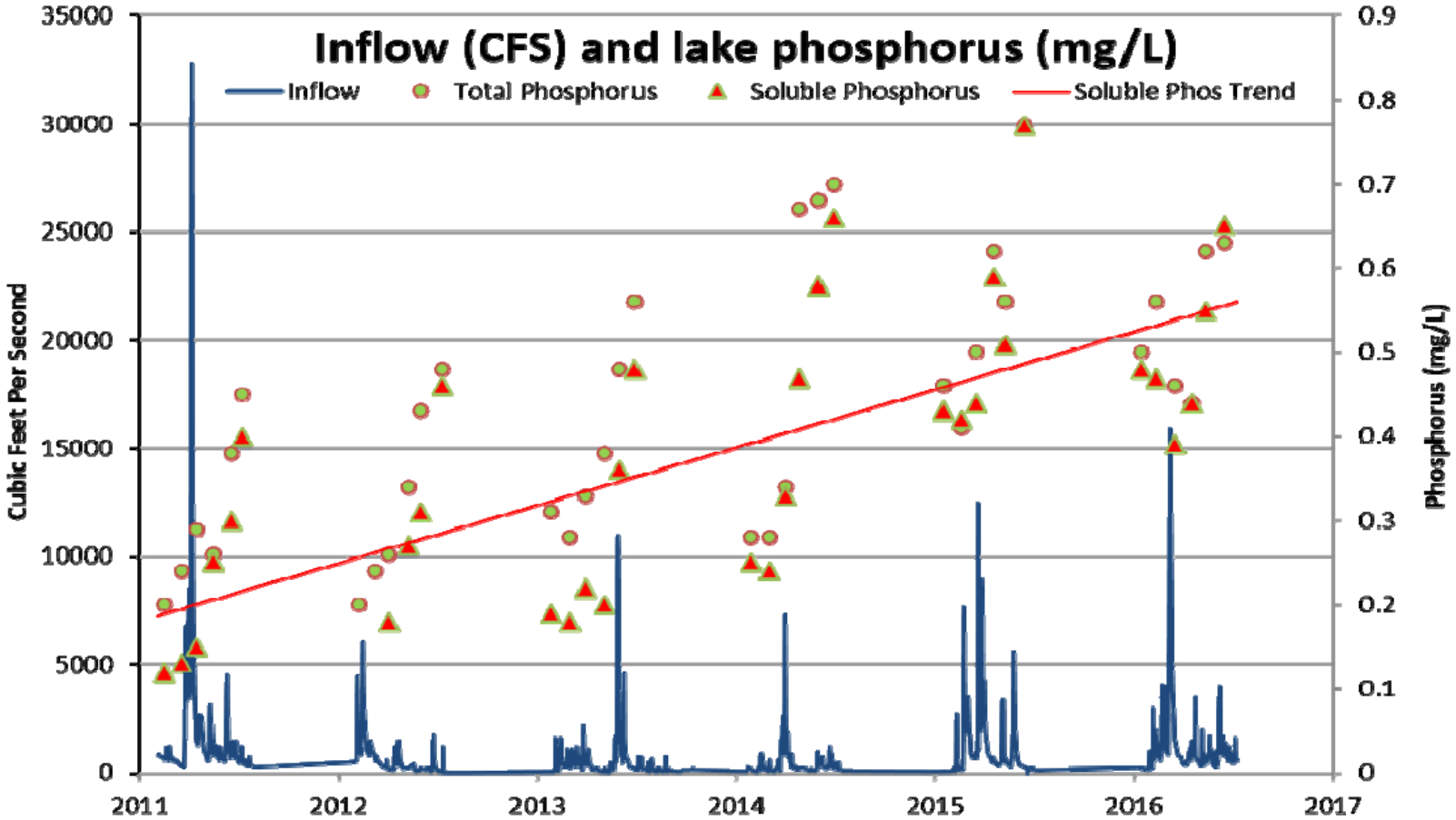
CURRENT EFFORTS

Milford Lake Water Quality



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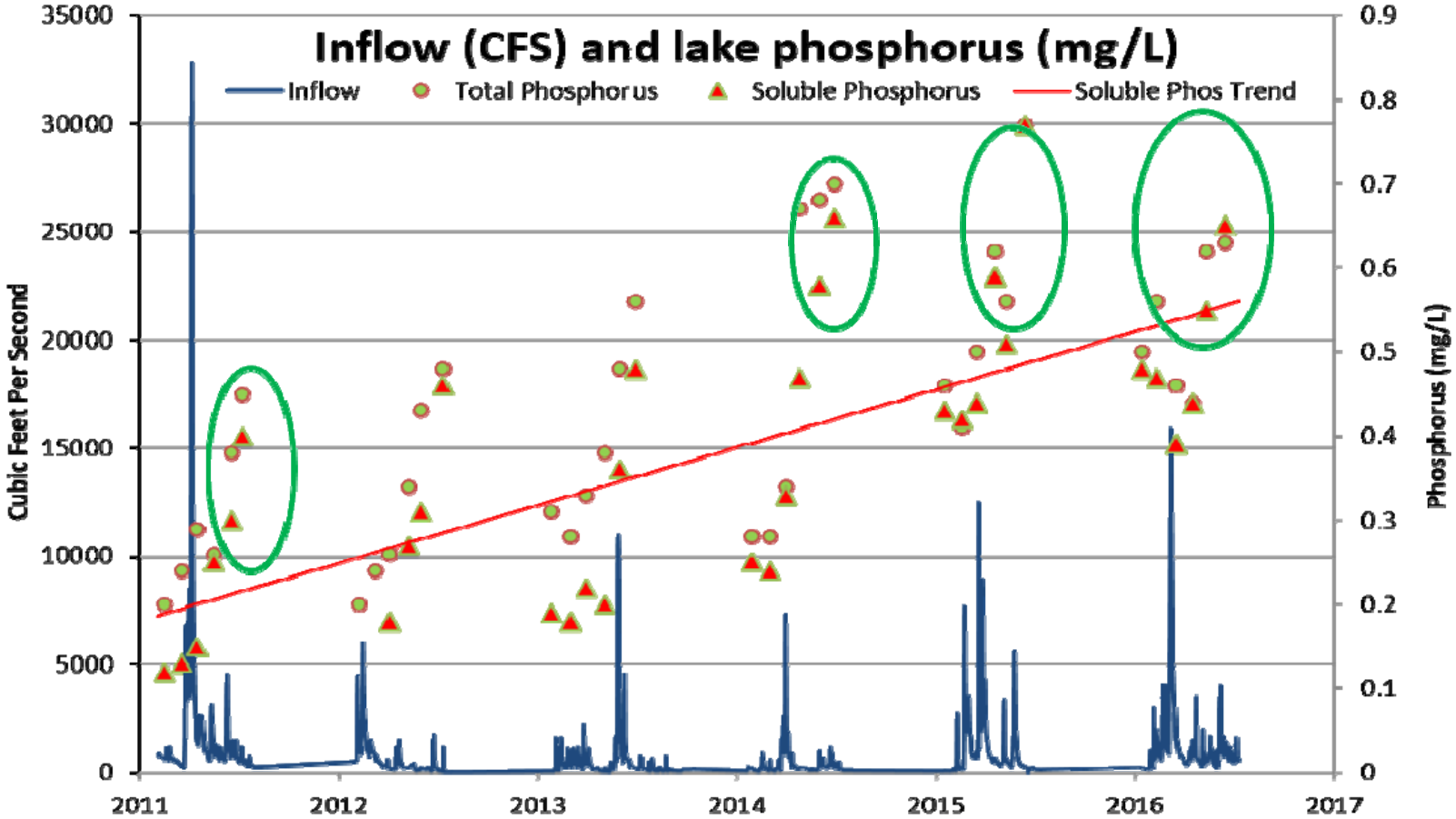
CURRENT EFFORTS

Milford Lake Water Quality



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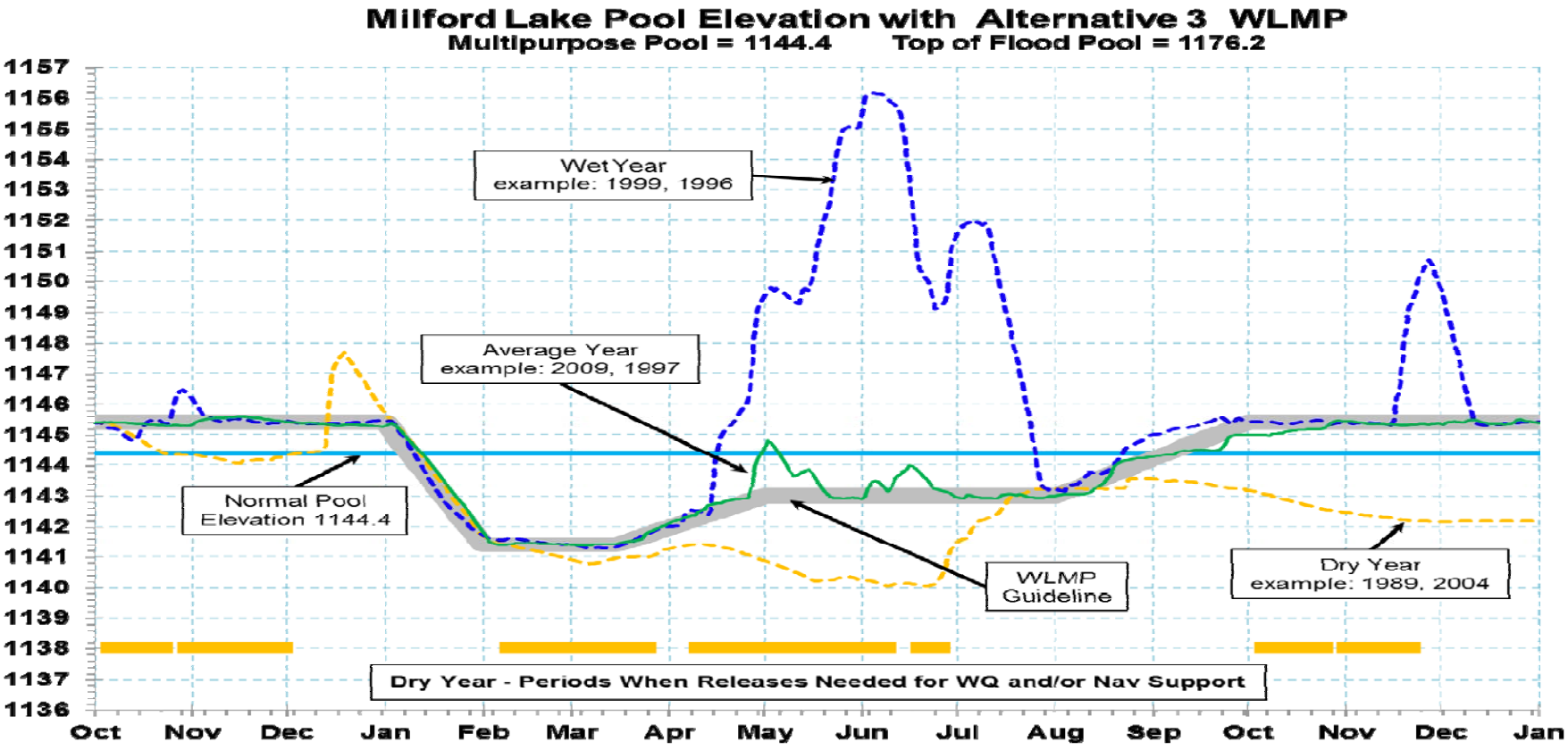
CURRENT EFFORTS

Lake Level Management Plan



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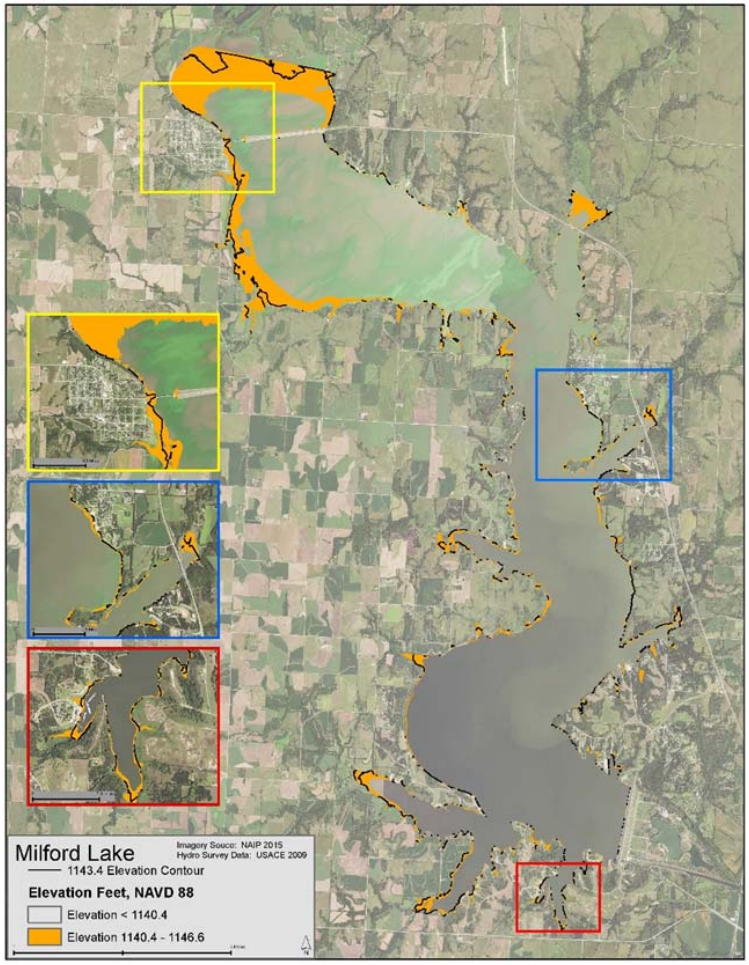
CURRENT EFFORTS

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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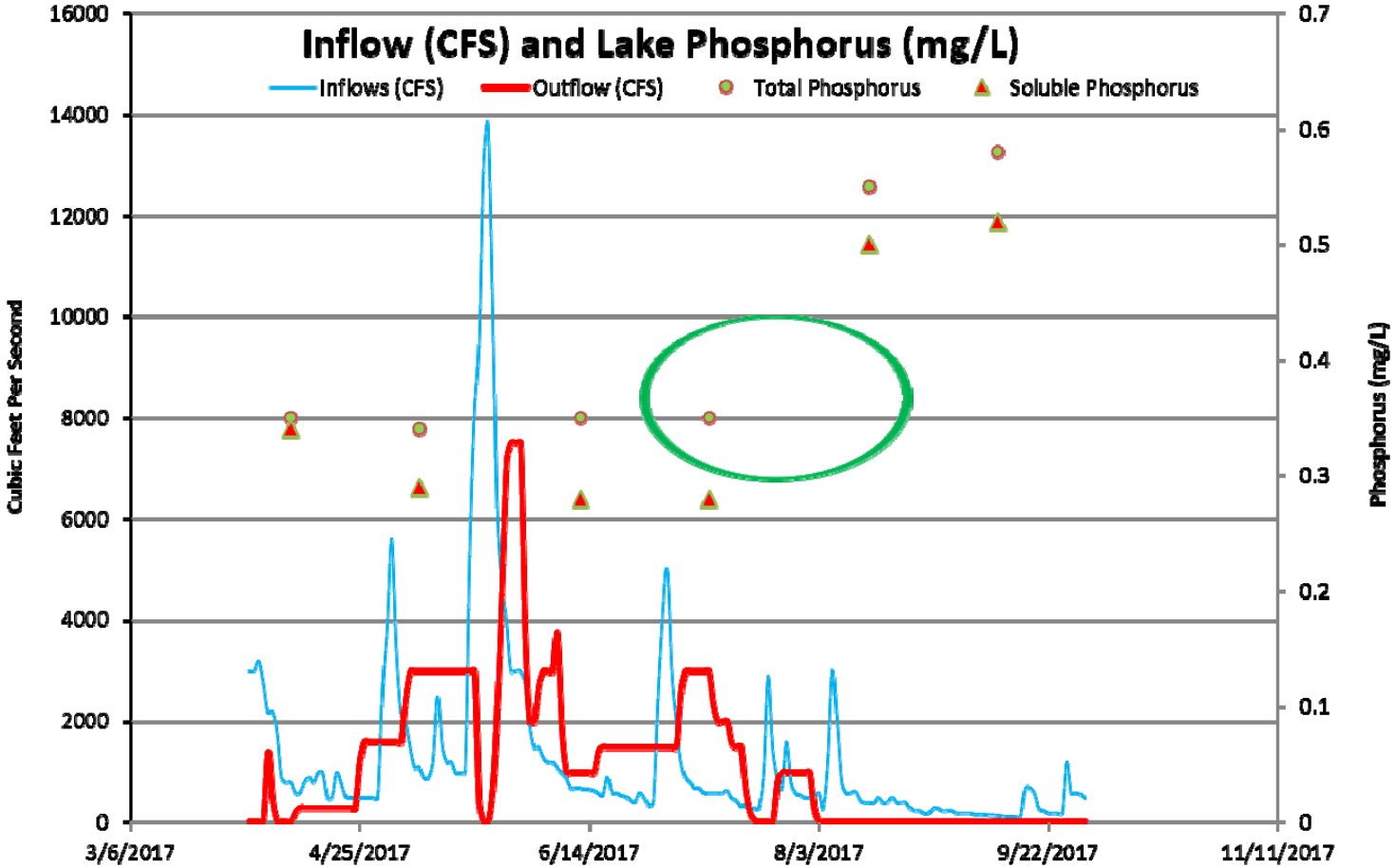
CURRENT EFFORTS

Horizontal Nutrient Flushing



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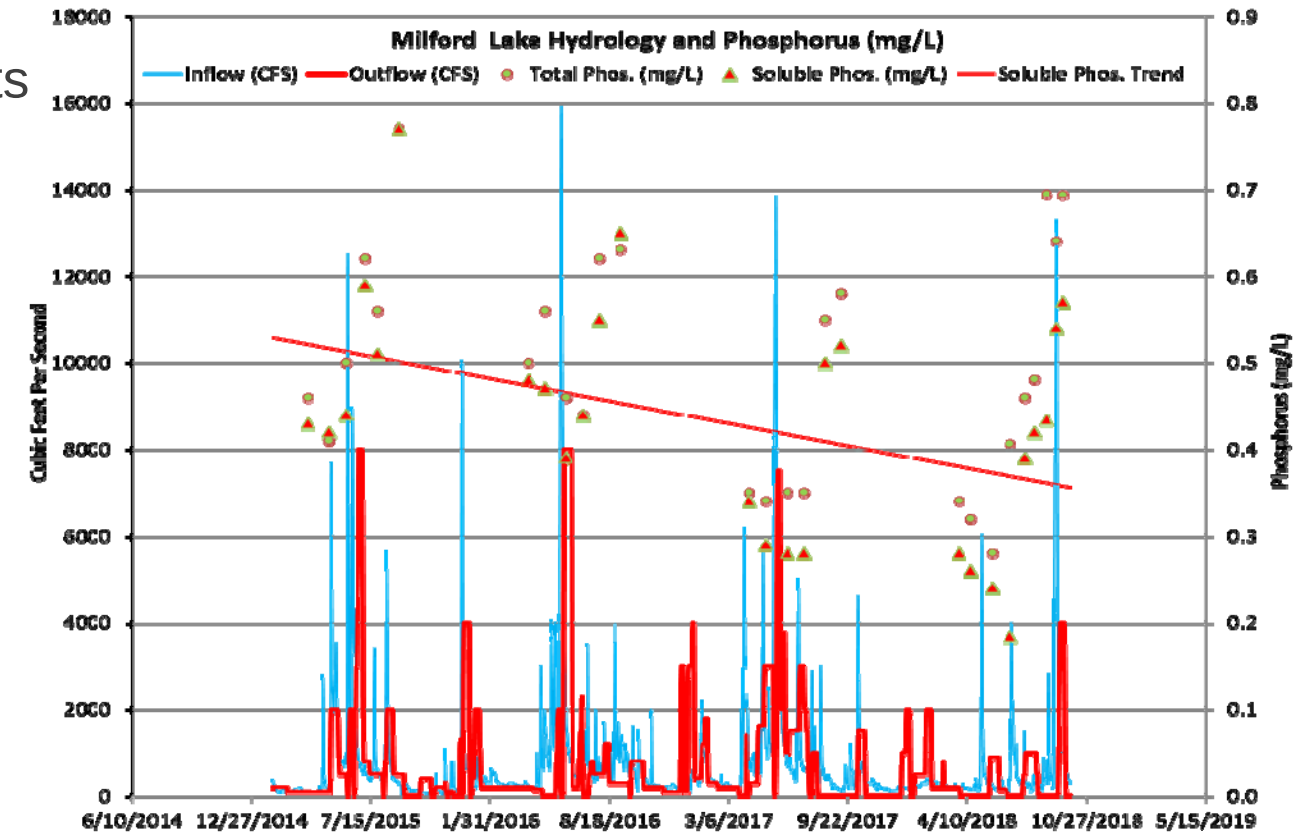
CURRENT EFFORTS

Horizontal Nutrient Flushing

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



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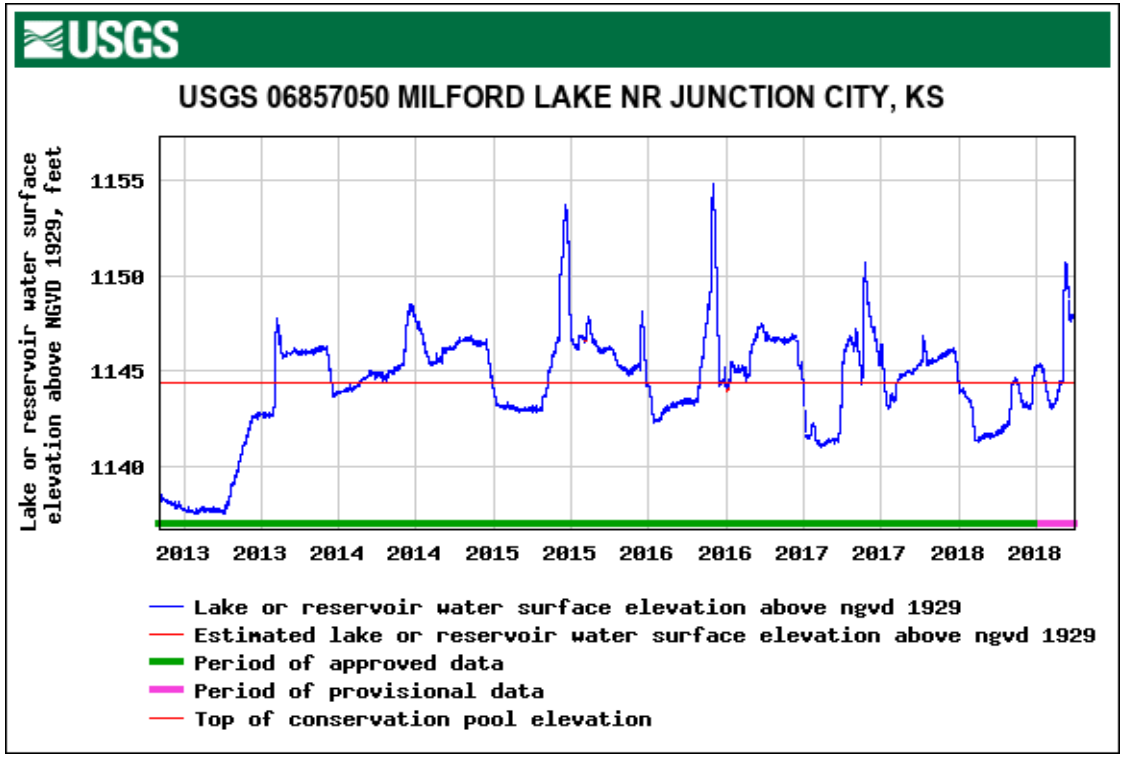
CURRENT EFFORTS

Confounded!

- Drought effect??
- 2012-2013 No HABS
- 2017-2018 less P load from smaller timely inflows w/flushing



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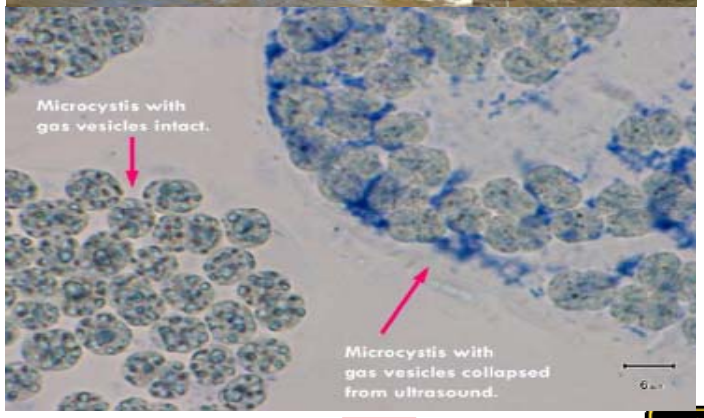
CURRENT EFFORTS

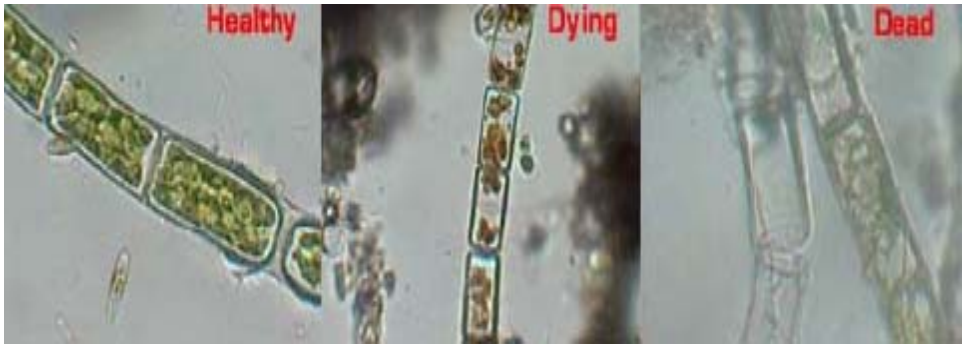
Ultrasonic Vibration

AKA sonication

AKA “high powered super-sonic algae smashing device”

- Frequencies programed for rupture of gas vesicles in floating cells
- Should not release toxins
- Effective for small areas (6.5a)
- Floating systems with solar power





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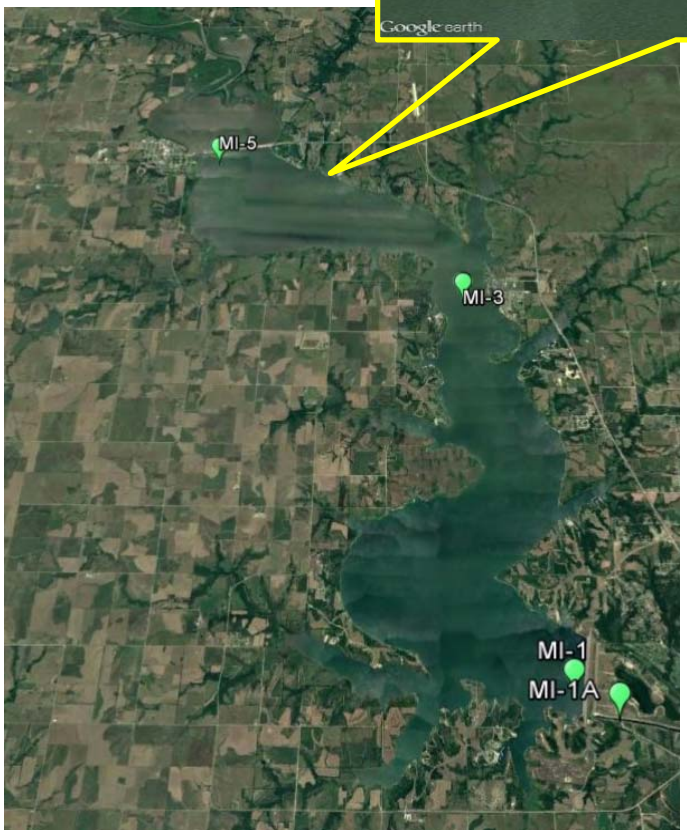
CURRENT EFFORTS

Locations for sonication

- Melvern Outlet Park River Pond (3.4 SA cove on 82 SA)
- Milford Lake Military Cove (3.6 SA on 15,729 SA)



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CURRENT EFFORTS

Milford Lake

No 2018 HABs

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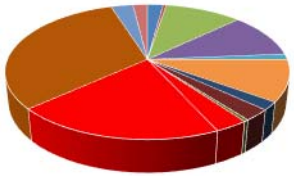
CURRENT EFFORTS

Melvern Outlet River Pond

- No visible results-scale issues
- No positive species, cell count or toxin results

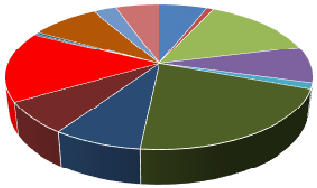
Treatment Cove



1.19 mil. cells/mL

- Aphanocapsa sp.
- Chroococcus microscopicus
- Chroococcus spp.
- Coelomoron sp.
- Cyanodictyon sp.
- Cylindrospermopsis spp.
- Dolichospermum cf. compactum
- Dolichospermum sp.
- Merismopedia tenuissima
- cf. Microcystis sp.
- Microcystis sp.
- Planktothrix sp.
- Raphidiopsis sp.
- Snowella sp.

Control Cove



1.2 mil. cells/mL

- Aphanocapsa spp.
- Chroococcus microscopicus
- Chroococcus spp.
- Coelomoron sp.
- Cyanodictyon sp.
- Cylindrospermopsis sp.
- Dolichospermum cf. compactum
- Dolichospermum spp.
- Microcystis sp.
- cf. Planktolyngbya sp.
- Planktolyngbya sp.
- Planktothrix sp.
- Raphidiopsis sp.
- cf. Snowella sp.

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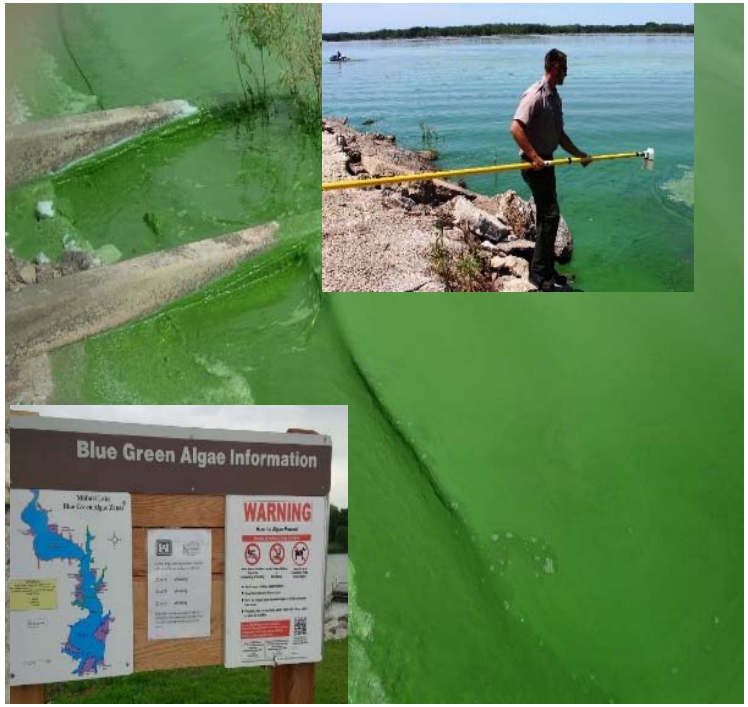
NEXT STEPS

Work within authorities to research and manage HABs

- Continue to provide annual data in historic data set
- Continue to evaluate LLMP and nutrient flushing as tool to maximize benefits related to authorized purposes of USACE Lake Projects
- Continue to work with agencies/stakeholders as partners working for management solutions (i.e. evaluate new technologies for remediation, forecasting, and public health alerts)



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QUESTIONS?

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