

USGS HAB Science in Virginia

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USGS Virginia & West Virginia Water Science Center

■ What we do...

- Operate **streamgages**, observation wells, and **water-quality monitoring stations** to provide **reliable scientific information** needed to make **informed management decisions**.
- Conduct **interpretive investigations** of specific water-resources problems.
- Most work is **jointly funded** by other Federal, State, and Local agencies.



USGS NAAR* HAB Capability Team

Team formed to optimize use of USGS resources for studying HABs

- Hydrologists
- Biologists
- Geneticists
- Engineers
- Phycologists
- Geographers



- Water Science Centers
 - Virginia-West Virginia
 - New England
 - New Jersey
 - Pennsylvania
 - New York
- Leetown Science Center
- Woods Hole Coastal and Marine Science Center
- Patuxent Wildlife Research Center
- Earth Resources Observation and Science Center

USGS NE Region HAB Pilot Study

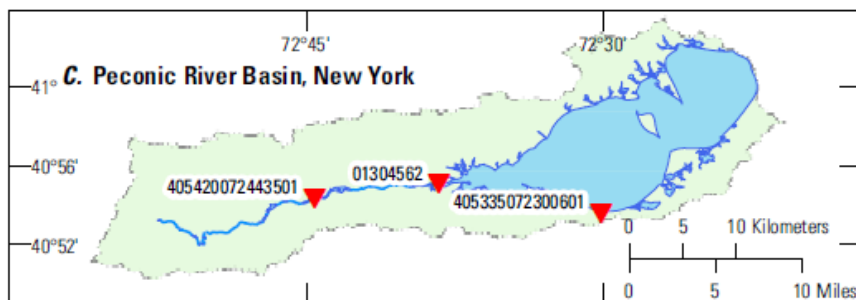
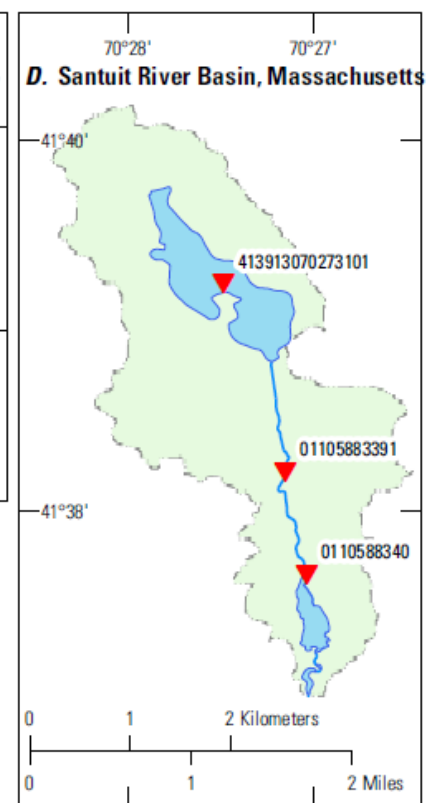
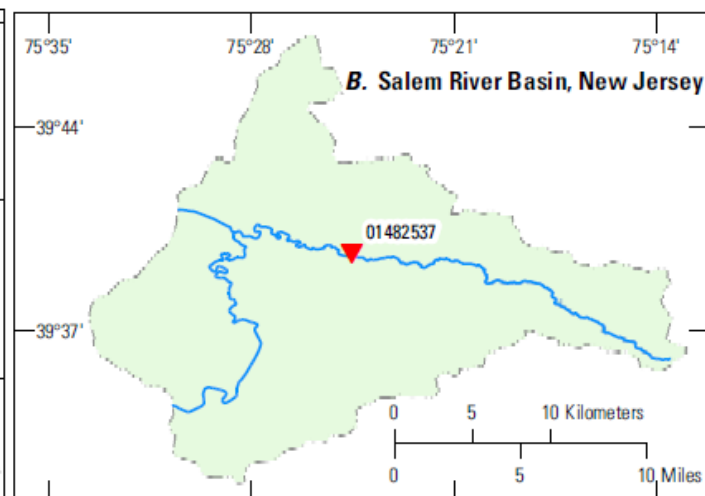
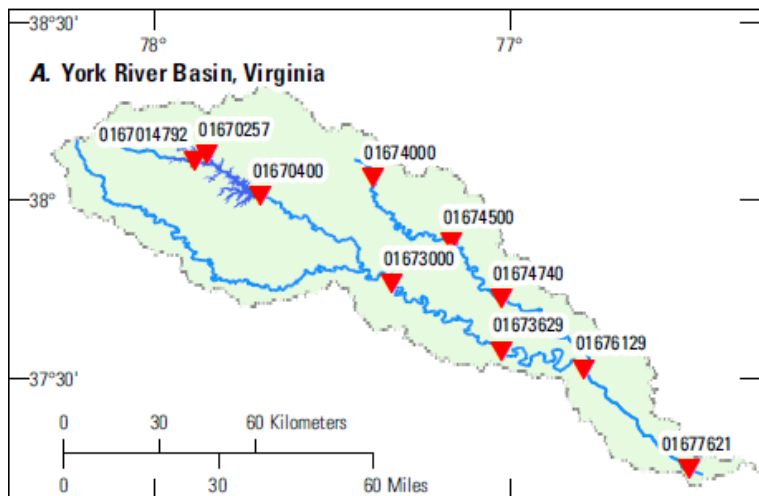
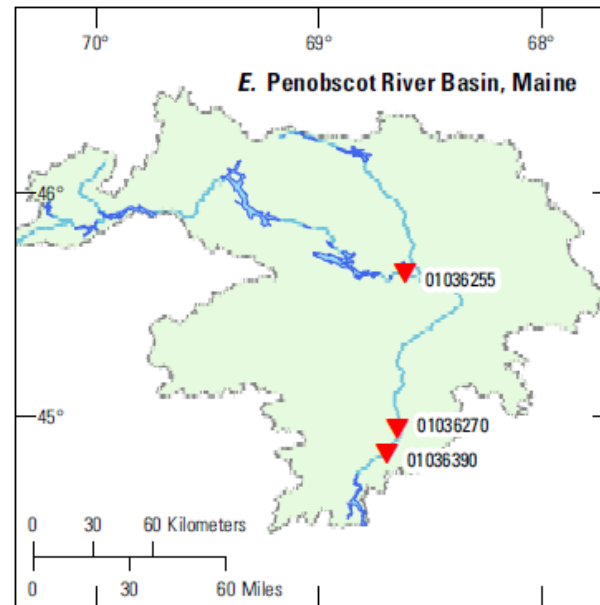
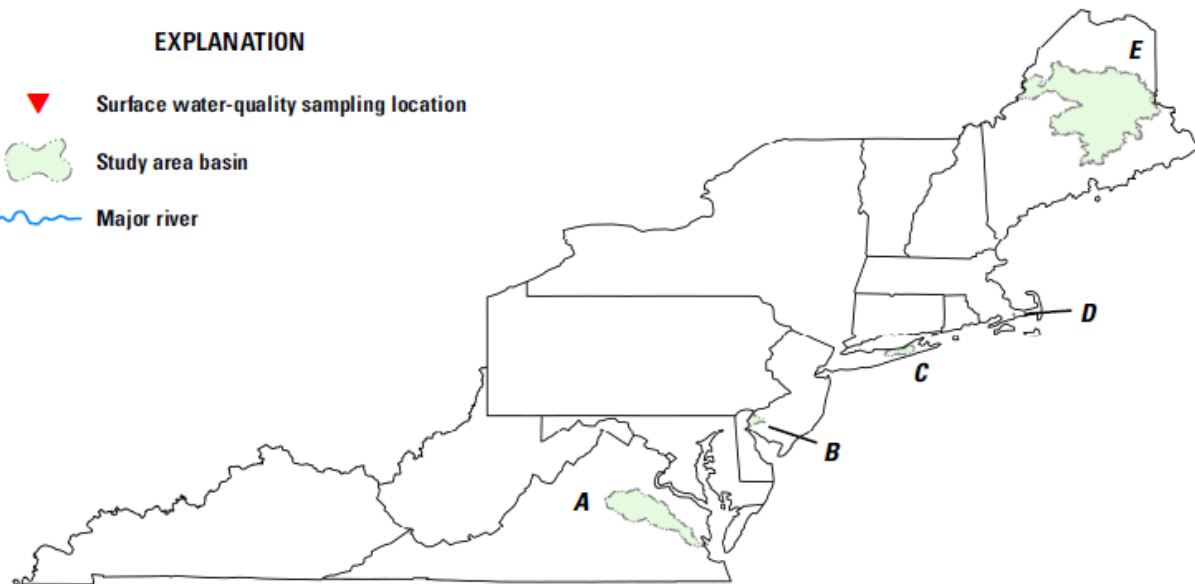
Objectives:

- 1) Conduct preliminary assessment of cyanotoxin transport from freshwater to marine systems in the Northeast US;
- 2) Evaluate ability of low-cost passive time-integrative Solid Phase Adsorption Toxin Tracking (SPATT) samples to capture ephemeral toxin events that could be missed by routine discrete sampling approaches



EXPLANATION

- ▼ Surface water-quality sampling location
- Study area basin
- Major river



Discrete Samples

Cyanotoxins, chlorophyll, cyanotoxin synthetase genes, phytoplankton community composition

Temperature, pH, SC, DO, turbidity, dissolved organic matter fluorescence, chlorophyll fluorescence, phycocyanin fluorescence, and nitrate (via sensor)

Samples collected September 2nd

SPATT Sampler

Cyanotoxins (by ELISA):

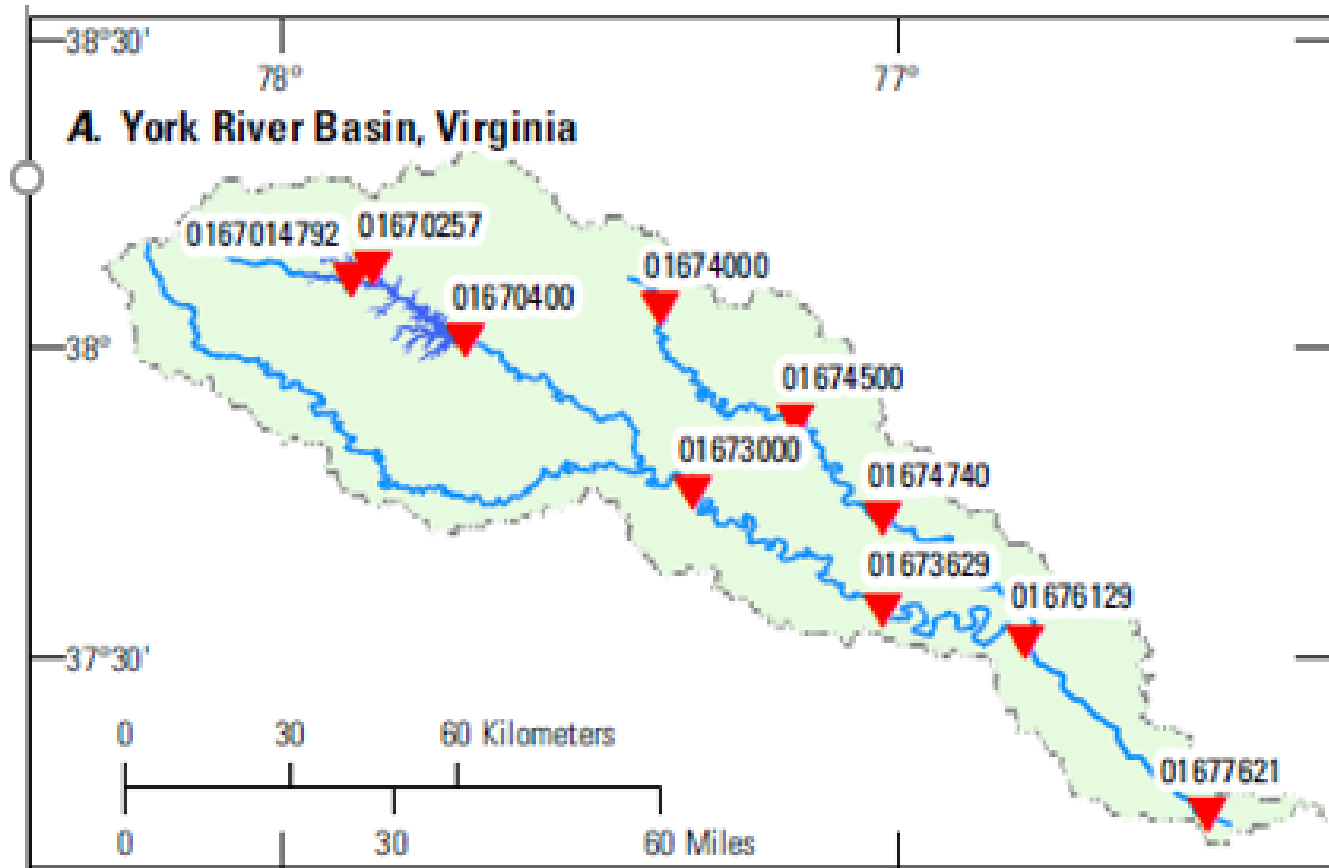
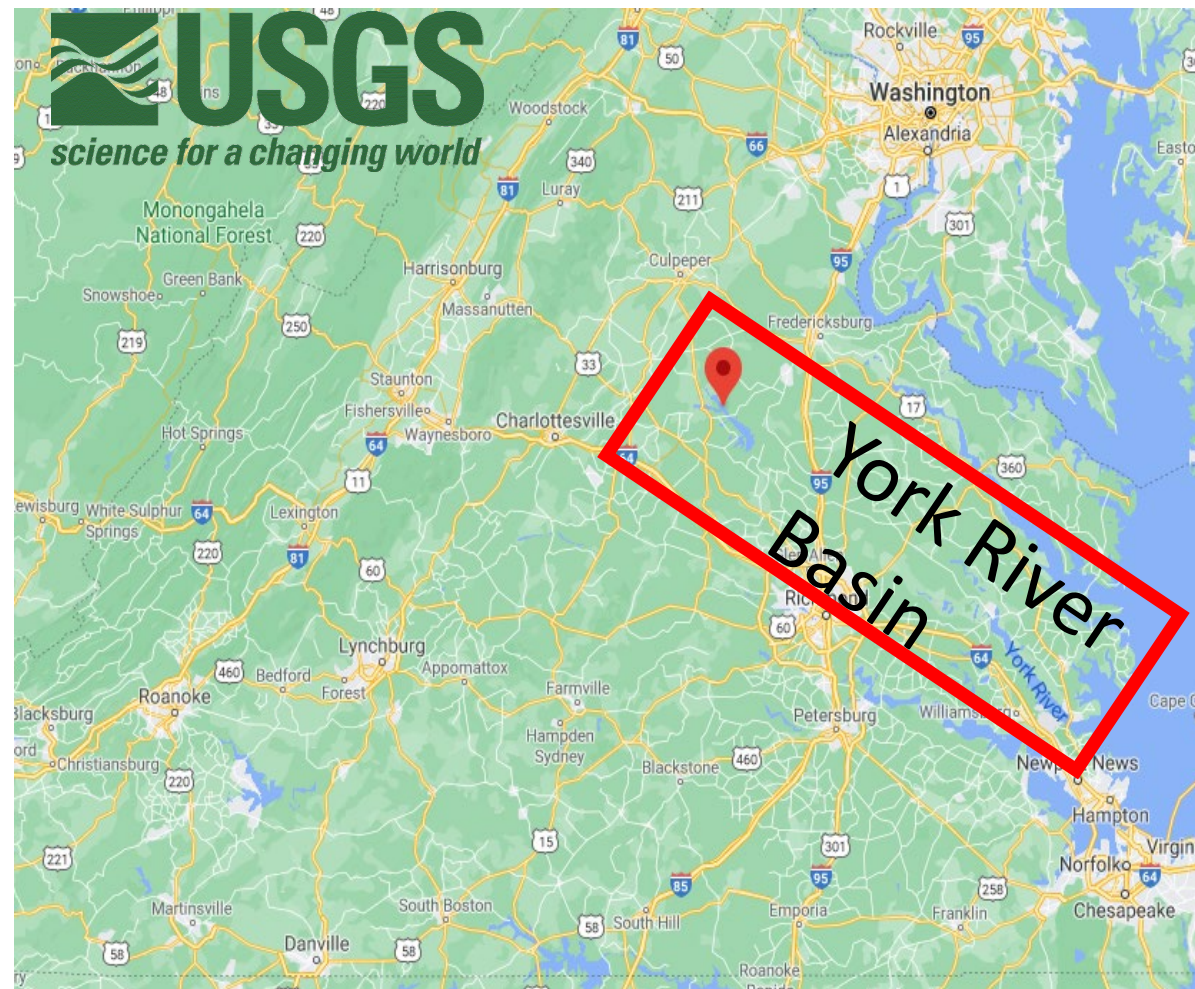
- Anatoxins
- Cylindrospermopsin
- Microcystins
- Saxitoxins

SPATTs deployed September 2nd retrieved September 9th (one lost)

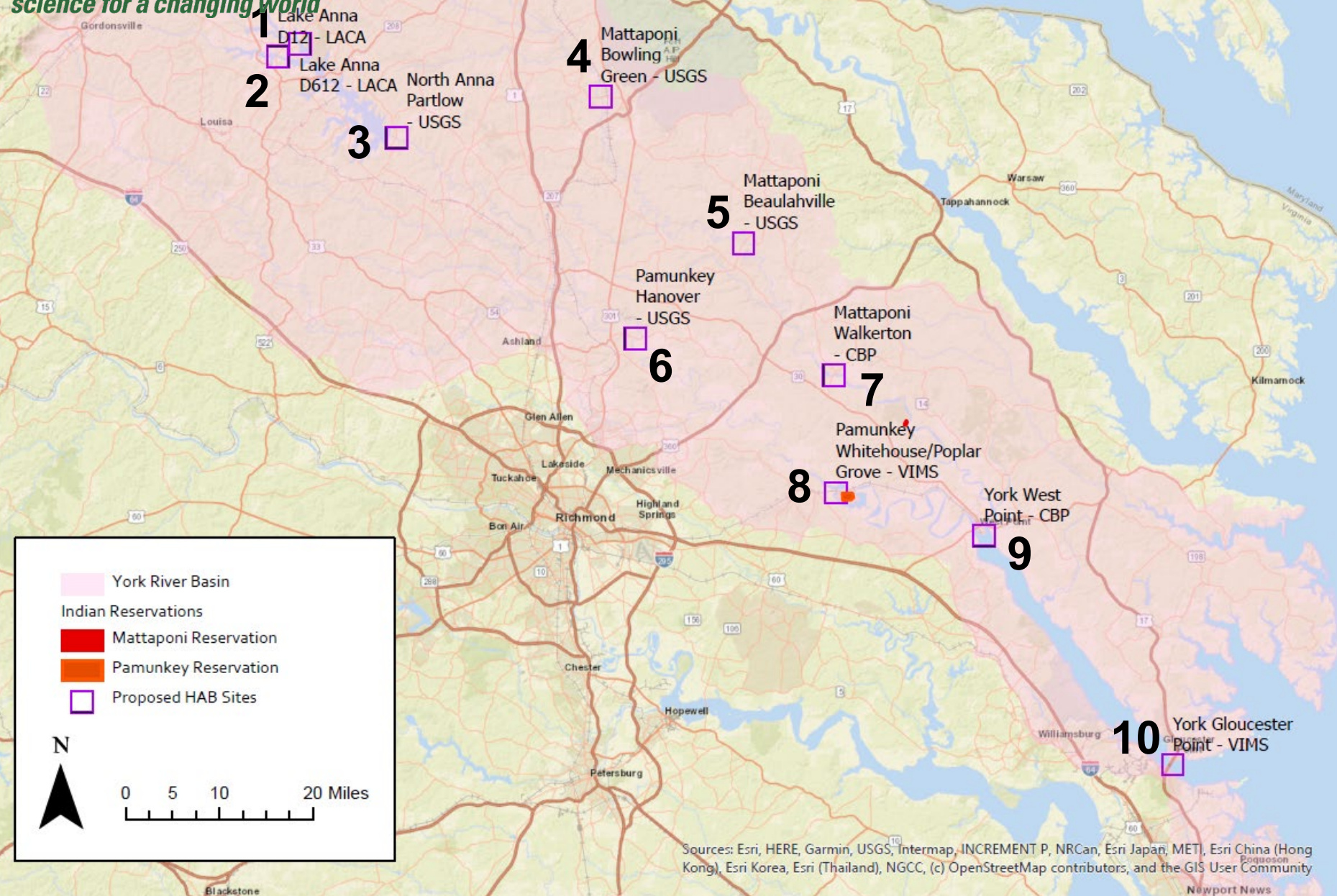
Advantages (SPATTs)

- Provides continuous toxin measurement to capture ephemeral events that discrete samples can miss
- More robust indicator of toxin prevalence compared to grab samples
- Applicable to marine, brackish and freshwater environments
- Can be deployed in many ways and in areas where there is limited sampling
- Time-integrated assessment
- Low cost, simple and easy to deploy/recover
- Year-round detection of algal toxins





York River Basin



- 10 sites sampled for pilot study
- 2 sites associated with Native American reservations
- 2 sites associated with VIMS monitoring sites
- 2 sites associated with Lake Anna
- 1 site associated with CBP

VDH

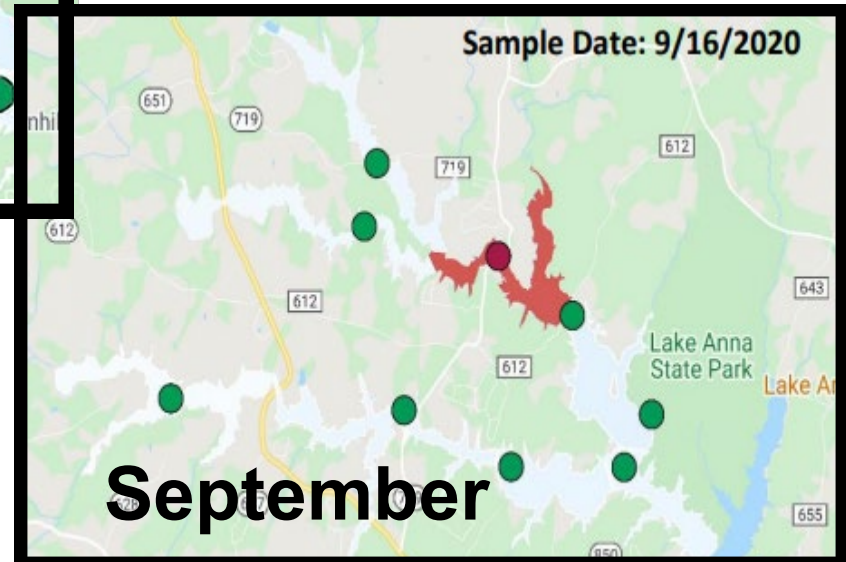
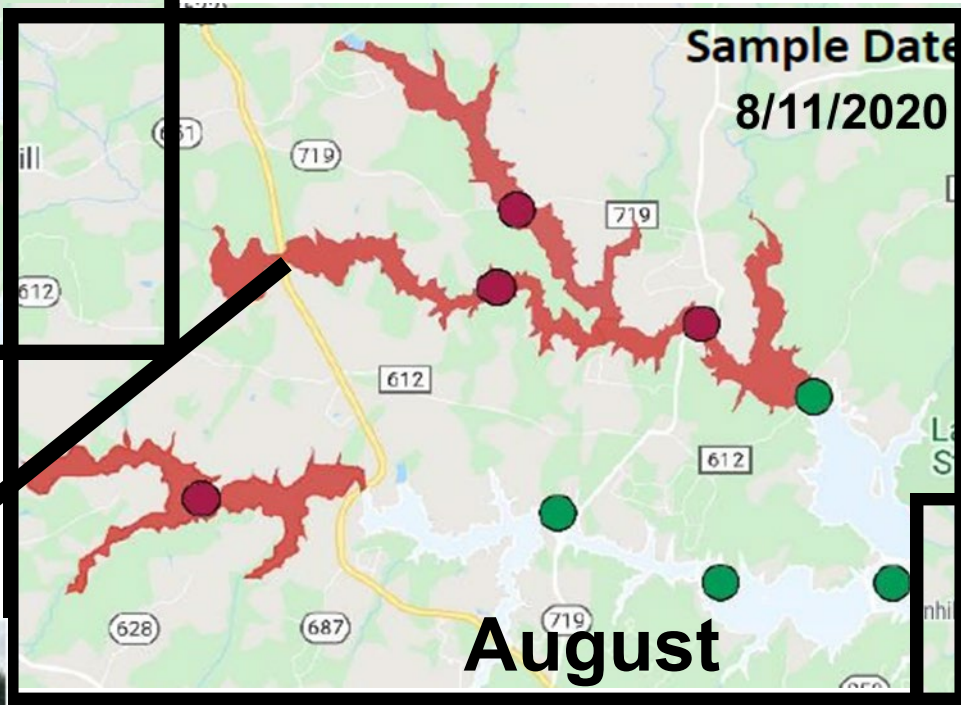
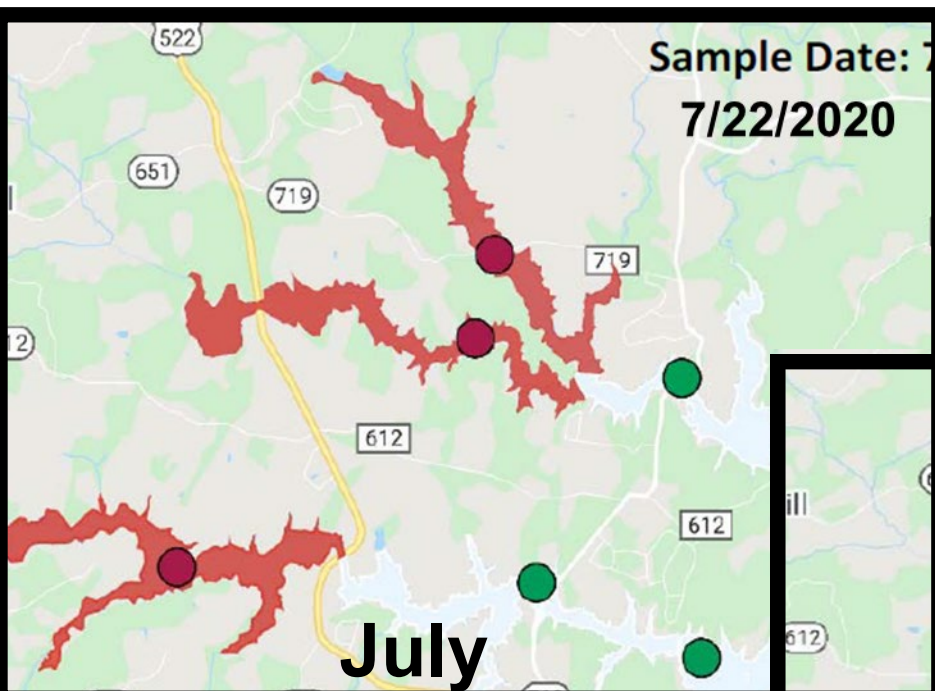


Photo taken 8/22/2020;
Pamunkey Branch at Rt. 522;
crowd-sourced.

Water-Quality Sensors are Used as Early Indicators for Potentially Harmful Blooms

ENVIRONMENTAL QUALITY WATERWATCH USER

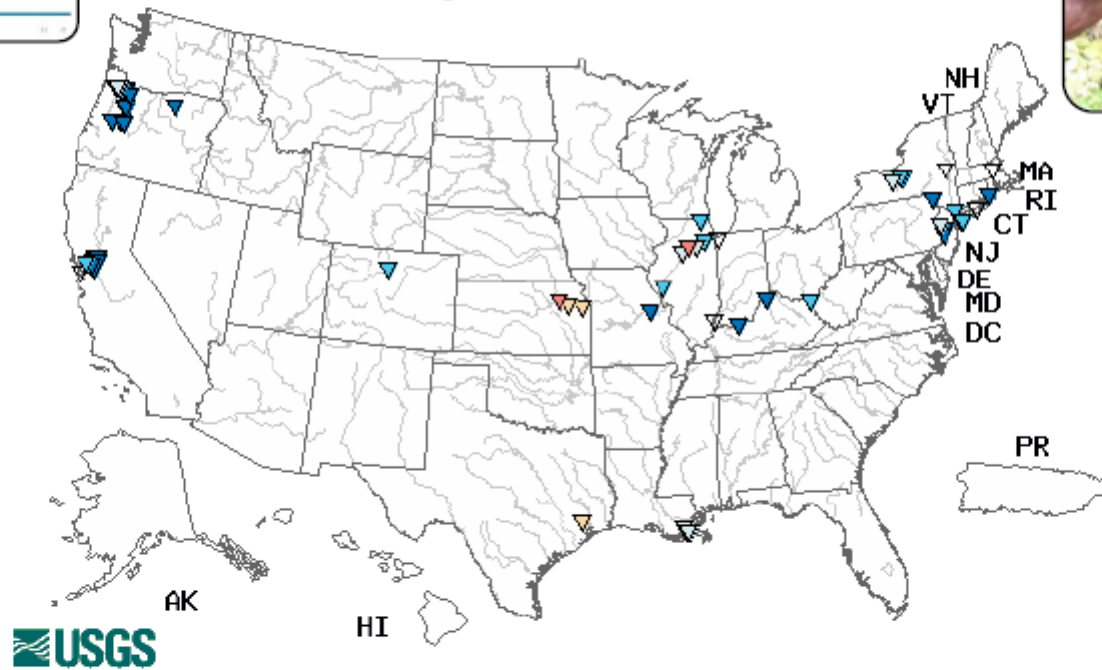
STUDY SHOWS HOW ALGAL BLOOMS CAN BE RAPIDLY PREDICTED

After collecting weekly or monthly data for two consecutive seasons, the sensors should find patterns that could be used to predict future algal blooms in a variety of freshwater settings.



Real-Time Chlorophyll, in $\mu\text{g/l}$

August 26, 2020 17:31ET



Explanation							
< 3	3-11.9	12-24.9	25-49.9	50-99.9	100-199	>200	No Data

- Temp
- Cond
- pH
- D.O.
- Turb
- Nitrate
- Disch
- Chlorophyll**
- Surrogates



<http://waterwatch.usgs.gov/wqwatch>

The Spatiotemporal Variability of Cyanobacteria Poses Unique Challenges to Monitoring and Assessment



26 minutes later

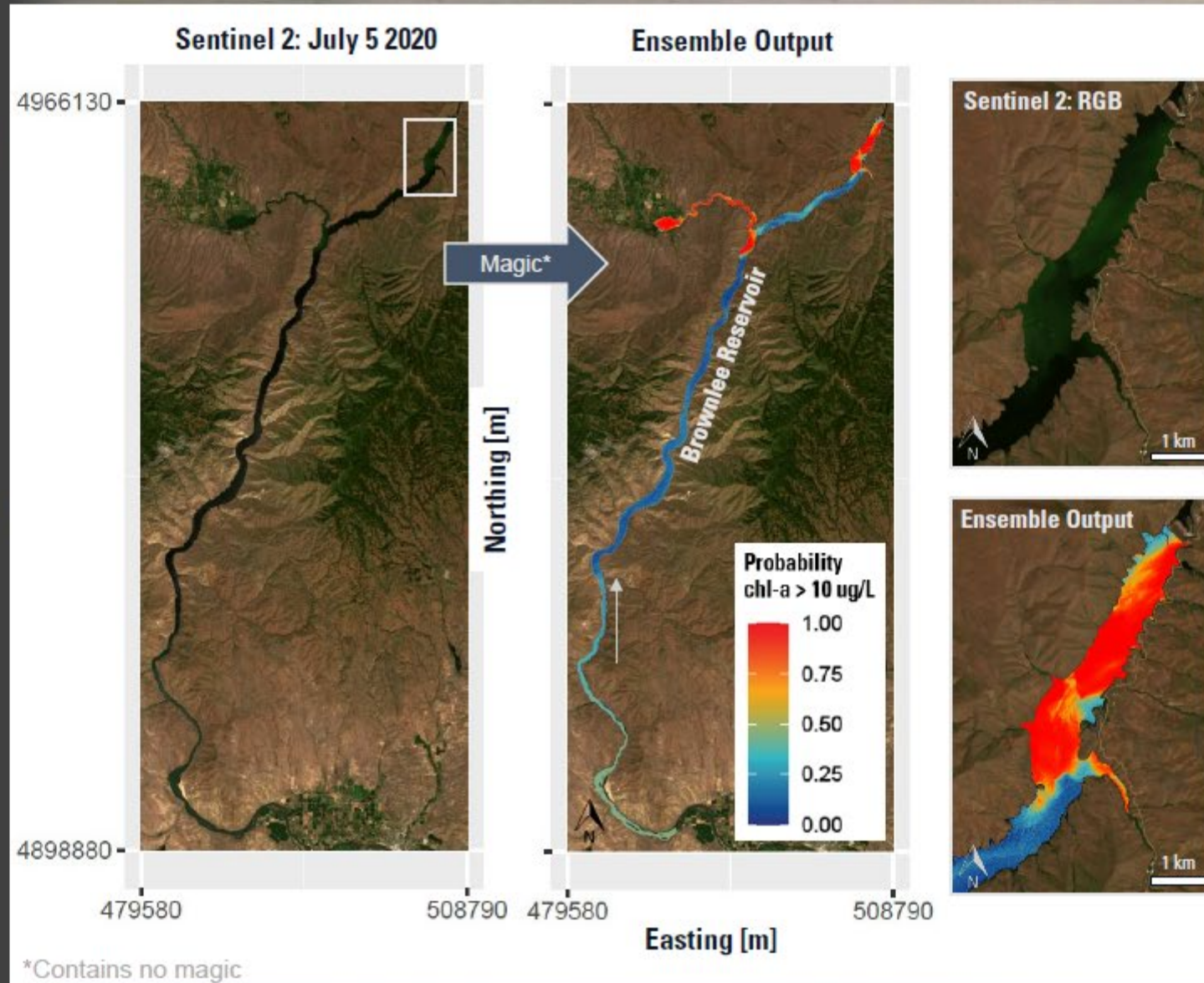
Remote sensing as a potential management tool

Beneficial attributes:

- High resolution
- Large spatial coverage
- Consistent return period

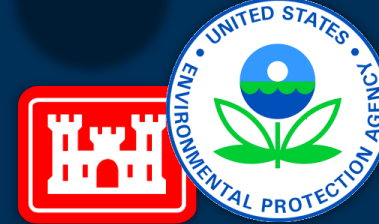
How it helps managers:

- Identify locations to sample
- Provide standardized assessment



USGS Partnering Opportunities

- USGS can partner with most organizations
 - Cooperative Projects
 - Technical Assistance Projects
- Funding opportunities
 - Cooperative Water Program
 - Matching funding to work with State and Local agencies
 - Capital investments
 - Grant programs
 - USGS 104G - VWRRC



US Army Corps of Engineers®

