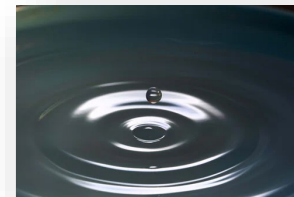




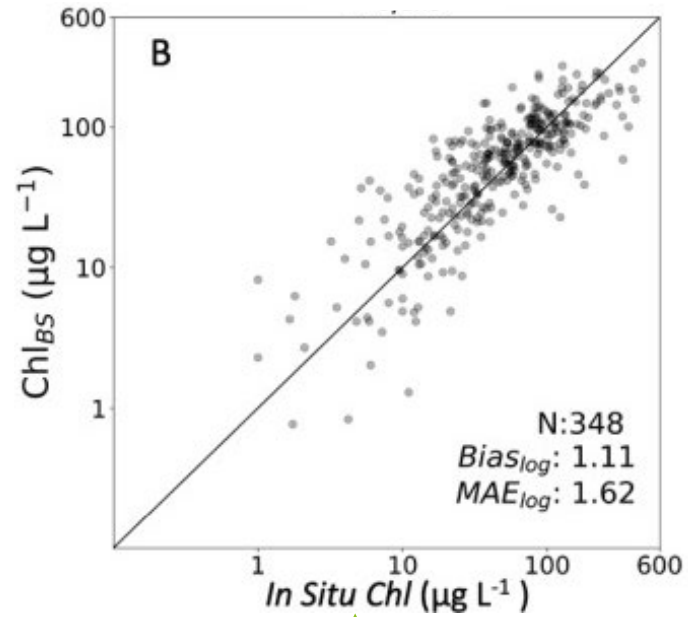
# Cyanobacteria Assessment Network (CyAN)



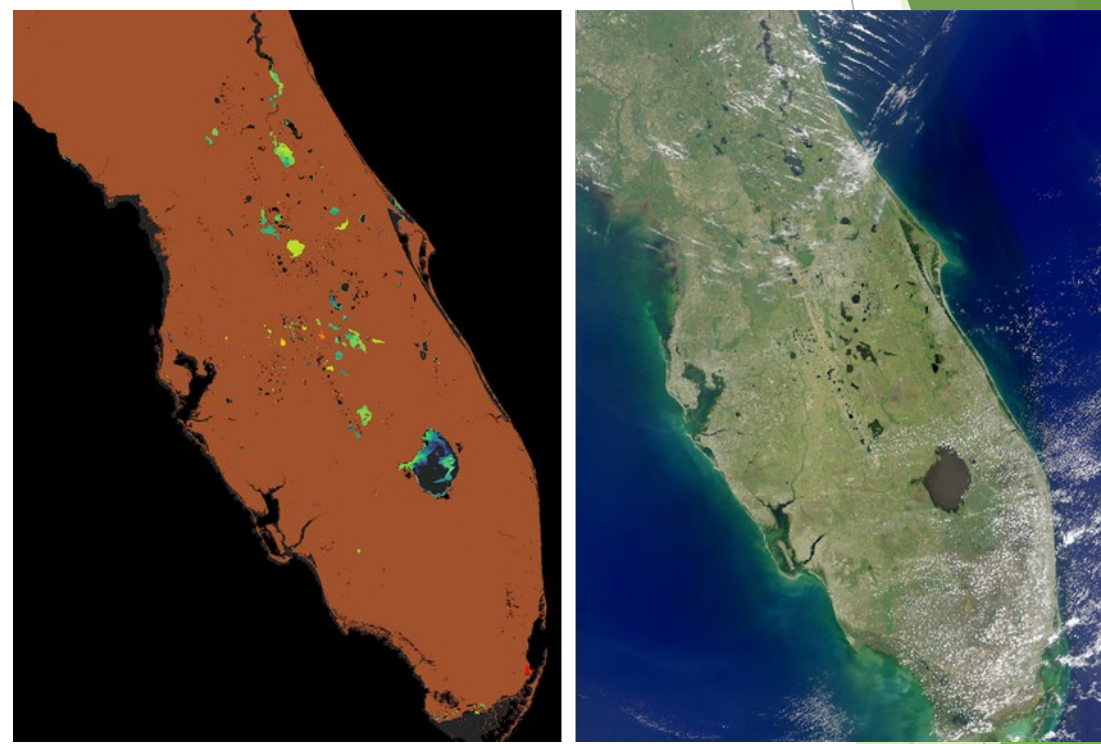
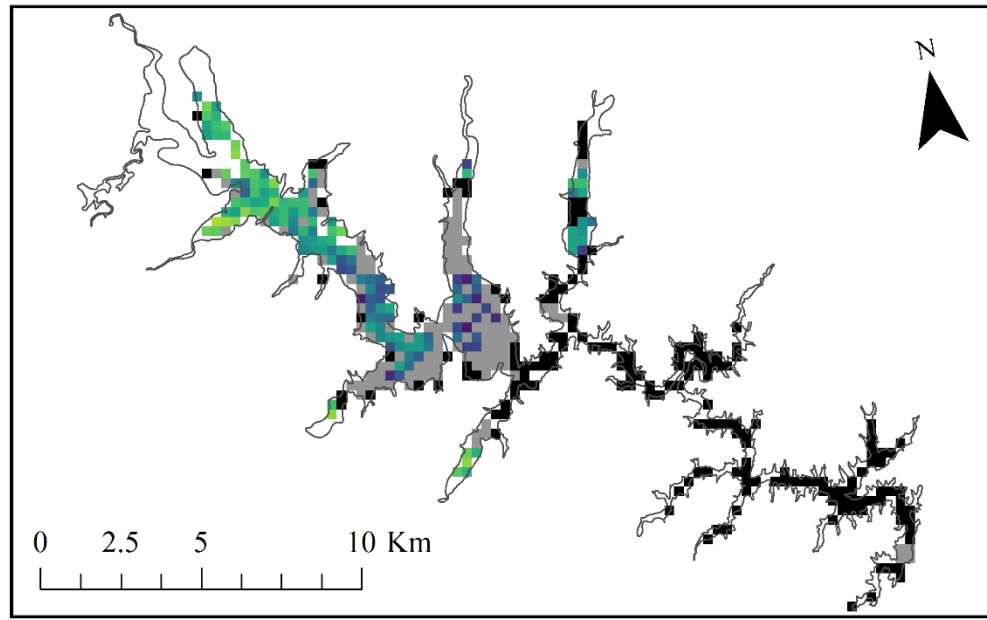
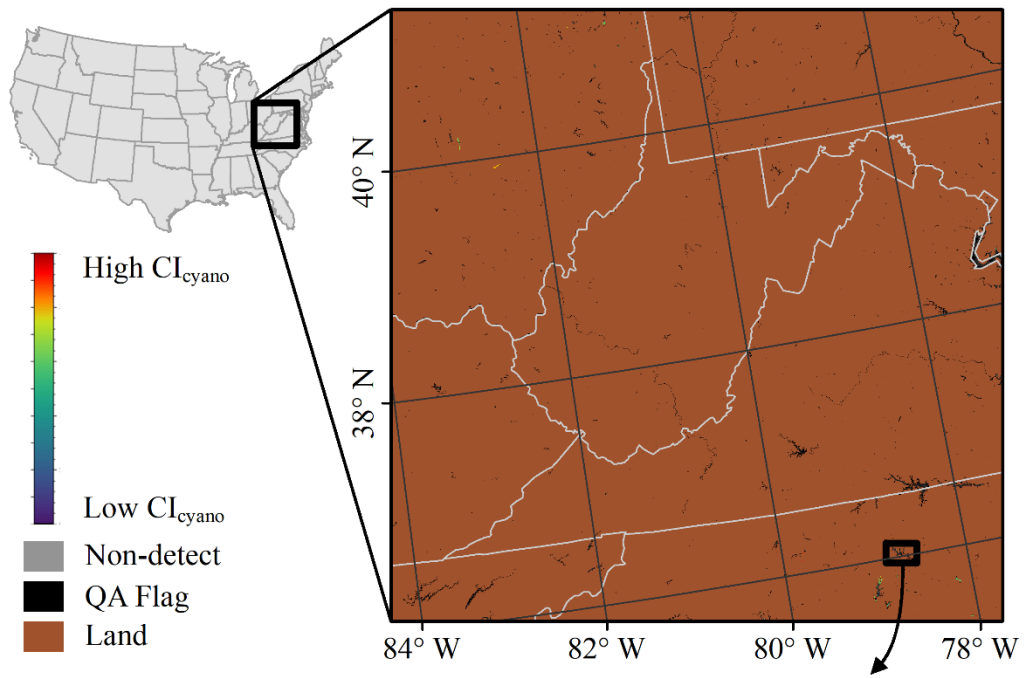
- ▶ Problem: Limited resources w/ broad spatial and temporal scales
- ▶ Action: Satellite technologies complement traditional field measures
- ▶ Result: Earlier response and informed decision making
- ▶ Impact: Save money and protect humans, animals and the environment

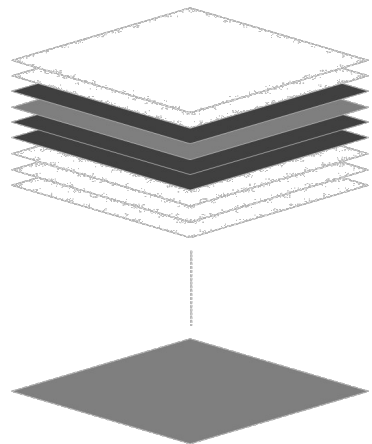


- ▶ State cell counts
- ▶ Land and ice QA
- ▶ National phenology
- ▶ National state toxin and cell counts
- ▶ National drinking water  
Unregulated Contaminant Monitoring Rule
- ▶ National recreational advisories and events (Whitman et al. In Review, Harmful Algae)
- ▶ National chlorophyll
- ▶ National temperature

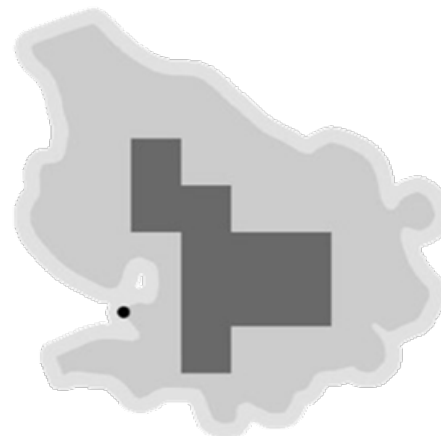


# Near real time

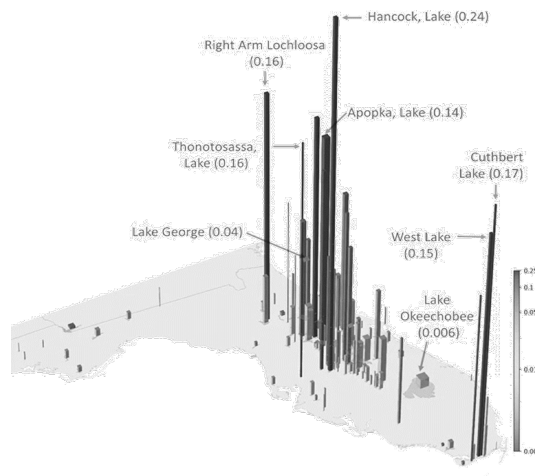




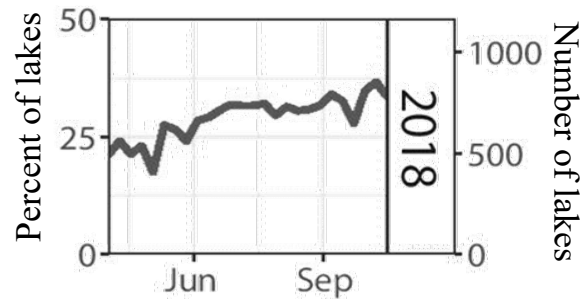
## Temporal Frequency



## Spatial Extent



## Magnitude

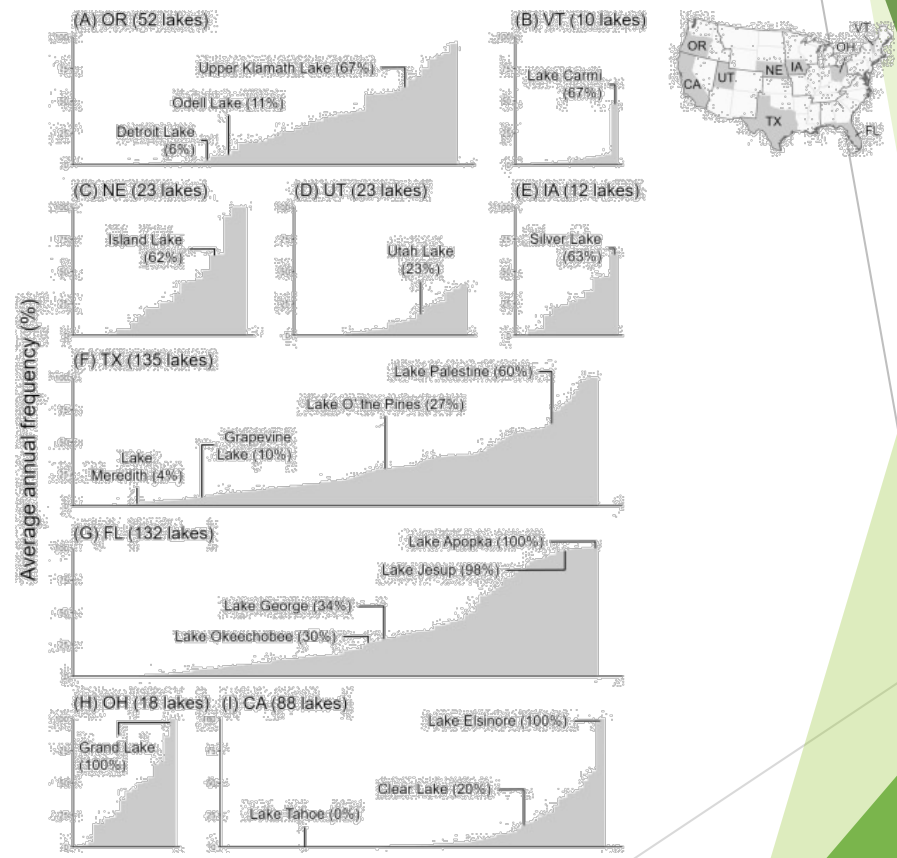
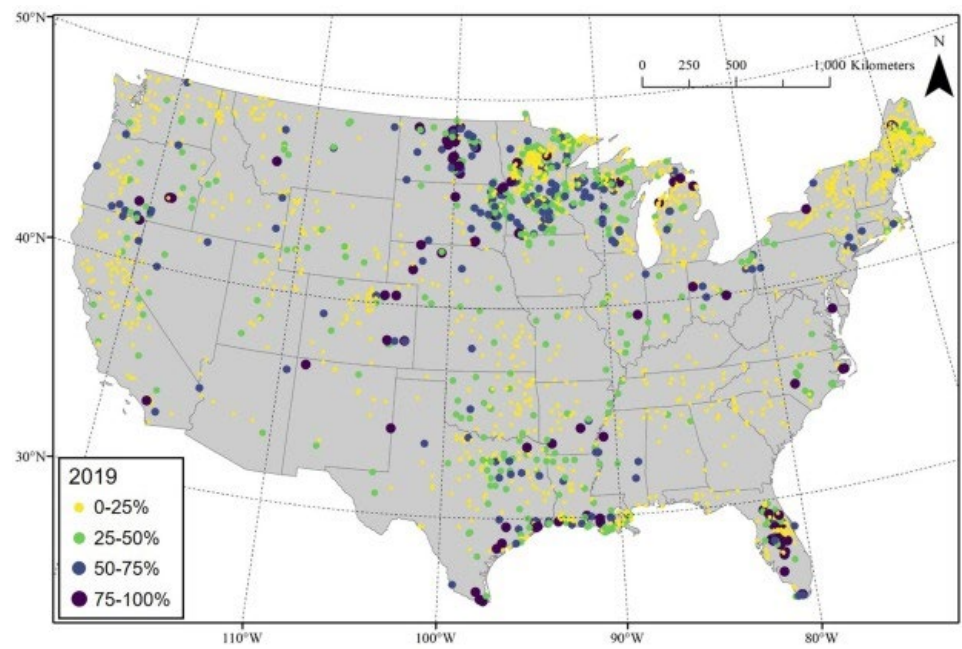
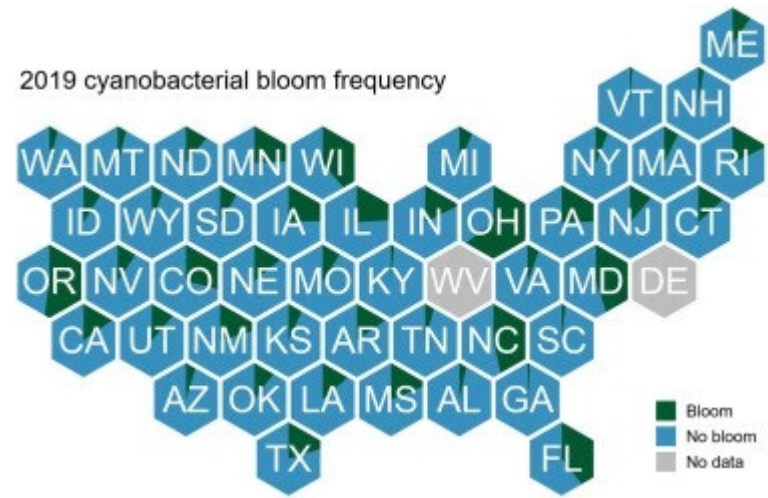


## Occurrence

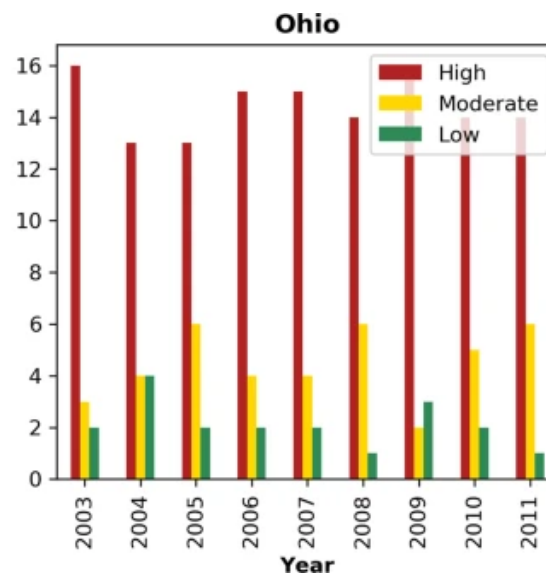
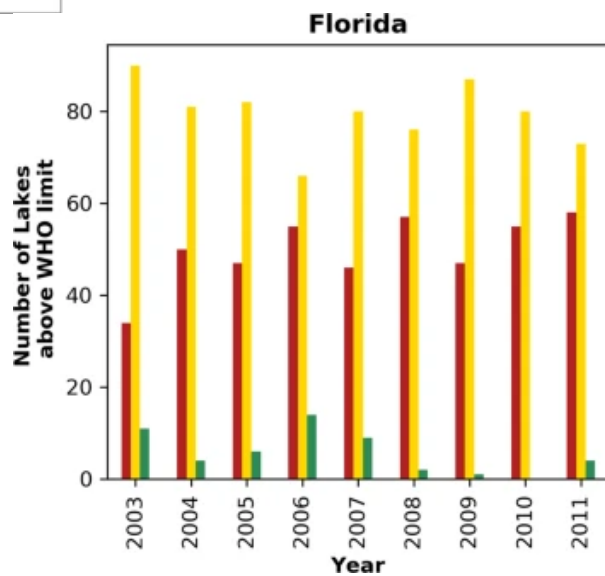
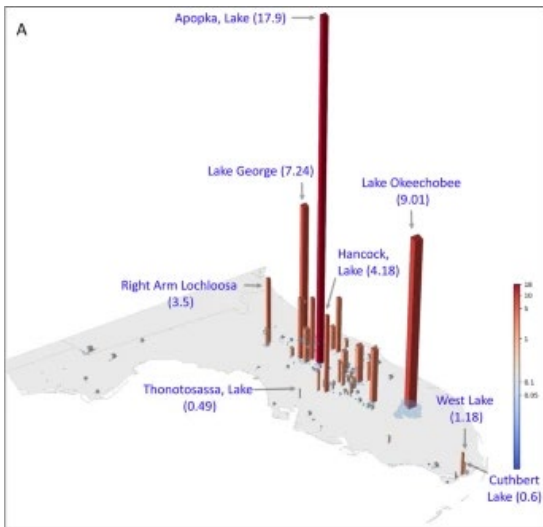




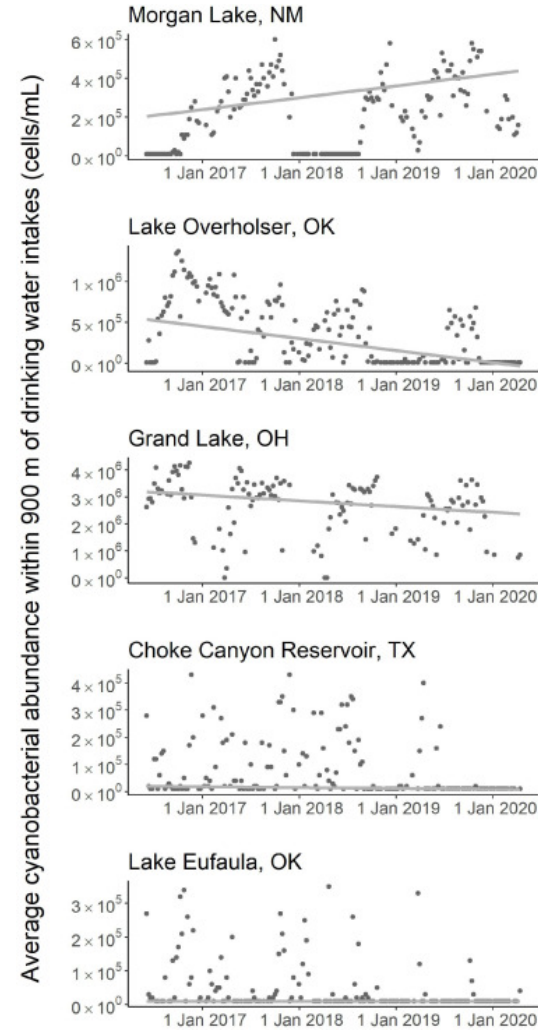
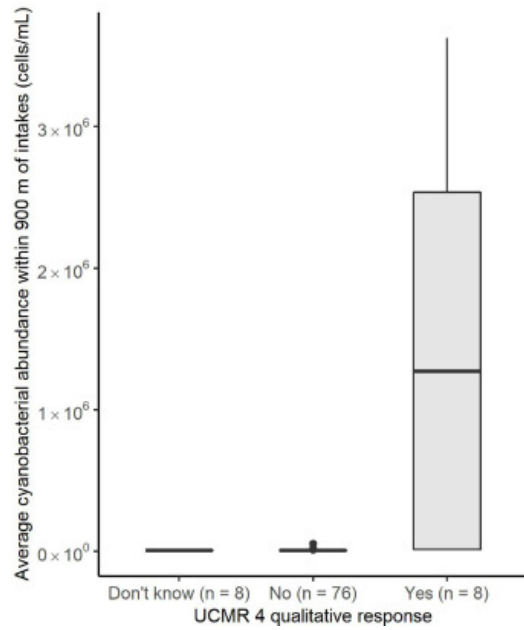
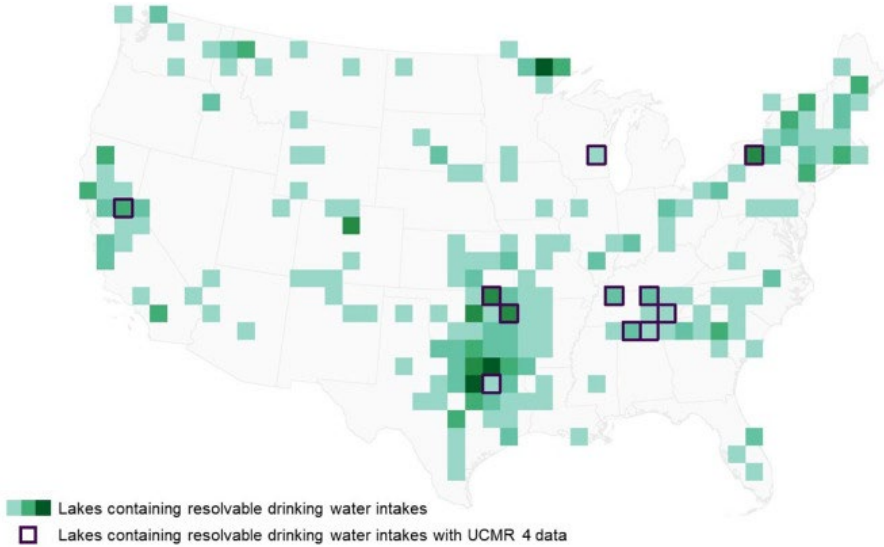
# Temporal Frequency



# Magnitude

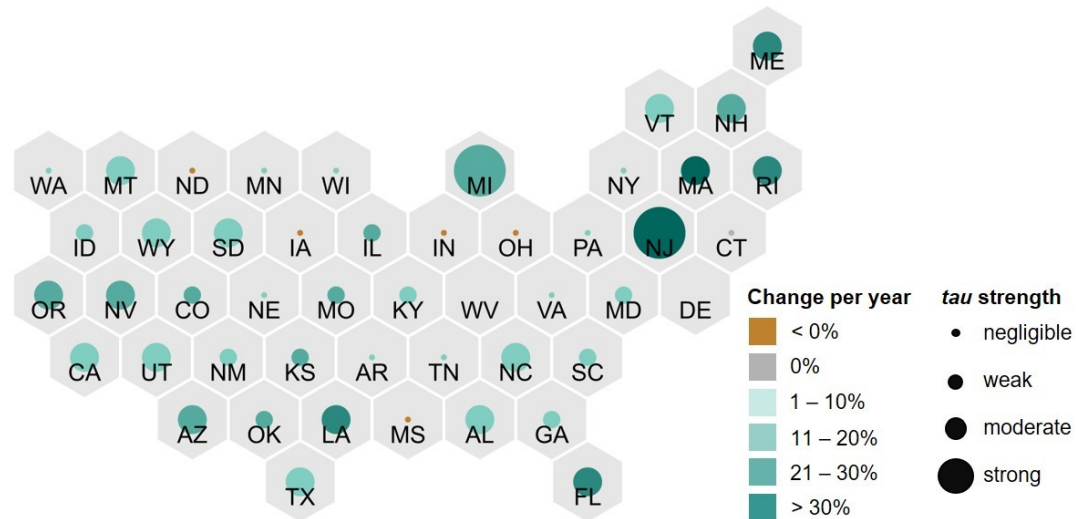
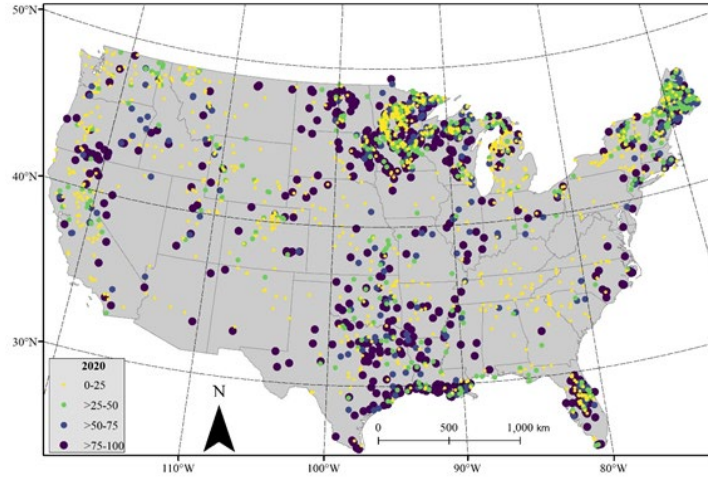


# Drinking Water Frequency and Magnitude

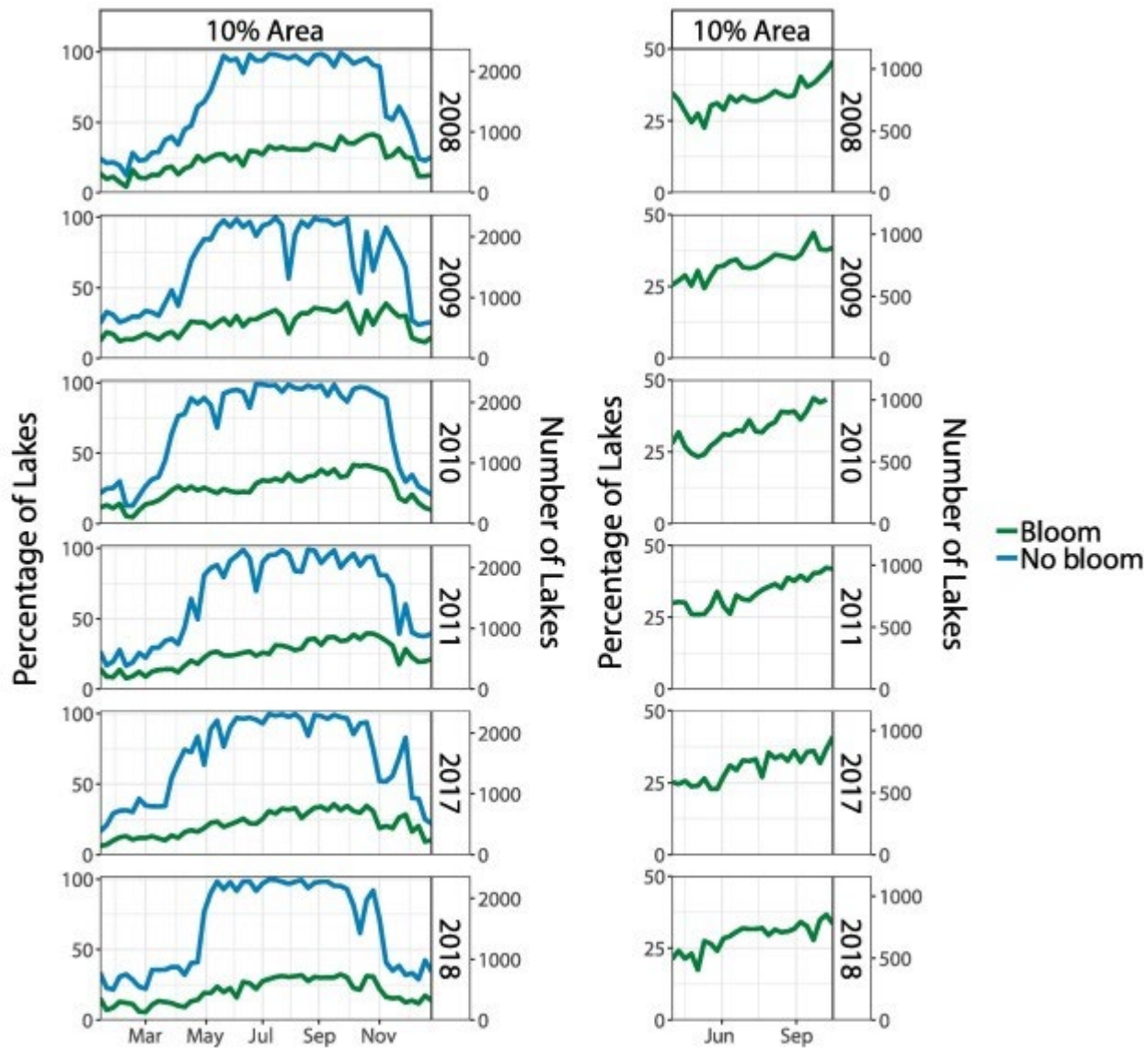




# Spatial Extent

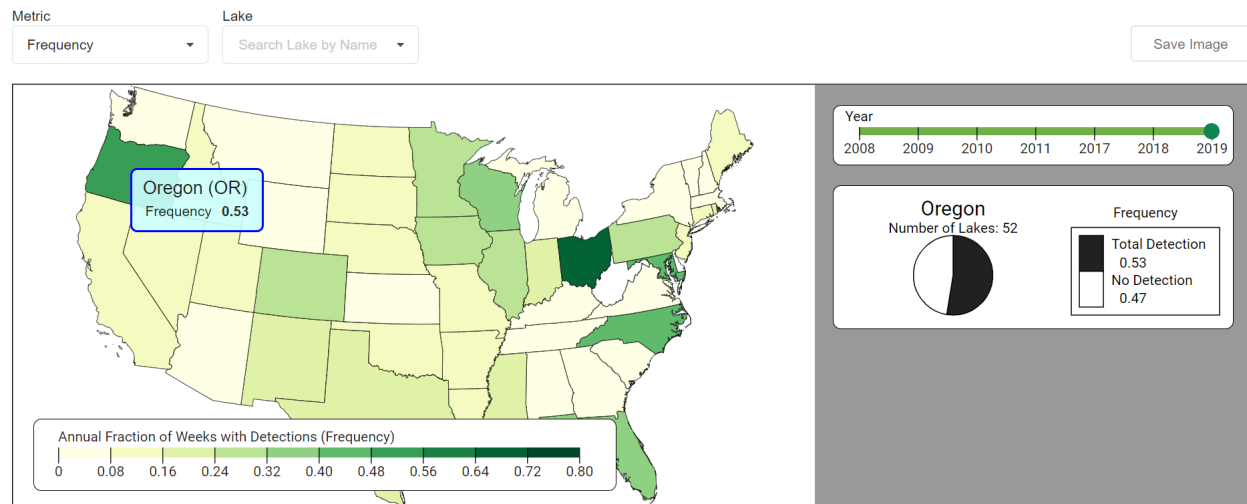


# Lake Occurrence

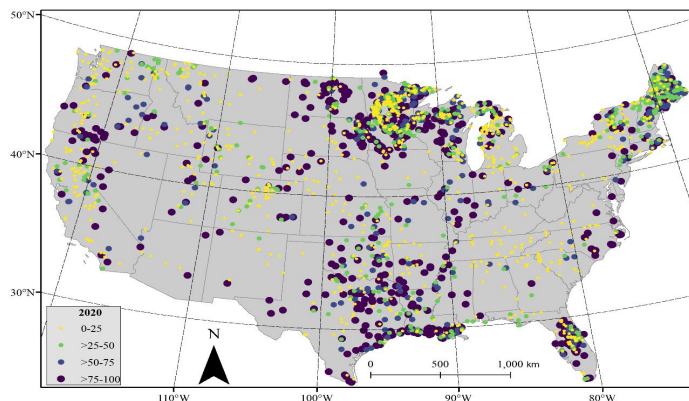


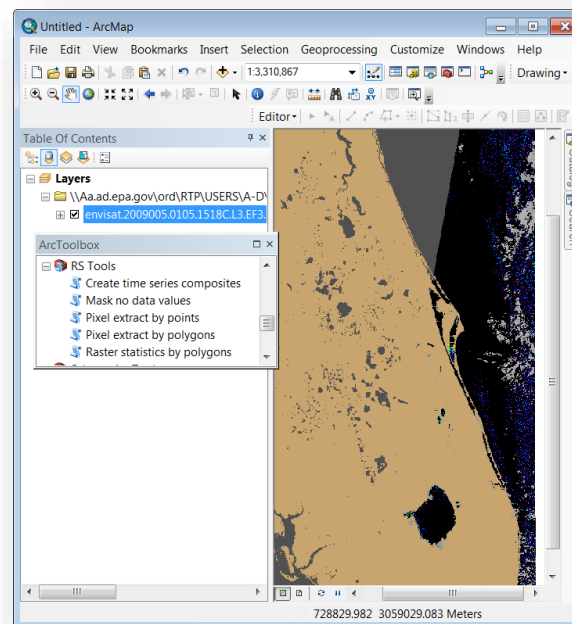
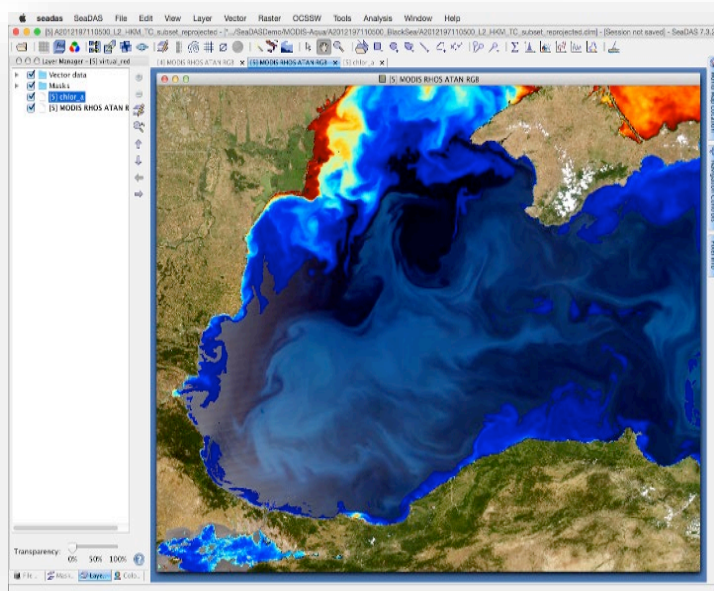
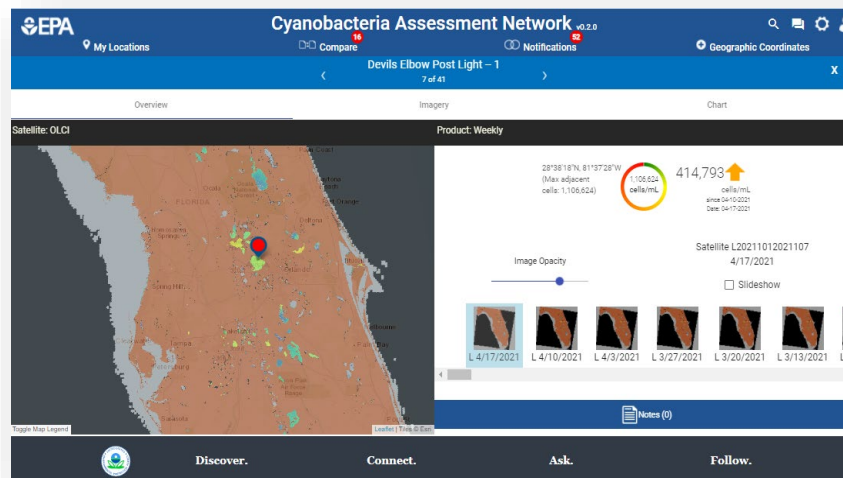
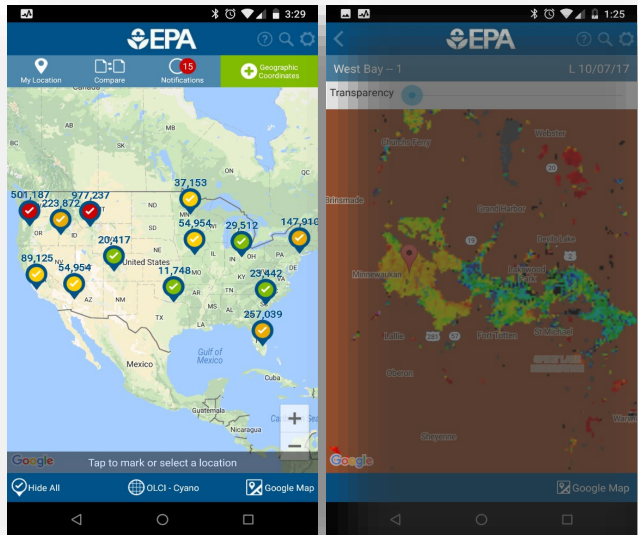
## EPA's Report on the Environment

### Cyanobacterial Interactive Lake Mapper



## EPA's EnviroAtlas



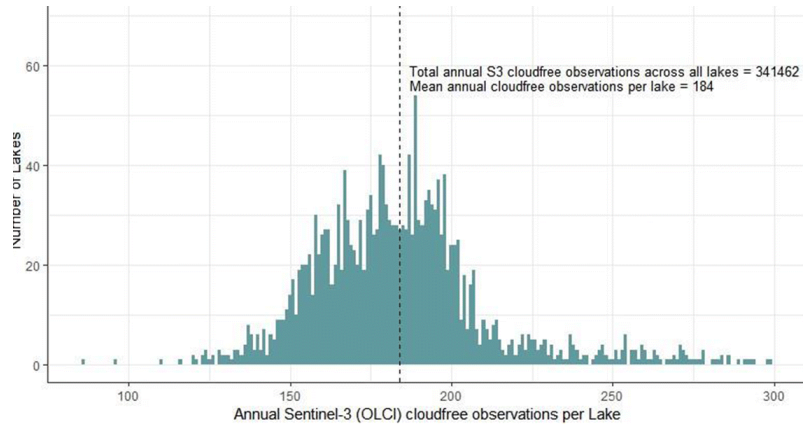




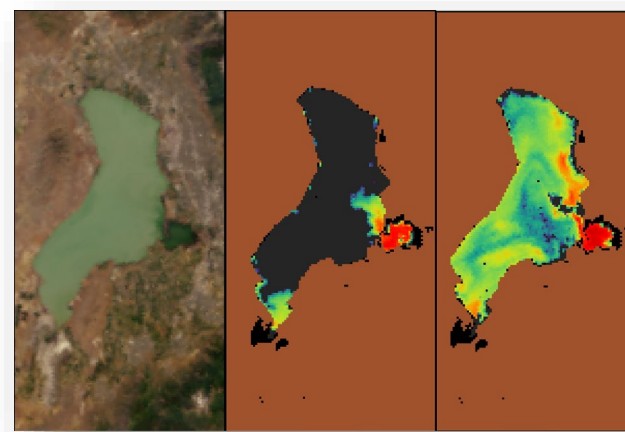
**Harmful Cyanobacterial Bloom (HCB) Recreational Use Advisories: Big Sandy, Eden, Lower North Crow, Pathfinder, and Woodruff Narrows Reservoirs**

The Wyoming Department of Health has issued recreational use advisories...

Potential blooms were identified by satellite imagery from the [Cyanobacteria Assessment Network](#) (CyAN) or reported to the Wyoming Department of Environmental Quality.



Annual potential avoided costs  
~\$5.7 million/year



Improving human health  
outcomes ~\$370,000





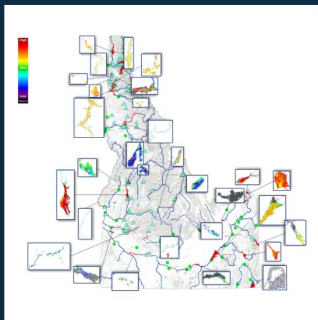


Scenario	Upper Midwest	South	Northeast
Per house annual benefits from 1 week/year reduction in cyanobacterial detection at nearest lake	\$124	\$54	\$146
Per house annual benefits from 25 percent reduction in cyanobacterial bloom days at nearest lake	\$337	\$160	\$261

Phaneuf, Zhang, Schaeffer. Environmental Economics. (In Review).



### Cyanobacteria Assessment Network (CyAN)



Satellite data imagery compilation from 2015-2018

Remote sensing data allows DEQ staff to remotely monitor their region's lakes and reservoirs as the summer bloom-season begins to identify which water bodies may be in the early stages of bloom development, remotely monitor the density of a bloom once high toxin levels are confirmed, and see when population levels are returning to the normal levels that indicate toxin concentrations may have returned to safe levels.

CyAN - Cyanobacteria Assessment Network: a NASA, EPA, NOAA, and USGS Project

The CyAN project agencies collaborated to develop an early warning indicator system for detecting algal blooms in U.S. freshwater systems. This research supports federal, state, tribal, and local partners in their monitoring efforts to assess water quality to protect aquatic and human health.

### Pictures of Idaho Blooms



### Harmful Cyanobacterial Blooms

**HCB Advisories** [CLICK HERE](#)

**Report a HCB** [CLICK HERE](#)

**Report a HCB illness** [CLICK HERE](#)

**View Satellite Imagery** [CLICK HERE](#)



### HABs in Western NY

#### Creating Composites

Using reflectance values provided by the EPA and CyAN, time series composites were created from the Sentinel-3 Imagery.

WHO-mandated reflectance values

Creating these composites took some trial and error. There are many different settings to play with that provide different results. It was decided that, for our purposes, the baseline composites should show the mean level of HABs reflectance for the first two and last two weeks of each month, from 2017 to 2020.



### AIR, LAND & WATER

Stories of environmental protection in Oregon

### Breakthroughs in detecting Harmful Algal Blooms using satellite imagery

Oregon Department of Environmental Quality October 2, 2020



# Impact





# Seneca Lake PURE WATERS Association

HOME ABOUT > CITIZEN SCIENCE > PARTNERSHIP > EDUCATION > JOIN >

As the team watches for the first blooms, the question always comes up about whether they can be forecast. The short answer is no, however, there is an interesting federal program that might allow us to detect increased cyanobacteria activity before actual blooms occur. The Pure Waters HAB program is monitoring satellite products designed to detect cyanobacteria to see if there are satellite detections before our volunteers see blooms. So far this summer, there have been virtually no satellite detections of cyanobacteria in Seneca Lake, whereas there have been in nearby Finger Lakes.

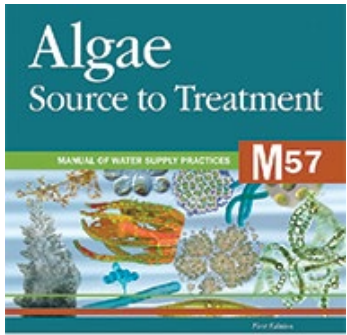
### Cyanobacteria Assessment Network (CyAN)

CyAN is a multi-agency project among the Environmental Protection Agency (EPA), the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and the United States Geological Survey (USGS) to develop an early warning indicator system to detect algal blooms in U.S. freshwater systems.

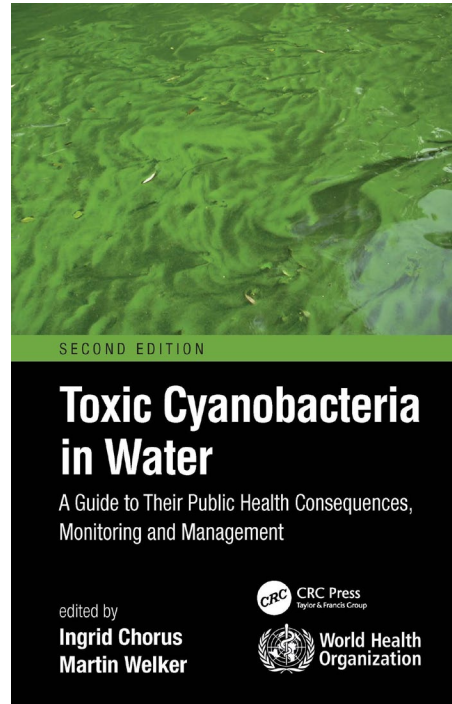
The screenshot shows a social media post from 'Friends of Lake Cascade' dated September 13 at 6:53 AM. The post text reads: 'Saturday 9/11/21 Lake Water Sampling Results: Harmful Algae Bloom Health Advisory still in effect. Secchi Depths (water clarity): 3.5 to 4 feet (slight decreasing trend) Lake Storage Level: 52% capacity (dropping) Near Surface Water Temperature: 63 to 64 degrees F depending on time of day. ... See More'. Below the post is a screenshot of the EPA's 'Lake Cascade' transparency page for 09/11/21. The map shows cyanobacteria concentrations in cells/ml, with a legend indicating values from 0 to 1000. A color scale legend shows: 0 (blue), 250 (green), 500 (yellow), 750 (orange), 1000 (red). The map shows higher concentrations (red/orange) in the western part of the lake near 'Arling' and 'Barnesville', and lower concentrations (blue/green) in the eastern part near 'Cascades'.

U.S. Environmental Protection Agency





In Review: Quantification through Remote Sensing



Chapter 11



Strategies for Preventing and Managing Harmful Cyanobacterial Blooms (HCBs)



Monitoring Section

AVAILABLE NOW!







# Questions?

