

Cyanobacteria Assessment Network (CyAN)

NASA ARSET Webinar Series

Week 4: Large-Scale Monitoring Using Remote Sensing and Citizen
Science

26 September 2007

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U.S. EPA Office of Research and Development



Mission Statement and Objectives

“Support the environmental management and public use of U.S. lakes and estuaries by providing a capability of detecting and quantifying algal blooms and related water quality using satellite data records.”

- Create a **standard and uniform** approach to identify harmful algal blooms (HABs)
- Develop information **dissemination** system
- Understand connections between **health, economic, and environmental** conditions to HABs



CyAN Work Products

- Field validation data
- Algorithm development
- Algorithm evaluation
- Landscape factors
- Health effects
- Economic benefits of early warning
- Data dissemination



Source: MERIS/NASA; processed by NOAA/NOS/NCCOS

In Situ Data



National Water Quality Monitoring Council
Working together for clean water

Water Quality Data

[WQP Home](#) [Download Data](#) [How to use the WQP](#) [National Results Coverage](#) [About the WQP](#)

LOCATION

Place:

Country: ?

State: ?

County: ?

Point Location: ?

Within miles of

Lat:

Long:

Bounding Box: ?

North:

South:

East:

West:

SITE PARAMETERS

Site Type: ?

Organization ID: ?

Site ID: ?

HUC: ?

Minimum sampling activities per site: ?

Search Upstream and Downstream (BETA) ?



SAMPLING PARAMETERS

Sample Media: ?

Characteristic Group: ?

Characteristics: ?

Project ID: ?

Parameter Code: (NWIS ONLY) ?

Minimum results per site: ?

Date range - from: to:

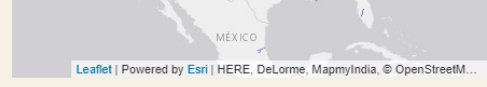
Biological sampling parameters: ?

Assemblage: ?

Taxonomic Name: ?

<https://www.waterqualitydata.us/>

STATES



Leaflet | Powered by Esri | HERE, DeLorme, MapmyIndia, © OpenStreetM...

DATA SOURCE

Select database:

Style sites:




Select data to download:

- Site data only
- Sample results (physical/chemical metadata)
- Sample results (biological metadata)
- Sample results (narrow)
- Sampling Activity
- Sampling Activity Metrics
- Result Detection Quantitation Limit Data

File format:

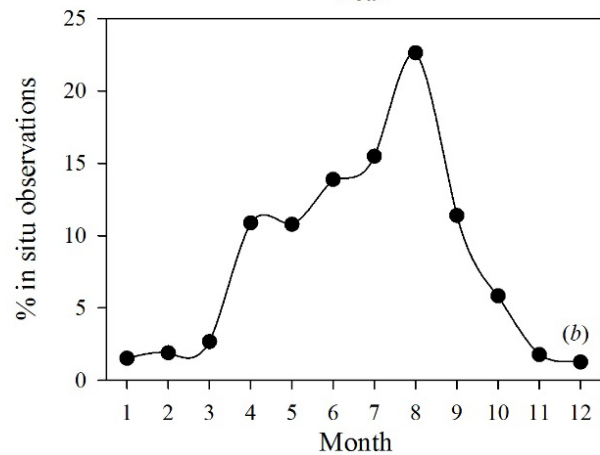
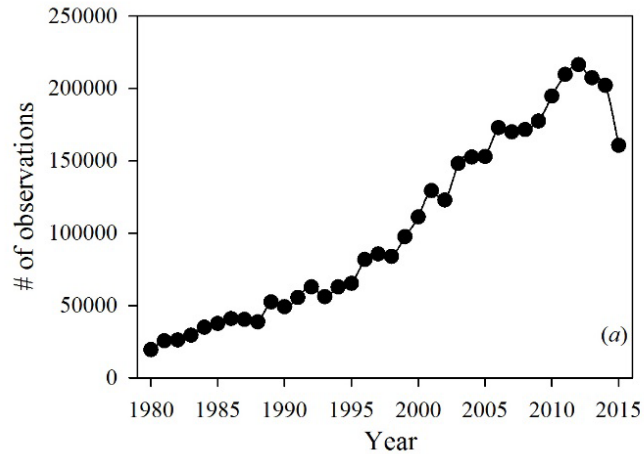
- Comma-separated
- Tab-separated
- MS Excel 2007+
- KML (Keyhole Markup Language - for Sites only)

Sort data

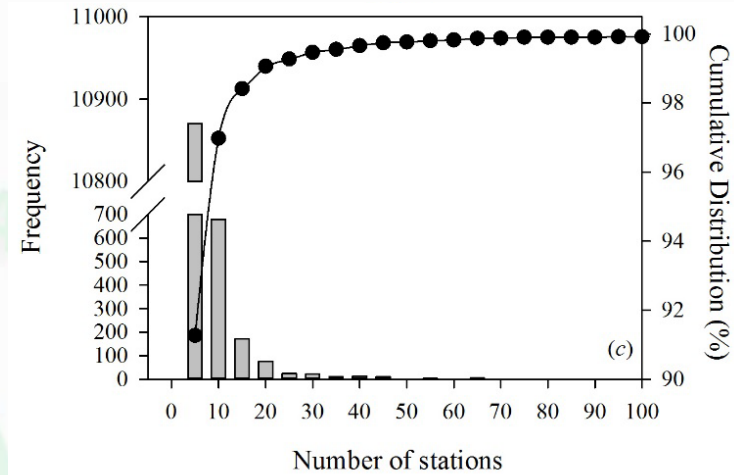
Contact us   

In Situ Sampling: Spatial & Temporal Resolution

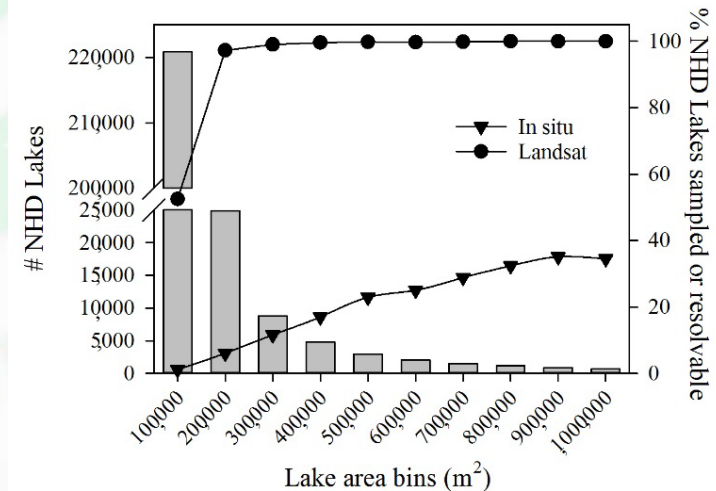
Example: Lake Temperature



Number of in situ observations by year (top) and distribution of samples by month (bottom).



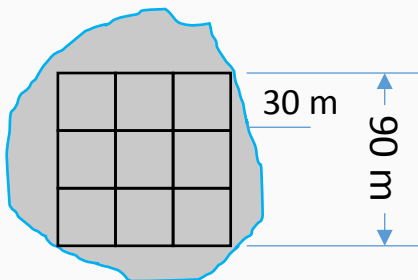
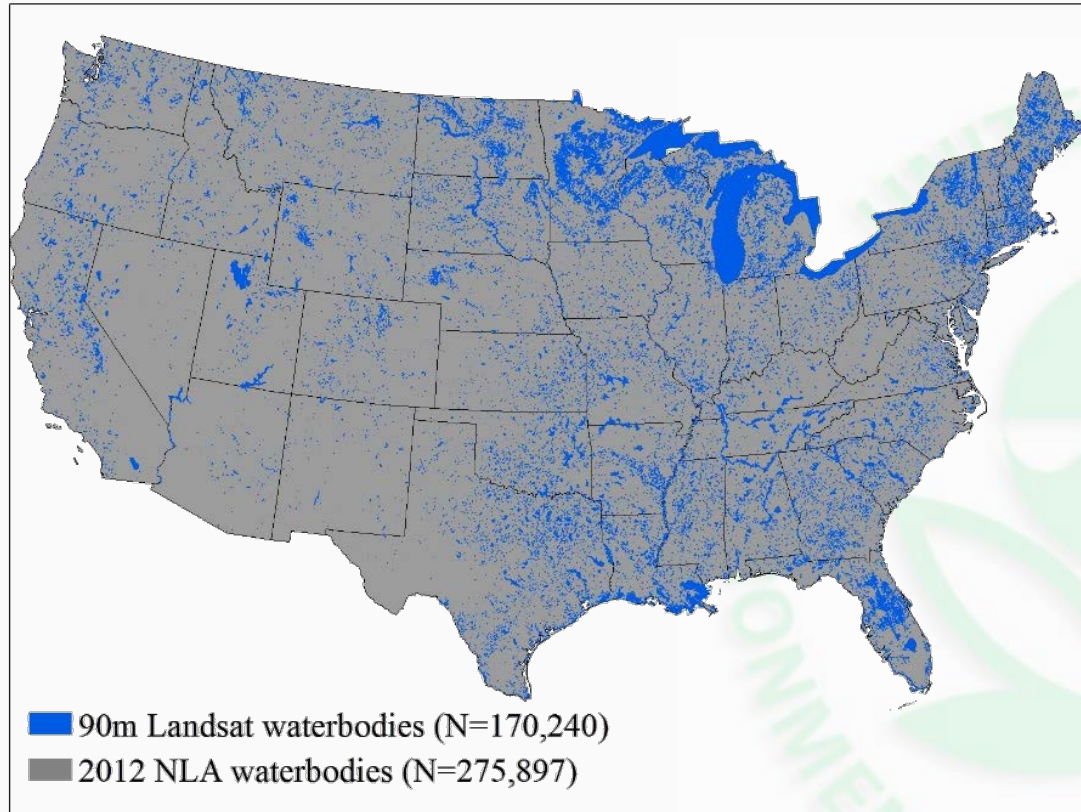
Number of stations per lake and cumulative distribution per lake.



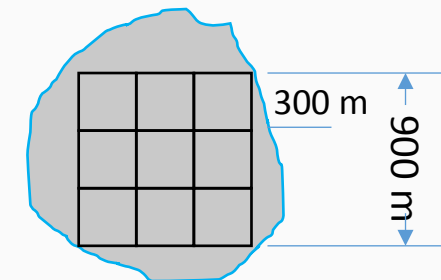
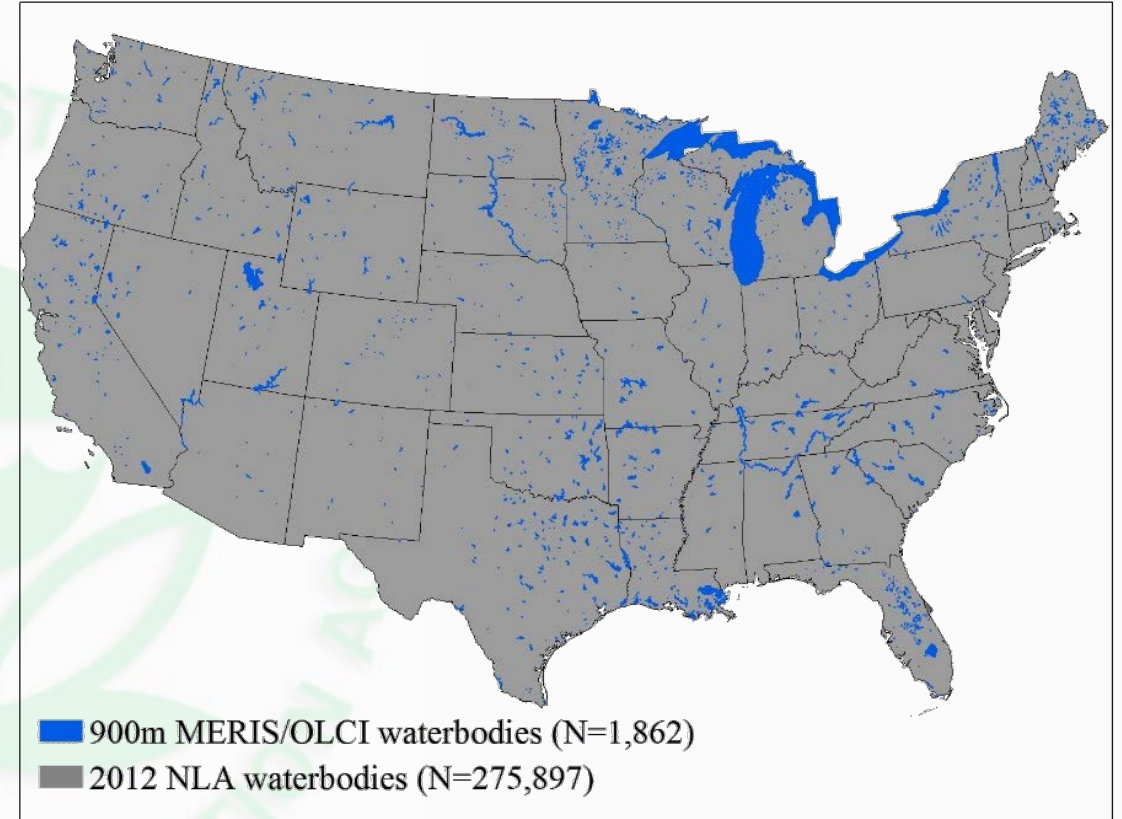
Percentage of lakes sampled by surface area.

Spatial Resolution

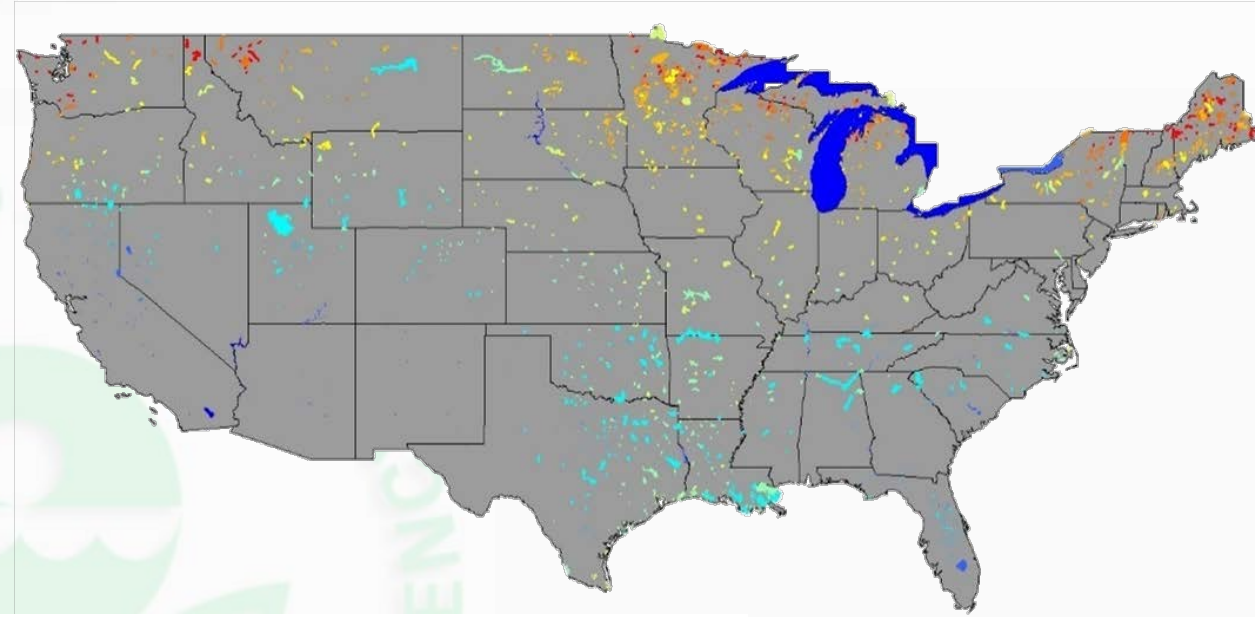
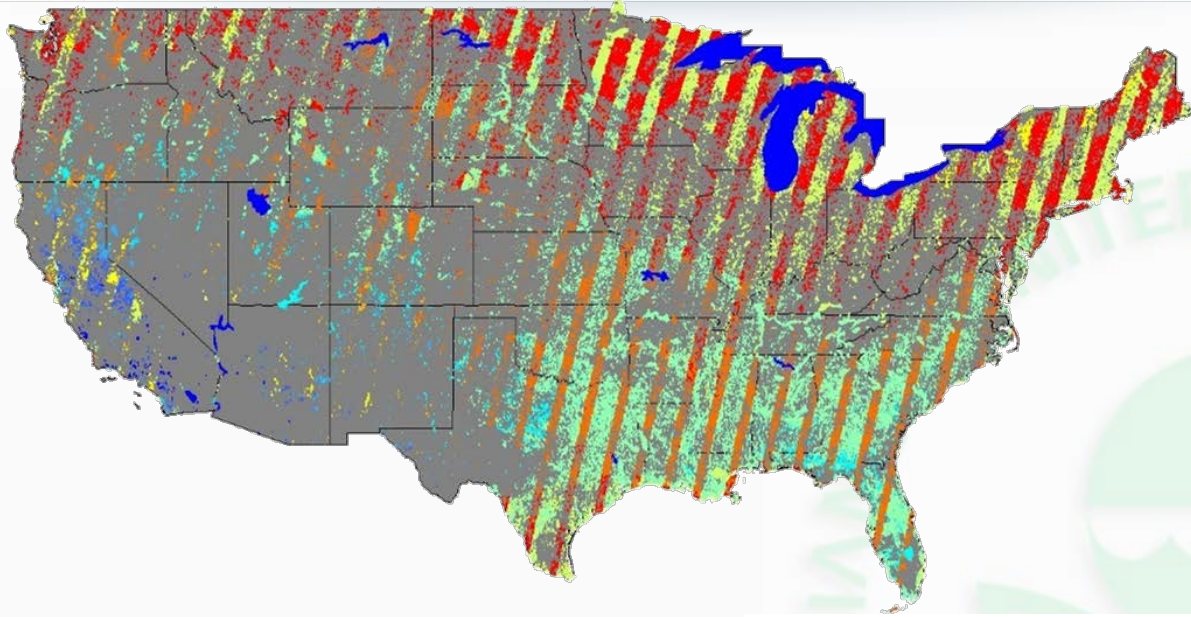
Landsat 8 Operational Land Imager (OLI)



Envisat **MEDium Resolution Imaging Spectrometer (MERIS)**

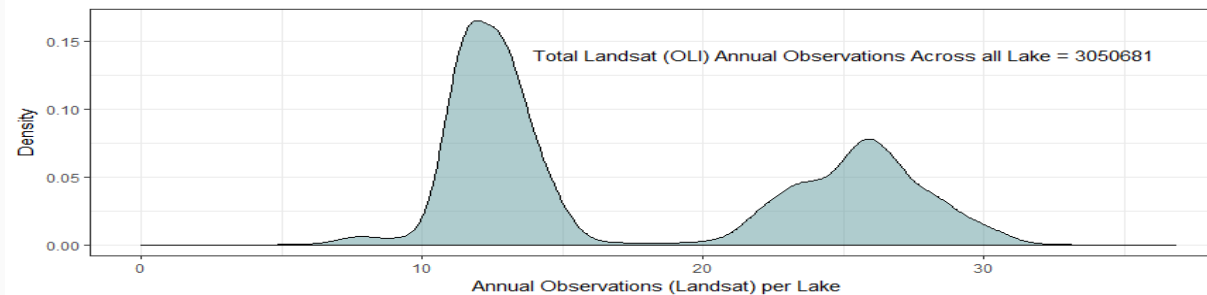
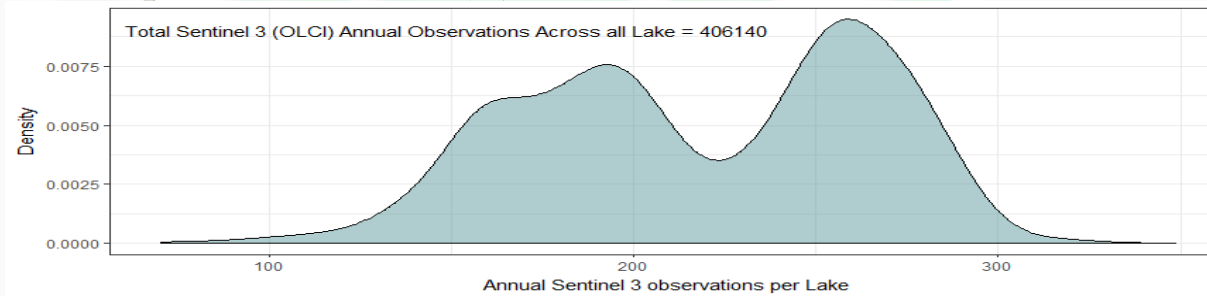
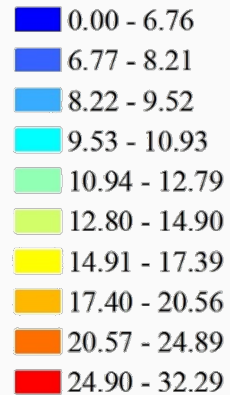


Temporal Resolution



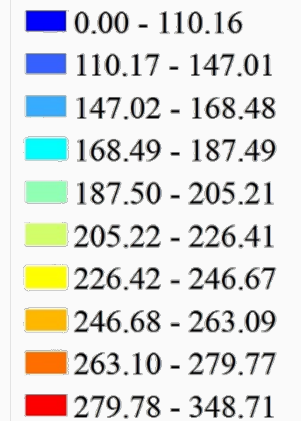
Landsat_Full_Year_Cloudfree_views

#Observations/Yr

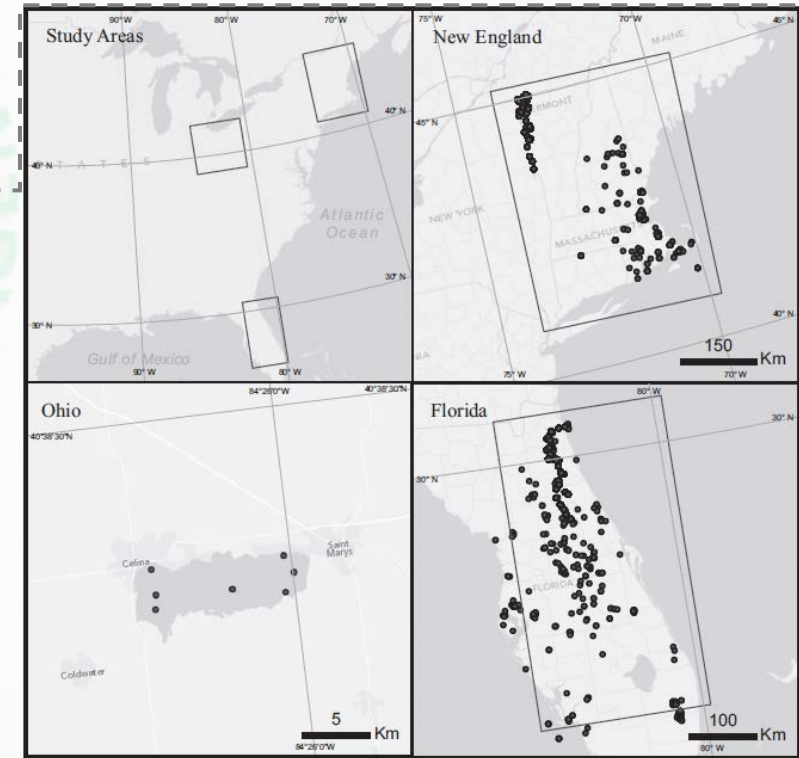
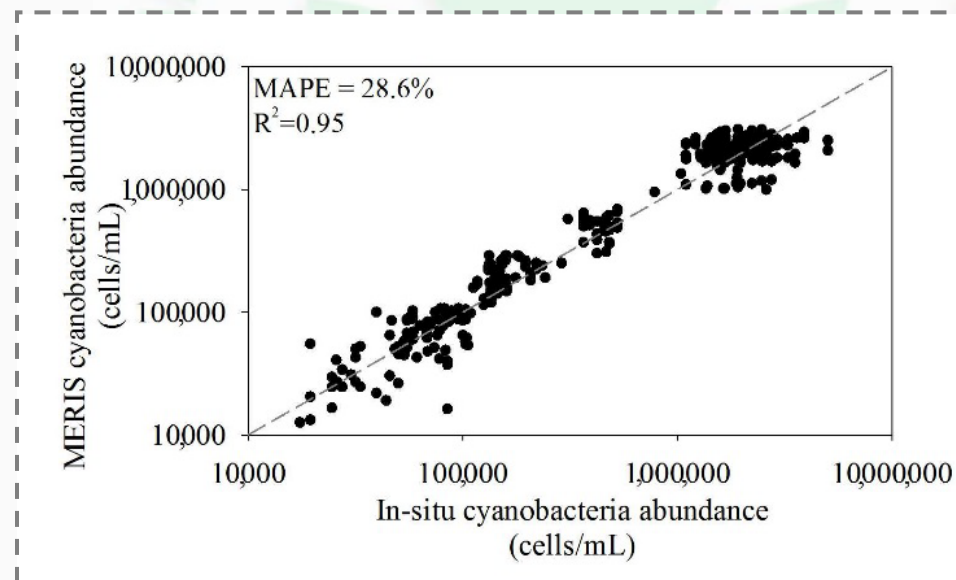
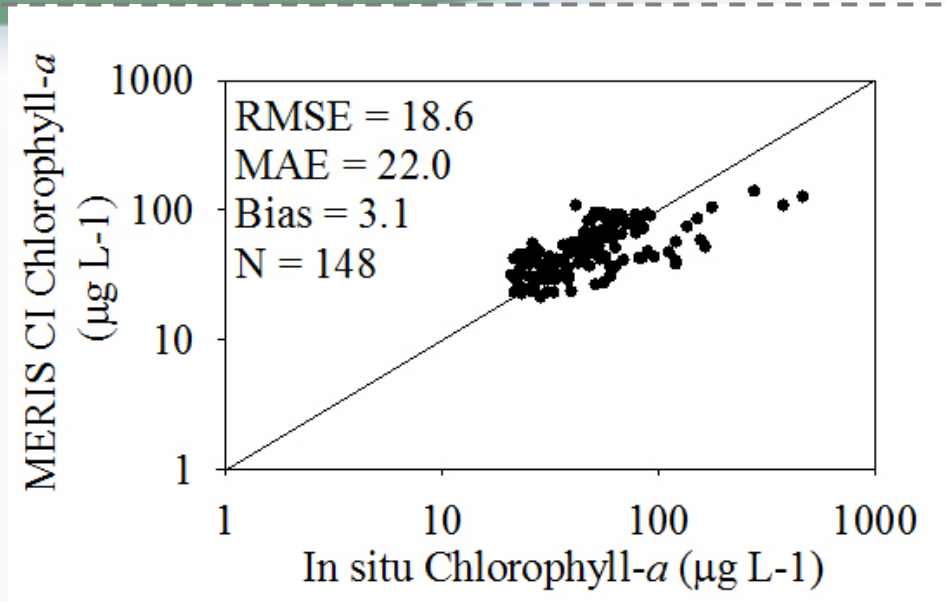
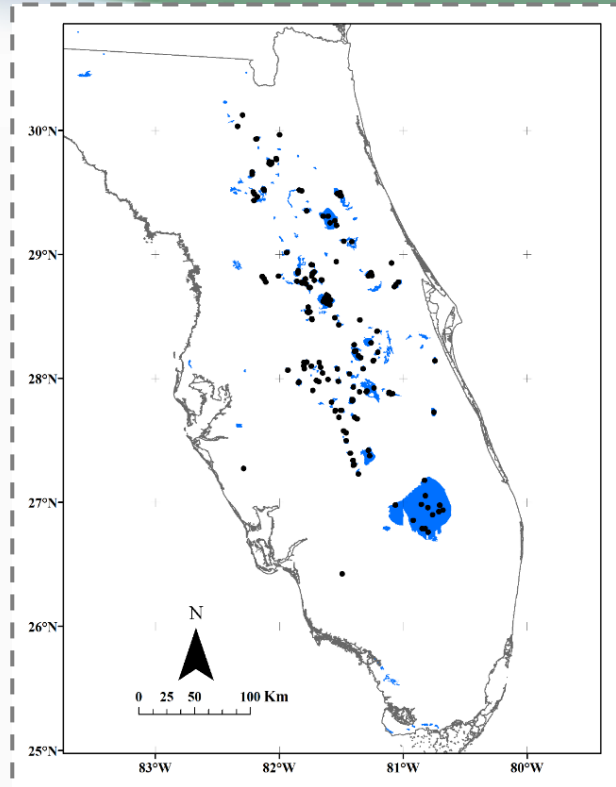


Sentinel 3

#Observations/Yr

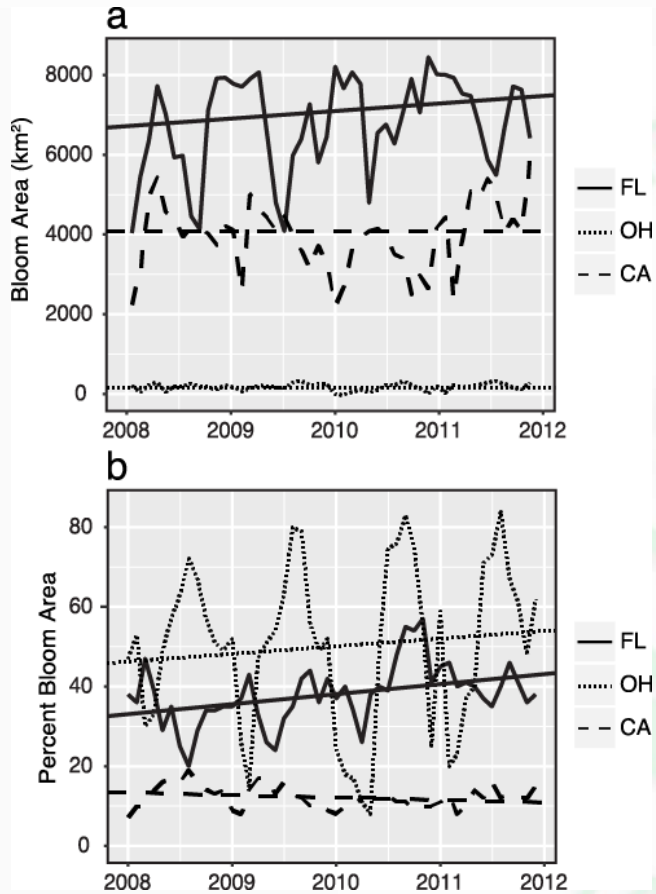


Validation



Source: Lunetta et al. 2015.
Evaluation of cyanobacteria cell
count detection derived from
MERIS imagery across the eastern
USA. RSE 157:24-34.

CyanoHAB Spatial Extent



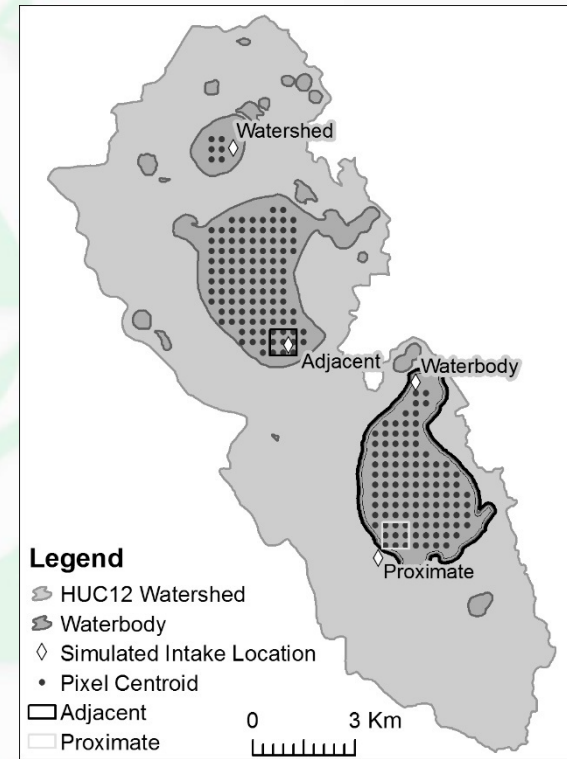
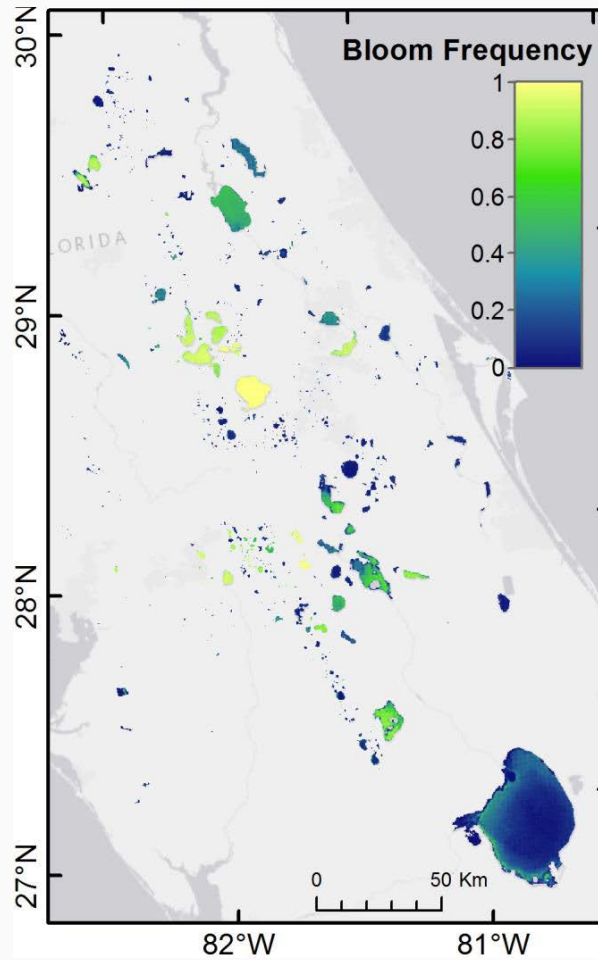
region	WHO	Y
FL	ND	3.3
	bloom	4.1
	low	7.8
	mod	26.4
OH	high	1.9
	ND	7.94
	bloom	>100
	low	Inf
CA	mod	7.72
	high	29.4
	ND	2.9
	bloom	43.9
	low	6.5
	mod	24.4
	high	31.9

Residual variability (Y):

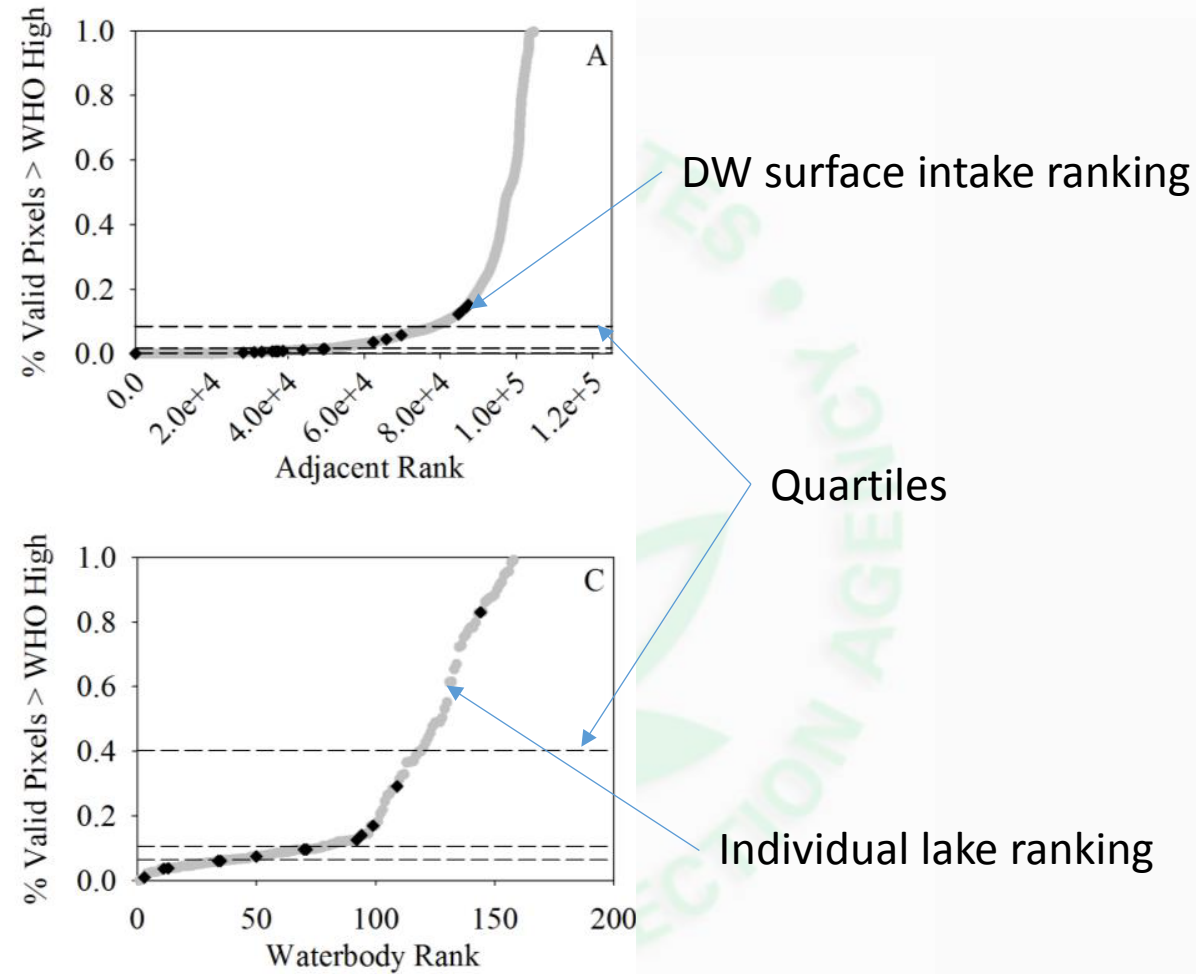
Years required to indicate a cyanoHAB trend

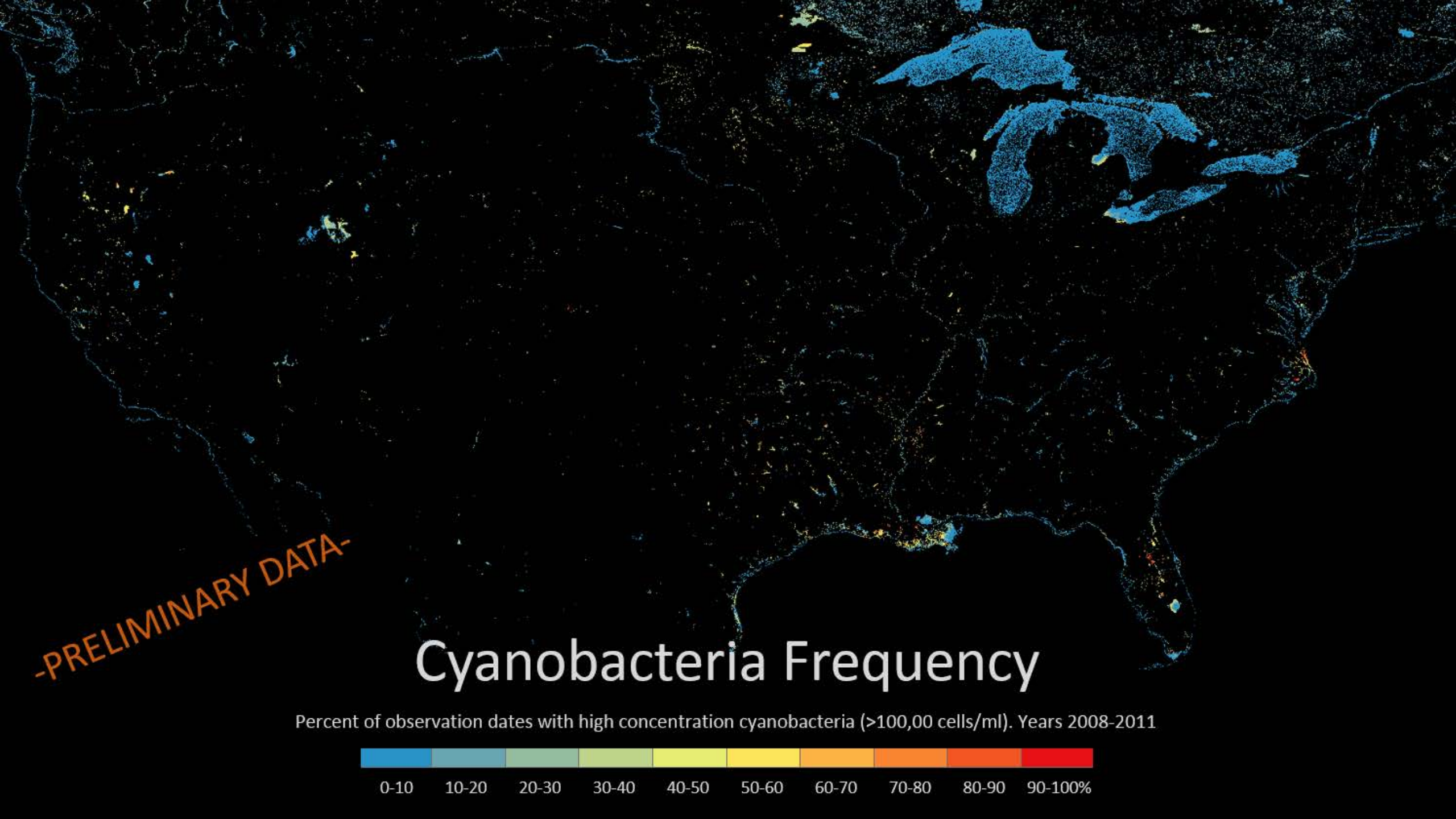


CyanoHAB Frequency



Drinking Water and Recreation Water Prioritization

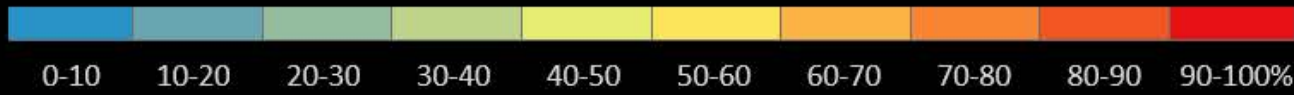




-PRELIMINARY DATA-

Cyanobacteria Frequency

Percent of observation dates with high concentration cyanobacteria (>100,000 cells/ml). Years 2008-2011

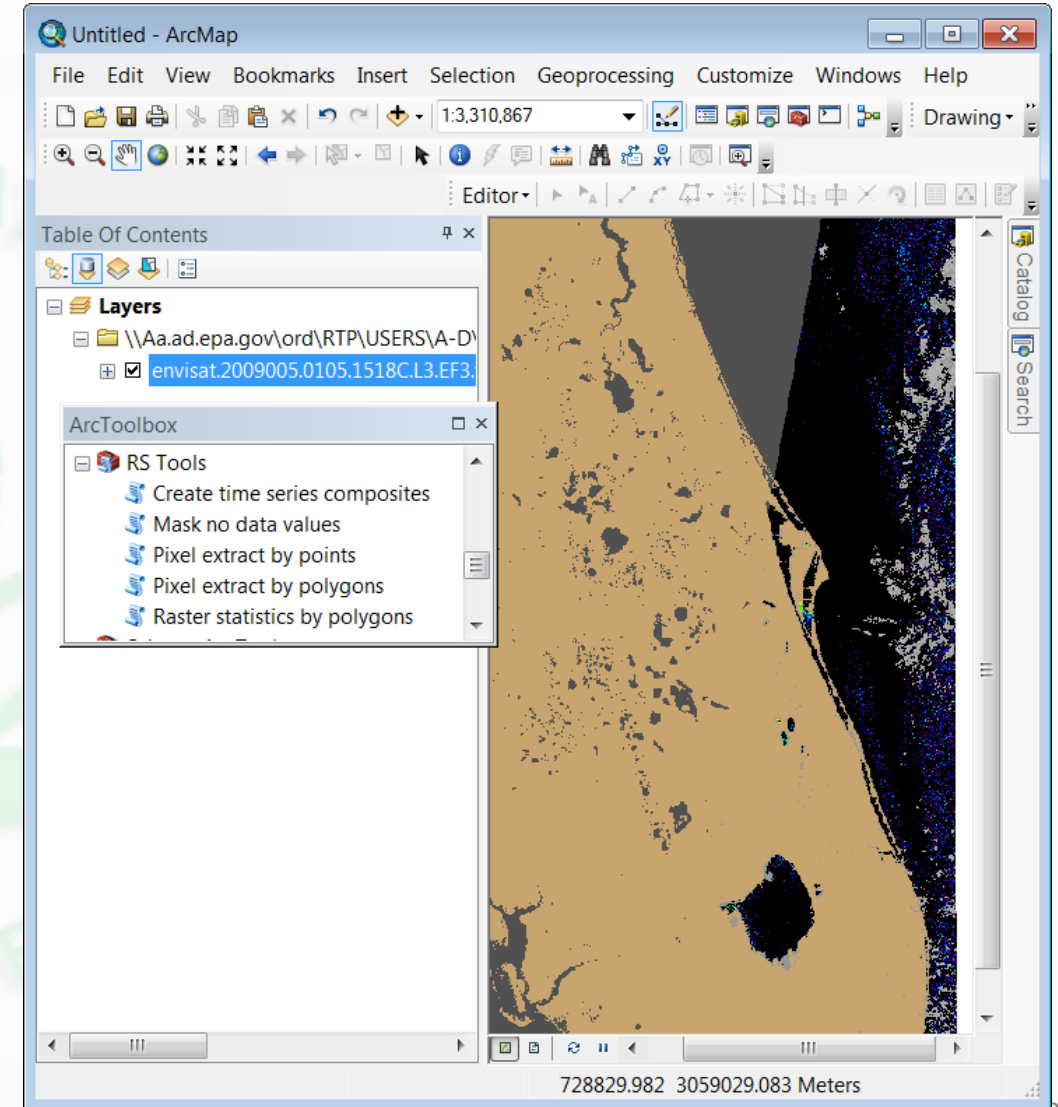


Tools

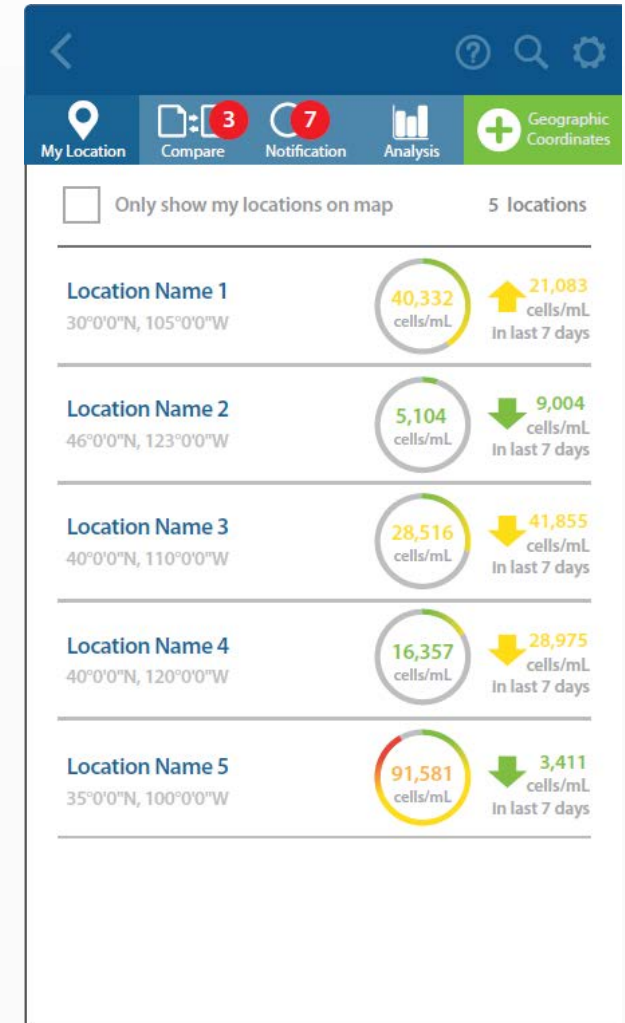
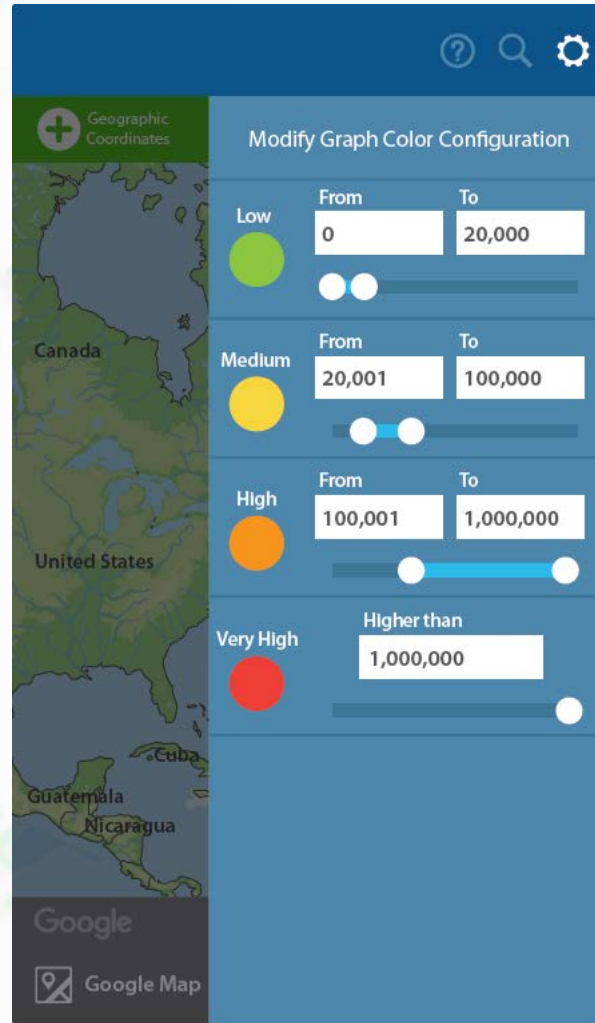
- NASA SeaDAS
- NOAA RS Tools
 - ArcGIS Toolbox for data extraction from geoTIFFs
 - Contact Michelle Tomlinson for access:
michelle[dot]tomlinson[at]noaa[dot]gov

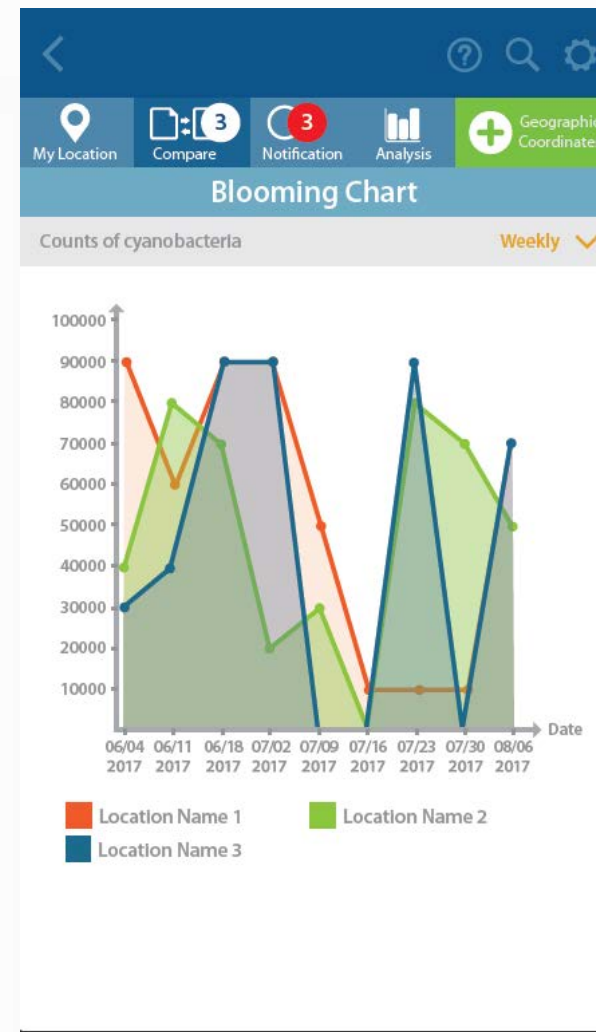
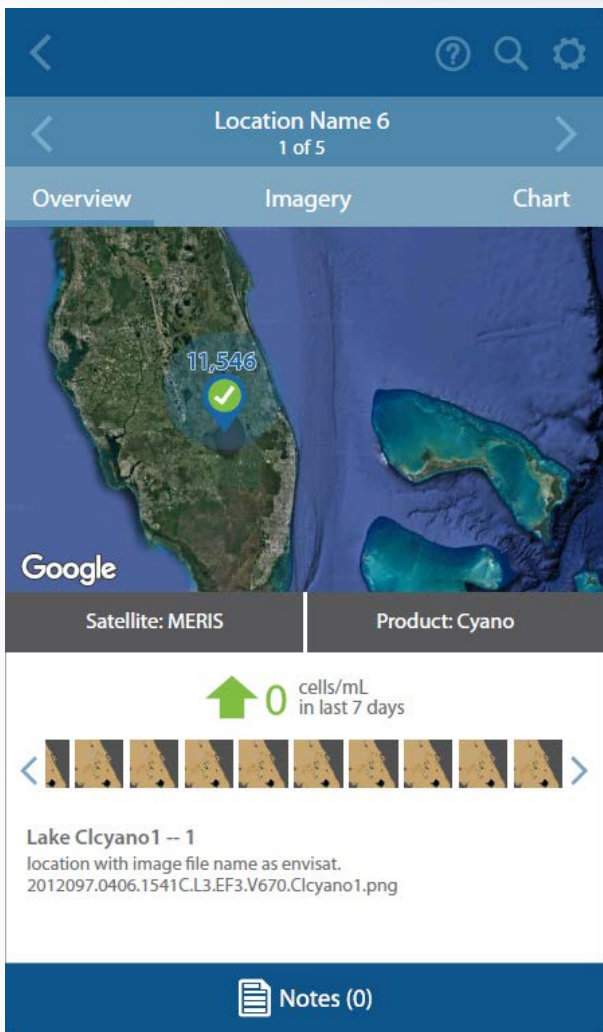


<https://seadas.gsfc.nasa.gov/>



CyAN EPA Mobile Application





Source: Schaeffer et al. (In Review). Title: Cyanobacteria Assessment Network (CyAN) satellite mobile device application. Environmental Modelling & Software.

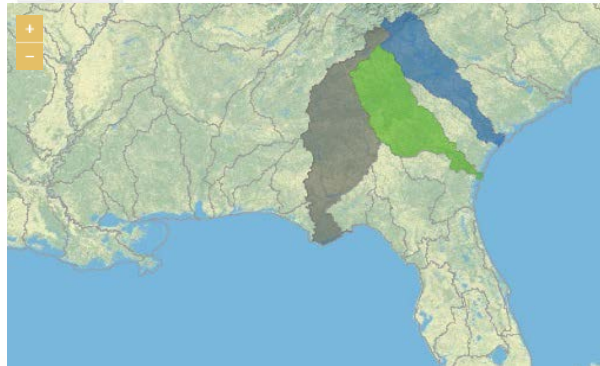
Get Started with EnviroAtlas



CyAN Historic Data Dashboard



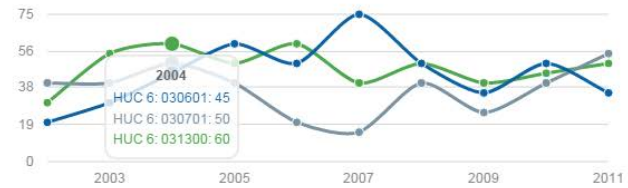
Watersheds Lakes Points



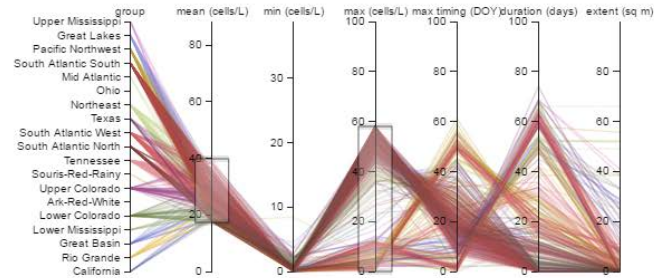
Explore cyanobacteria trends over time. Choose to view patterns for entire watersheds, individual lakes, or point locations.

Select areas of interest by clicking on the map, searching the table, or selecting parameter ranges using the graphical "Bloom Properties" query tool.

Cyanobacteria Annual Max Concentration (cells/L)



Graphical Bloom Properties Query Tool



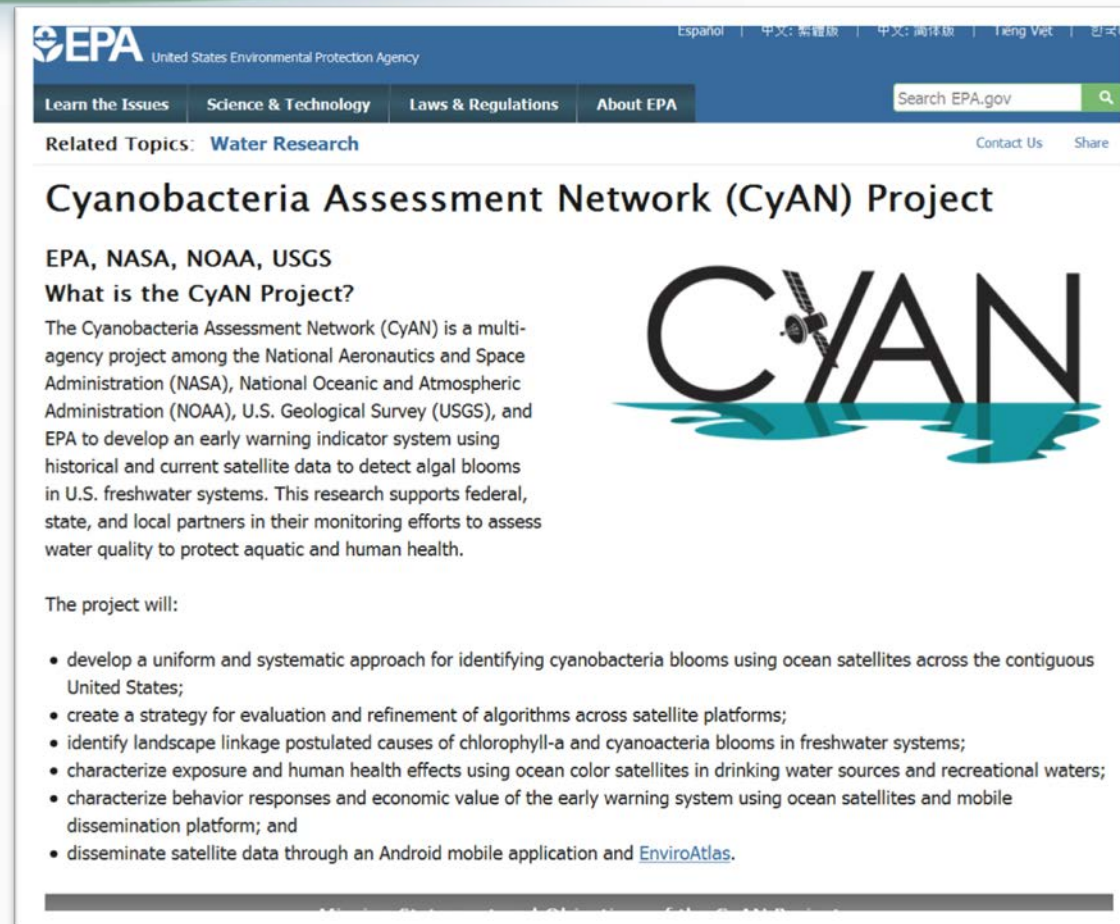
10 records per page Search:

watershed HUC8	duration (days)	extent (meters)	max (cells/L)
030601	4	102	4
030701	5	140	5
031200	5.5	60	5.5

Showing 1 to 3 of 3 entries

← Previous 1 Next →

Thank you!



The screenshot shows the EPA website header with the logo and navigation menu. The main content area features the title "Cyanobacteria Assessment Network (CyAN) Project" and a sub-header "EPA, NASA, NOAA, USGS". Below this is a section titled "What is the CyAN Project?" followed by a paragraph describing the project's goals. To the right of the text is a graphic of the word "CYAN" in large letters, with a satellite orbiting the letter 'Y' and a reflection of the letters in water below. A list of project goals is provided at the bottom of the page.

EPA United States Environmental Protection Agency

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Cyanobacteria Assessment Network (CyAN) Project

EPA, NASA, NOAA, USGS

What is the CyAN Project?

The Cyanobacteria Assessment Network (CyAN) is a multi-agency project among the National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), and EPA to develop an early warning indicator system using historical and current satellite data to detect algal blooms in U.S. freshwater systems. This research supports federal, state, and local partners in their monitoring efforts to assess water quality to protect aquatic and human health.



The project will:

- develop a uniform and systematic approach for identifying cyanobacteria blooms using ocean satellites across the contiguous United States;
- create a strategy for evaluation and refinement of algorithms across satellite platforms;
- identify landscape linkage postulated causes of chlorophyll-a and cyanoacteria blooms in freshwater systems;
- characterize exposure and human health effects using ocean color satellites in drinking water sources and recreational waters;
- characterize behavior responses and economic value of the early warning system using ocean satellites and mobile dissemination platform; and
- disseminate satellite data through an Android mobile application and [EnviroAtlas](#).

epa.gov/cyanoproject

salls.wilson@epa.gov