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

Source: Nicholas Aumen, USGS

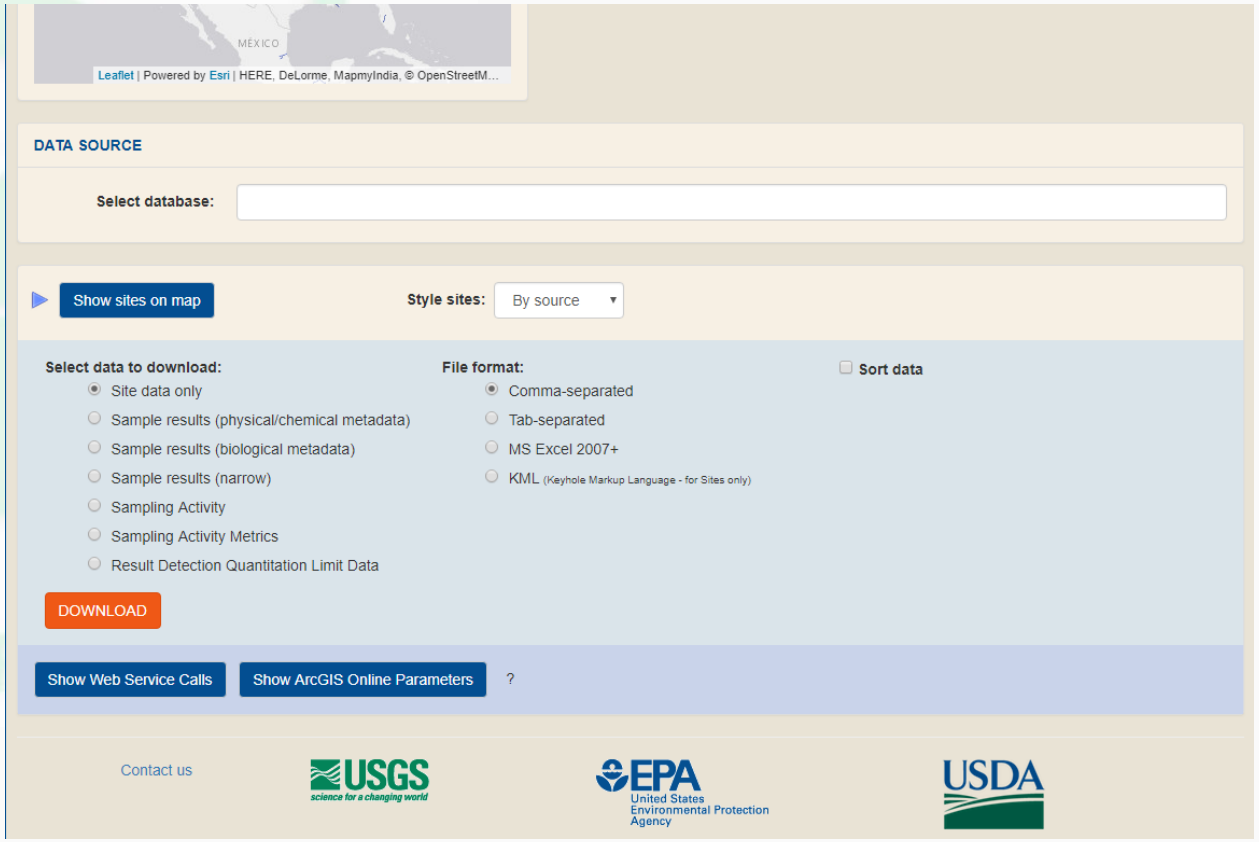
CyAN Work Products

- 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

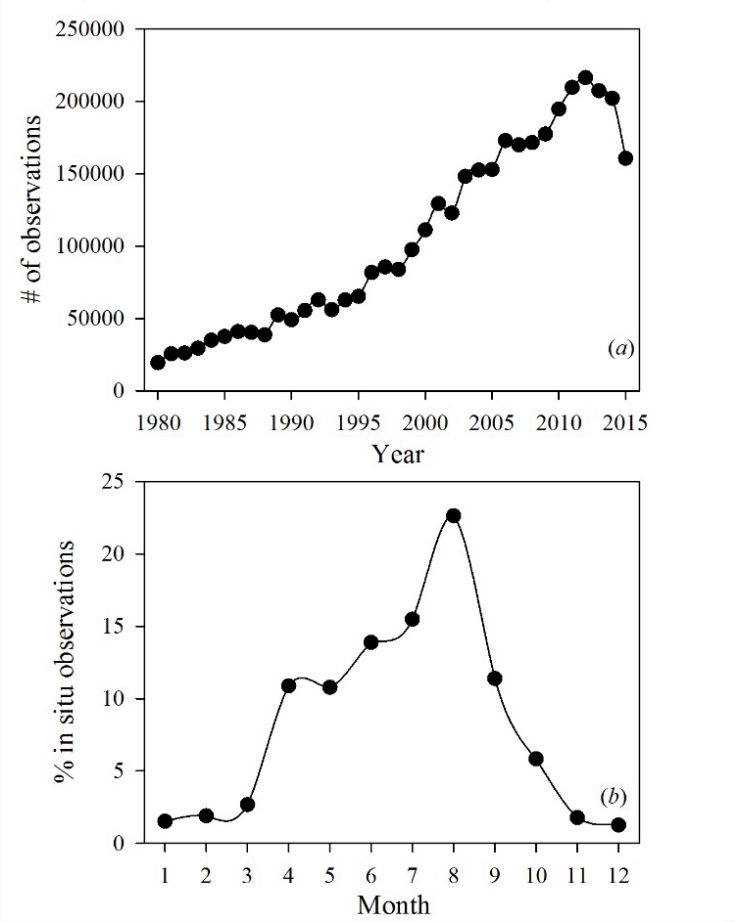
In Situ Data

https://www.waterquality data.us/

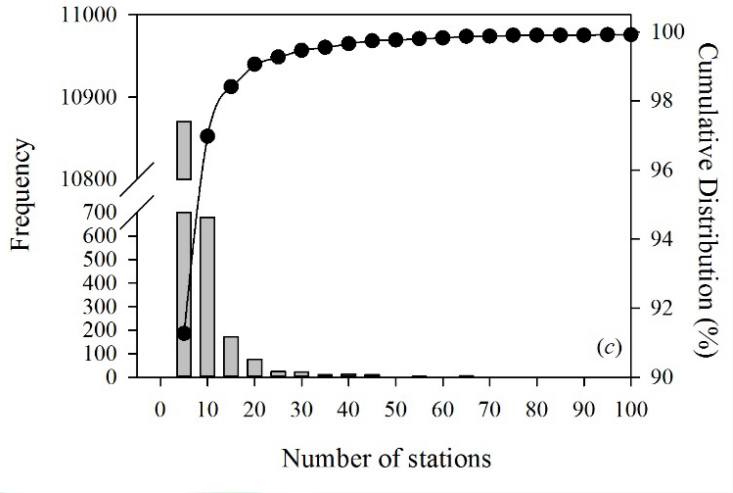


In Situ Sampling: Spatial & Temporal Resolution

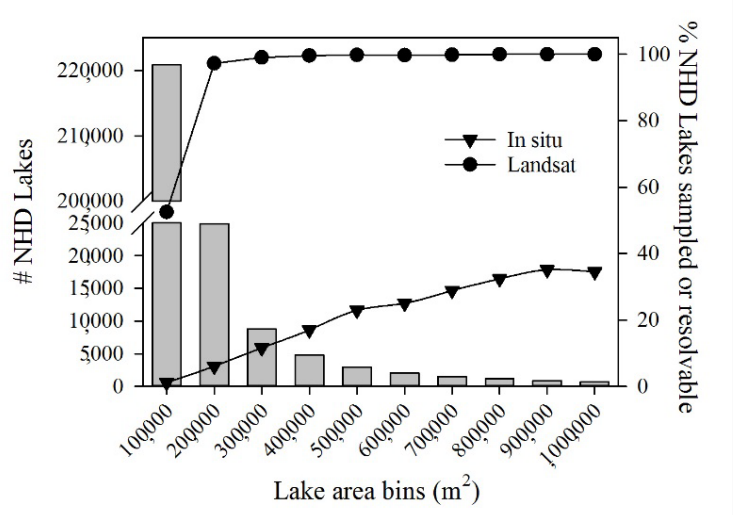
Example: Lake Temperature



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.

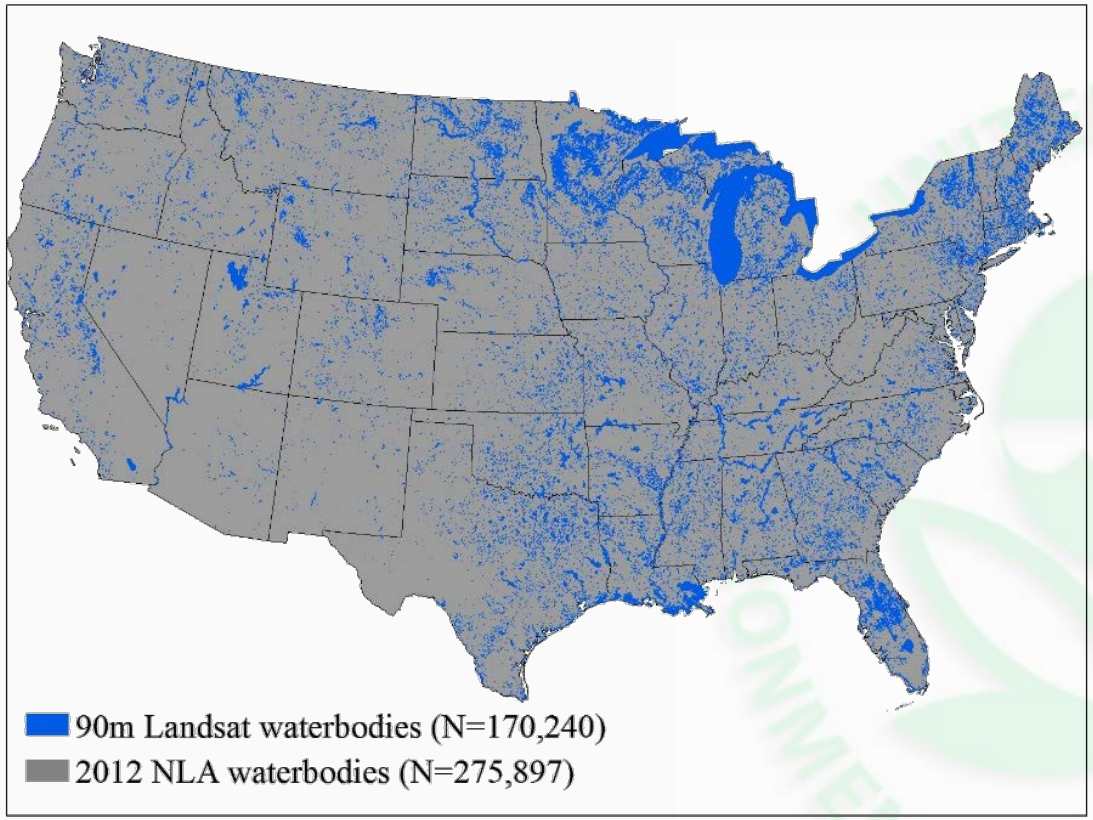


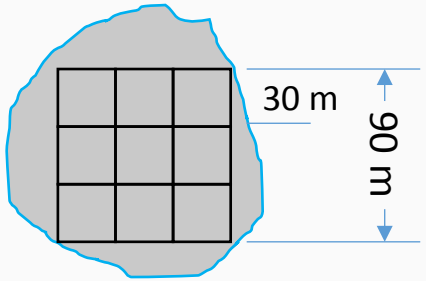
Percentage of lakes sampled by surface area.

Source: Iiames et al. (*in prep.*)

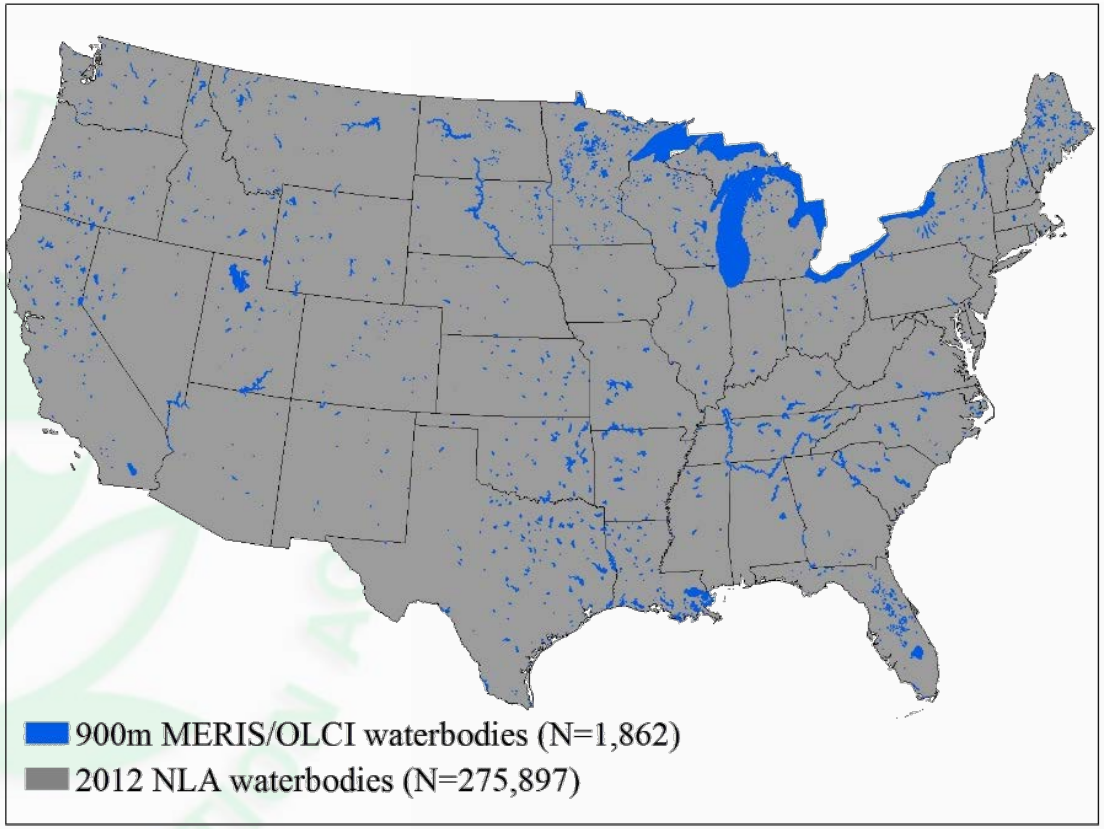
Spatial Resolution

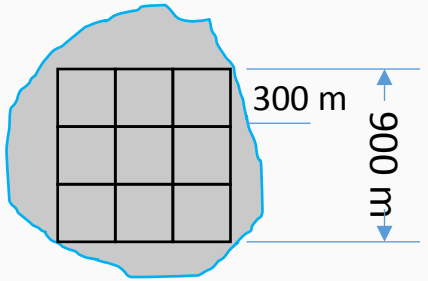
Landsat 8 Operational Land Imager (OLI)





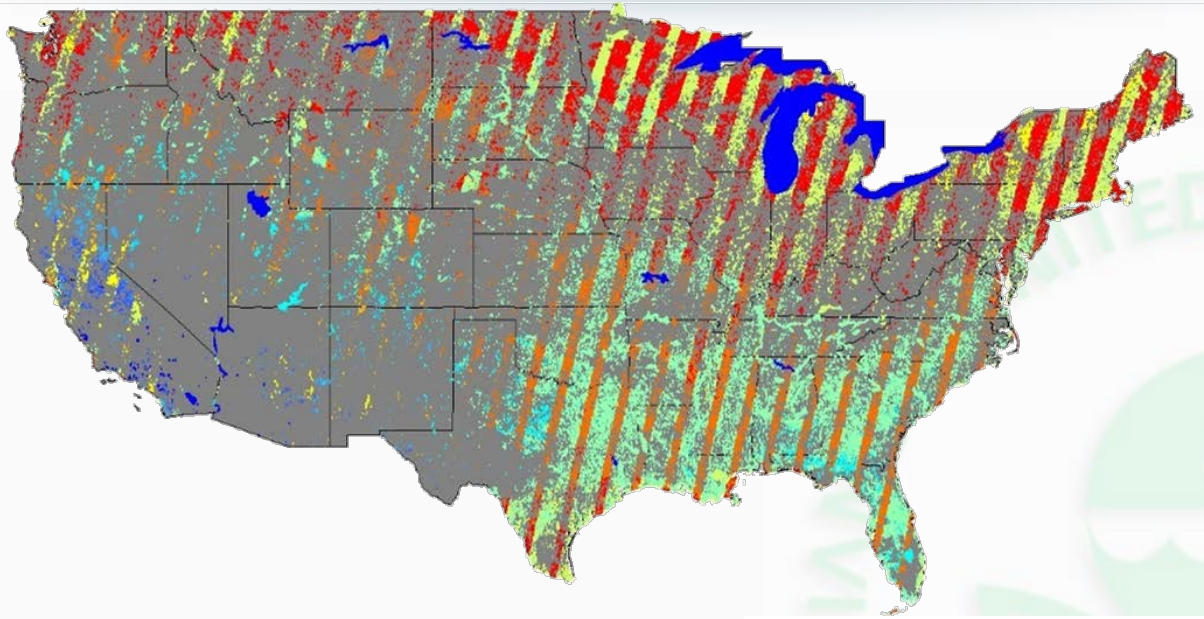
Envisat **MEdium Resolution Imaging Spectrometer (MERIS)**

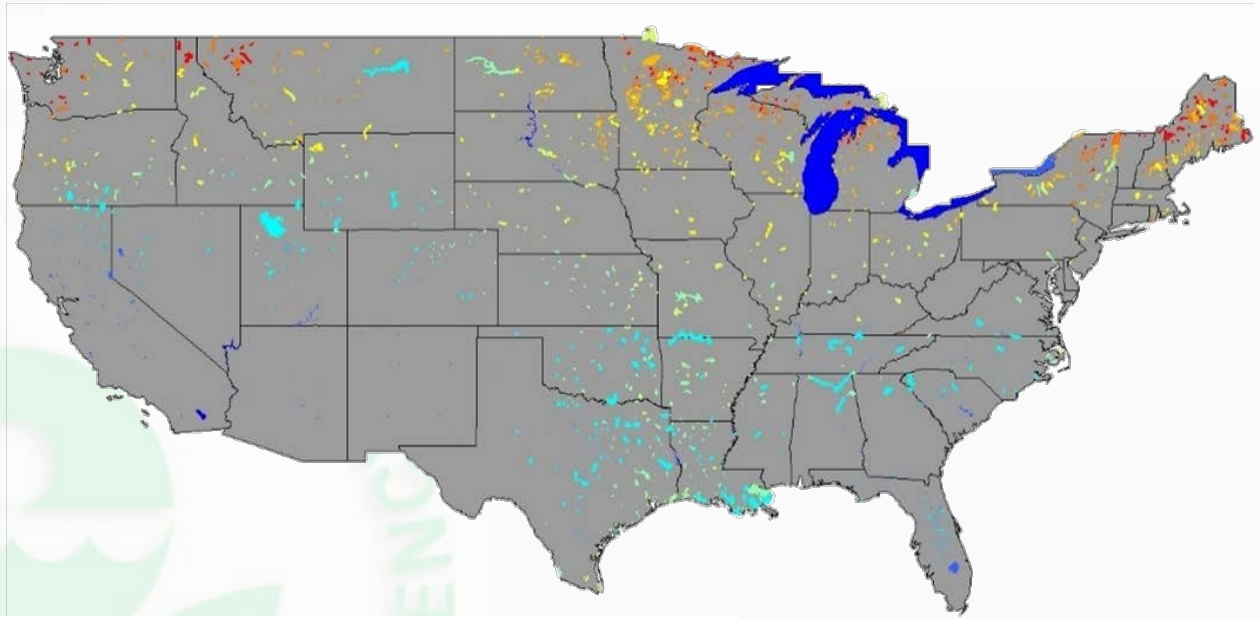




Source: Clark et al. 2017. Ecological Indicators. 80: 84-95.

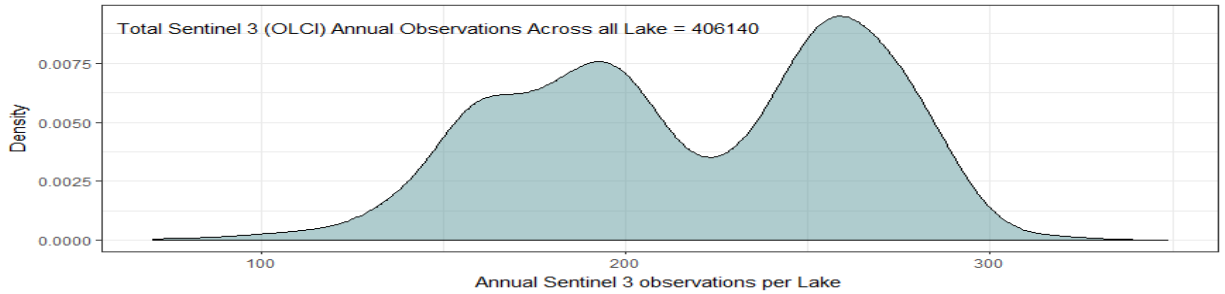
Temporal Resolution

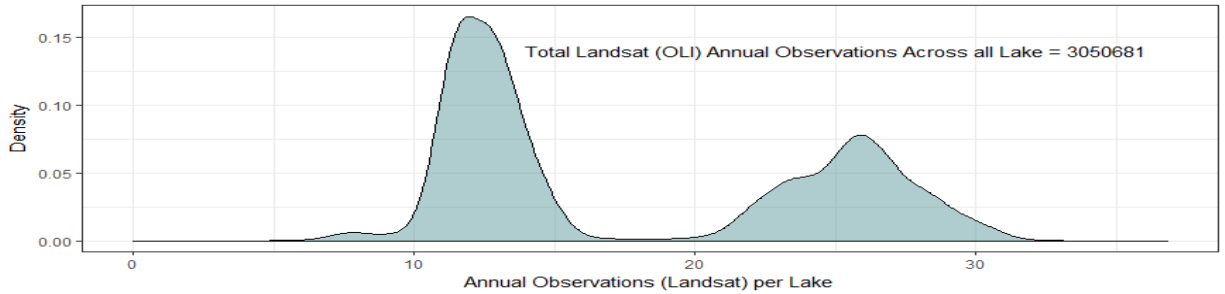




Landsat_Full_Year_Cloudfree_views
#Observations/Yr

- 0.00 - 6.76
- 6.77 - 8.21
- 8.22 - 9.52
- 9.53 - 10.93
- 10.94 - 12.79
- 12.80 - 14.90
- 14.91 - 17.39
- 17.40 - 20.56
- 20.57 - 24.89
- 24.90 - 32.29

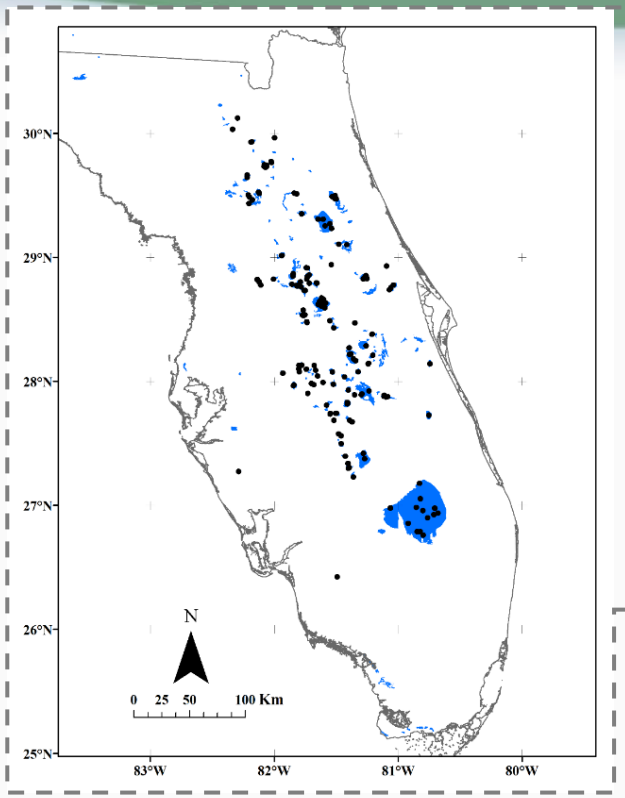


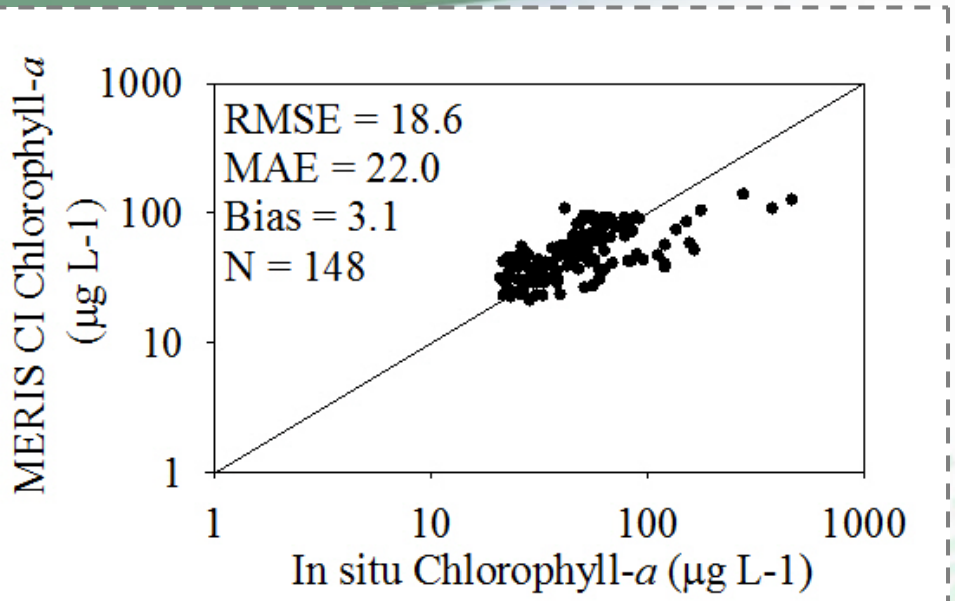


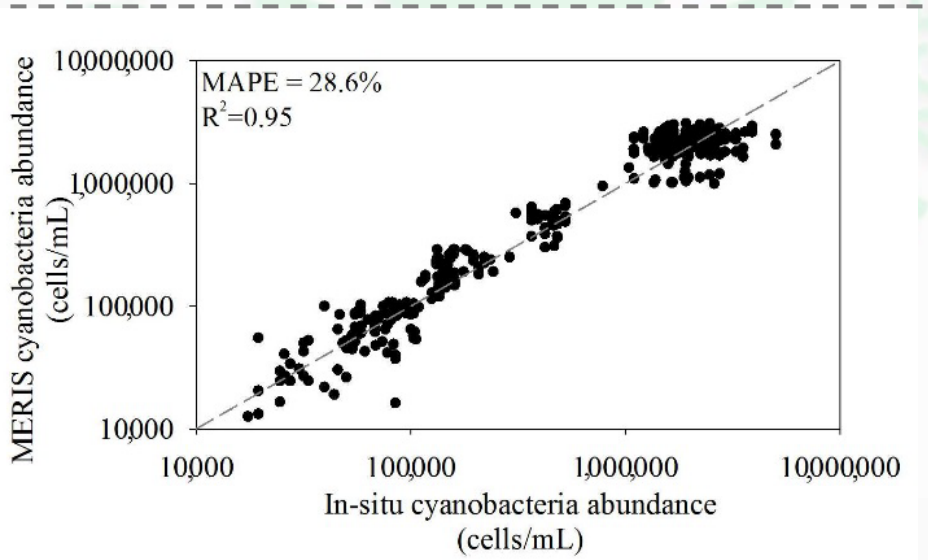
Sentinel 3
#Observations/Yr

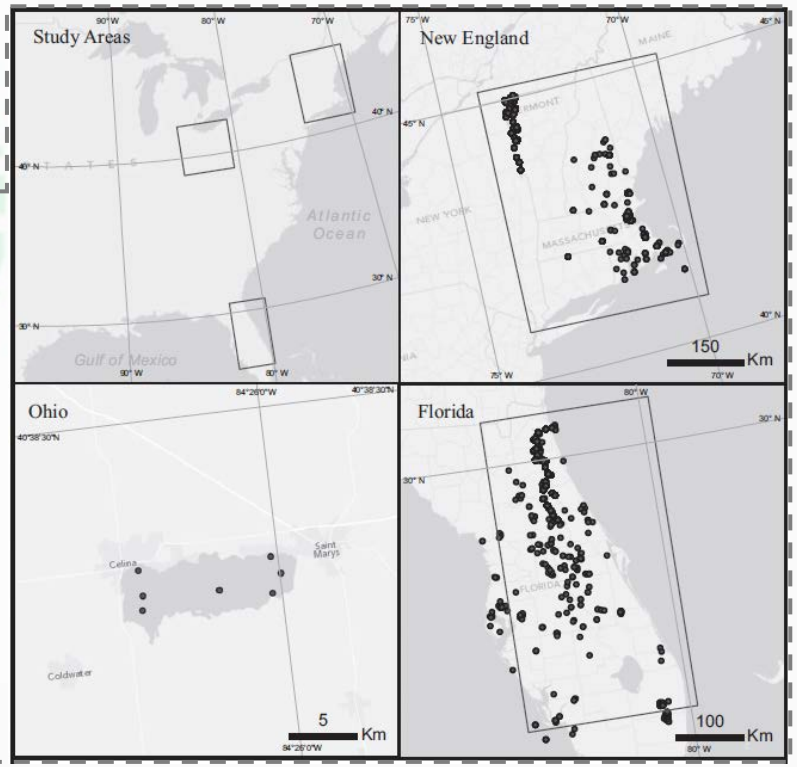
- 0.00 - 110.16
- 110.17 - 147.01
- 147.02 - 168.48
- 168.49 - 187.49
- 187.50 - 205.21
- 205.22 - 226.41
- 226.42 - 246.67
- 246.68 - 263.09
- 263.10 - 279.77
- 279.78 - 348.71

Validation



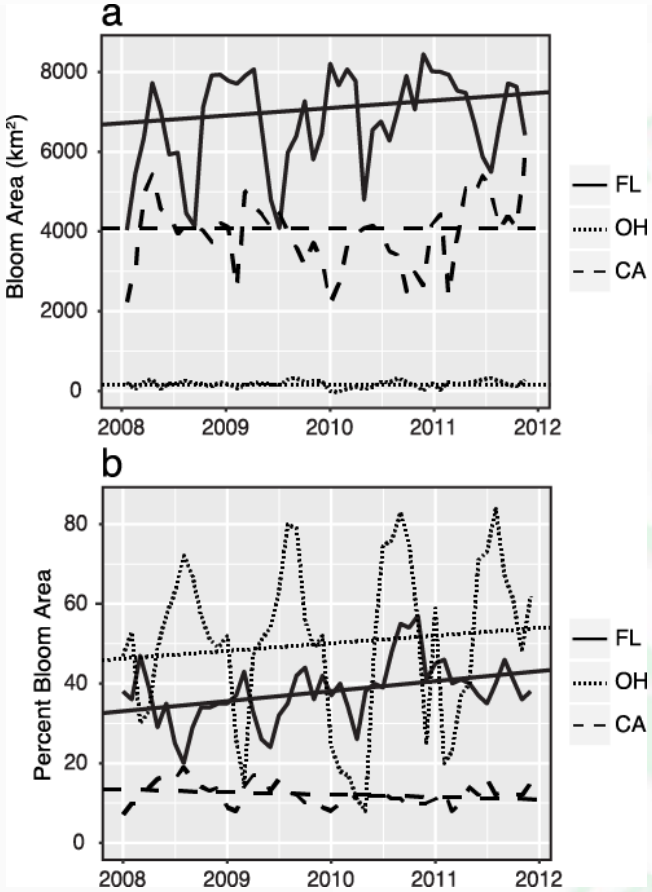






Source: Lunetta et al. 2015. Evaluation of cyanobacteria cell count detection derived from MERIS imagery across the eastern USA. RSE 157:24-34.

CyanoHAB Spatial Extent

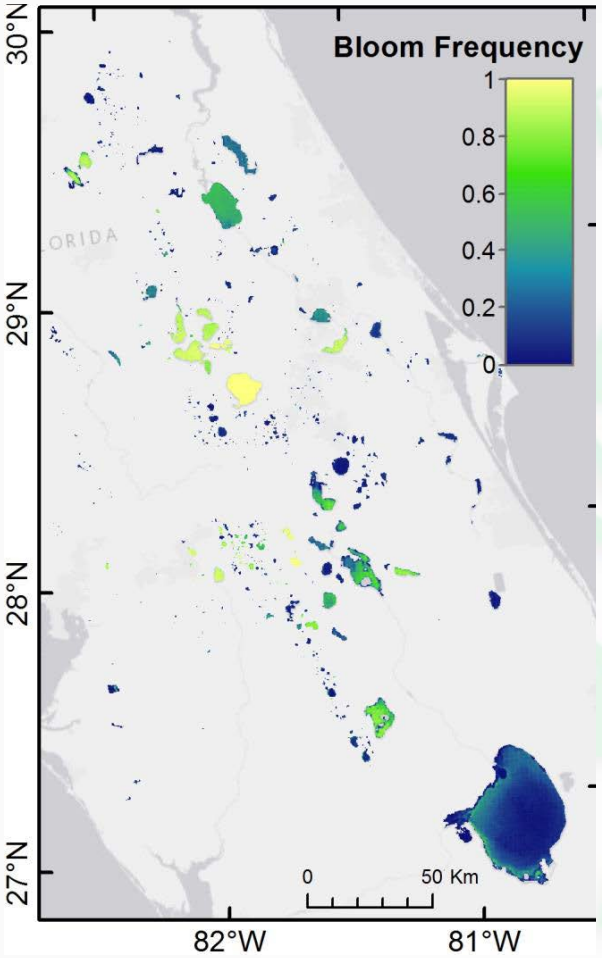


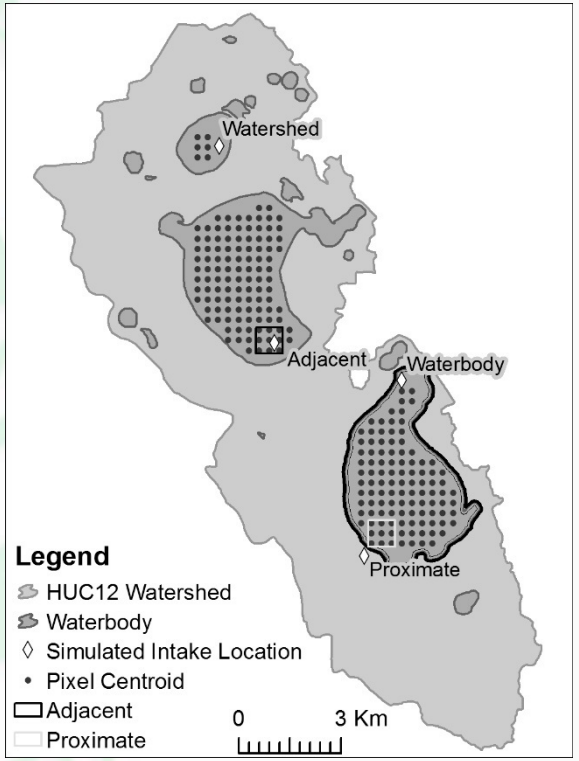
region	WHO	Y
FL	ND	3.3
	bloom	4.1
	low	7.8
	mod	26.4
	high	1.9
OH	ND	7.94
	bloom	>100
	low	Inf
	mod	7.72
	high	29.4
CA	ND	2.9
	bloom	43.9
	low	6.5
	mod	24.4
	high	31.9

Residual variability (Y):
Years required to indicate a cyanoHAB trend

Source: Urquhart et al. 2017. Harmful Algae. 67: 144-152.

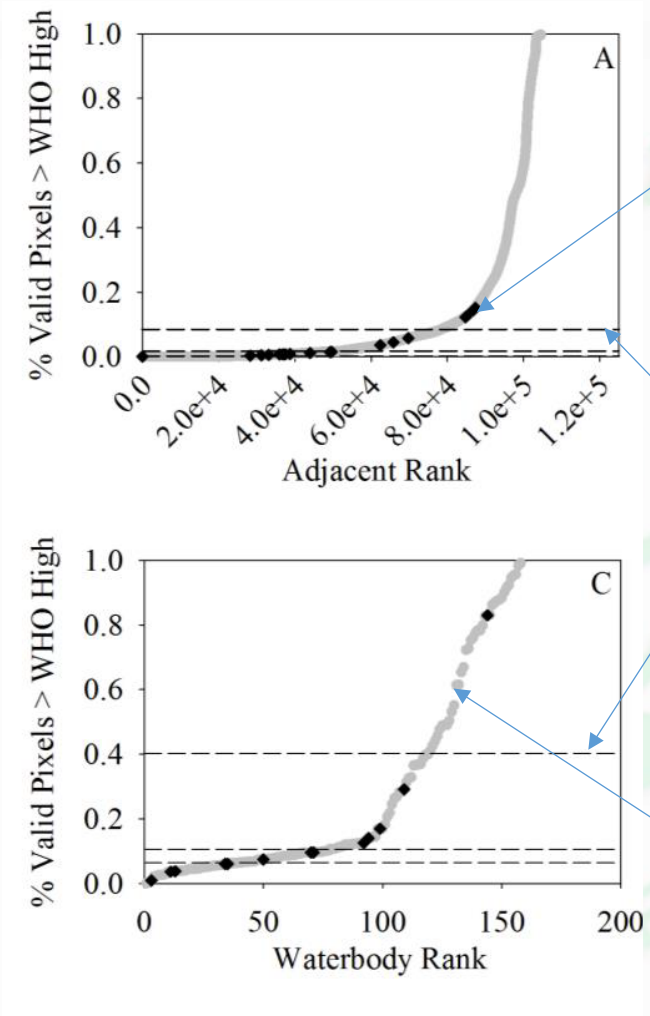
CyanoHAB Frequency





Source: Clark et al. 2017. Ecological Indicators. 80: 84-95.

Drinking Water and Recreation Water Prioritization

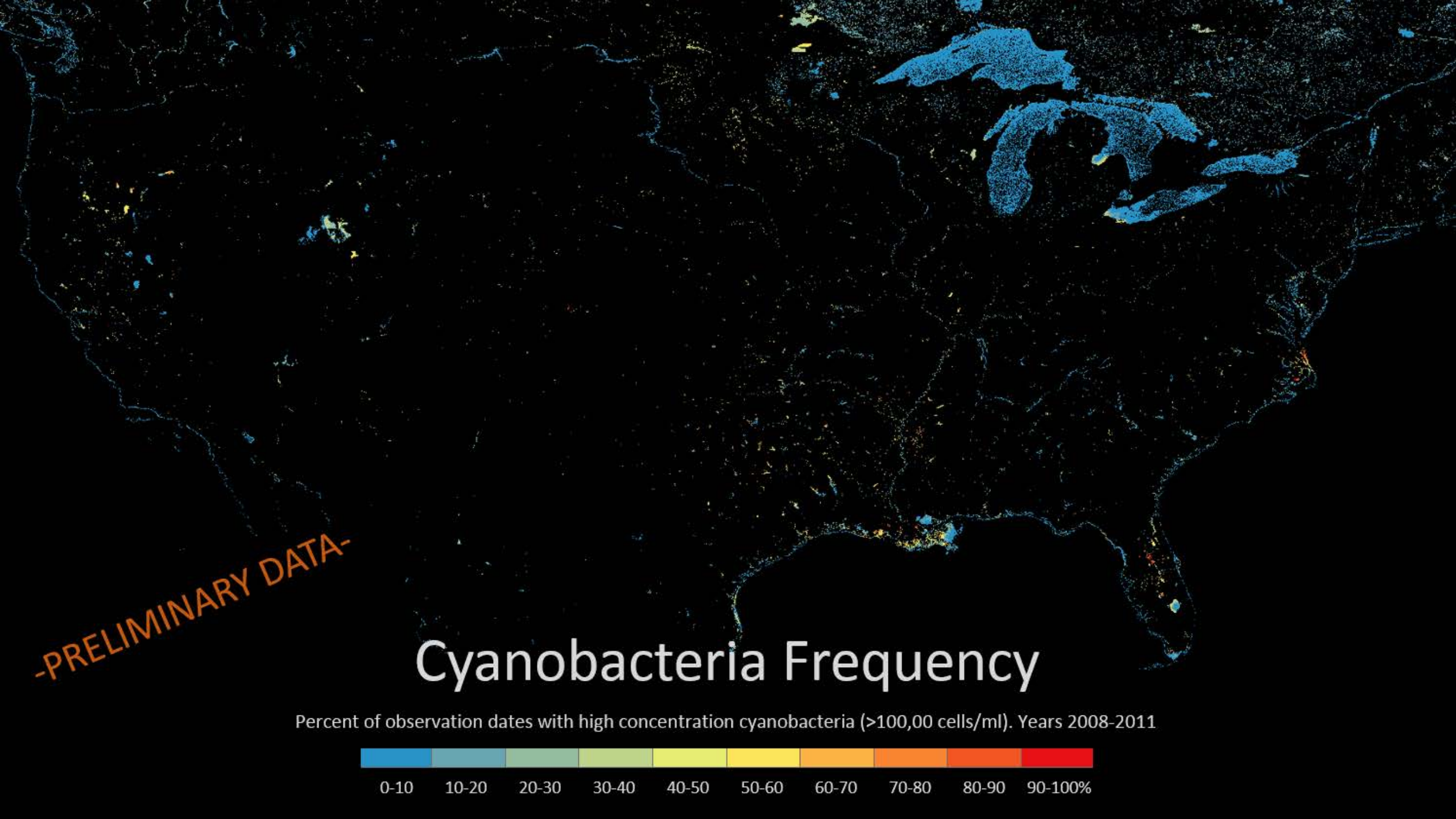


DW surface intake ranking

Quartiles

Individual lake ranking

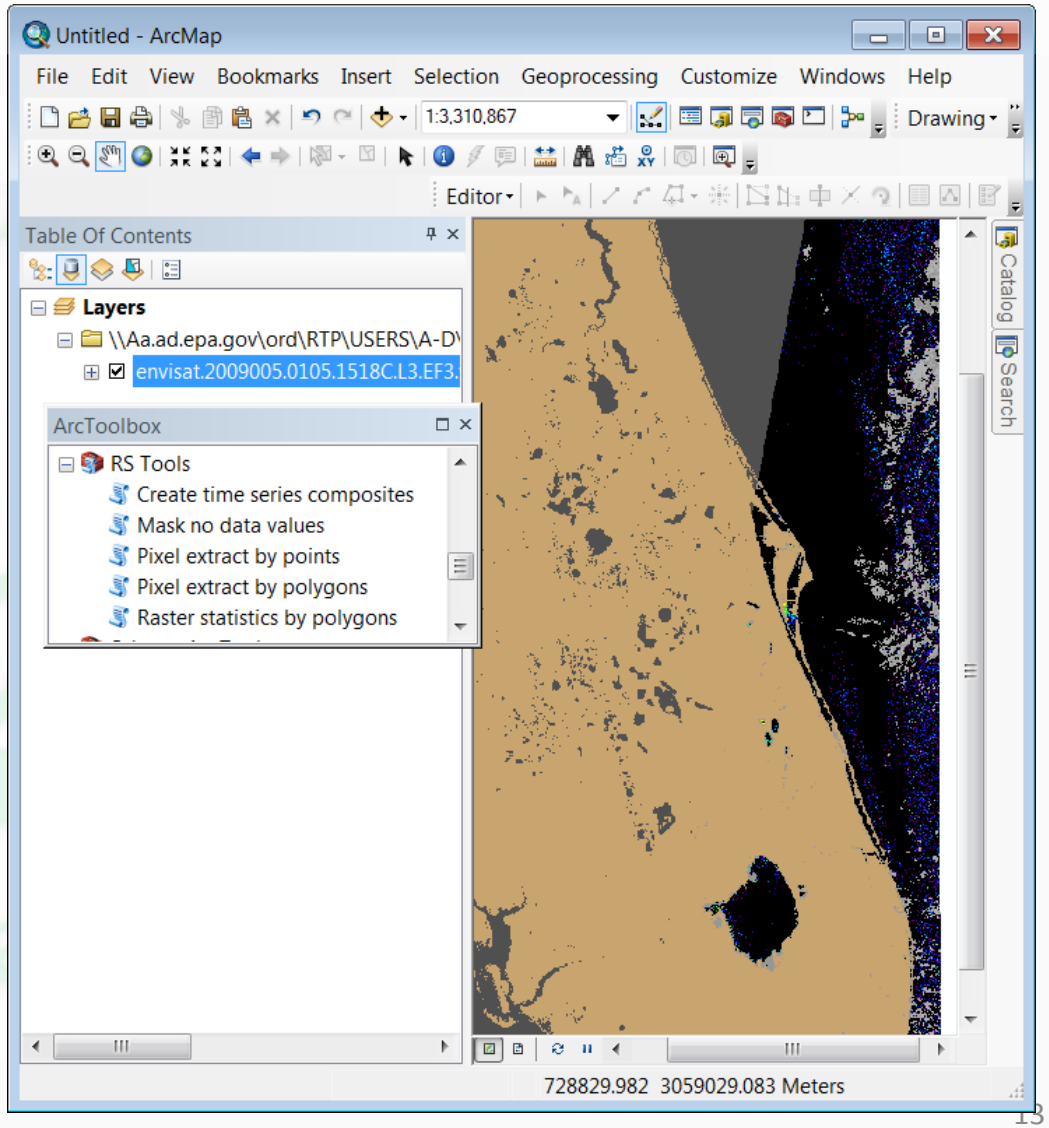
Source: Clark et al. 2017. Ecological Indicators. 80: 84-95.


-PRELIMINARY DATA-
Cyanobacteria Frequency
Percent of observation dates with high concentration cyanobacteria (>100,00 cells/ml). Years 2008-2011
0-10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
90-100%

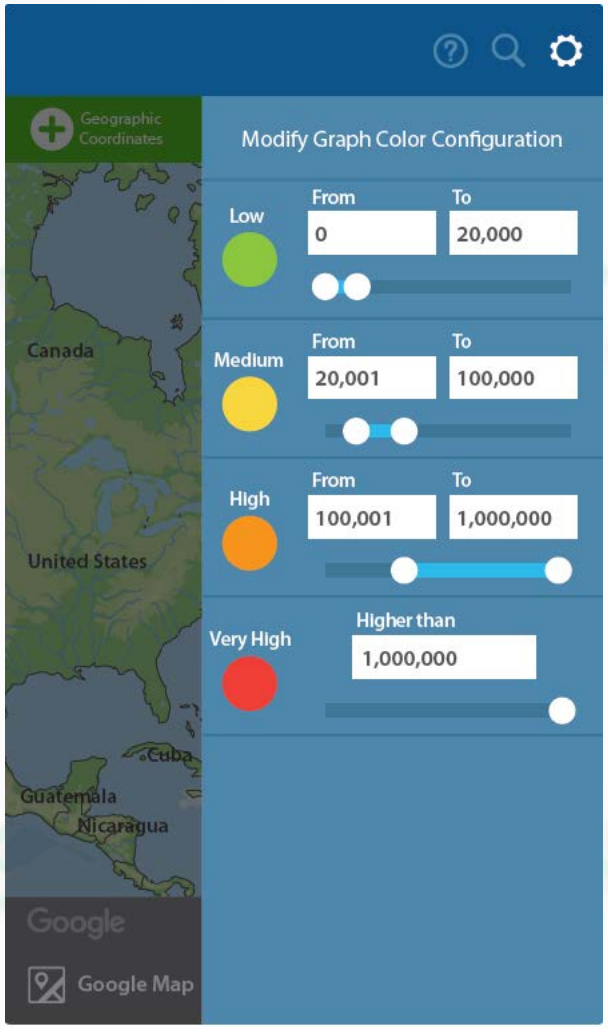
Tools

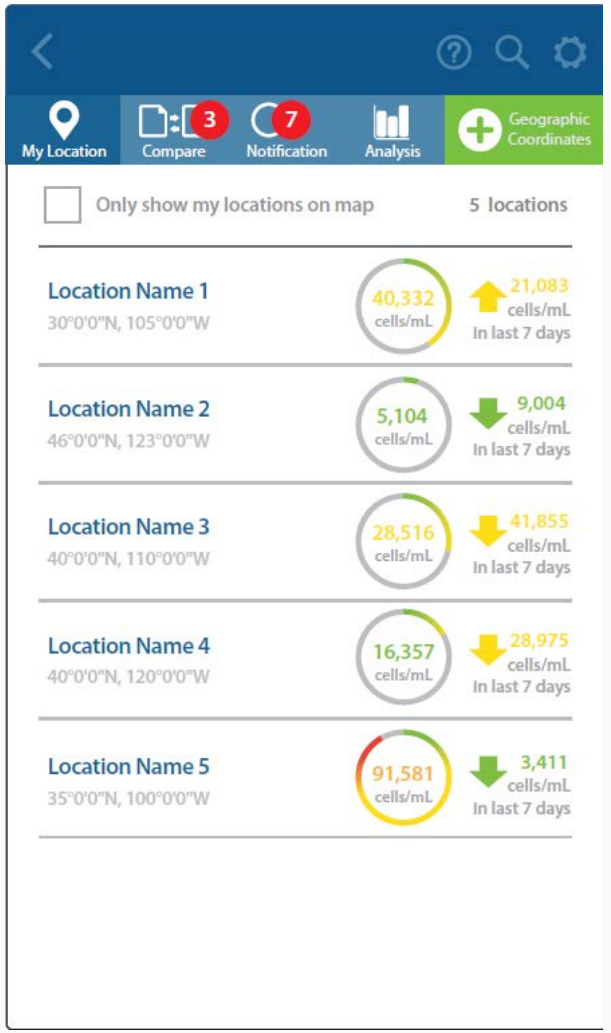
- NASA SeaDAS
- NOAA RS Tools
  - ArcGIS Toolbox for data extraction from geoTIFFs
  - Contact Michelle Tomlinson for access: michelle[dot]tomlinson[at]noaa[dot]gov

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

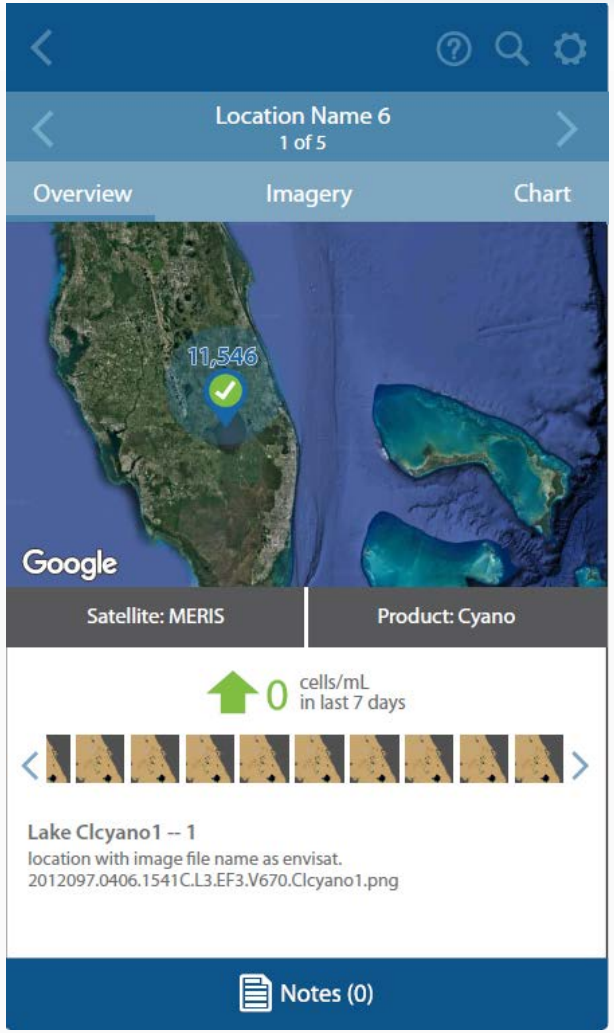


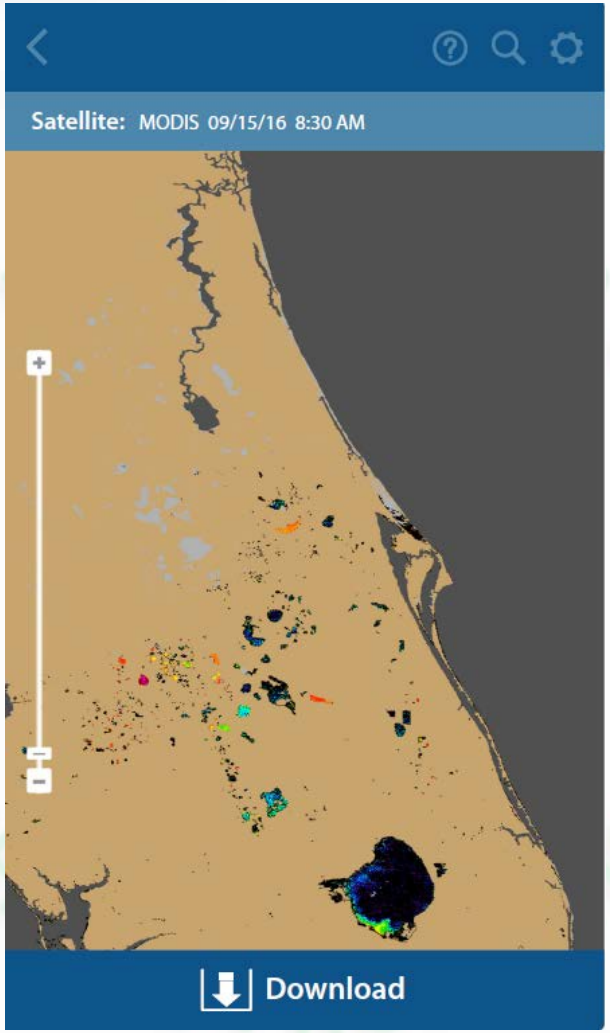
CyAN EPA Mobile Application

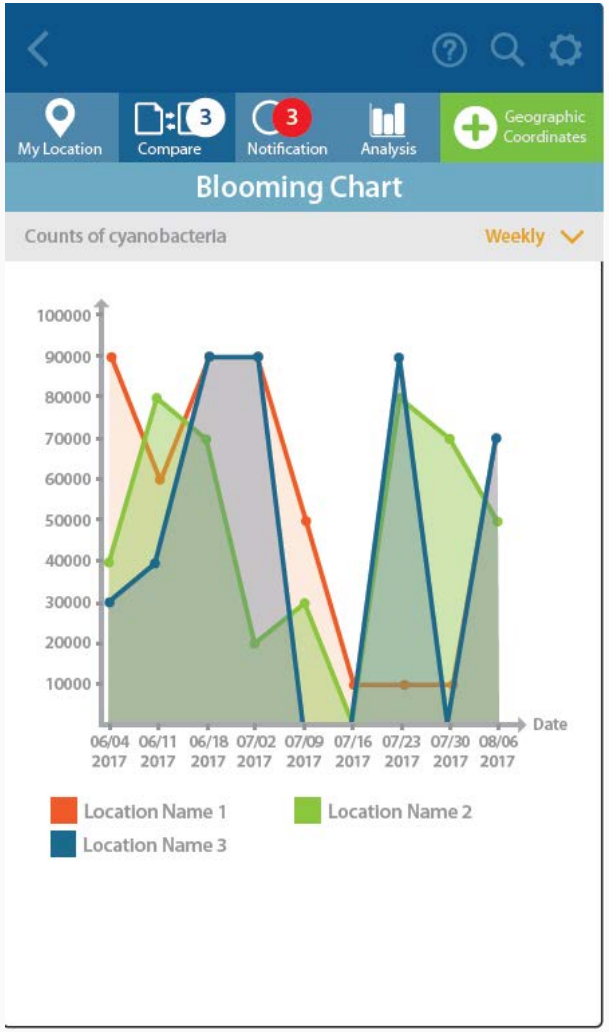




Source: Schaeffer et al. (*In Review*). Title: Cyanobacteria Assessment Network (CyAN) satellite mobile device application. Environmental Modelling & Software.



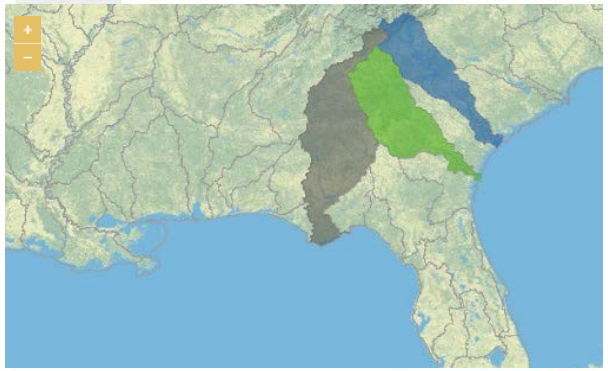




Source: Schaeffer et al. (*In Review*). Title: Cyanobacteria Assessment Network (CyAN) satellite mobile device application. Environmental Modelling & Software.

CyAN Historic Data Dashboard

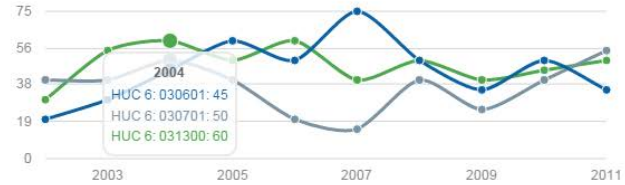
Watersheds | Lakes | Points



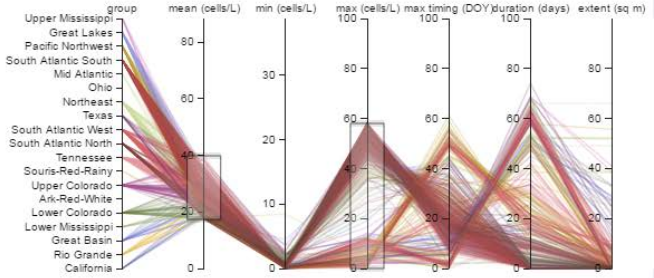
Explore cyanobacteria trends over time. Choose to view patterns for entire watersheds, individual lakes, or point locations.

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

Cyanobacteria Annual Max Concentration (cells/L)



Graphical Bloom Properties Query Tool



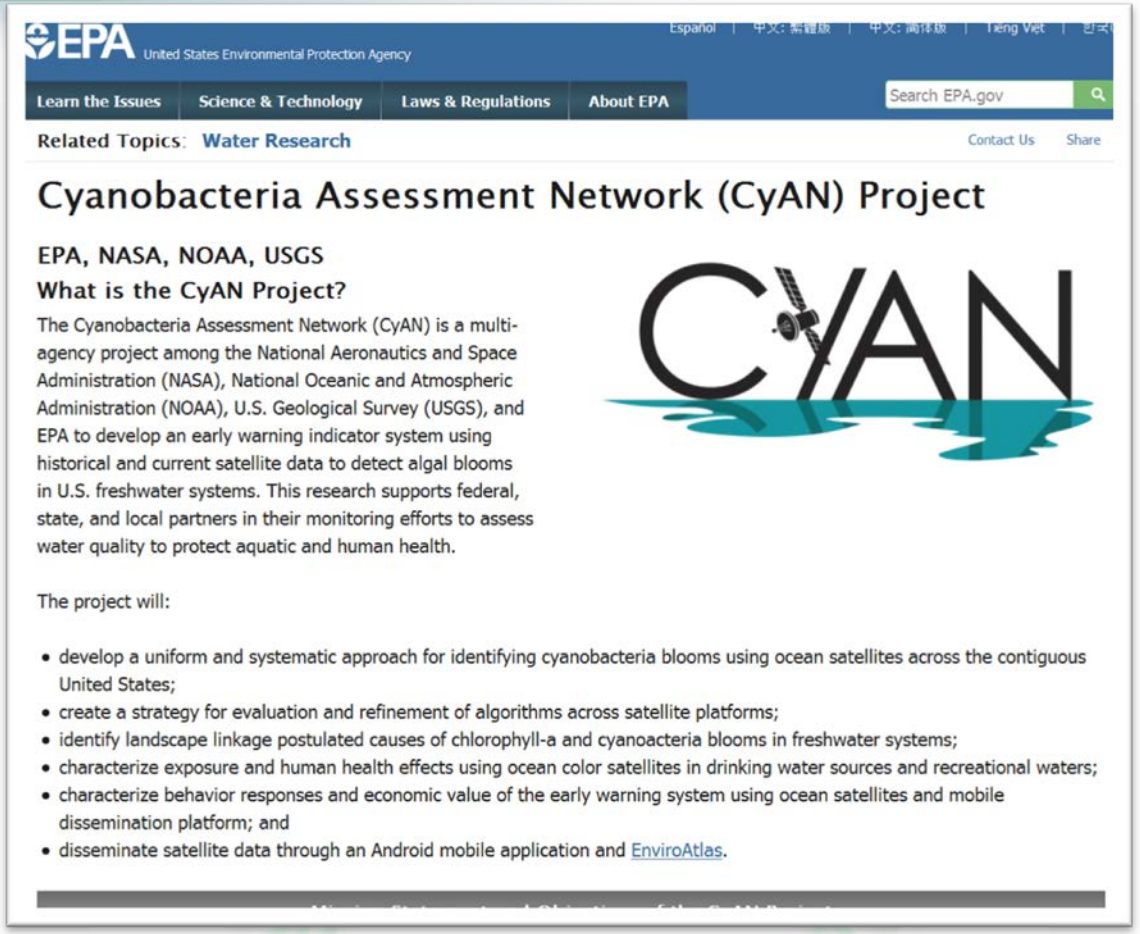
10 ▾ records per page Search:

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 →

CyAN Website Home

Thank you!



epa.gov/cyanoproject

salls.wilson@epa.gov