



CYANOBACTERIA ASSESSMENT NETWORK

CyAN Science Team
2016



Overview

- **Problem:** How to support the environmental management and public use of U.S. waters by monitoring HABs and related water quality using satellites?
- **Opportunity:** Cyanobacteria, chlorophyll-a, turbidity and temperature indicators can be monitored with satellites.
- **Approach:** Strengthen EPA, NASA, NOAA, and USGS cross-agency research to mainstream satellite capabilities for water quality management decisions.
- **Results:** New methods to quantify frequency of occurrence and spatial extent of cyanobacteria HABs.
- **Impact:** Scalable information across any geo-political boundary. Potential to prioritize locations for management actions.



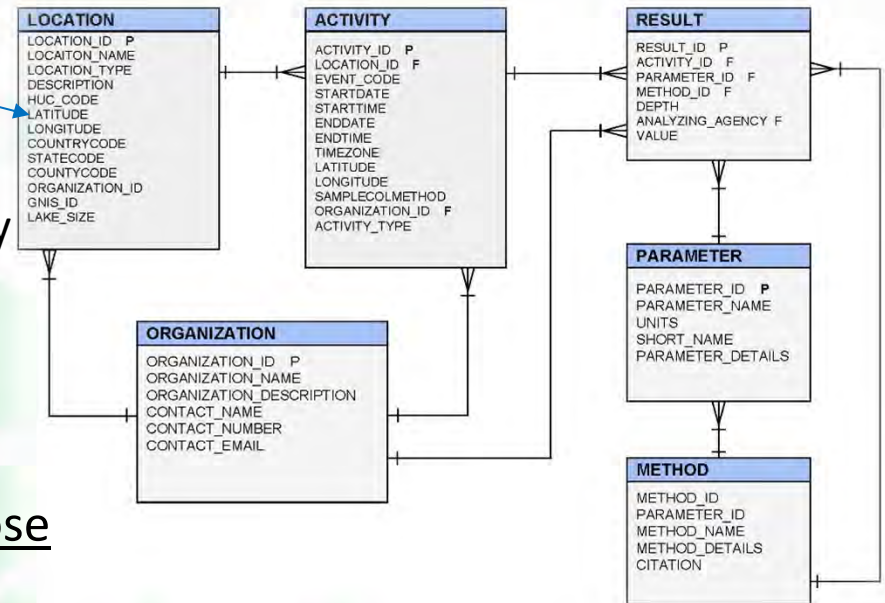
Schaeffer et al. 2015. Agencies collaborate, develop a cyanobacteria assessment network. Eos, 96, 16-20.

Work Package 1



Target Data Criteria for Database Schema

- Natural and manmade lakes and ponds
- Temporal/spatial datasets within waterbody
 - Low, medium, and high concentrations for phytoplankton, pigments, toxins, WQ variables



Tiered Criteria for Field Data Fitness of Purpose

Quality Control Tiers

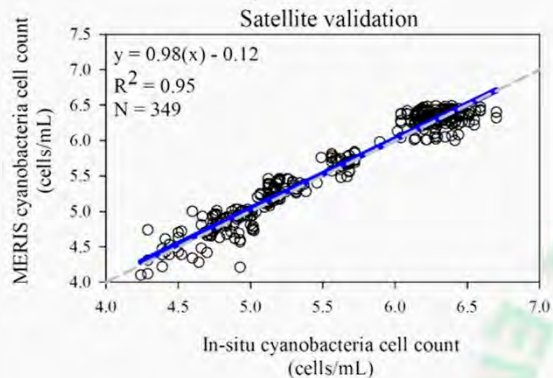
Interpretative Thresholds for Data Comparison, Algorithm Development and Validation



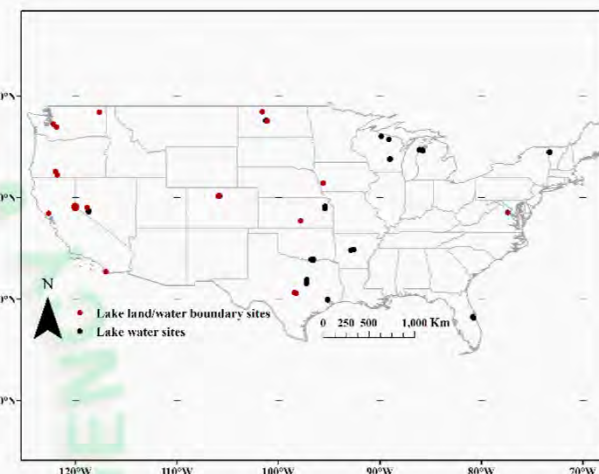
Work Package 2 & 3



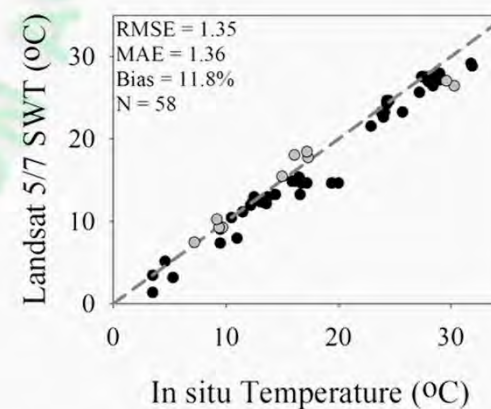
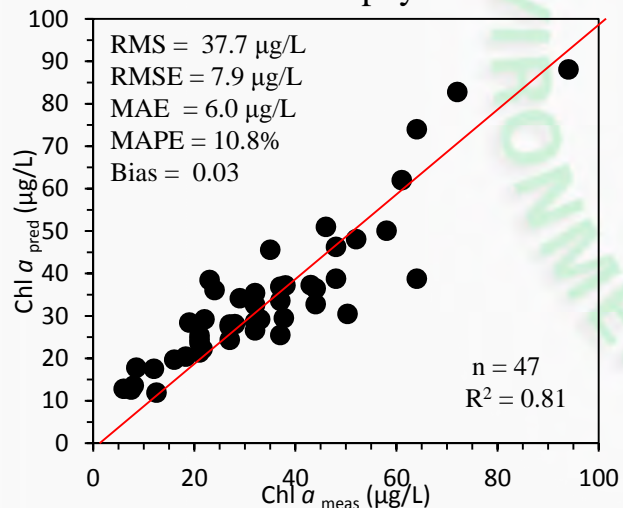
MERIS initial cyanobacteria validation



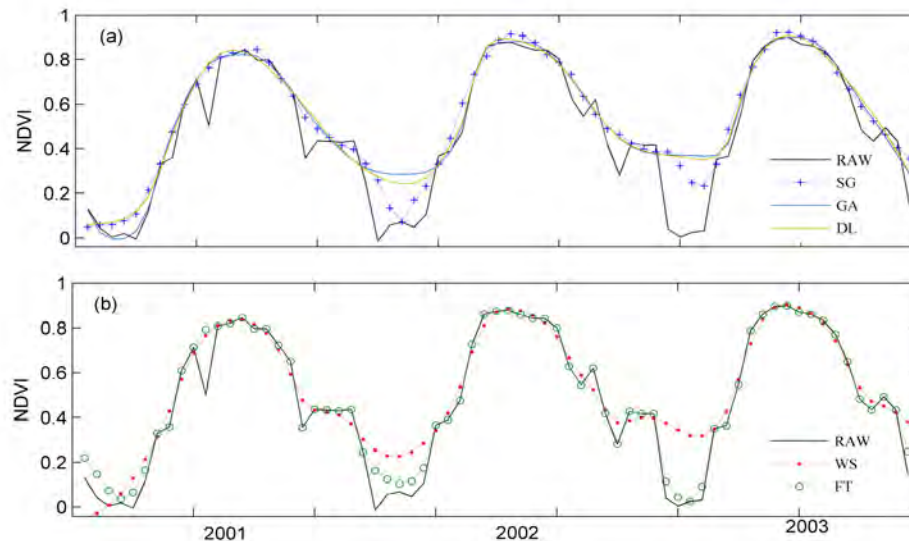
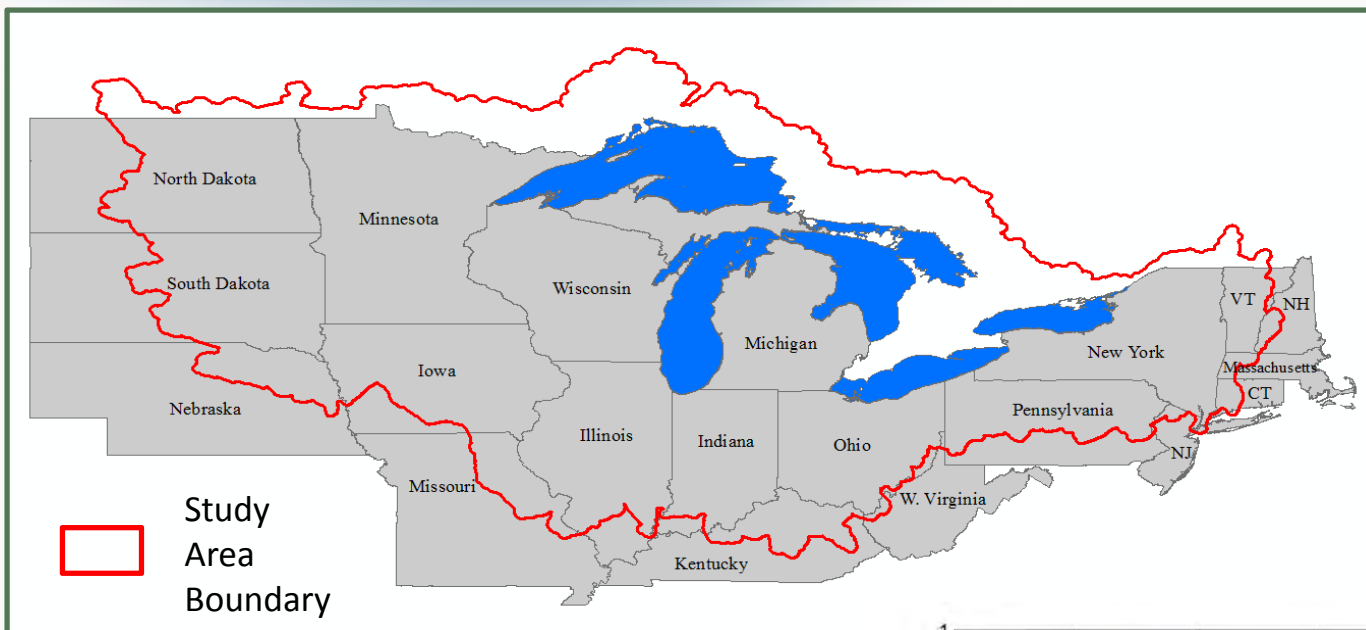
Landsat-5/7 surface temperature validation



Landsat-8 initial chlorophyll-a validation



Work Package 4

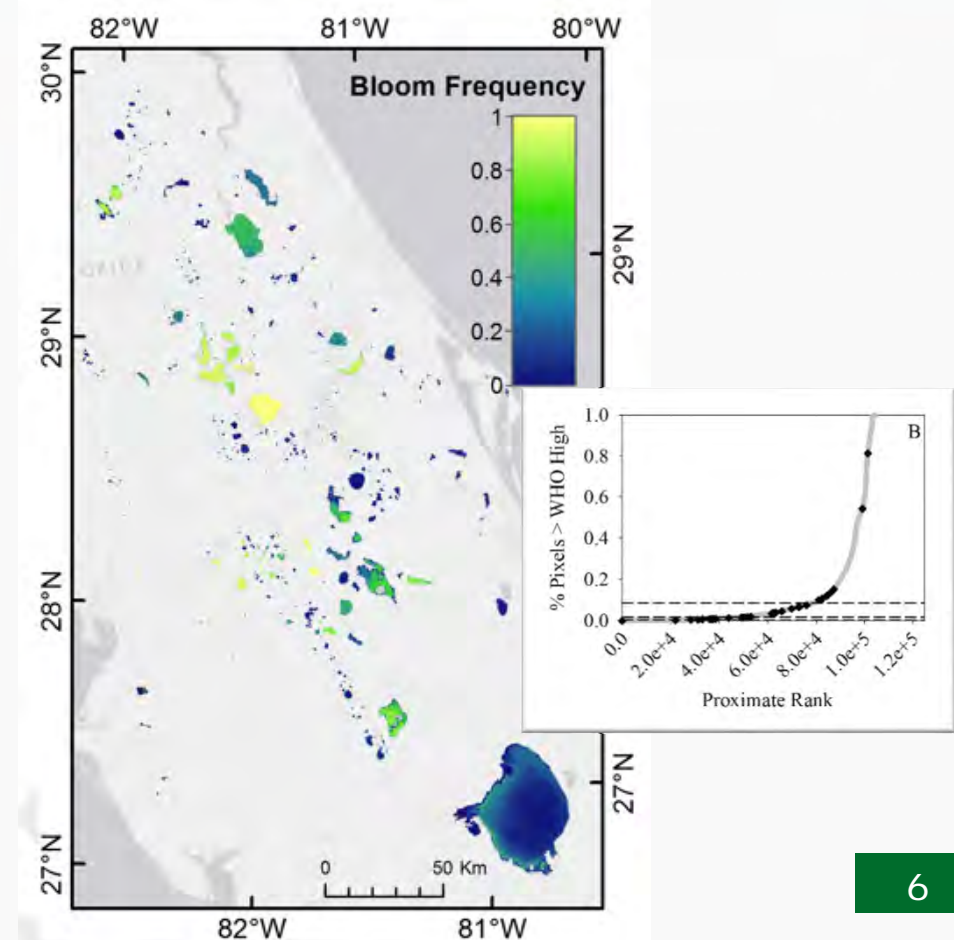


Shao et al., *Remote Sensing of Environment*, 174 (2016) 258-265



Quantifying cyanobacteria *frequency*

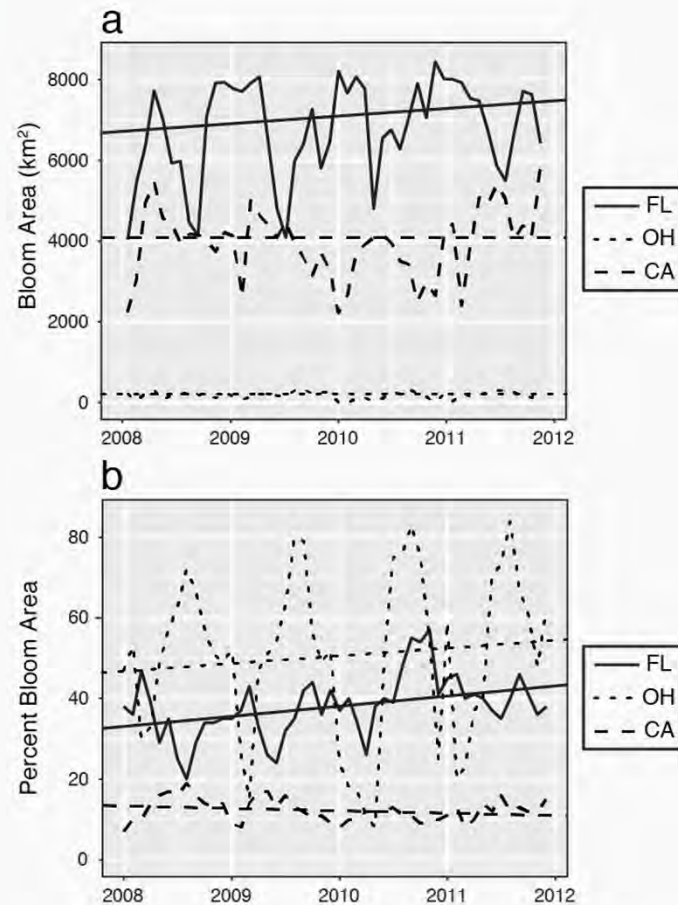
- **Problem:** How do we quantify bloom frequency at relevant spatial scales?
- **Action:** Determine coverage of satellite data and analyze site-specific frequencies of cyanobacterial concentration.
- **Result:** Derive relative risk profiles from frequency data, but current resolution limits applicability.
- **Impact:** Possible applications for understanding HAB risk at management-relevant sites, e.g. surface water intakes or rec. waters.



Clark et al. (*In Clearance*). Methods for monitoring cyanobacteria harmful algal blooms in recreational waters and drinking source waters with satellites. *Ecological Indicators*.

Quantifying cyanobacteria *extent*

- **Problem:** How do we quantify the spatial extent of cyanobacteria?
- **Action:** Time series analysis evaluated overall trend.
- **Result:** Florida cyanobacteria HABs increasing, California exhibits decreasing trend, and Ohio (excluding Lake Erie) small increases.
- **Impact:** Each year EPA could report on status of HABs in the U.S. with new Sentinel-3 satellite.



Urquhart et al. (*In Clearance*). A method for monitoring cyanobacterial harmful algal bloom spatial extent using satellite remote sensing data. Environmental Science & Technology.

Work Package 7: Decision Support



- Mobile Application Infrastructure
 - Administrative website
 - Data management module
 - Processing module
- geoTIFF product configuration for GIS analysis
 - ArcGISToolbox for data extraction from geoTIFFs, beta testing by California
- EnviroAtlas – interactive web portal for ecosystem goods and services
- SeaDAS

