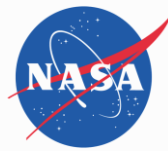


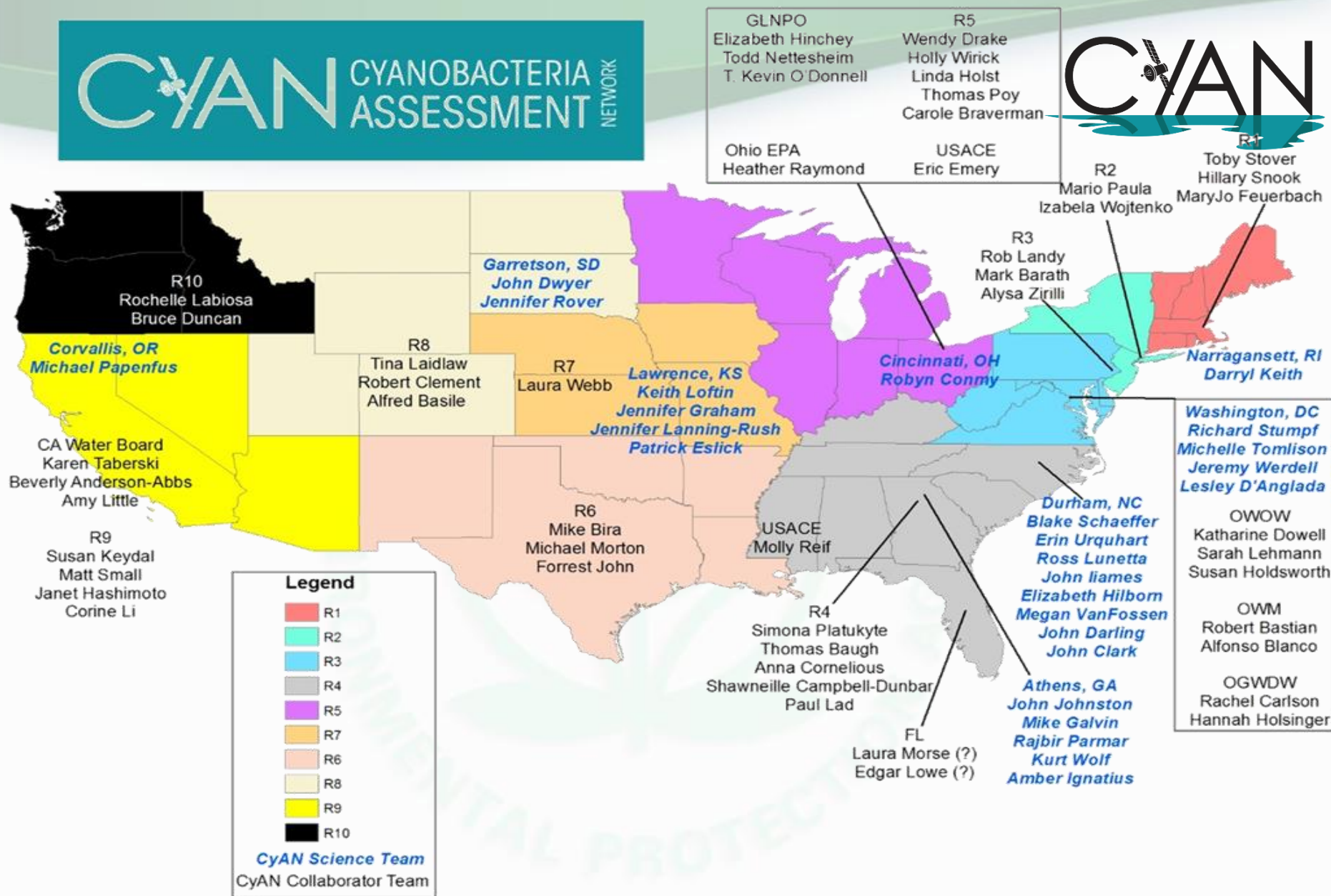


# CYANOBACTERIA ASSESSMENT NETWORK

CyAN Science Team  
2016



# CYAN CYANOBACTERIA ASSESSMENT NETWORK

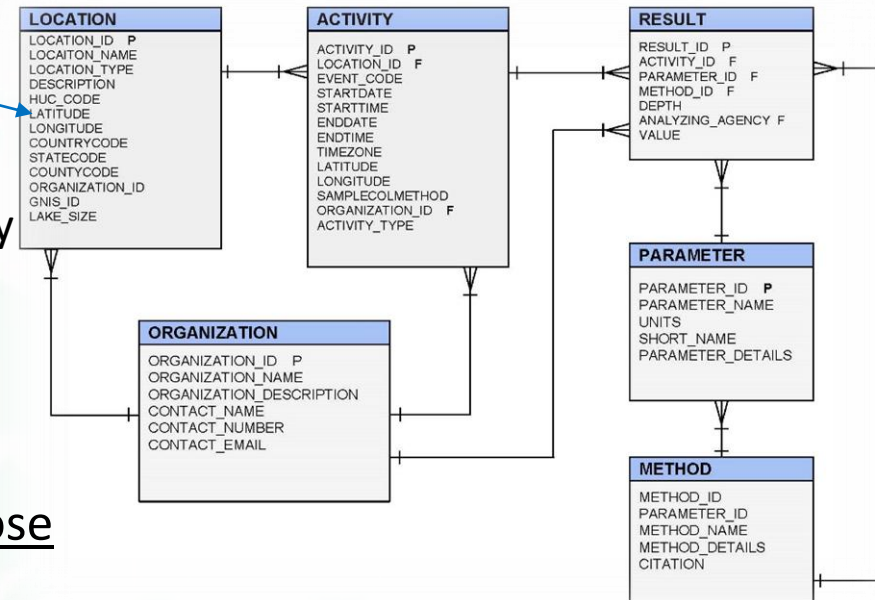


# Work Package 1



## Target Data Criteria for Database Schema

- Natural and manmade lakes and ponds
- GoM Coastal data
- Temporal/spatial datasets within waterbody
  - Low, medium, and high concentrations for phytoplankton, pigments, toxins, WQ variables
- Sample metadata, methods, QA/QC plans



## Tiered Criteria for Field Data Fitness of Purpose

### Quality Control Tiers

- Documentation -Study Design, Sample Collection/Processing, Analytical Methods
- Converging Lines of Evidence -Agreement between field values at a threshold basis

### Interpretative Thresholds for Data Comparison, Algorithm Development and Validation

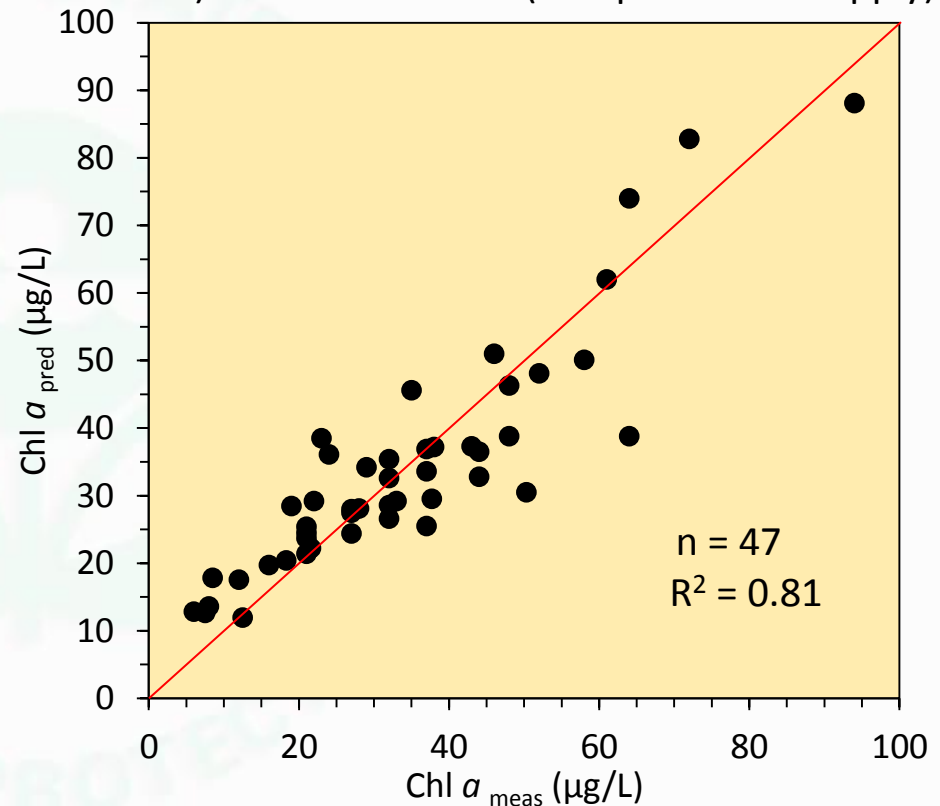
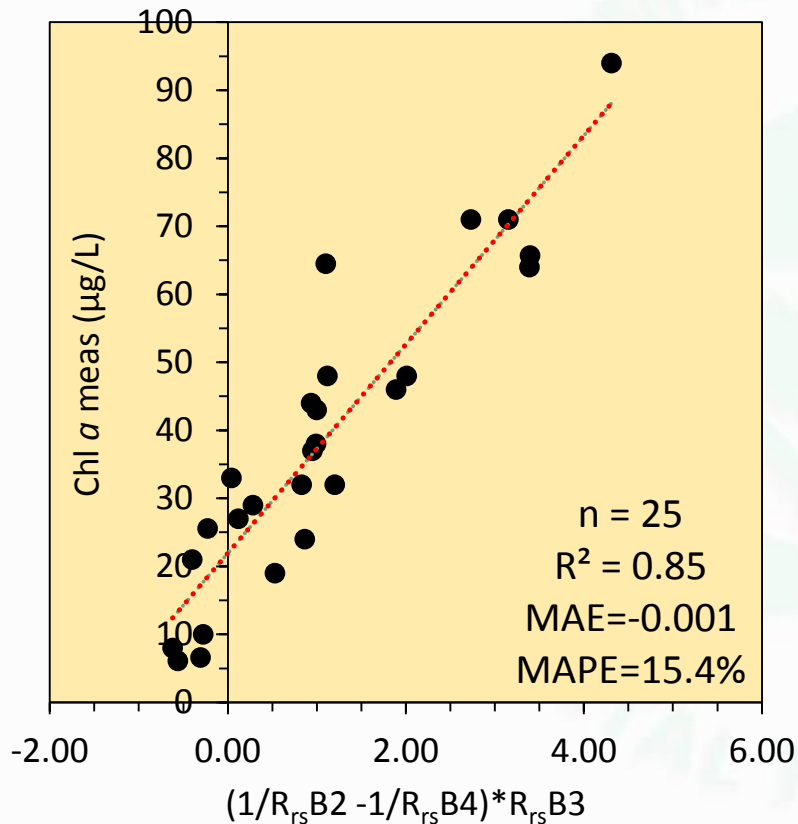
- WHO and EPA Thresholds for Microcystins
- Using microcystins, chlorophyll, and cyanobacterial abundance
- Trophic Status Thresholds (e.g. Chlorophyll, Secchi Depth, Nutrients)

# Work Package 2



- 3 band reflectance model derived from USGS Landsat 7 & 8 surface reflectance products to predict chlorophyll (chl *a*) concentrations in lakes and ponds.

- Model validated using predicted chl *a* concentrations and data from state water quality monitoring programs in North Carolina (Jordan Lake) and Rhode Island (Newport water supply).



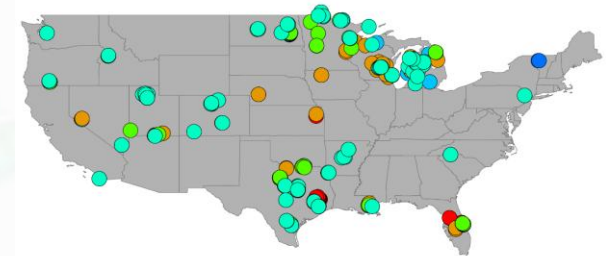
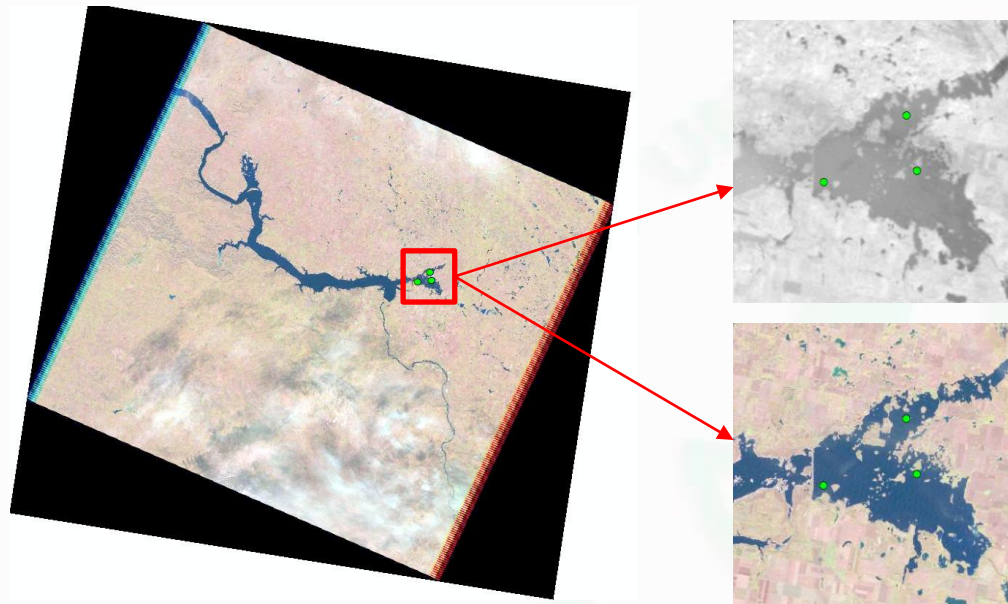
RMS = 37.7  $\mu\text{g/L}$ ; RMSE = 7.9  $\mu\text{g/L}$   
MAE = 6.0  $\mu\text{g/L}$ ; MAPE = 10.8%  
Bias = 0.03



# Work Package 2



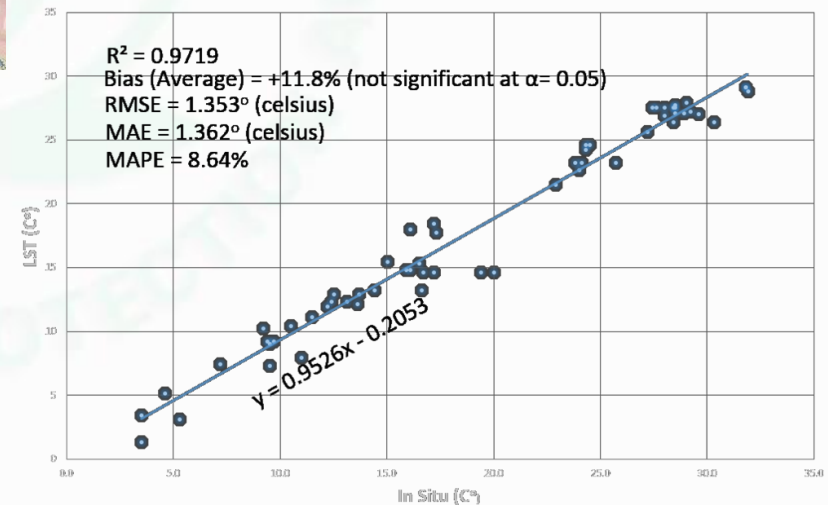
## Assessment of Landsat Surface Temperature Product



Lake Temperatures (2005-10)

- 0-5 deg
- 5-10 deg
- 10-15 deg
- 15-20 deg
- 25-30 deg
- 30-35 deg

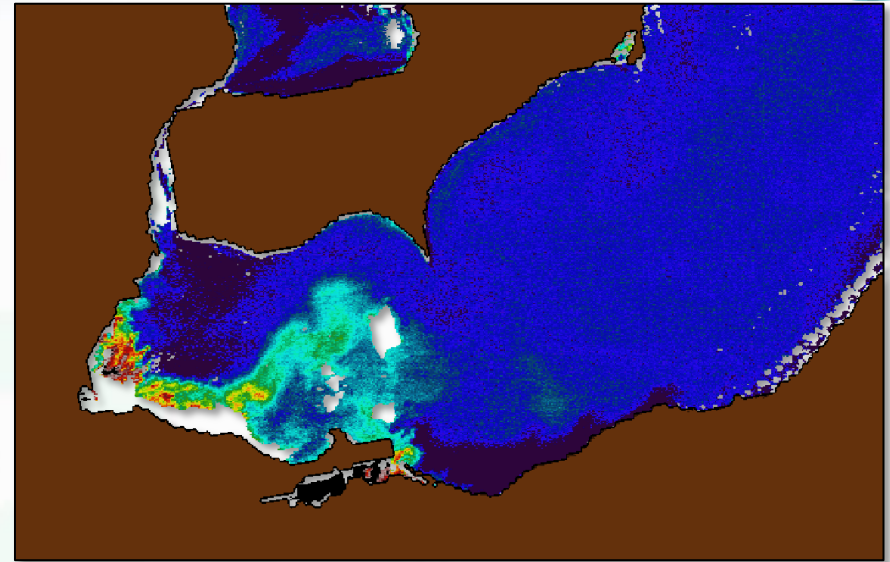
In situ and Landsat Surface Temperatures across 15 Landsat 5/7 Scenes: 2005-2010



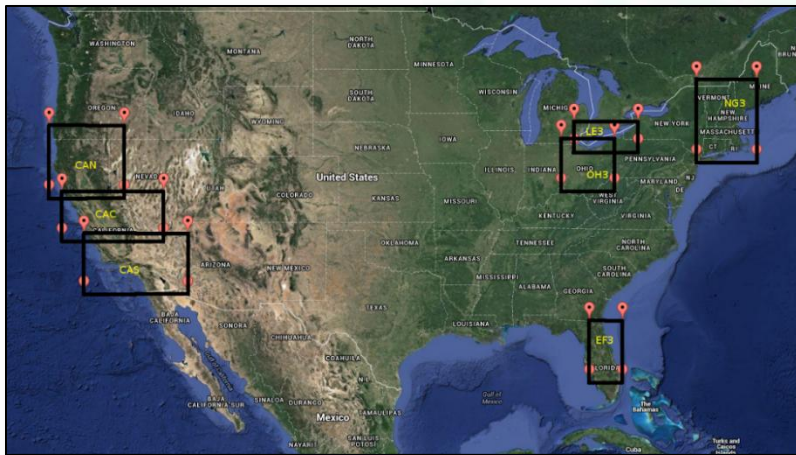
# Work Package 2 & 3



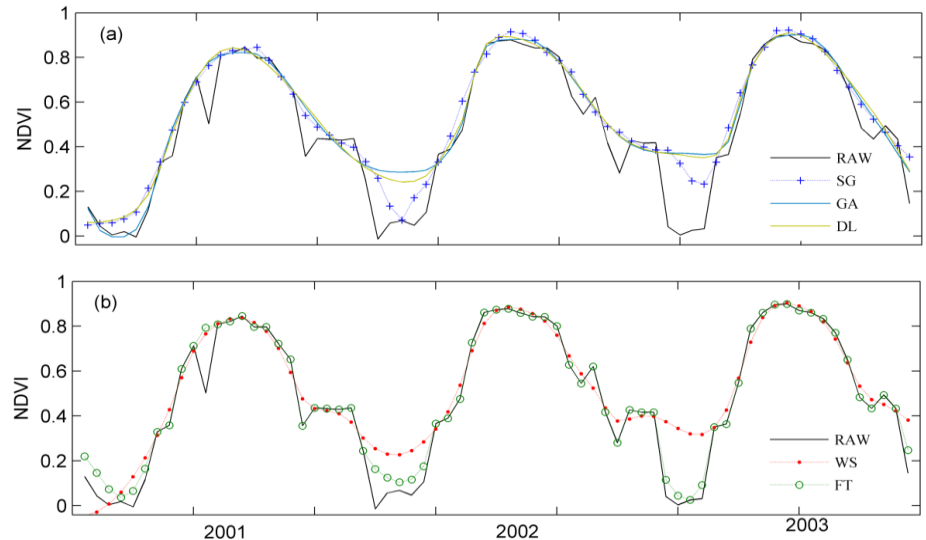
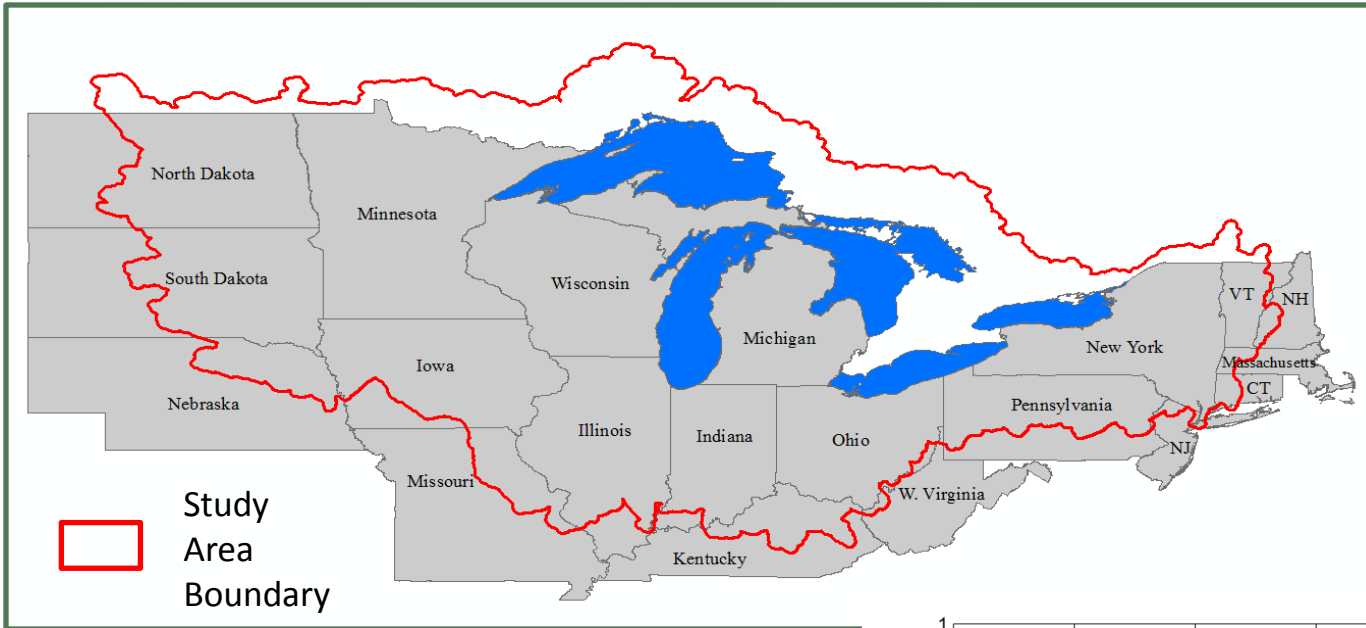
- Preliminary versions of NOAA cyanobacteria algorithms implemented into NASA standard processing software
  - Joint evaluation with NOAA ongoing
  - First vetted implementation expected in Spring 2016
  - To be made publicly available via SeaDAS ([seadas.gsfc.nasa.gov](http://seadas.gsfc.nasa.gov))



- MERIS regional extracts identified & produced
  - CA, OH, FL, New England, plus Great Lakes (not shown to left)
  - Example products available to stakeholders in Spring 2016
  - Full mission time-series available in Summer 2016
  - Reprocessing(s) anticipated following algorithm refinements



# Work Package 4

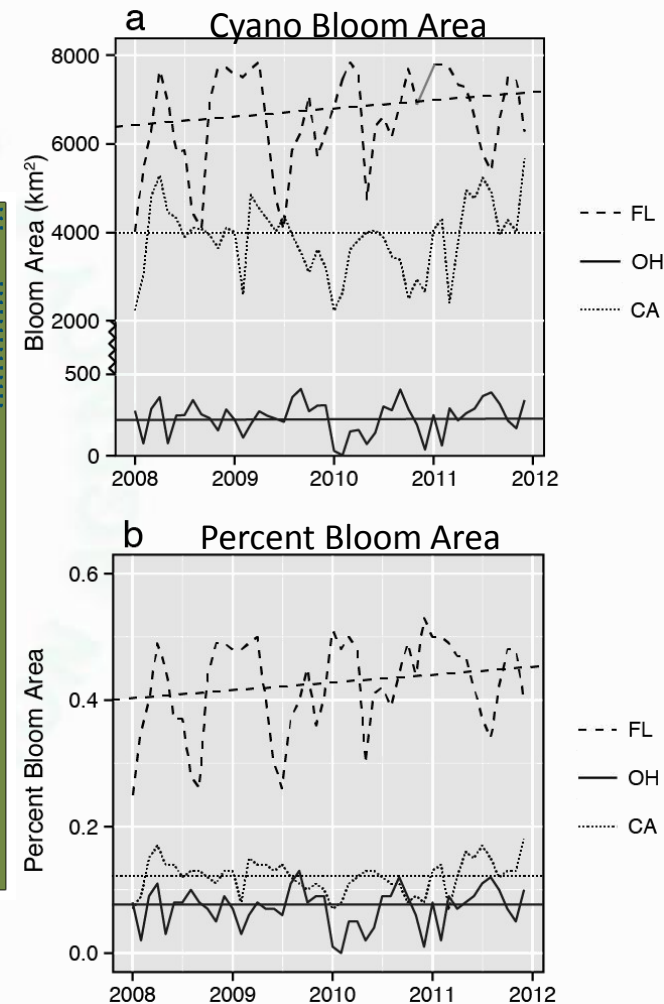
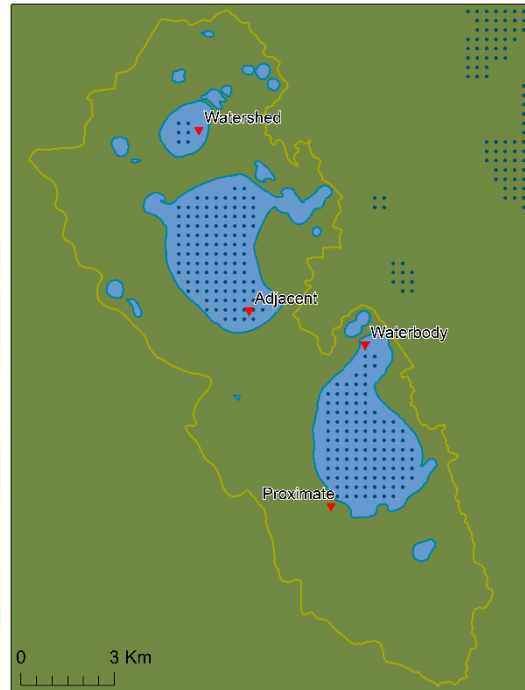
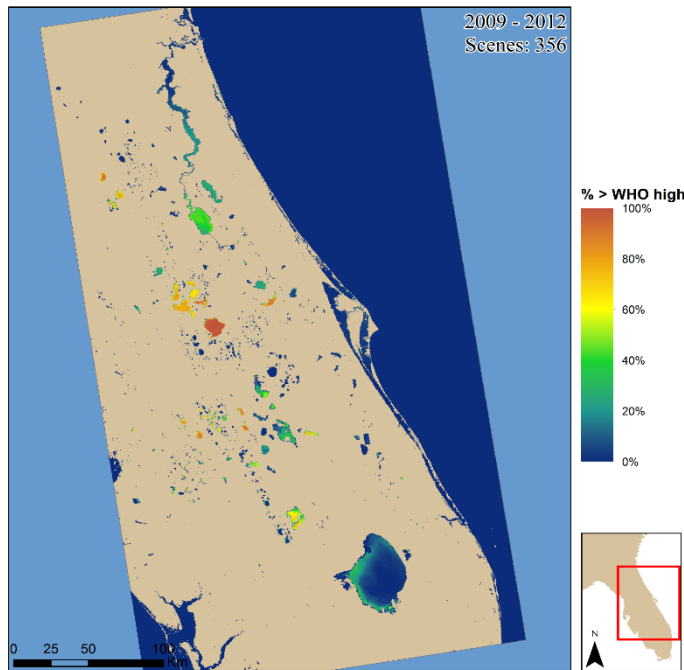


Shao et al., *Remote Sensing of Environment*, 174 (2016) 258-265

# Work Package 4 & 5



- Statistical time series analysis of blooms in FL, OH, and CA (2008-2011)
- Heat maps and surface drinking water intake monitoring methods





# Work Package 5



## **“Beach-goer behavior during a retrospectively detected algal bloom at a Great Lakes beach”**

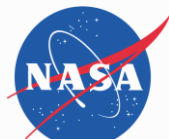
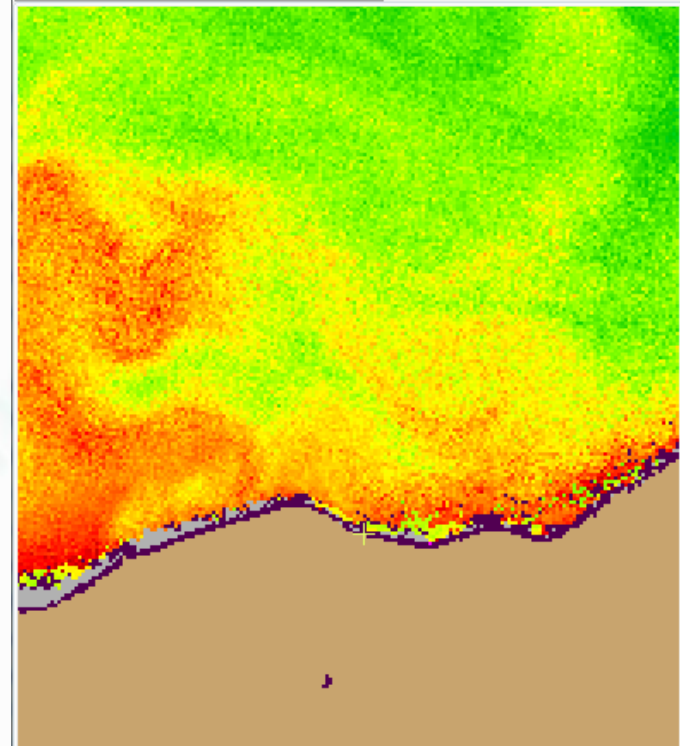
- An early product
- 2016 Recreational Waters Conference , April 12–15, 2016, New Orleans, Louisiana

## **Study of beachgoer characteristics and behavior at a great Lakes beach during summer, 2003**

- Beach attendees not notified of algal bloom
- Algal bloom retrospectively identified at beach using MERIS data from the Envisat-1 satellite
- Beach attendees did not avoid the water during the bloom

## **Community level evaluation of health effects associated with algal blooms**

- Partners- states of Ohio and California Departments of Public Health
- Analyze hospital admission and emergency room visits of potentially impacted communities before, during and after algal blooms
- Progress: human subjects and other approvals for data



## Work Package 6



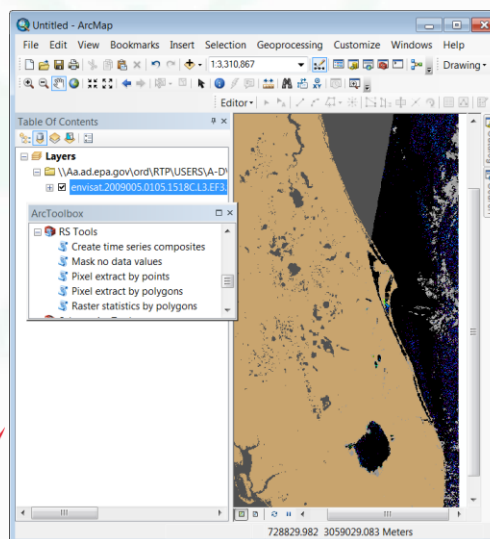
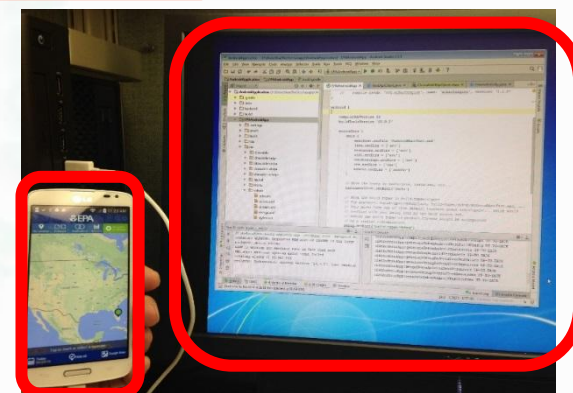
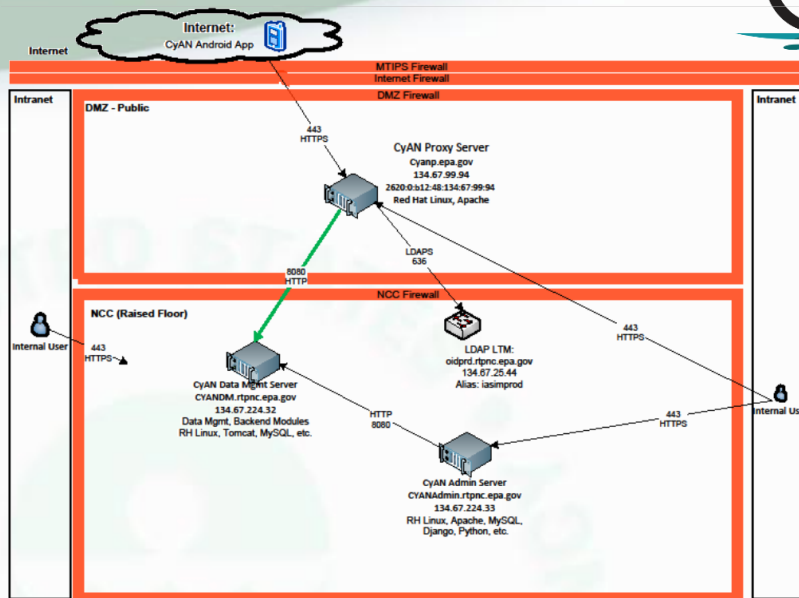
- GEOValue Data to Decisions:  
Valuing the societal benefits of  
geospatial information  
workshop
- Gathering data on costs of  
HAB monitoring programs:
  - Ohio EPA
  - Washington Dept. of  
Ecology
  - EPA Region 5
  - EPA Region 9
- National Center for  
Environmental Economics



# Work Package 7: Decision Support



- Mobile Application Infrastructure
  - Administrative website
  - Data management module
  - Processing module
- EPA National Computing Center deployment
  - FedRAMP compliant, FISMA approved.
  - Proxied access, fire walls abound.
  - Future Cloud deployment possible
- Mobile app debugging:
  - IDE breakpoints, view code execution/results, see immediate effects of code changes.
- geoTIFF product configuration for GIS analysis
  - ArcGISToolbox for data extraction from geoTIFFs, beta testing by California

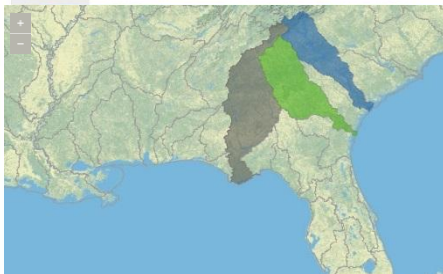


# Work Package 7: Decision Support

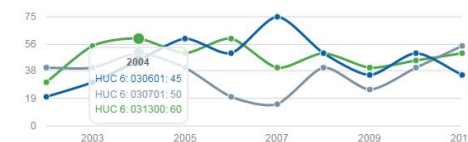


## CyAN Historic Data Dashboard

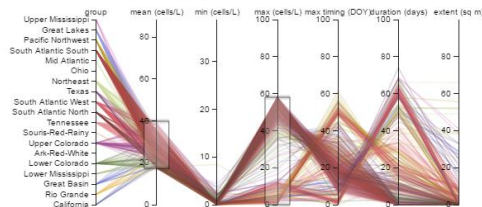
Watersheds Lakes Points



### Cyanobacteria Annual Max Concentration (cells/L)



### Graphical Bloom Properties Query Tool



10 records per page

Search:

watershed HUC6	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

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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 cyanobacteria 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](#).

CyAN Website Home

