CYANOBACTERIA ASSESSMENT NETWORK

CyAN Science Team

2016

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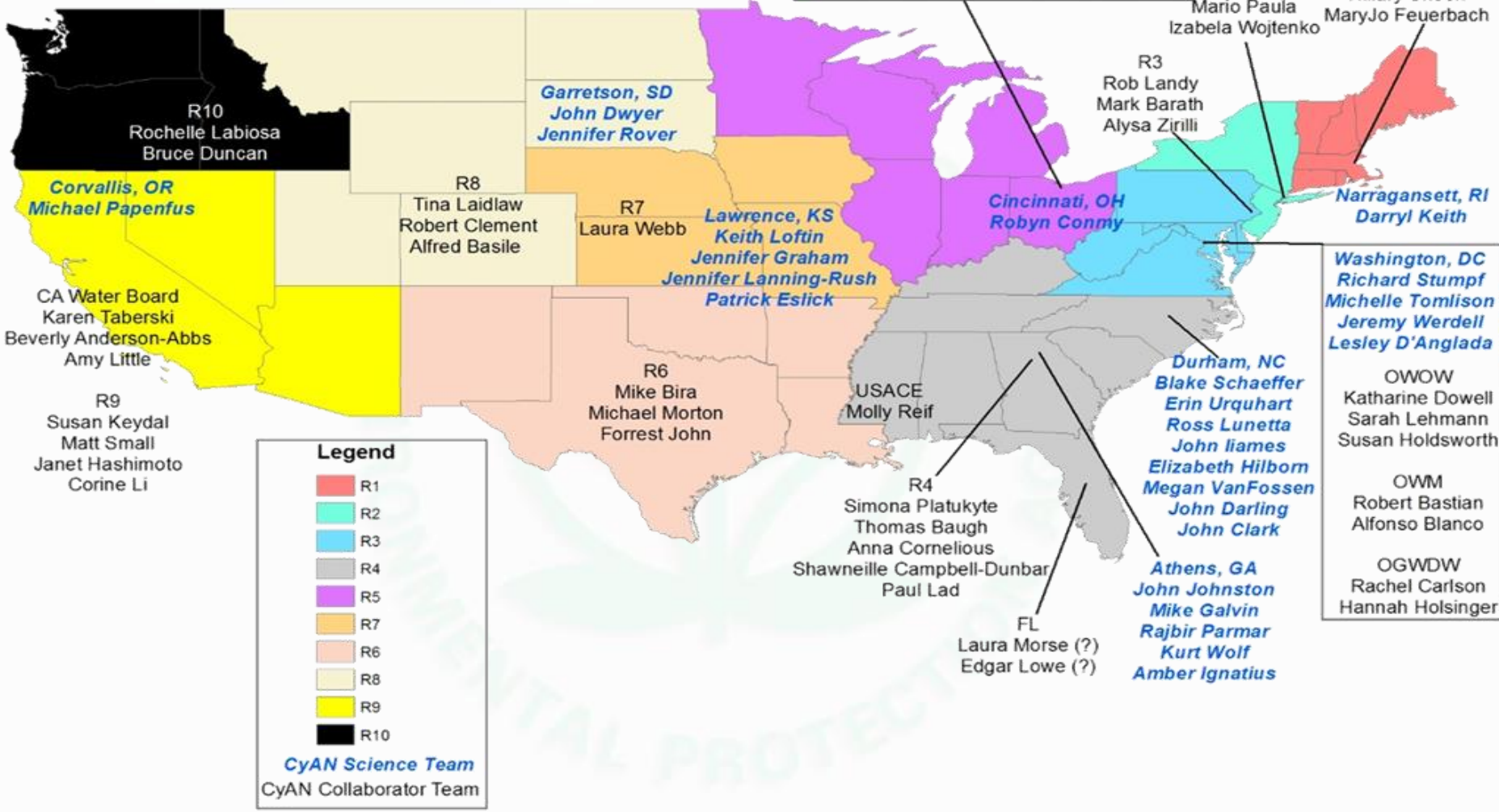
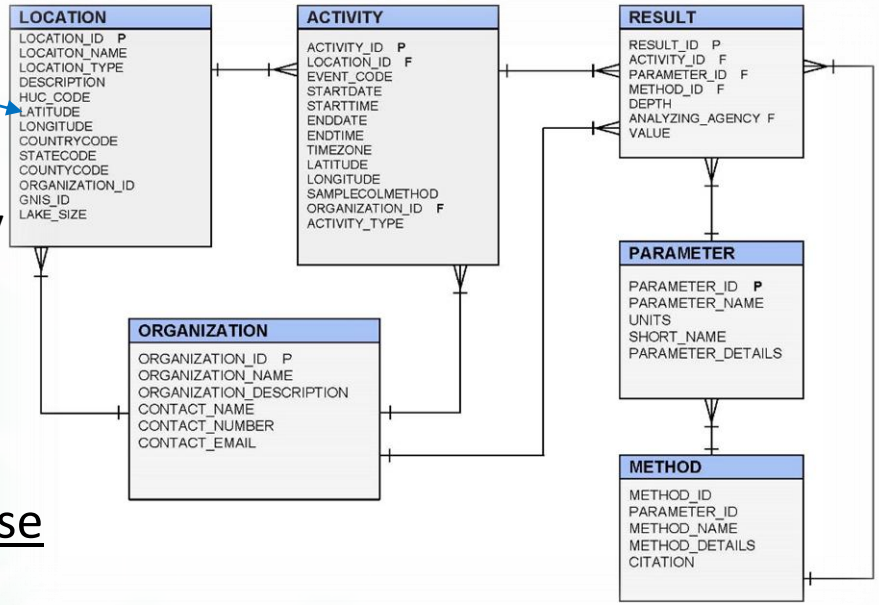


USGS science for a changing world

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

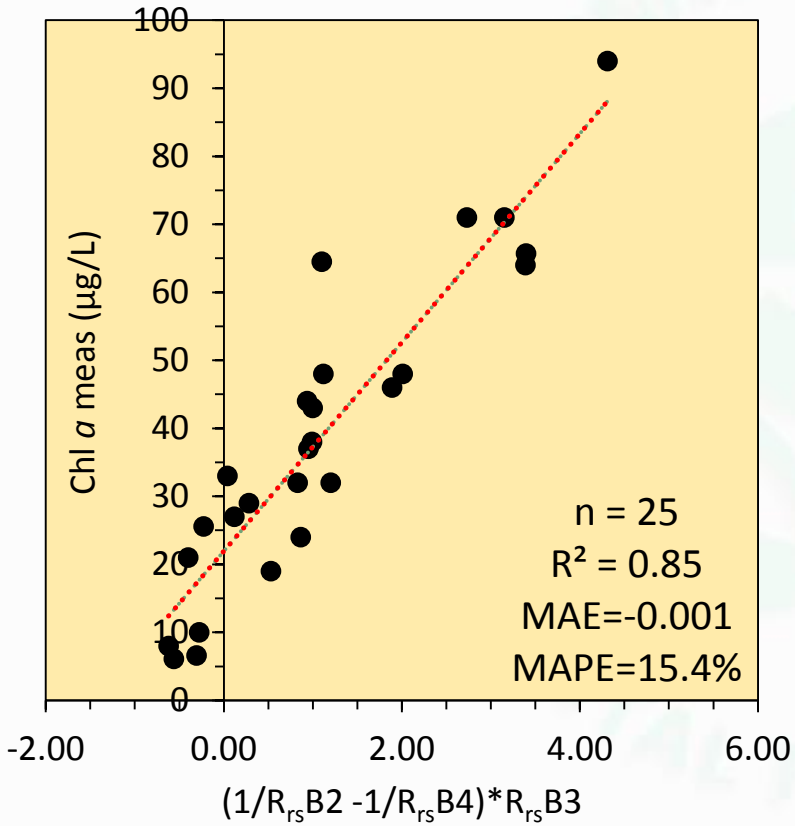
- Documentation -Study Design, Sample Collection/Processing, Analytical Methods
- Converging Lines of Evidence -Agreement between field values at a threshold basis

Interpretative Thresholds for Data Comparison, Algorithm Development and Validation

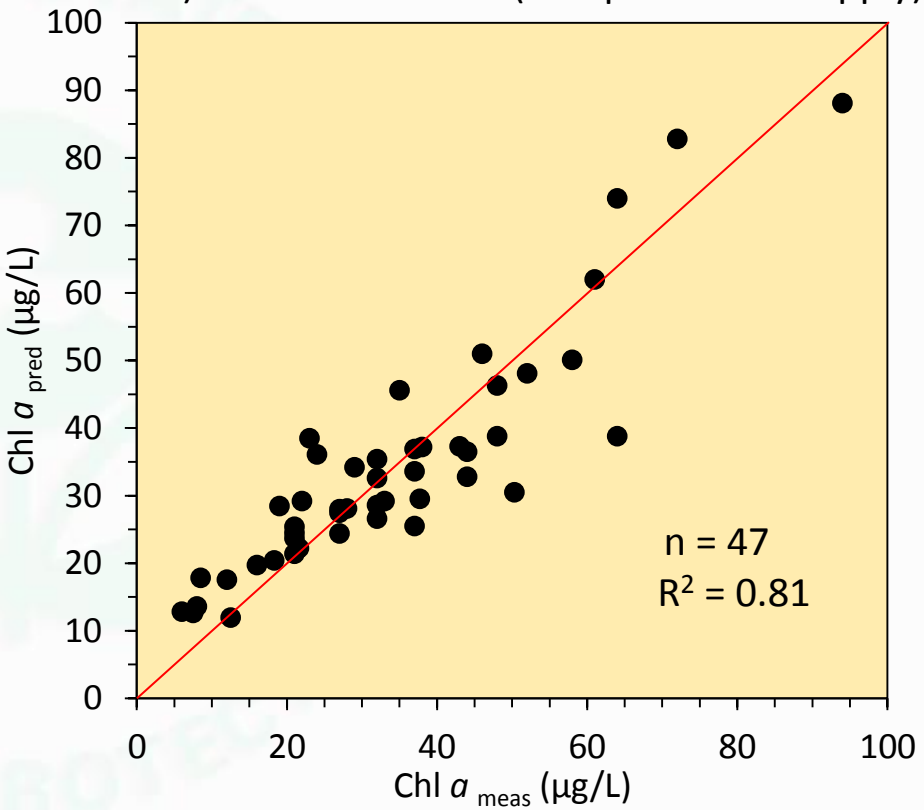
- WHO and EPA Thresholds for Microcystins
- Using microcystins, chlorophyll, and cyanobacterial abundance
- Trophic Status Thresholds (e.g. Chlorophyll, Secchi Depth, Nutrients)

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.



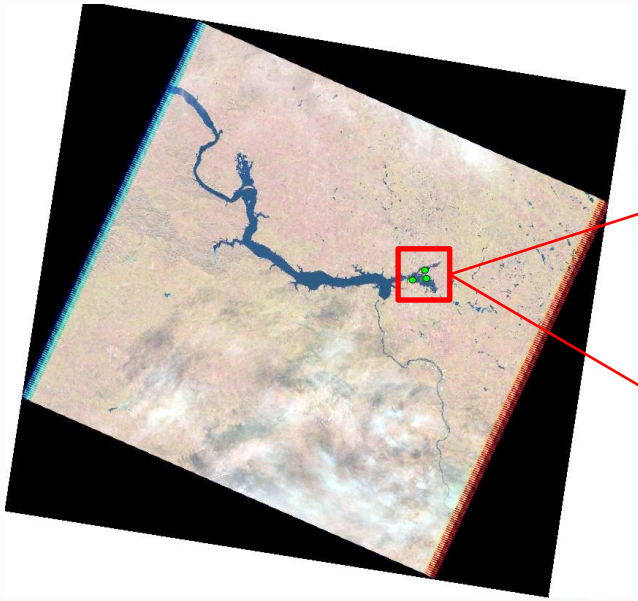
- Model validated using predicted chl *a* concentrations and data from state water quality monitoring programs in North Carolina (Jordan Lake) and Rhode Island (Newport water supply).

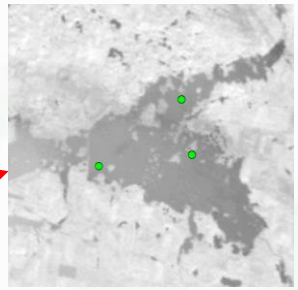


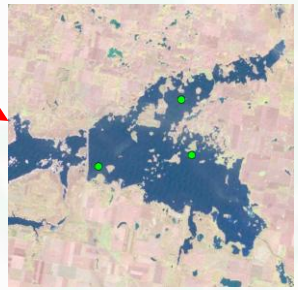
RMS = 37.7 µg/L; RMSE = 7.9 µg/L
MAE = 6.0 µg/L; MAPE = 10.8%
Bias = 0.03

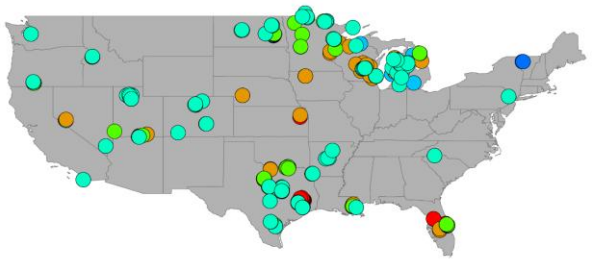
Work Package 2

Assessment of Landsat Surface Temperature Product

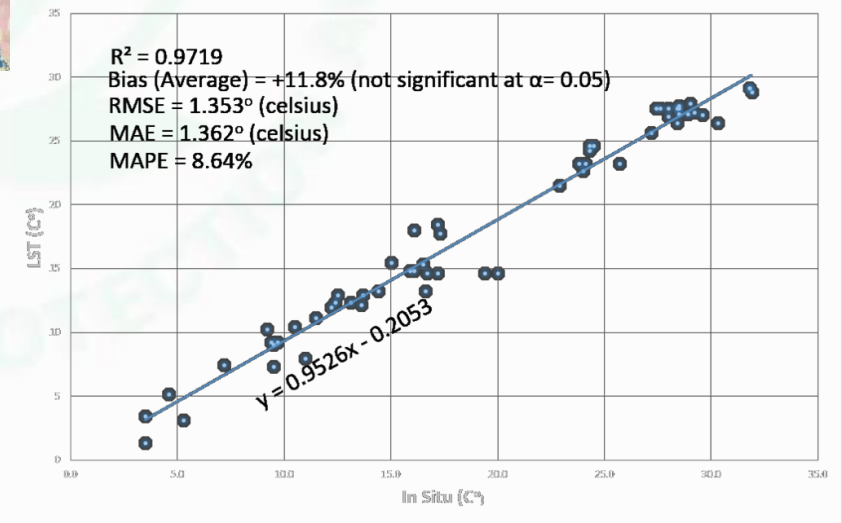






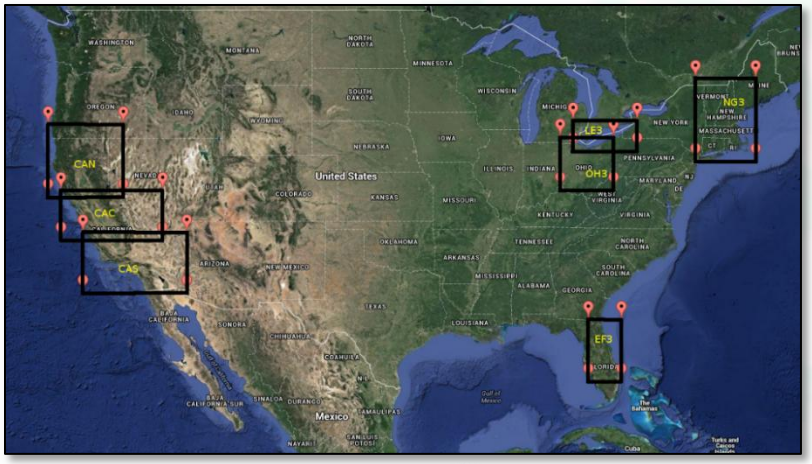


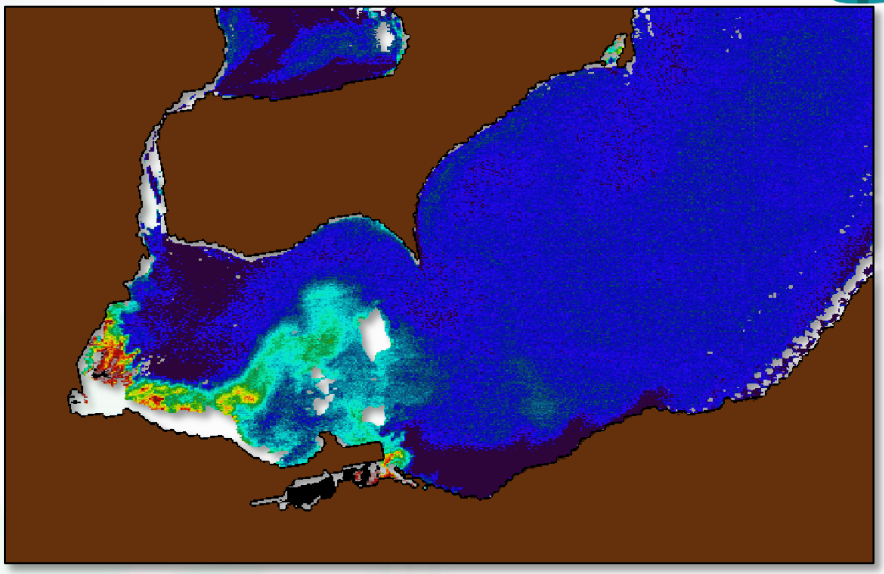
In situ and Landsat Surface Temperatures across 15 Landsat 5/7 Scenes: 2005-2010



Work Package 2 & 3

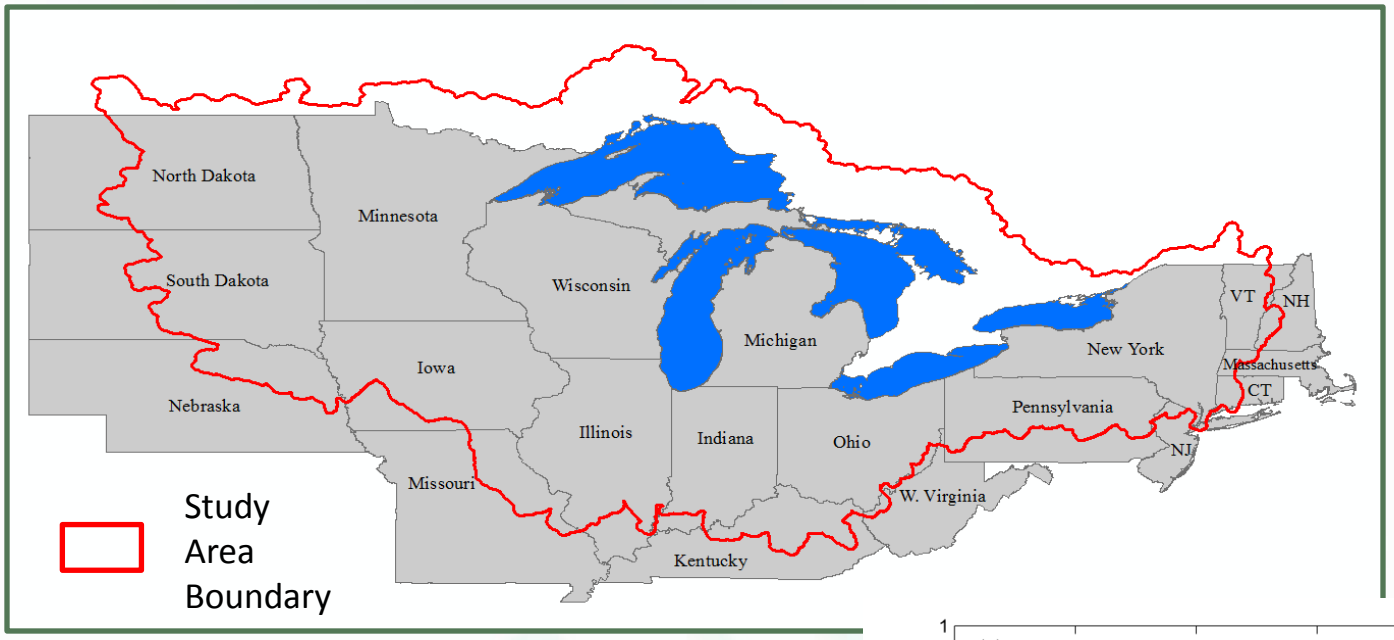
- Preliminary versions of NOAA cyanobacteria algorithms implemented into NASA standard processing software
  - Joint evaluation with NOAA ongoing
  - First vetted implementation expected in Spring 2016
  - To be made publicly available via SeaDAS (seadas.gsfc.nasa.gov)

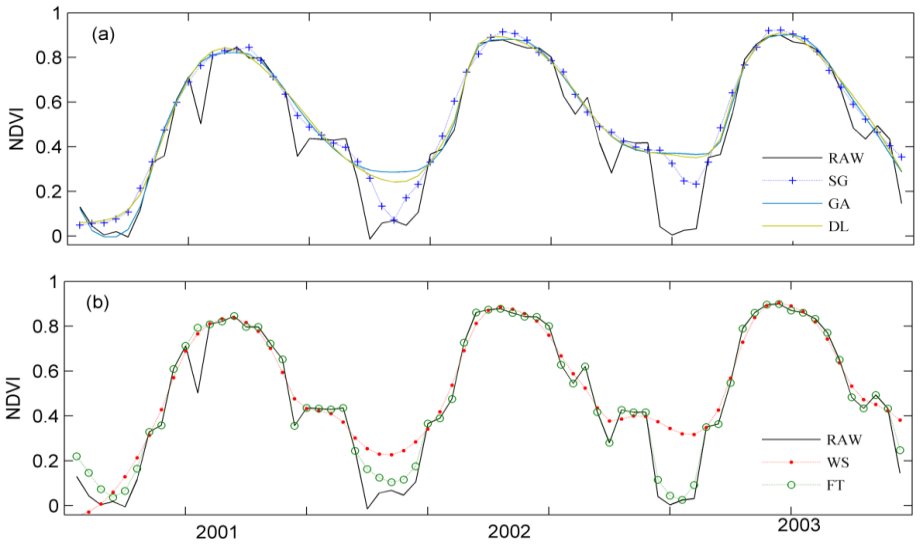




- MERIS regional extracts identified & produced
  - CA, OH, FL, New England, plus Great Lakes (not shown to left)
  - Example products available to stakeholders in Spring 2016
  - Full mission time-series available in Summer 2016
  - Reprocessing(s) anticipated following algorithm refinements

Work Package 4

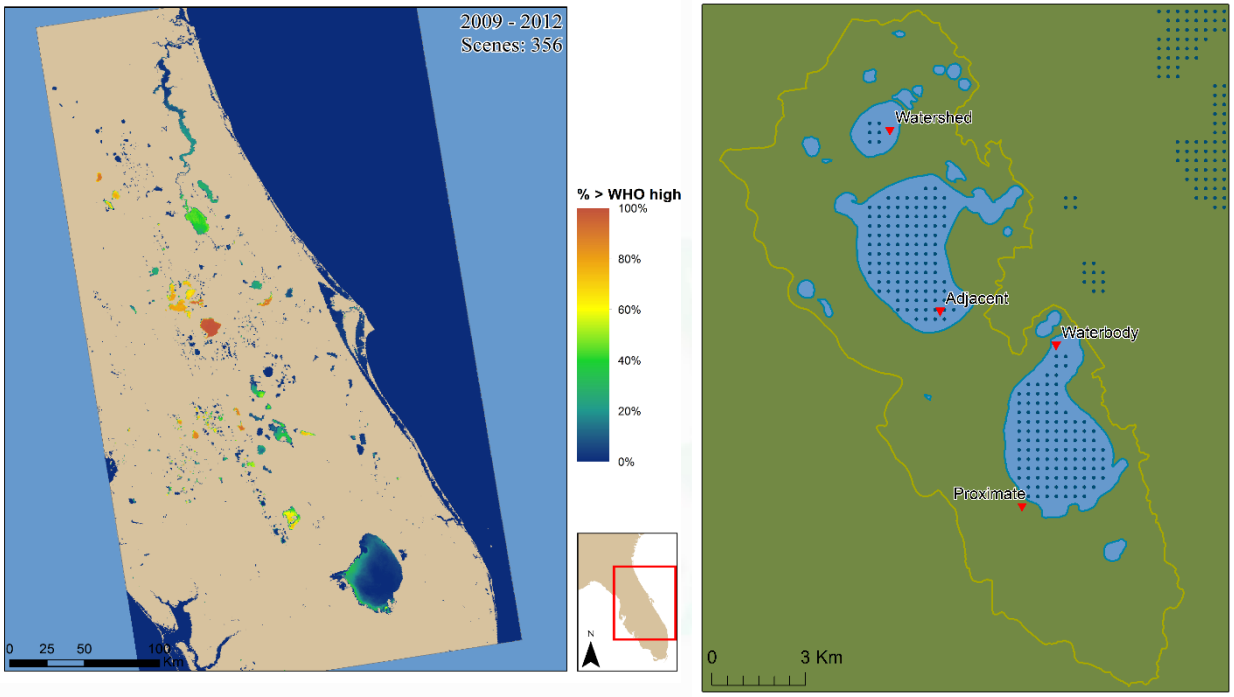


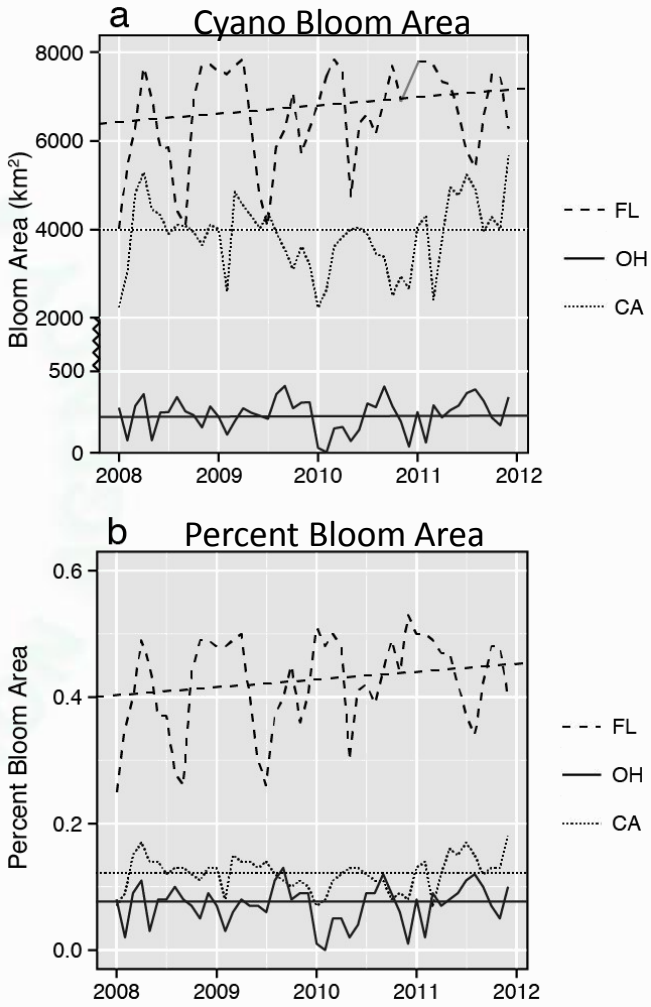


Shao et al., *Remote Sensing of Environment*, 174 (2016) 258-265

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





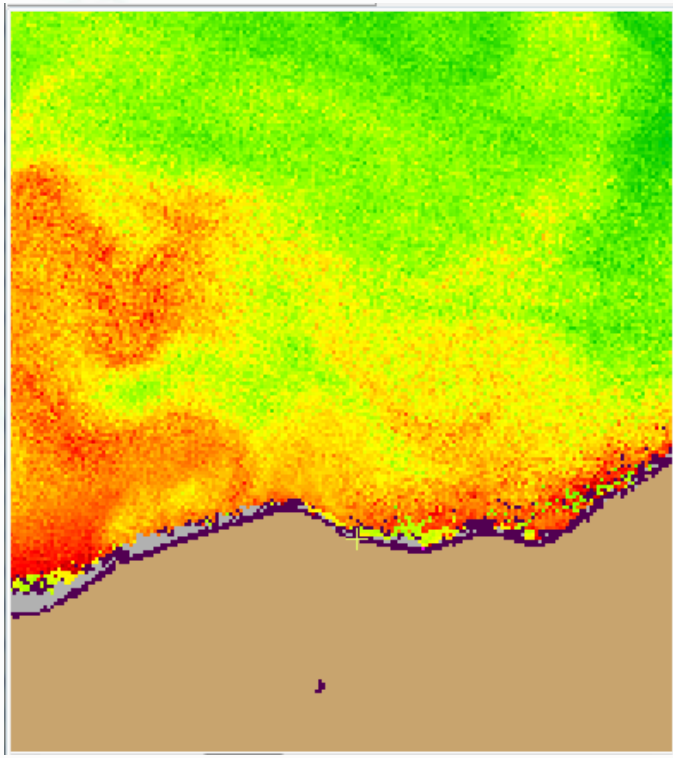
Work Package 5

“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

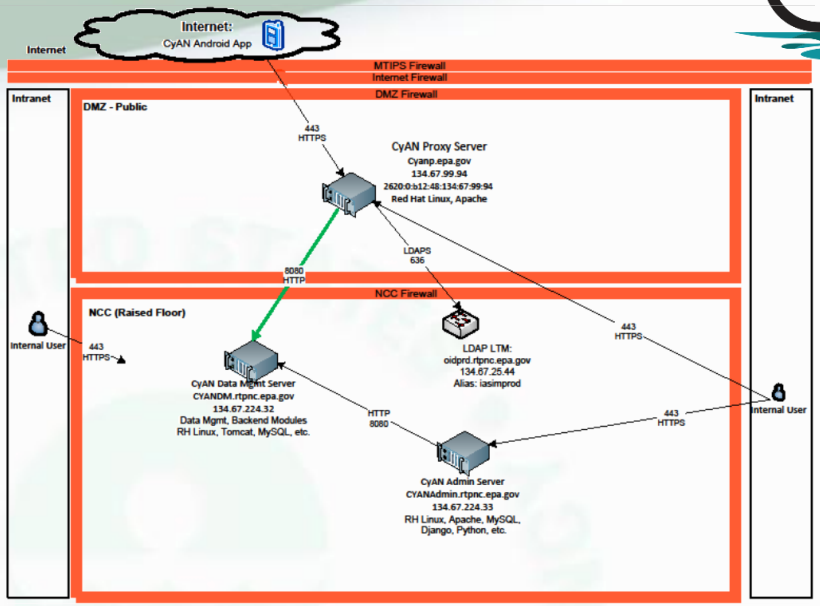
- Partners- states of Ohio and California Departments of Public Health
- Analyze hospital admission and emergency room visits of potentially impacted communities before, during and after algal blooms
- Progress: human subjects and other approvals for data

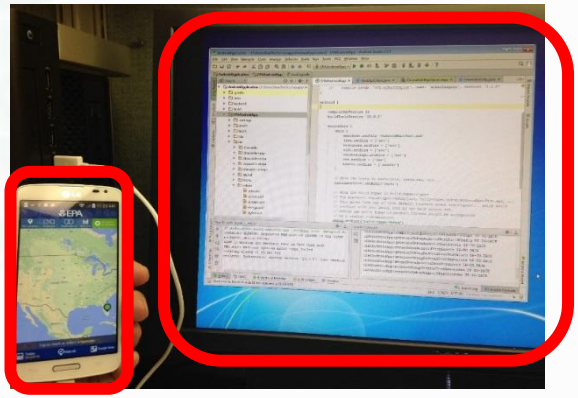
Work Package 6

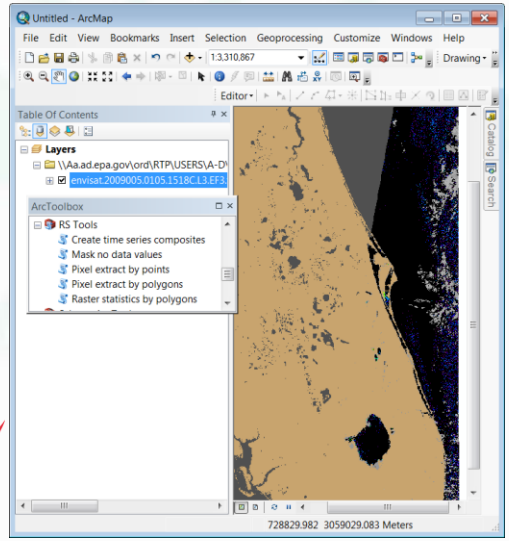
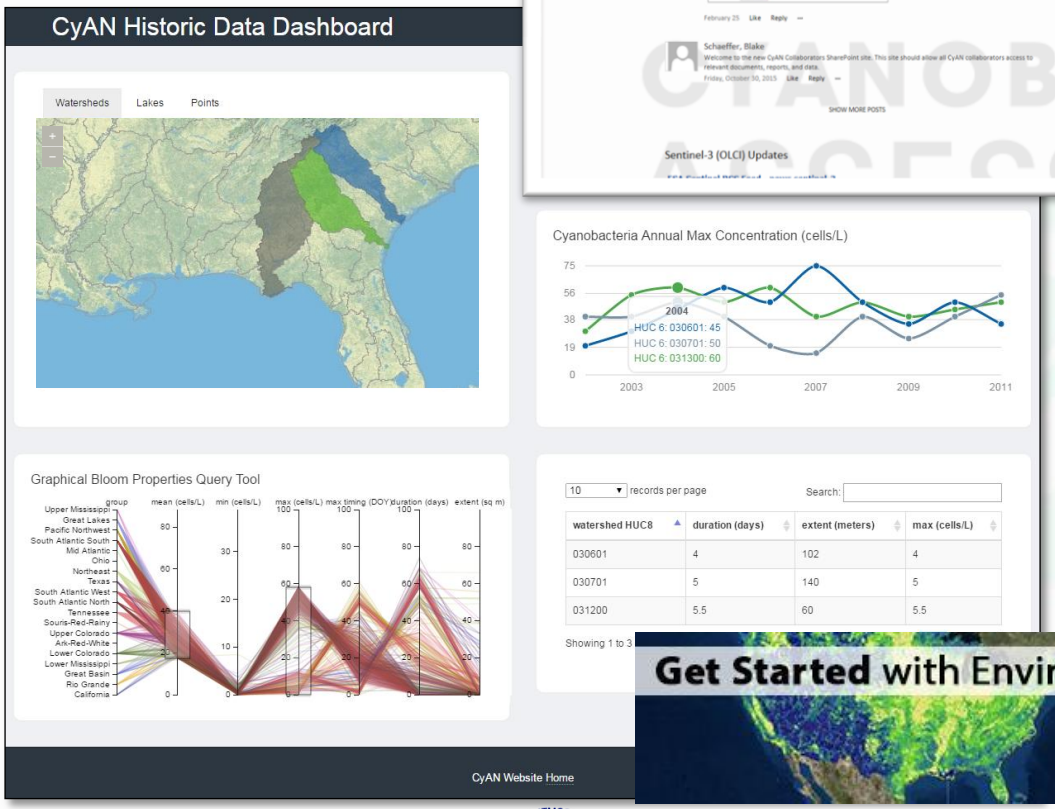
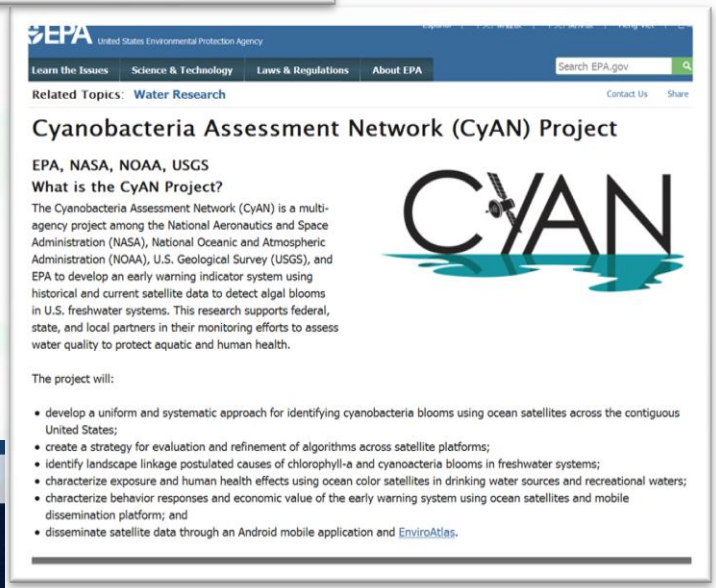
- GEOValue Data to Decisions: Valuing the societal benefits of geospatial information workshop
- Gathering data on costs of HAB monitoring programs:
  - Ohio EPA
  - Washington Dept. of Ecology
  - EPA Region 5
  - EPA Region 9
- National Center for Environmental Economics

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