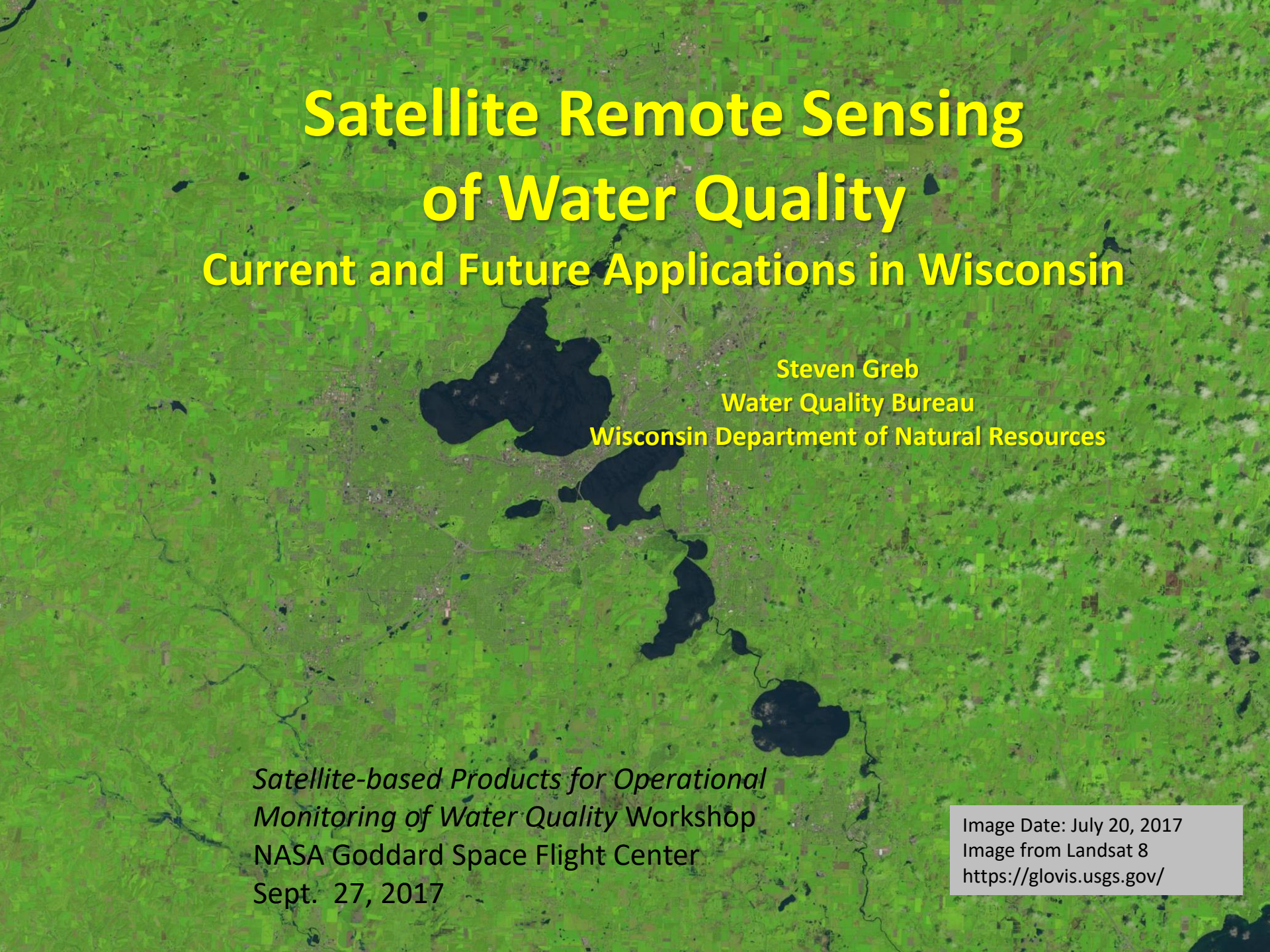


A satellite image of a landscape, likely a wetland or agricultural area, showing a mix of green vegetation and dark, irregular shapes representing water bodies. The text is overlaid on this image.

Satellite Remote Sensing of Water Quality

Current and Future Applications in Wisconsin

Steven Greb
Water Quality Bureau
Wisconsin Department of Natural Resources

*Satellite-based Products for Operational
Monitoring of Water Quality Workshop*
NASA Goddard Space Flight Center
Sept. 27, 2017

Image Date: July 20, 2017
Image from Landsat 8
<https://glovis.usgs.gov/>

Remote sensing activities at the WDNR

Towards new monitoring capabilities

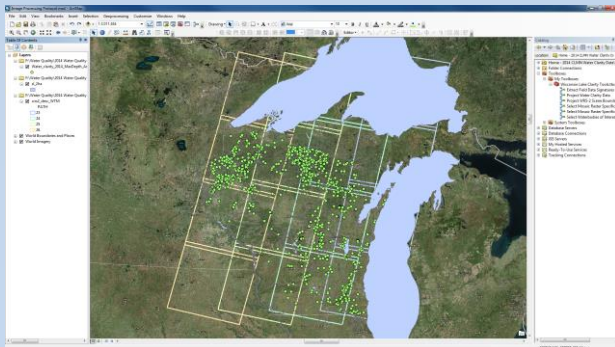
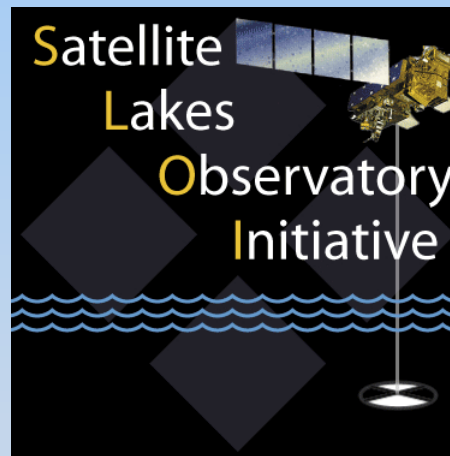
- Systematic processing of Landsat 7 ETM+ and Landsat 8 OLI imagery for water clarity
- Studies of the major drivers of lake water clarity, their interactions, and the potential impacts of land use and climate on water clarity
- Increase in earth observation monitoring capabilities through the optical and biogeochemical characterization of lakes in support of algorithm calibration, refinement, and validation



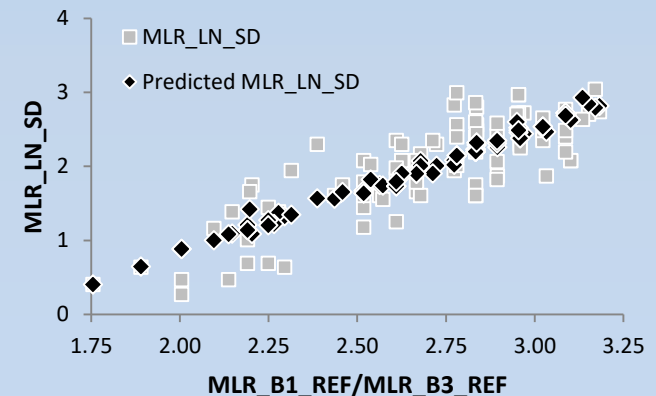
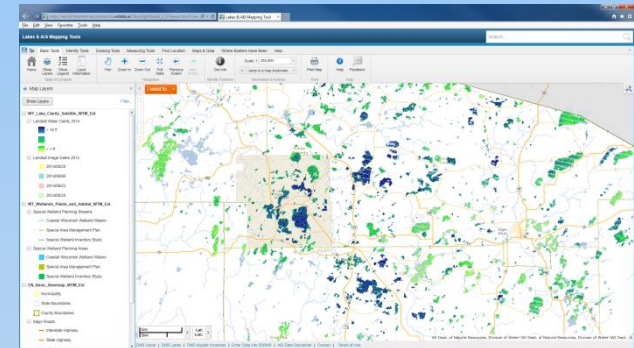
Landsat 8 image of southern Wisconsin from 08/13/2014. U.S. Geological Survey

Satellite retrieval of water clarity

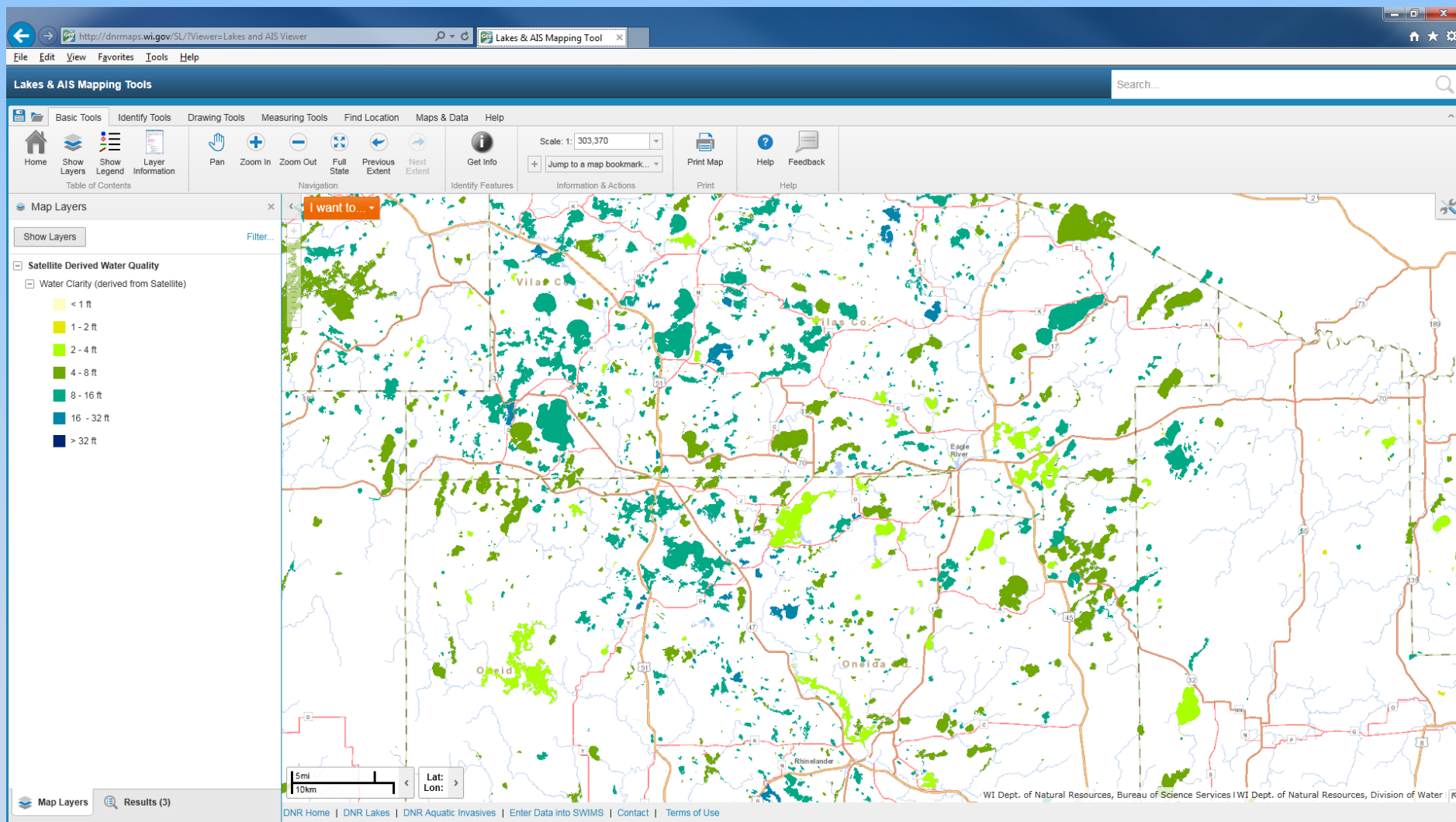
Statewide water clarity products



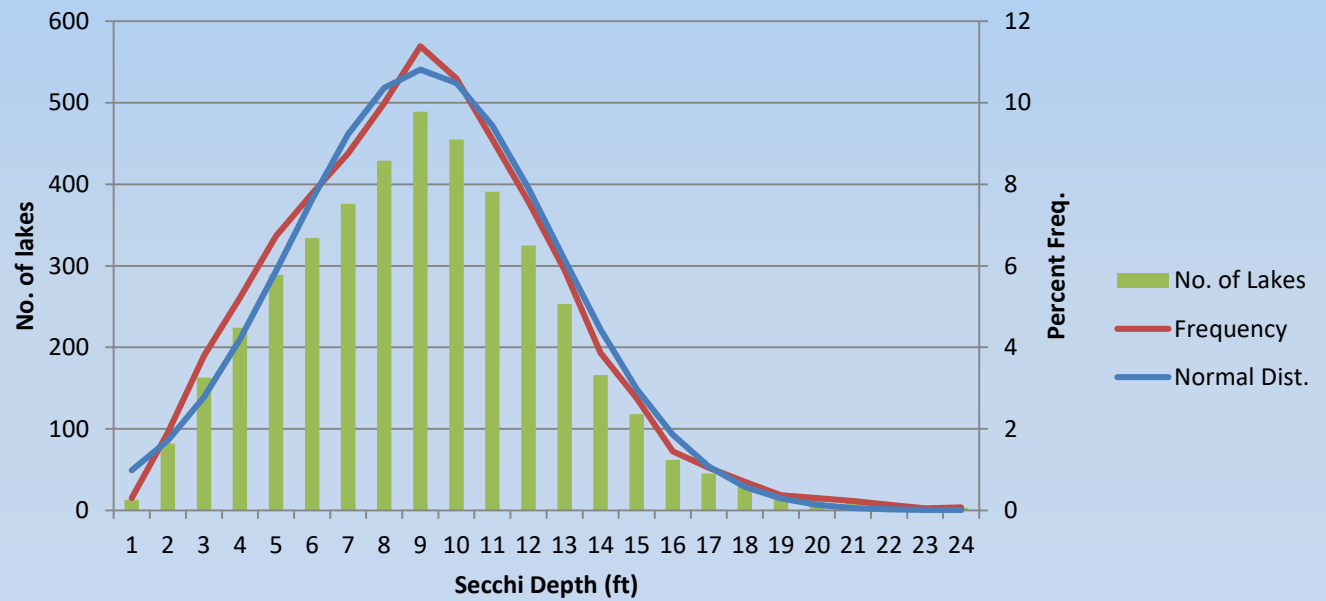
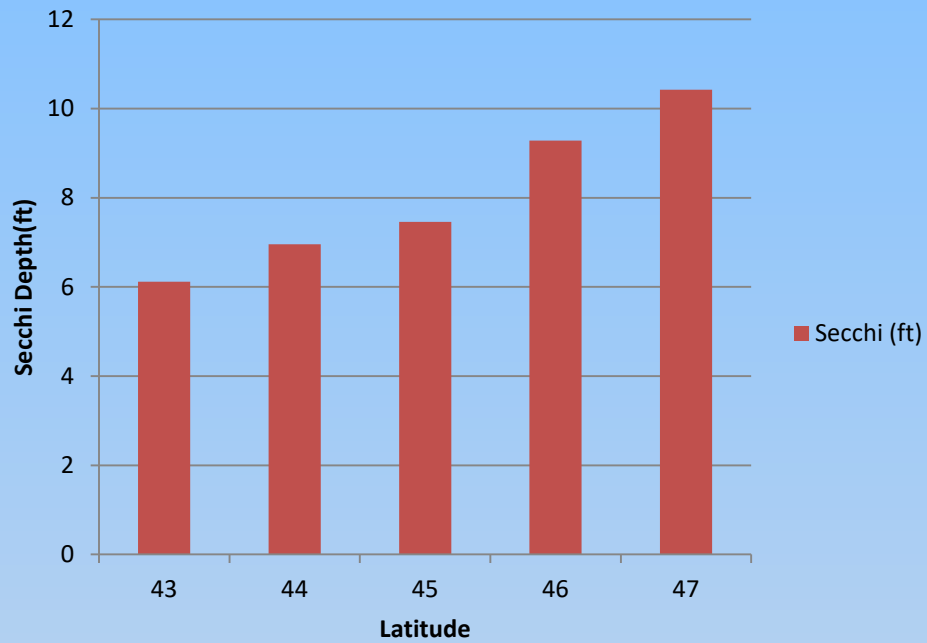
Lakes and AIS Mapping tool



Wisconsin DNR Web-based Lake Viewer

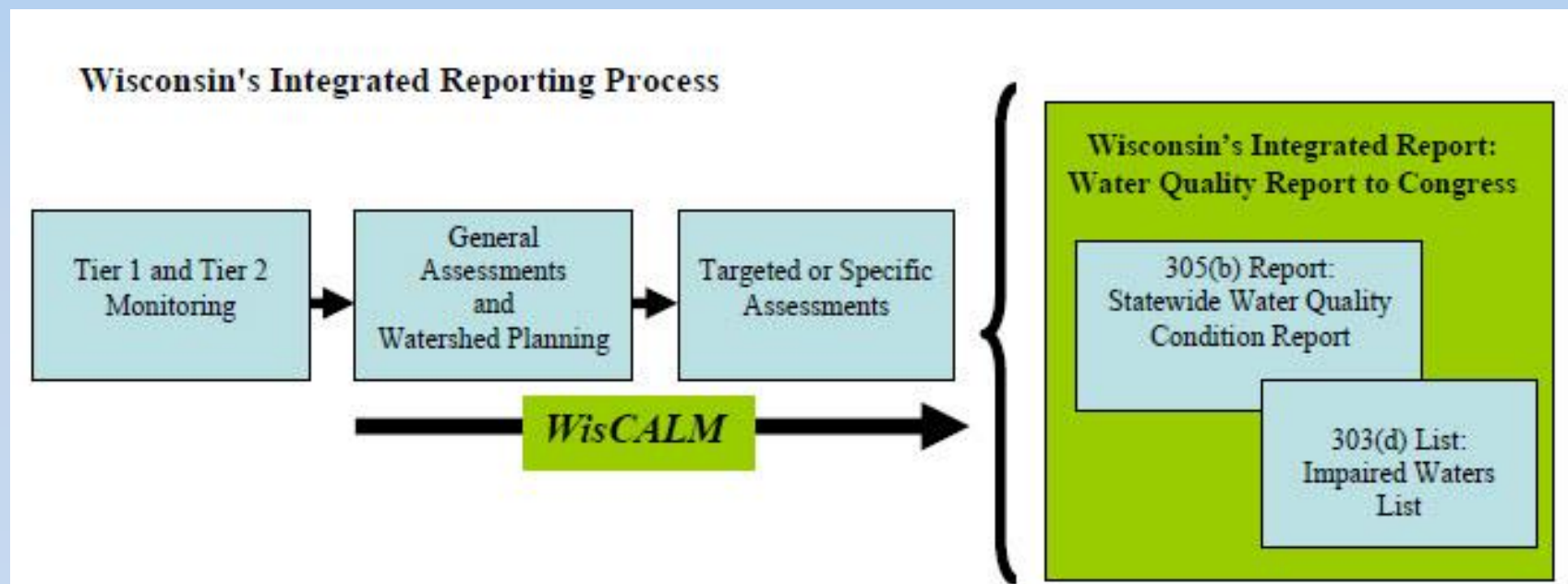


<http://dnr.wi.gov/lakes/viewer/>



State Water Quality Reporting Requirements

- The Federal Clean Water Act requires all states to prepare a Water Quality Report to Congress every two years.
- This "Integrated Report" combines the Clean Water Act sections 305(b) and 303(d). The report contains an overall summary of water quality conditions in the State and an updated Impaired Waters List.



Wisconsin's 2014 Water Quality Report to Congress

Integrated Report of Water Quality -
Executive Summary

Prepared by the Wisconsin Department of Natural Resources,
Bureau of Water Quality. This is a product of the Integrated
Reporting Team and Water Quality Biologists statewide, 2014.

DNR PUB-WY-011 2014



Wisconsin routinely processes TSI values extrapolated from satellite imagery correlated with Secchi depth readings gathered by Citizen Lake Monitoring Network volunteers. These data are used to calculate general assessments for fish and aquatic life use assessments for lakes. This method provided the state with over 6,000 new lake assessments in 2014, bringing the number of lakes assessed to approximately 85%. This is an extraordinary accomplishment, particularly given the magnitude of waters in the state and the technical work involved in the analysis.

Working towards a Early Warning System

Sentinel 3 Imagery August 30, 2017

True Color



Cyanobacteria chlorophyll index



From Richard Stumpf, NOAA

Light #2 from south



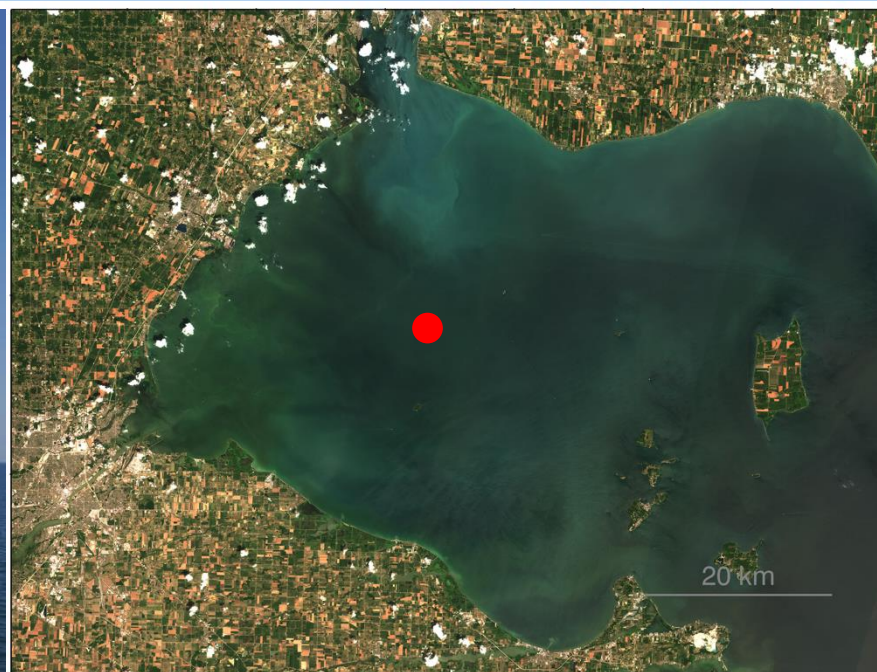
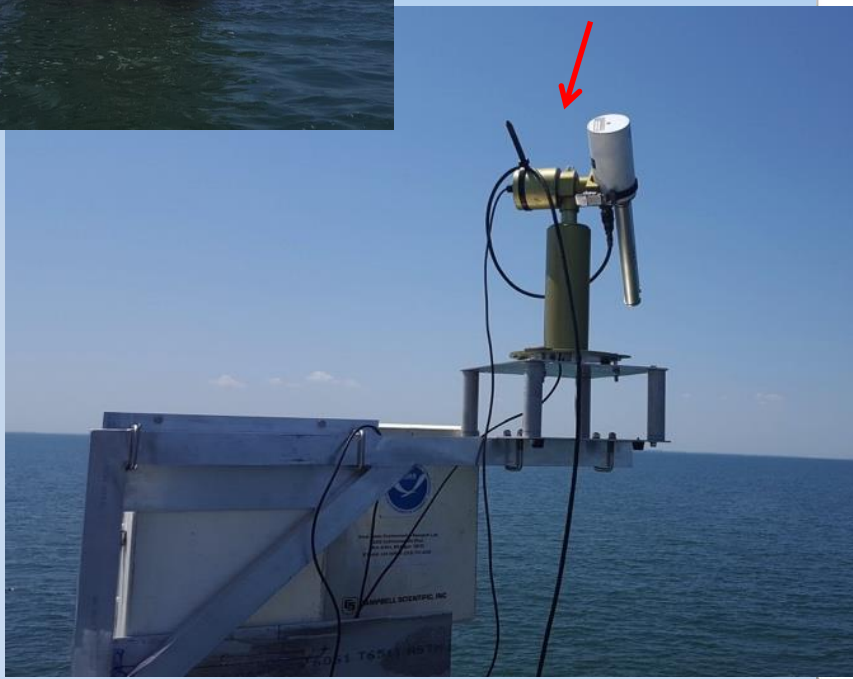
Lake Erie AeroNET-OC program
Autonomous radiometer system



Webcam view

SeaPRISM

Photos from Tim Moore (UNH)



AquaWatch

The GEO Water Quality Community of Practice

The GEO Water Quality Community of Practice



GROUP ON
EARTH OBSERVATIONS



GEO AquaWatch

- AquaWatch is a water quality community activity within the Group on Earth Observations (GEO)
- AquaWatch participants presently include individuals state, federal, and international governmental agencies, private consulting companies, nonprofit organizations, and academic institutions.
- The AquaWatch Goal is to develop and build the global capacity and utility of Earth Observation-derived water quality data, products and information to support water resources management and decision making.

For more information see
<http://geo-water-quality.org>



Thank you

Questions and Discussion



<https://www.geoaquawatch.org/>