Great Lakes Workshop Series on Remote Sensing of Water Quality

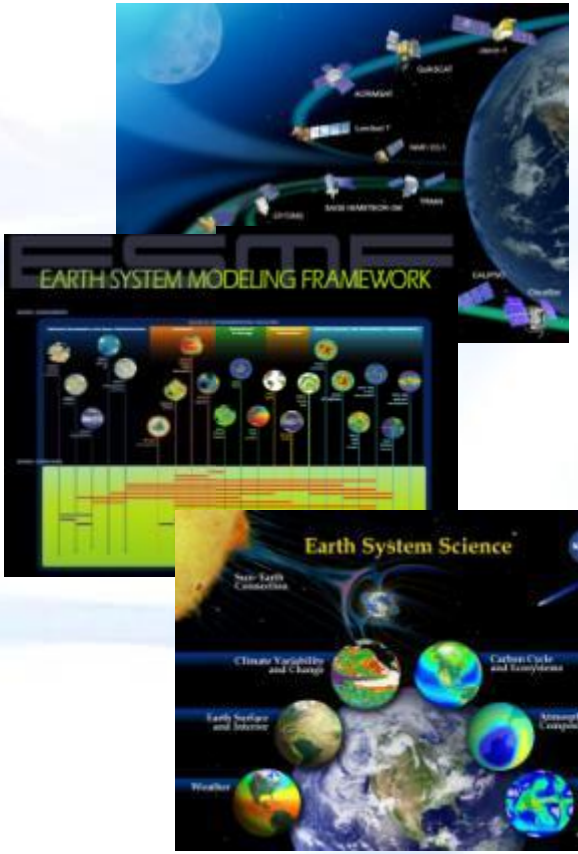
NASA Water Resource Program Update

7-8 May, NOAA - GLERL

NASA Applied Sciences Program
A Pathway Between Earth Science & Society

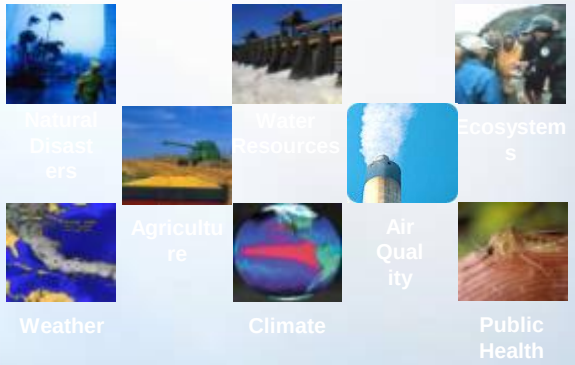
Results of NASA Earth Science Research

Uses by Partners and Stakeholder Communities



NASA Applied Sciences Program

GEOSS Societal Benefit Areas



NASA Water Resource Applied Sciences

The NASA Water Resources Program Element:
The Water Resources Program Element addresses concerns and decision processes that are related to water availability, water forecast, and **water quality**. The goal of the Water Resources Program Element is to apply NASA satellite data to improve the Decision Support Tools (DSTs) of user groups that manage water resources. Implementation requires close and enduring partnerships with Federal agencies, academia, private firms, and international organizations.

Water Resources Projects:
Projects are tactical implementations led by Principle Investigators, driven by water management challenges, and ultimately sustained by water resource information stakeholders.

Programmatic Activities:
National and international activities to improve skills, share data and applications, and broaden the range of users who apply satellite data and Earth science in water resource decisions.

NASA Water Resource Applied Sciences

Applied Sciences Program

Home (Start here) | About (Our Mission) | News (What's happening) | Projects (Learn more) | Community (Collaborate) | Resources (More info) | Events | Login / Register

NASA Applied Sciences Program
Water Resources

Earth Science Serving Society

The goal of the ASP Water Resources application area is to apply NASA satellite data to improve the decision support systems of organizations and user groups that manage water resources. The ASP Water Resources application area partners with Federal agencies, academia, private firms, and international organizations.

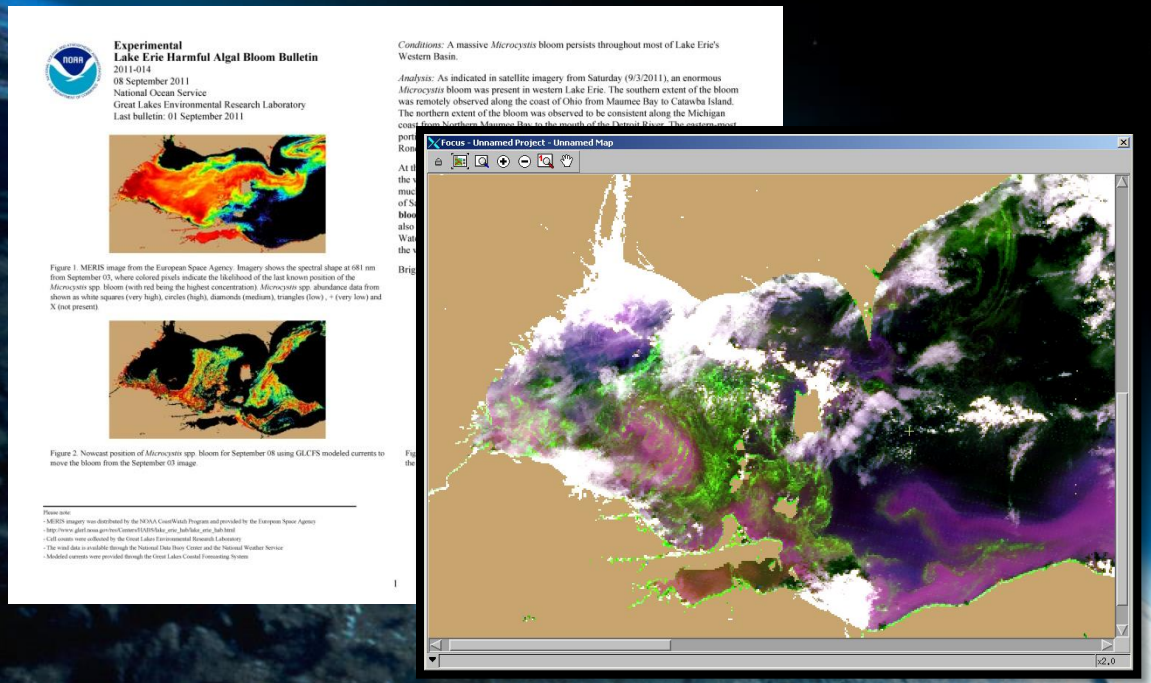
LEARN MORE

https://c3.nasa.gov/water/

Welcome to the NASA Applied Sciences Program Water Resources Application Area

Water Quality in Applied Sciences (HAQ)

NASA Partnership with NOAA on Harmful Algal Bloom Monitoring and Forecasts in Lake Erie



Experimental
Lake Erie Harmful Algal Bloom Bulletin
2011-014
08 September 2011
National Ocean Service
Great Lakes Environmental Research Laboratory
Last bulletin: 01 September 2011

Conditions: A massive *Microcystis* bloom persists throughout most of Lake Erie's Western Basin.

Analysis: As indicated in satellite imagery from Saturday (9/3/2011), an enormous *Microcystis* bloom was present in western Lake Erie. The southern extent of the bloom was remotely observed along the coast of Ohio from Maumee Bay to Catawba Island. The northern extent of the bloom was observed to be consistent along the Michigan

Figure 1. MERIS image from the European Space Agency. Imagery shows the spectral shape at 681 nm from September 03, where colored pixels indicate the likelihood of the last known position of the *Microcystis* spp. bloom (with red being the highest concentration). *Microcystis* spp. abundance data from shown as white squares (very high), circles (high), diamonds (medium), triangles (low) , + (very low) and X (not present).

Figure 2. Nowcast position of *Microcystis* spp. bloom for September 08 using GLCFS modeled currents to move the bloom from the September 03 image

Please note:
- MERIS imagery was distributed by the NOAA CoastWatch Program and provided by the European Space Agency
- http://www.glerl.noaa.gov/res/Centers/HABS/lake_erie_hab/lake_erie_hab.html
- Cell counts were collected by the Great Lakes Environmental Research Laboratory
- The wind data is available through the National Data Buoy Center and the National Weather Service
- Modeled currents were provided through the Great Lakes Coastal Forecasting System

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Highlight: Produced a bulletin for HABs that was hosted by NOAA; this tool helped reduce the impact/costs to the public from HABs. According to Ohio EPA, these products help focus and minimize resources necessary for large scale

OBJECTIVE

Produce Harmful Algal Bloom (HAB) products and forecasts based on observations from MODIS and (formerly) ESA MERIS for Lake Erie.

OPERATIONAL PARTNERS

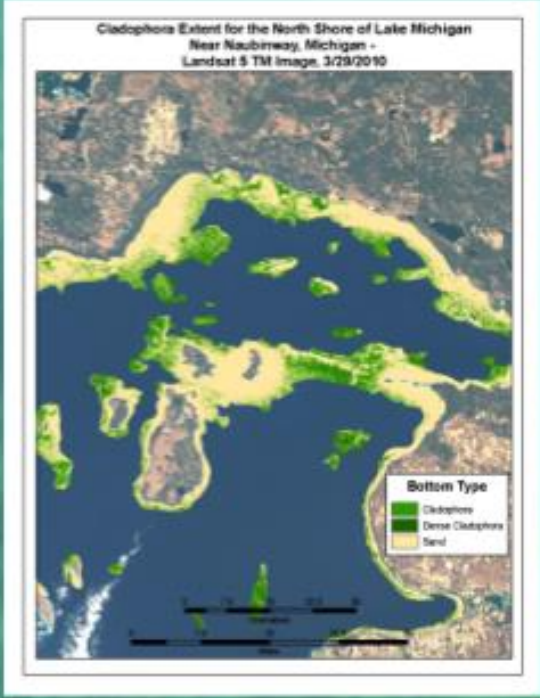
Ohio EPA, Ohio DNR, Toledo Water Supply, Sandusky Water Supply, Cuyahoga Dept of Health, NOAA

APP SCI INVESTIGATORS

R. Stumpf (PI)

Water Quality in Applied Sciences (WR)

Mapping and Monitoring the Extent of Cladophora Algae in the Great Lakes using Multi-Resolution, Multi-temporal Satellite Imagery



OBJECTIVE
Map Cladophora algae extent in near-shore regions from tracking and responding to nuisance algae issues
OPERATIONAL PARTNERS
EPA
APP SCI INVESTIGATORS
R. Shuchman, C. Brooks, M. Sayers, M Auer, G Meadows, N Jesse, A Dayton

Highlight: Mapped algae extent using Landsat; EPA funded the operational use of this algorithm under the Great Lakes Restoration Initiative

Michigan Tech
Create the Future

2 Current Opportunities for Supporting Great Lakes Activities in Applied Sciences

Health and AQ solicitation

Released as Element A.44 of NASA's 2013 *Research Opportunities in Space and Earth Science*

Proposals due: April 24, 2014

http://nspires.nasaprs.com/external/

Water Resources Solicitation

Released as Element A.45 of NASA's 2013 *Research Opportunities in Space and Earth Science*

Proposals due: April 30, 2014

http://nspires.nasaprs.com/external/
www.c3.nasa.gov/water

Upcoming Water Resources Applied Research Activities

- PEER Water Initiative – USAID
- Global Agriculture - GEOGLAM Next Phase – USDA
- Sustainable Land Imaging - USGS
  - Study Report to Congress and OMB
  - Summer 2014
- NASA – WSWC Meeting
  - 18-20 Aug
  - JPL, Pasadena, CA
- Water Resources Team Meeting
  - Fall 2014

CHALLENGE:

What are other ways for AppSci to support the GL community in bridging research to operations?

- *Key partners?*
- *Key water quality challenges (for the operational community, not just the science/research community)?*
- *Models or analyses that can (within 2-3 years) become decision support tools or operationalized?*
- *Can training help?*
- *Other ideas?*

Thanks to the GL community and GRC for organizing this workshop and for the opportunity to learn more about on-going work, activities, and potential synergies.

Thanks to the Water Resources Applied Research Program Team:
Forrest Melton, ARC
John Bolton, GSFC
Christine Lee, AAAS Fellow.

Jeanine Jones, CDWR

DWR Photography Kelly Grow

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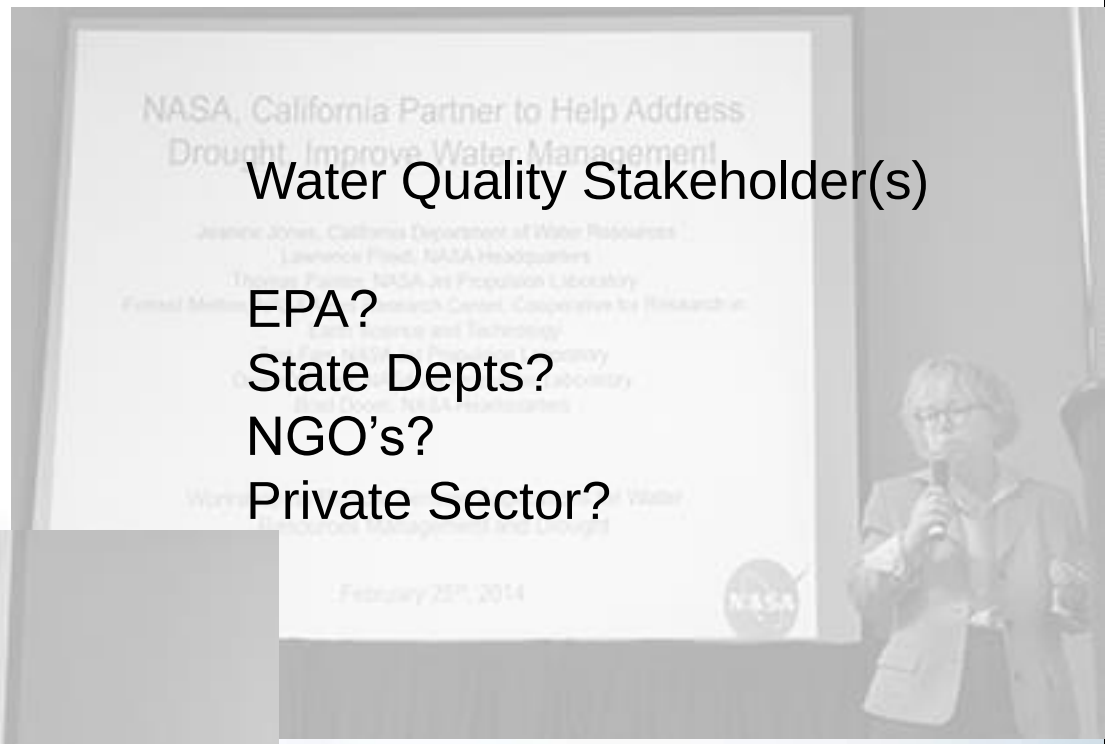
Tom Painter, JPL

Remote Sensing for Water Quality Stakeholder – Research Community Meetings??



Water Quality Stakeholder(s)

EPA?
State Depts?
NGO's?
Private Sector?

Water Quality Applied Research PI's