

RECOVER Update Meeting
March 2, 2016



Satellite Imagery for Bloom Monitoring

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Harmful Algal Blooms (HAB)



- Bloom- Increase in concentration and mass development of algal and cyanobacterial cells
- Typical Conditions
 - Warm Temperature
 - Sunlight
 - Nutrients- phosphorus
 - Calm conditions

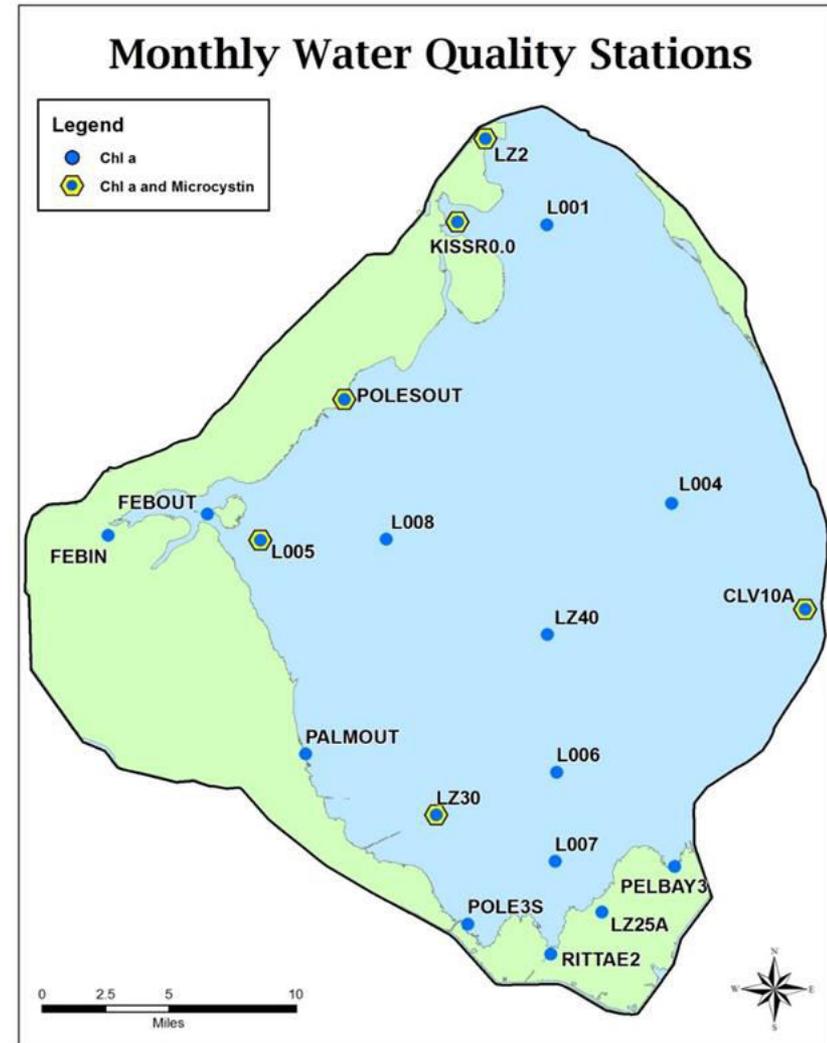
Lake Okeechobee RECOVER
PM: Chlorophyll a <40ppb



Lake Okeechobee Algal Bloom Monitoring

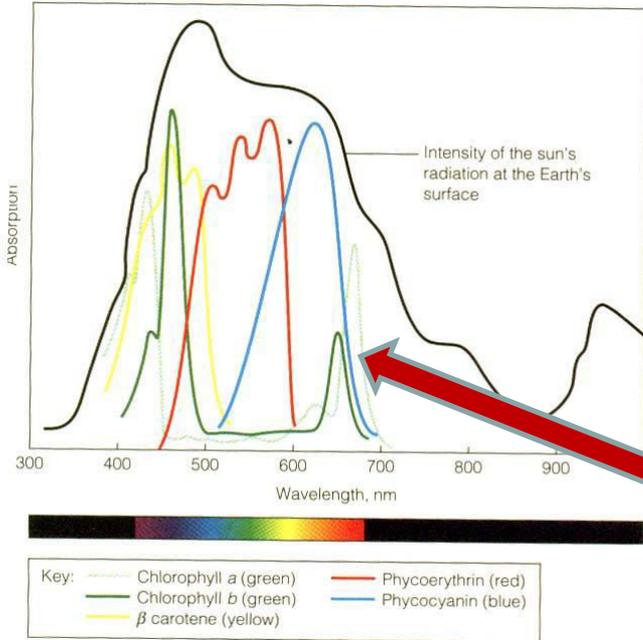
- WQM Section collect grab samples monthly
- Time, Labor, and Cost
- Limits spatial and temporal scale
- Lag in data availability
- Can identify general trend in bloom and toxin occurrence
- However, Algal Blooms tend to be transient and ephemeral

Evaluate a rapid, effective, affordable option?





NOAA Cyanobacterial Index (CI)



Absorption and Backscatter of materials in water:

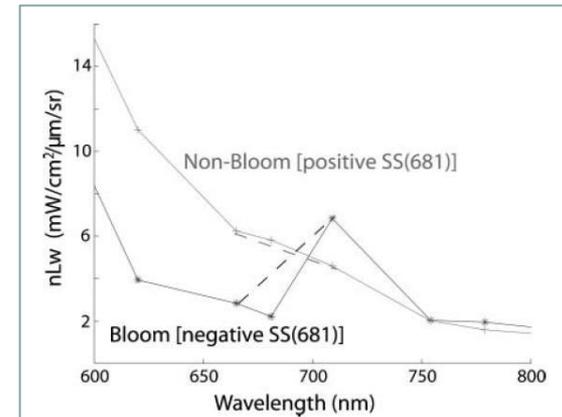
- Water
- Sediment-Detritus
- Dissolved Inorganics
- **Phytoplankton**

Use absorption at 681nm to find cyanobacteria

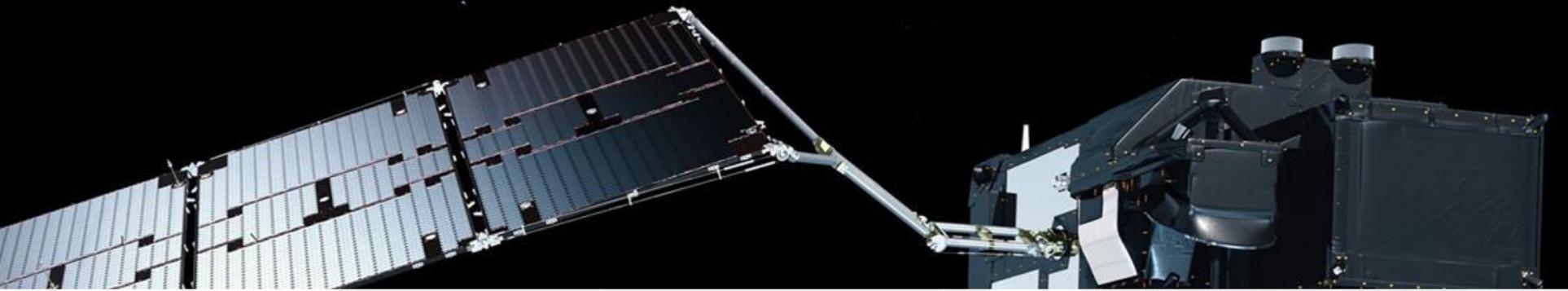
Effective for Lake Erie

High Correlation with Chl a in Lakes and River in SJRWMD

Validation with Lake Okeechobee on going



Satellite Resolution



Satellite	Spatial (Minimum Mapping Size)	Temporal (Data Acquisition Lag)	Spectral (Cyano Detection)	Notes
MERIS	300m	2 day	10 (5 on red edge)	Until 2012
MODIS	1km	1-2 day	7-8 (2 on red edge)	Currently Used
Landsat	30m	16 day	4 (1 red, 1NIR)	Long Revisit Time
OLCI on Sentinel 3	300m	2 day	10 (5 on red edge)	Launched Feb 2016; Usable data within 6 months



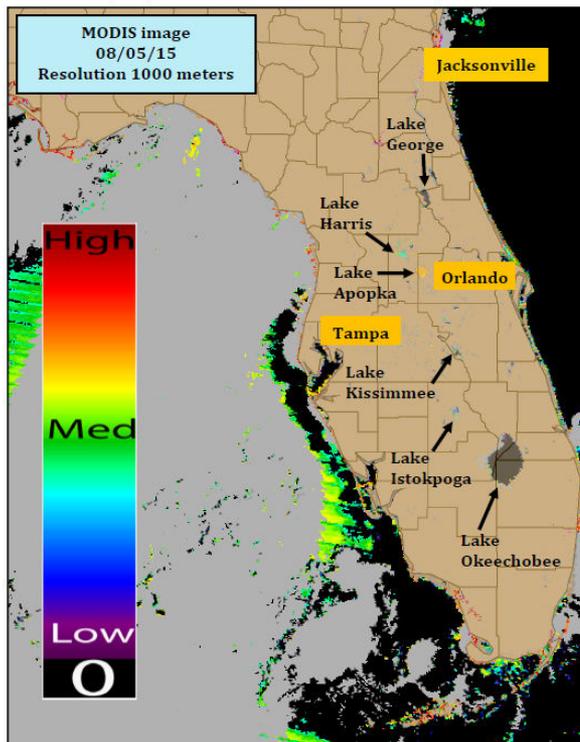
FDOH HAB Health Bulletin



Inland Harmful Algal Blooms Health Bulletin: August 7, 2015



To report an illness related to a freshwater, estuarine, marine toxin or harmful algal bloom, please contact the Florida Poison Information Center at 1-800-222-1222. Images/data are obtained from Florida Fish and Wildlife Research Institute, Florida Water Management Districts, National Oceanic and Atmospheric Administration (NOAA), NOAA National Climatic Data Centers and National Weather Centers. This report was produced through a collaboration between the Florida Department of Health Water Toxins Program (WTP) and the NOAA Center for Coastal Monitoring and Assessment.



MODIS Images display a chlorophyll-a index generated with a Moderate Resolution Imaging Spectroradiometer provided by the National Aeronautics and Space Administration (NASA)

Very low likelihood of a bloom
 May indicate clouds or missing data
 Low estimated chlorophyll-a concentrations
 Medium estimated chlorophyll-a concentrations
 Higher estimated chlorophyll-a concentrations

CyanoHAB Conditions Report

- A composited MODIS image was not made for the imagery period ending 8/5/2015.
- As shown in the true color image on page 2, cloud cover and glint were present around various areas of the state throughout the imagery period.
- Lake George (Volusia/Putnam Counties) and Lake Apopka (Orange/Lake Counties) displayed high estimated elevated chlorophyll-a concentrations.
- Lake Kissimmee (Osceola/Polk Counties) displayed medium estimated elevated chlorophyll-a concentrations.
- Lake Harris (Lake County), Lake Istokpoga (Highlands County), and Lake Okeechobee (Okeechobee/Glades/Hendry/Palm Beach/Martin Counties) displayed low to medium estimated elevated chlorophyll-a concentrations.

NOAA awards \$88,000 in grant funding to respond to West Coast harmful algal bloom outbreak



Toxic blooms affecting fisheries, coastal residents
 By Amanda Banks Posted July 23, 2015

NOAA ... is committing \$88,000 in grant and event response funding for Washington state to monitor and analyze an unusually large bloom of toxic algae off its coast. During large blooms such as this, the algae, *Pseudo-nitzschia*, can produce a potent toxin that can be harmful to people, fish, and marine mammals. So far this year, the presence of the toxin in Washington state water's has resulted in fishery closures, which can have tremendous economic and ecological effects. In May, the razor clam fishery closed resulting in an estimated \$9.2 million in lost income. The state's commercial crab fishery, worth roughly \$84 million annually, has also been affected. Blooms of *Pseudo-nitzschia* have been occurring along the entire West Coast from southern California to Alaska since May 2015, prompting public health concerns. Some species of *Pseudo-nitzschia* create a strong neurotoxin, domoic acid, which accumulates in filter-feeding fish such as anchovies, and shellfish, and can affect marine mammals such as sea lions. Also, seafood contaminated with domoic acid can cause Amnesic Shellfish Poisoning, a severe illness that can cause permanent short-term memory loss, brain damage, or death, in severe cases. When domoic acid exceeds regulatory limits, state officials close shellfish beds and certain fishing areas....



The full article is available at <http://www.noaanews.noaa.gov/stories2015/072315-noaa-awards-88000-in-grant-funding-to-respond-to-west-coast-harmful-algal-bloom-outbreak.html>.

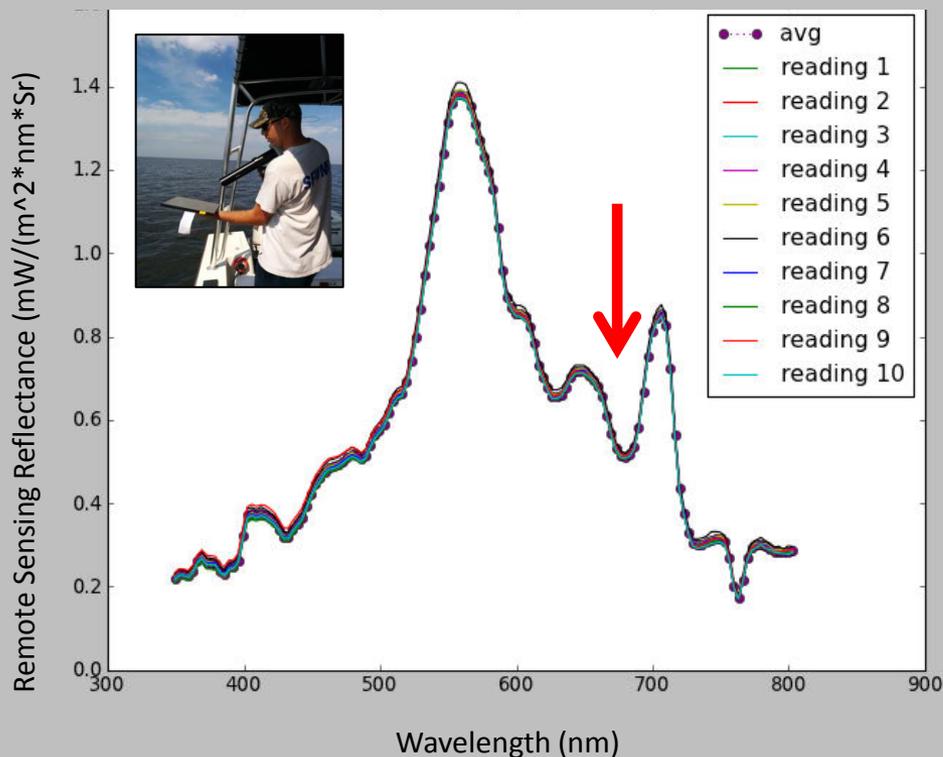
Marine Update: *Karenia brevis*

Red Tide Status - FWC/FWRI 8/7/2015: *Karenia brevis*, the Florida red tide organism, was not detected in samples collected throughout Florida this week. For additional information, see <http://mvfwc.com/research/redtide/statewide/>.
Red Tide Health Effects - NOAA 8/3/2015: There is currently no indication of *Karenia brevis* along the coast of southwest Florida, including the Florida Keys. No respiratory irritation is expected alongshore southwest Florida Monday, August 3 through Monday, August 10. Check http://tidesandcurrents.noaa.gov/hab/beach_conditions.html for recent observations.

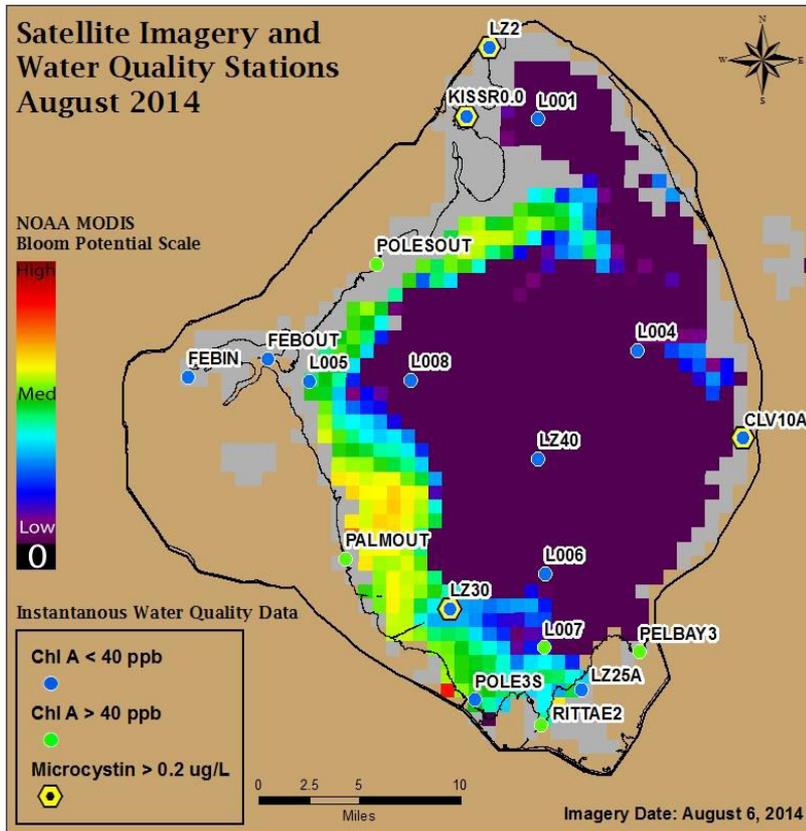


MODIS Modified CI and Chl a

PALMOUT 8/6/2014



Satellite Imagery and Water Quality Stations August 2014

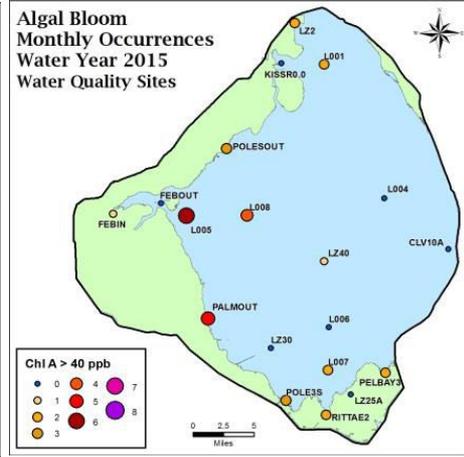
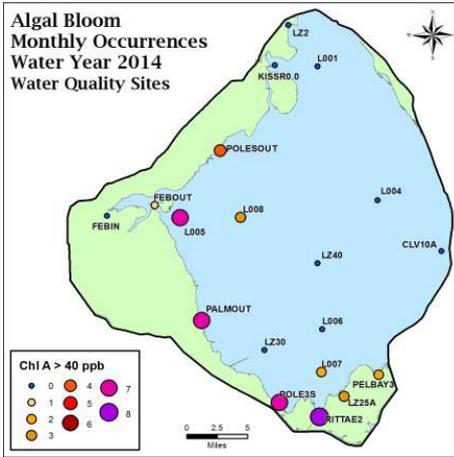
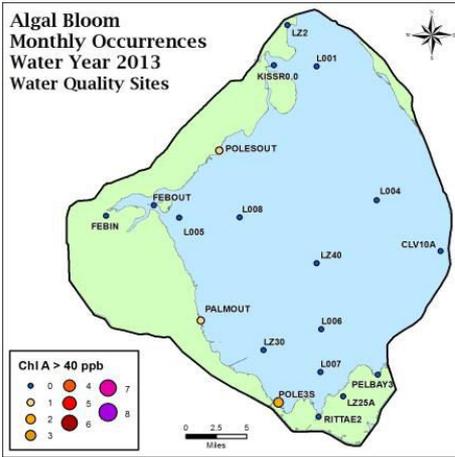
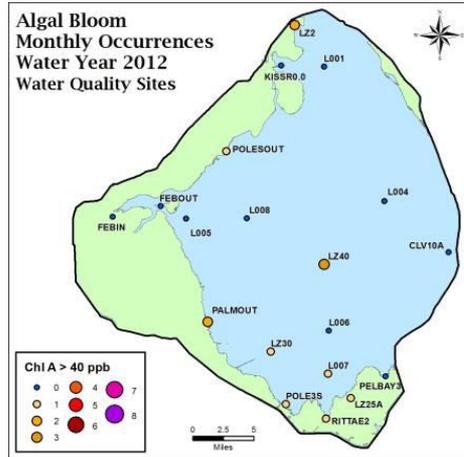
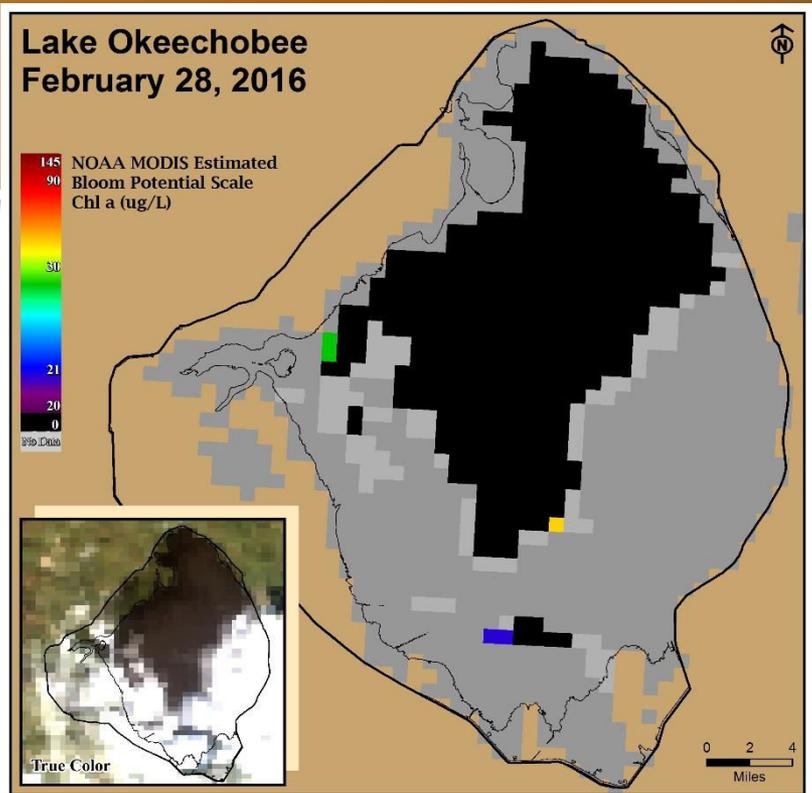


Cyanobacterial Bloom dominated by:
Cylindrospermopsis raciborskii and *Anabaena* spp.



Satellite Detection Limitations

- Land/Water Edge
- Emergent and Submerged Aquatic Vegetation
- Cloud Coverage



Conclusions

- Satellite has shown to be a valuable tool for monitoring HAB elsewhere
- Near real-time and satellite data is free
- MODIS is good
- MERIS was better
- OLCI is the future
- Potential for use on Lake Okeechobee and validation is on going



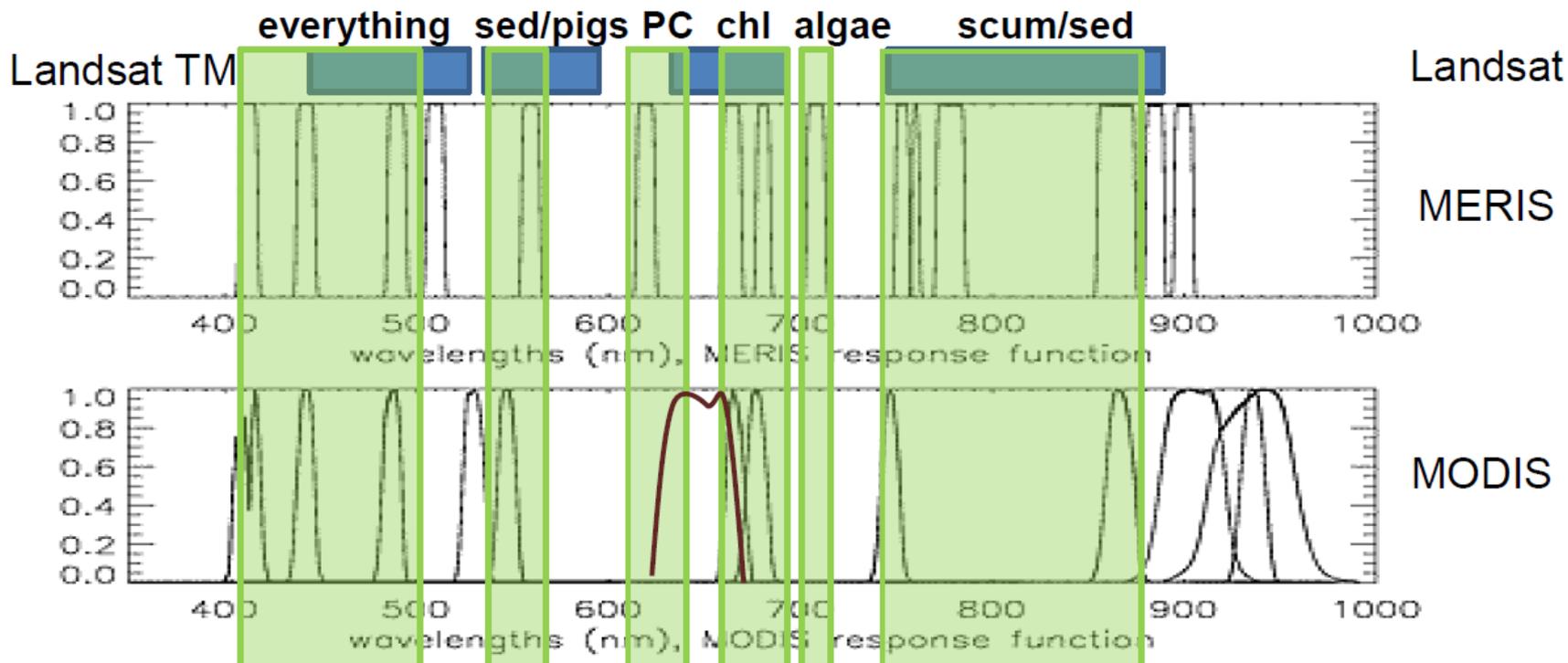
Extra Slides





Satellites and Sensitivity

Satellite bands and sensitivity to materials in the water





Microcystin > 0.2 ug/L WY 2012 to WY 2015

