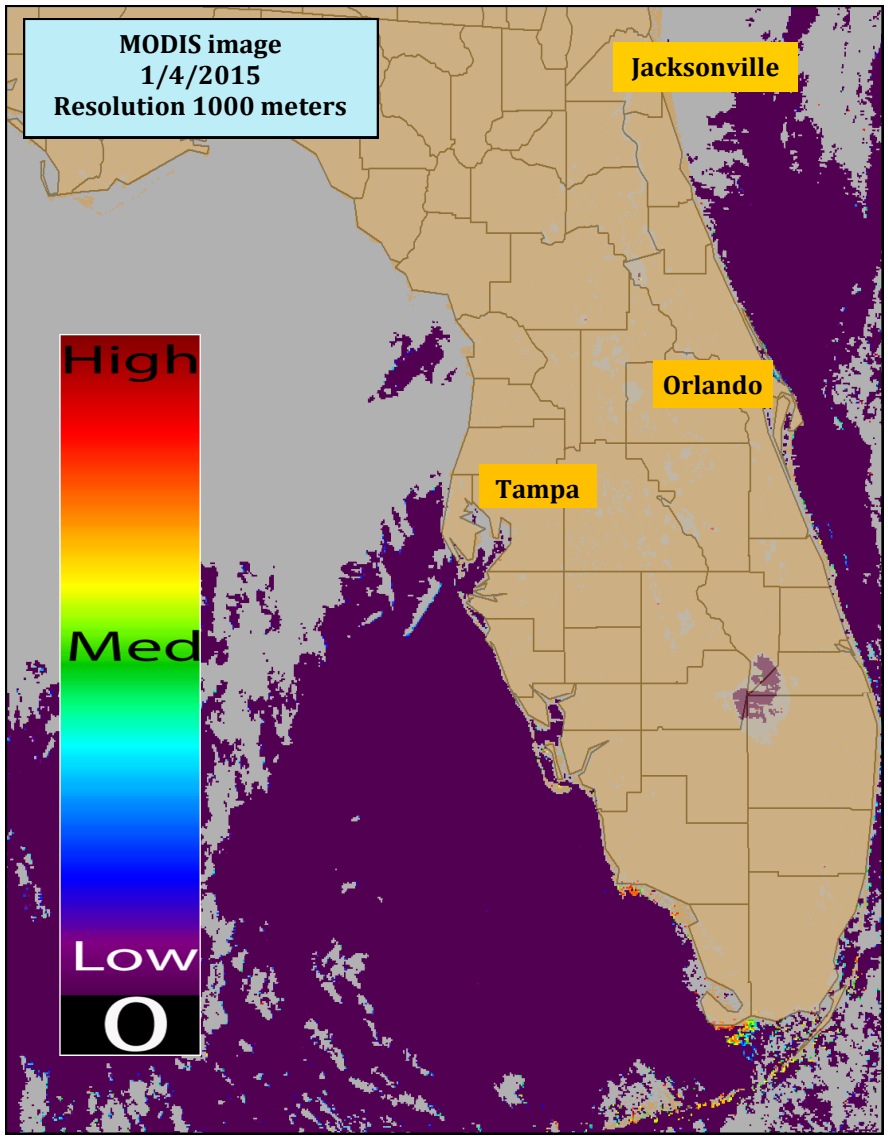
Inland Harmful Algal Blooms Health Bulletin: January 9, 2015

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

- Due to significant cloud cover over much of the state during the imagery period, no composited MODIS image is available for this week's bulletin.
- As shown in the true color image on page 2, cloud cover interfered with data collection and interpretation throughout much of the state.

Cyanobacteria as biological drivers of lake nitrogen and phosphorus cycling

ECOSPHERE

By Kathryn L. Cottingham, Holly A. Ewing, Meredith L. Greer, Cayelan C. Carey, Kathleen C. Weathers
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Abstract. Here we draw attention to the potential for pelagic bloom-forming cyanobacteria to have substantial effects on nutrient cycling and ecosystem resilience across a wide range of lakes. Specifically, we hypothesize that cyanobacterial blooms can influence lake nutrient cycling, resilience, and regime shifts by tapping into pools of nitrogen (N) and phosphorus (P) not usually accessible to phytoplankton. The ability of many cyanobacterial taxa to fix dissolved N2 gas is a well-known potential source of N, but some taxa can also access pools of P in sediments and bottom waters. Both of these nutrients can be released to the water column via leakage or mortality, thereby increasing nutrient availability for other phytoplankton and microbes. Moreover, cyanobacterial blooms are not restricted to high nutrient (eutrophic) lakes: blooms also occur in lakes with low nutrient concentrations, suggesting that changes in nutrient cycling and ecosystem resilience mediated by cyanobacteria could affect lakes across a gradient of nutrient concentrations. We used a simple model of coupled N and P cycles to explore the effects of cyanobacteria on nutrient dynamics and resilience. Consistent with our hypothesis, parameters reflecting cyanobacterial modification of N and P cycling alter the number, location, and/or stability of model equilibria. In particular, the model demonstrates that blooms of cyanobacteria in low-nutrient conditions can facilitate a shift to the high-nutrient state by reducing the resilience of the low-nutrient state. This suggests that cyanobacterial blooms warrant attention as potential drivers of the transition from a low-nutrient, clearwater regime to a high-nutrient, turbid-water regime, a prediction of particular concern given that such blooms are reported to be increasing in many regions of the world due in part to global climate change.

Citation: Cottingham, K. L., H. A. Ewing, M. L. Greer, C. C. Carey, and K. C.Weathers. 2015. Cyanobacteria as biological drivers of lake nitrogen and phosphorus cycling. Ecosphere 6(1):1.
http://dx.doi.org/10.1890/ES14-00174.1

Marine Update: *Karenia brevis* Bloom

Red Tide Status – FWC/FWRI 1/9/2015: *Karenia brevis*, the Florida red tide organism, was detected at background concentrations in one sample collected offshore of Broward County. Additional samples collected throughout Florida this week did not contain *K. brevis*. For additional information, see *http://myfwc.com/research/redtide/statewide/*.

Red Tide Health Effects – NOAA 1/5/2014: 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, including the Florida Keys, Monday, January 5 through Monday, January 12. Check *http://tidesandcurrents.noaa.gov/hab/beach_conditions.html* for recent, local observations.

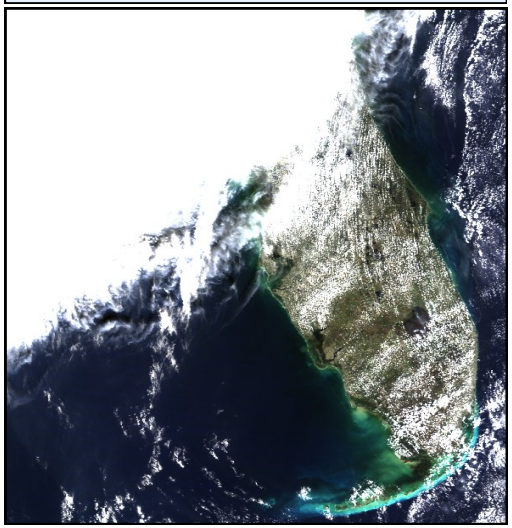
Interpreting Moderate Resolution Imaging Spectroradiometer Data

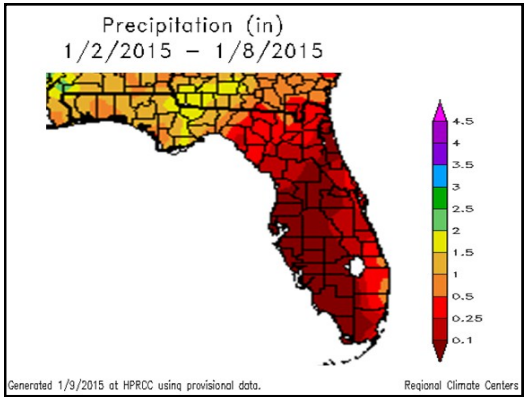
- The Moderate Resolution Imaging Spectroradiometer (MODIS) is deployed by NASA onboard the Terra (EOS AM) and Aqua (EOS PM) satellite. It passes over the Earth, collecting new imagery every 1-2 days.
- This imagery is used as a surveillance tool. Data collected by the MODIS sensor are used to generate a chlorophyll-a index, which is used to forecast harmful algal blooms. The results are not specific to any one HABs species, and should be followed-up with onsite field observations. Data is only suggestive of a potential HAB event.
- MODIS uses a spectral band that is much coarser than MERIS; therefore, only select larger water bodies in FL are visible using this technology.
- MODIS is better at depicting low to medium chlorophyll-a concentrations. Once a potential bloom is depicted, a switch in algorithms may be used to improve the visibility. MODIS has a few spectral bands, which have higher resolution that are more comparable to MERIS. However, these bands do not cover all of FL.
- Several environmental factors may affect how results can be interpreted. For example, areas with abundant aquatic vegetation may present with a high chlorophyll-a index resulting in a false positive bloom reading.
- The sensor identifies biomass near the surface (in the upper few feet of water). As a result, it may underestimate the total biomass for blooms that are mixed or dispersed through the water column.
- While patches of red or warm colors may indicate higher chlorophyll-a concentrations, these data have not been verified in most cases using ground-truth methods.

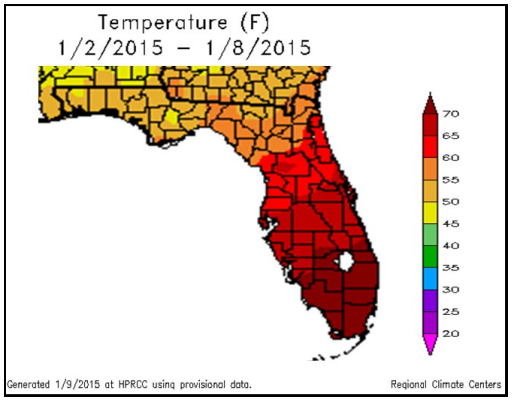
Weather Conditions: Precipitation and Temperature - 01/02/15 to 01/08/15

- Weather conditions can impact the duration and location of blooms and the satellite imagery shown in this report may no longer be relevant.
- Images represent the last image taken with a realization that blooms may have moved, dissipated or intensified.
- Cloud coverage can obscure imagery and create patches or gray areas on map and obscure bloom detection.

MODIS True Color Image
January 4, 2015







To review HABs satellite reports in the Gulf of Mexico and marine waters visit the NOAA Harmful Algal Bloom Operational Forecast System bulletin archive at: http://tidesandcurrents.noaa.gov/hab/bulletins.html

For Individual Weather Station Data, visit: http://www.sercc.com/climate

For information, please contact: Laura Morse, Public Health Toxicology Program, at 850.245.4444 x 2080 or laura.morse@flhealth.gov