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# Harmful Algal Bloom Monitoring

Leveraging Advanced Technologies for  
Harmful Algal Bloom Early Detection

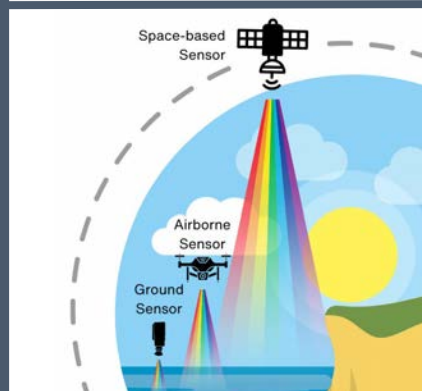
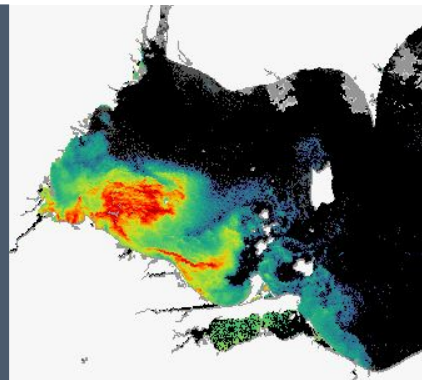
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## NCCOS Nationwide HAB Monitoring

Harmful Algal Blooms (HABs) are caused by an overgrowth of microscopic algae in freshwater and coastal environments, several of which produce toxins which are harmful to both humans and wildlife. NCCOS uses advanced technologies to identify and track HABs in coastal and Great Lakes regions across the U.S. Information on HAB location, intensity, and potential toxicity provides health officials, environmental managers, and water treatment facility operators information to focus their testing to guide beach and shellfish bed closures or water treatment in a more appropriate timeframe. The information also allows the seafood and tourism industries to minimize impacts and provide beachgoers, fishers, and other users information to make informed decisions about recreational activities.

## Rapid Response Capabilities

In addition to routine HAB monitoring, new technologies developed and implemented by NCCOS can be leveraged and rapidly deployed in areas experiencing a HAB event. This allows for adaptive management in areas that may not routinely experience HABs, providing valuable support to local resource managers and communities.



P.C. Paul Schmidt (Charlotte Sun Herald)



## HAB Satellite Remote Sensing

NCCOS maintains the ***Harmful Algal Bloom Monitoring System*** to routinely deliver near real-time satellite remote sensing products to identify, locate, and monitor HABs in coastal and lake regions. We provide a suite of HAB detection products in specific geographic regions around the U.S. We are currently transitioning to a nationwide map for HAB monitoring around U.S. coastlines and Great Lakes regions and work with the multi-agency ***CyAN*** project to provide nationwide HAB monitoring.

## Evaluating Hyperspectral Sensors

Hyperspectral sensors launched on new satellite missions (e.g., NASA's PACE) which measure a range of light wavelengths, have the potential to provide detailed HAB monitoring information, including species composition. NCCOS is leading efforts to ***develop new methods and algorithms to use hyperspectral sensors*** for remote identification of HAB species and to provide advanced information on bloom status. These new methods will allow coastal managers to make more informed decisions for HAB management.

## Real-Time HAB Monitoring

HABs are inherently patchy and rapidly change in response to dynamic weather and environmental conditions. NCCOS, in collaboration with industry partners, are ***developing new hyperspectral-based sensors and associated apps***, which can be deployed on Unmanned Aircraft Systems (UAS) to detect and identify coastal HABs in real-time. This rapid detection and identification allows coastal managers to make near real-time decisions for HAB management and mitigation.

## Applying AI for HAB Identification

NCCOS researchers and academic partners are developing ***BloomScope, a user-friendly, inexpensive, portable microscope system that relies on AI technology*** to identify and count individual HAB species and cells in coastal and freshwaters. BloomScope can be used by trained community scientists around the U.S. to monitor HAB events in near real-time. Collected data provides rapid information on HAB events that can be incorporated into HAB early warning and forecasting systems.