

Innovation to Protect Our Water

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Green water is not clean water. By the time the slimy mats of algae develop, it's too late to help the lake or river in the near-term. Time becomes the most essential ingredient. The long-term problem starts much earlier, when too much nitrogen and phosphorus enter the water. These nutrients are essential at normal levels. Excesses, though, can harm human health, ecosystems, and the economy. A prime example of the damaging impacts of nutrient runoff comes from Toledo, Ohio. Harmful algal blooms developed near the city's Lake Erie shoreline in August 2014 and left about 500,000 people without safe drinking water. That kind of widespread ecological event also takes a toll on recreation and the local economy, and similar financial detriments add up quickly across the country. A 2015 analysis found that health and environmental damages from excess nitrogen alone totals more than \$200 billion each year in the United States (Sobota et al. 2015).

This critical environmental issue requires innovative strategies. Sensors are one tool that could help identify the presence of excess nutrients in our waterways. Unfortunately, today's methods for measuring nutrient loads are complex and costly, which means more data are needed to inform decisions about nutrient reductions and improve the ability to track the progress of reductions.

Under the directive of the White House Office of Science and Technology Policy, the Challenging Nutrients Coalition is coordinating innovative approaches to develop a suite of affordable, reliable sensors. The group consists of federal agencies, universities, and non-profit organizations.



In December, the group launched the Nutrient Sensor Challenge, a two-year prize competition to accelerate the development and deployment of affordable nutrient sensors for use in aquatic environments. Sensors developed through this competition will cost less than \$5,000 to purchase, be deployable for three months without maintenance, and be ready for the commercial market by 2017.

Technologies with these capabilities will improve the basic scientific understanding of how excess nutrients affect our health and environment, and they will help expand monitoring and forecasting of nutrient levels and harmful algal blooms in lakes, rivers, and coastal waterways.

No-cost sensor beta testing for participants begins in August 2015, but the other key part of the Nutrient Sensor Challenge is the quantification of the market for those sensors. To minimize investment risk, technology producers are eager to understand the commercial market potential for nutrient sensors. Groups interested in providing their input for the numbers and types of sensors they might buy can visit the website: www.nutrients-challenge.org.

The Challenging Nutrients Coalition includes the Environmental Protection

Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), National Institute of Standards and Technology (NIST), United States Geological Survey (USGS), Department of Agriculture (USDA), the Everglades Foundation, the Partnership on Technology Innovation and the Environment, and Tulane University.

References

Sobota, D.J., Compton, J., McCrackin, M.L. and Singh, S. 2015. Cost of reactive nitrogen release from human activities to the environment in the United States. *Environmental Research Letters*. 10: 025006. doi:10.1088/1748-9326/10.025006.

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