



Nutrient Sensor Challenge

A Water Sensor Market Stimulation Challenge



Webinar: February 12, 2015

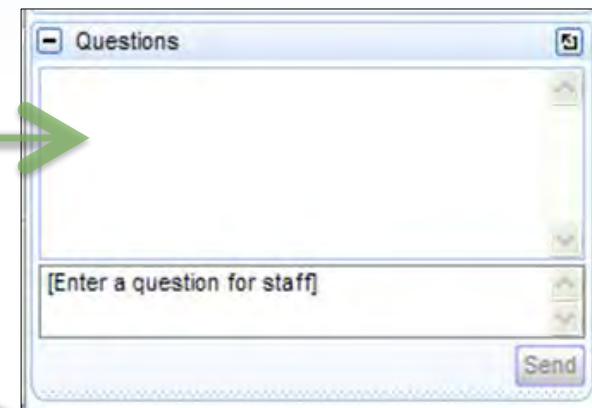
www.nutrients-challenge.org



Nutrient Sensor Challenge

Webinar Logistics

- You may submit a question at any time by typing into the *Enter a question for staff box* and clicking the *Send* button. All questions will be held until the Q&A session at the end of the webinar.
- If you would like to ask a question verbally during the Q&A session, please *click the raised hand button* and we will call on you if time allows.
 - If you are using your computer for audio (VoIP) you will need a microphone to participate verbally.
 - If you are calling in via telephone, please make sure you have entered your PIN # into your telephone. This will allow webinar staff to unmute your line should you raise your virtual hand to speak.





Nutrient Sensor Challenge

Today's Agenda

- **Information on:**
 - Challenge purpose and benefits
 - Preliminary market info
 - Process and schedule
 - Target sensor features
 - How to register
 - Beta testing and verification testing
 - Judging and awards
- **Q&A session**



Nutrient Sensor Challenge

Today's Presenters



Denice Shaw

Office of Research
and Development,
U.S. Environmental
Protection Agency



Beth Stauffer

Department of
Biology,
University of
Louisiana
at Lafayette



Mario Tamburri

Alliance for Coastal
Technologies,
University of
Maryland Center for
Environmental Science



Nutrient Sensor Challenge

First Speaker: Denice Shaw



Nutrient Sensor Challenge

Nutrient Pollution: One of the Nation's Biggest Environmental Problems

65% of assessed estuaries and coastal areas have moderate to high **WATER QUALITY IMPACTS** from nutrient pollution.

Freshwater nutrient pollution costs the nation
\$2.2 BILLION PER YEAR.

Reported drinking water violations for nitrates have nearly
DOUBLED in the last decade.



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The Challenging Nutrients Coalition

The White House OSTP convened a group of agencies and organizations to seek innovative ways to address pollution caused by excess nitrogen and phosphorus in water.





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The Challenging Nutrients Coalition



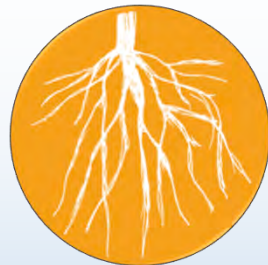
WATER NUTRIENT SENSORS



Nutrient Trading



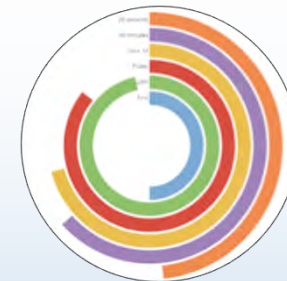
P Removal and Reuse



Soil N & P Sensors



Citizen Science & STEM



Data Visualization



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The Goal: affordable, accurate nutrient sensors to improve measurement and monitoring

WATER NUTRIENT SENSORS

Why?

- We have limited data
- Current sampling capabilities are not sufficient
- Current commercial sensors costly and cumbersome



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How?

- **A global competition to accelerate the development of affordable and accurate nitrate and orthophosphate sensors.**

- **A market stimulation challenge—incentivize development by identifying and mobilizing the potential market.**
 - **Examples**
 - **Dept. of Energy High Performance Rooftop Unit Challenge**
 - **Dept. of Energy Wireless Submeter Challenge**
 - **Environmental Defense Fund Methane Detectors Challenge**



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How Can You Benefit From Participating in the Challenge?

- Leadership in an emerging market.
- Verified sensor performance through no-cost beta-testing and lab & field testing
- Publicity and recognition for your innovation and expertise
- Access to potential partners, supporters, and customers



Awards

NITRATE

- First prize
- Second prize
- Third prize
- Recognition

PHOSPHATE

- First prize
- Second prize
- Third prize
- Recognition



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Initial Market Information

Outreach to:

- Academic researchers
- Water / wastewater utilities
- Aquaculture / aquariums / greenhouses
- Water quality monitoring community

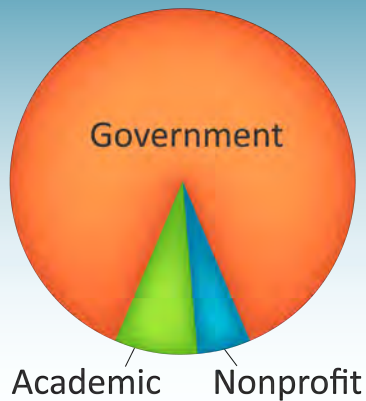
Diverse data collection methods for this highly granular market:

- Phone calls
- Third-party surveys
- Responses through the Challenge web page



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Initial Market Information



110 respondents to date

- Mainly water quality monitoring community

Have indicated potential purchase of

- Nitrate sensors: ~5000
- Orthophosphate sensors: ~4500





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Mobilizing the Market

Collective purchasing
approaches are being explored





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Efforts to Identify and Mobilize the Market Are Ongoing



Provide Your Input

A key to this challenge is the demonstration of strong market signals for those individuals and companies designing and building new sensors. **Help spur the development, use and adoption of this technology.** Indicate your interest and support below (non-binding). Please check all that apply:

- I/my organization would consider purchasing nutrient sensors if the instruments met our requirements and cost criteria.
- I/my organization would consider using nutrient monitoring services for water if they were available at an affordable rate.
- I support the Nutrient Sensor Challenge. More data and information are needed to monitor and manage nutrients in water.

Name

Organization

Email

I am a:

In the next five years, I would buy

My sensors would primarily be

Enter your comment:

Submit



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Next Speaker: Beth Stauffer



Nutrient Sensor Challenge

The Process

PHASE 0: Startup	
Challenging Nutrients Visioneering Meeting	November 2013
Challenging Nutrients Ideation Prize	December 2013
User Surveys	January - April 2014
ACT Nutrient Sensor Challenge Workshop	September 2014
Indications of Support, Interest in Competing - Open	October 2014
Publication of Workshop Report and Draft Challenge Criteria	December 2014
PHASE 1: Challenge Launch	
Challenge details released / Challenge Registration - Open	December 2014
Registration Closed	March 2015
PHASE 2: No-Risk Beta-Testing	
Beta-Testing Plans, Locations and Schedules Released	June 2015
Challenge Summit	August 2015
Beta-Testing available at Sites A, B and C	August - October 2015
PHASE 3: Verification Testing	
Verification Protocol Workshop	January 2016
Laboratory Verification Testing	April 2016
Field Verification Testing at Sites A, B and C	May - September 2016
PHASE 4: Awards	
Final Verification Reports Published, Awards Announced	December 2016



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Target Sensor Features

Measurement Criterion	Nitrate (\pm nitrite)	Orthophosphate	Weights
Accuracy	$\pm 5\%$ or 0.01 mg/L - N (at upper range) from reference value	$\pm 5\%$ or 0.005 mg/L - P (at upper range) from reference value	20%
Precision	$\pm 5\%$ or 0.01 mg/L - N (at upper range) from reference value	$\pm 5\%$ or 0.005 mg/L - P (at upper range) from reference value	15%
Range	0.005 - 60 mg/L - N	0.005 - 2 mg/L - P	15%
Deployment Length	3 months (at 15 minute sampling interval)		25%
Cost	Less than \$5,000 purchase cost Bill of materials for sensor and package		25%

- **Targets developed with input from:**
 - Coalition, state, and federal agency scientists, managers
 - User Needs survey results – American University
 - ACT Nutrient Sensor Challenge Workshop discussion
 - Guidance from a Technical Advisory Committee (TAC)



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Technical Advisory Committee

- **Suzanne, Bricker, National Oceanic and Atmospheric Administration**
- **Brian Pellerin, U.S. Geological Survey**
- **Dwane Young, U.S. Environmental Protection Agency**
- **Matt Cohen, University of Florida**
- **R. David Holbrook, National Institute for Standards and Technology**
- **Chris Gross, U.S. Department of Agriculture NRCS**
- **Joe Rudek, Environmental Defense Fund**



Group photo: ACT Nutrient Sensor Challenge Workshop, Washington, DC, Sept. 2014



Nutrient Sensor Challenge

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- **Target features evaluated in final verification testing (Summer 2016)**
 - Testing protocol details finalized in cooperation with participants prior to testing (Protocol Development Workshop, January 2016)
 - Second application required to participate in verification testing



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- **Target features evaluated in final verification testing**
 - **Laboratory: Accuracy, Precision and Range**
 - **Field: Accuracy and Deployment Length**
 - **Cost estimated from Bill of Materials and other information in Application for Verification Testing, confirmed at testing**



Nutrient Sensor Challenge

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- **Sensors will be recognized that meet and/or exceed targets**
 - 1st, 2nd, and 3rd place will be awarded to best-performing N and P sensors, regardless of whether all targets are met



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Registration

- **When?**
 - Opened December 17, 2014 and closes 5:00 pm ET, March 16, 2015
- **How?**
 - Complete the Registration Form - www.nutrients-challenge.org
 - Submit completed form via email - info@nutrients-challenge.org
- **Who?**
 - All innovators welcome - from startups to established manufacturers
 - Private sector, academia, agencies, etc.
 - Open globally to participants
- **Why?**
 - Opportunity to participate in Challenge Summit (Aug 2015)
 - Opportunity to participate in free, no-risk beta testing
 - Publicity throughout Challenge





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Registration

- **What?**
 - 2-page Registration Form
 - Nitrate and/or Phosphate sensor developer?
 - Technology/Trade Name
 - Commercial? Near-Commercial? Developmental?
 - Applicant Information
 - Company Name, Address, Website, Contact Name & Position, etc.
 - Technology ownership? (e.g., patent, license, etc.)
 - Beta testing participation?
 - Technology Description
 - Do NOT include proprietary/confidential information
 - Operating Information
 - Deployment mode, environment



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Registration

Closes 5:00 pm ET, March 16, 2015

Submit completed Registration Form via email

info@nutrients-challenge.org



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Next Speaker: Mario Tamburri



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Challenge Summit

- **When & Where?**
 - One-day gathering, August 2015
 - Washington, DC area; some travel support is possible
- **Who?**
 - Registered participants
 - People interested in the technologies
 - End users
- **What?**
 - Background and overview of Challenge
 - Expanded market information and collective purchasing efforts
 - Information on potential support for R&D and Challenge participation
 - Information on path towards future sensor approvals/certifications
 - Opportunities for networking and team building



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Beta Testing

- **No-risk and no-cost**
 - Developers manage, deploy and collect data from instruments
 - Local support provided as needed
 - August-October 2015: Two-week windows at each site in freshwater stream/river, brackish estuary and coastal ocean
 - ACT collects, analyzes and provide data to developers on reference water samples
 - Instrument data and performance kept confidential
- **Why?**
 - Opportunity to assess performance of prototypes, identify limitation and make improvements
 - Simulated “real-world” deployments, similar to conditions that will be employed in final verification testing
 - Opportunity for publicity for Challenge participants



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Verification Testing

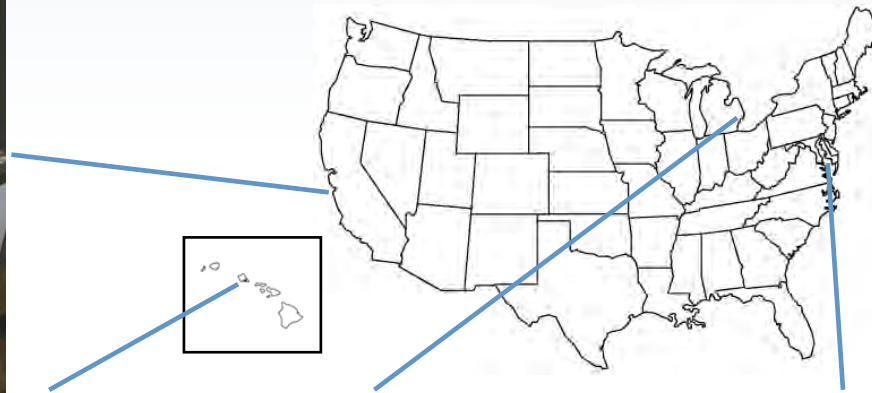
- **ACT independent Technology Verification**
 - Secondary applications and acceptance
 - Draft test protocol/quality plan and protocol workshop
 - Signed agreements, protection of proprietary information
 - Training and laboratory testing
 - Field testing freshwater river (1 month), brackish estuary (3 months) and coastal ocean (1 month)
 - Products will be individual Verification Reports for each instrument
 - Technical Advisory Committee oversight





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Locations





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Judging

- Independent Challenge Panel of Judges to be established
- Assessments based on:
 - Criteria and weights
 - ACT Verification Reports
 - Cost parameters
 - Overall Challenge goal of affordable, accurate and reliable next-generation nutrient sensors by 2017
 - Innovation
- Final recognition as meeting/ exceeding the criteria and/or finishing 1st, 2nd and 3rd for N and P



Awards

NITRATE

- First prize
- Second prize
- Third prize
- Recognition

PHOSPHATE

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Next Steps

- **16 March 2015 - Registration Deadline**

- **May 2015 - Beta testing and Challenge Summit details**
 - Let us know if you plan to be there!

- **August 2015 - Challenge Summit**
 - Location TBD in Washington, DC area

- **August-November 2015 - Optional beta testing**
 - 2-week windows available at multiple locations



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Questions?

www.nutrients-challenge.org

info@nutrients-challenge.org

