Partnership on Technology Innovation and the Environment

Workshop on Nutrient Monitoring to Support Water Quality Trading: Executive Summary
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The following summary outlines the results of the June 24th workshop on Nutrient Monitoring to Support Water Quality Trading held at the offices of Troutman Sanders LLP in Washington, DC.

The workshop grew out of discussions on water technology innovation of the Partnership on Technology Innovation and the Environment. The Partnership is a voluntary collaboration of agencies, universities, and non-governmental organizations, and is focused on accelerating the development and scale-up of innovative environmental and energy technologies. It aims to identify technology issues and opportunities, promote discussion and engagement, and catalyze more specific projects and efforts.

The workshop involved 35 participants from a range of organizations, including the Maryland Department of the Environment; U.S. Environmental Protection Agency; Chesapeake Conservancy; World Resources Institute; George Washington University; American University; and several private sector firms and industry associations.

The agenda consisted of three components. The first was an opening plenary discussion of objectives and expected outcomes and three opening presentations. The second was concurrent breakout sessions addressing two aspects of a proposal for a simulation project using nutrient sensors to support nutrient trading and targeted watershed monitoring in the Chesapeake Bay: one focused on the technical issues associated with the proposal and the other on policy issues that should be considered as part of the proposal. The third component was a closing plenary bringing together the results of the two breakouts and determining next steps for the simulation project—specifically on the leadership, participation and possible funding for the project.

This document provides an executive summary of conclusions and recommendations from the two breakout groups. Detailed notes have been distributed and are available upon request.

Workshop Purpose and Overview

The purpose of the workshop was to solicit ideas and recommendations on designing a project to simulate water quality trading on a sub-watershed of the Chesapeake Bay. This proposal is linked with the Nutrient Challenge underway at EPA, which aims to reduce the costs of nutrient sensing technology by 80% from current levels. This workshop emerged from the interest among members of the Partnership in promoting use of in-stream sensors, linked with other data sources, to facilitate water quality trading by reducing uncertainties associated with use and measurement of Best Management Practices (BMPs) for point/non-point source trading. The model would enable stakeholders to run simulations to show how real-time and remote sensing can validate agricultural and municipal BMP effectiveness.

The workshop brought together experts and key stakeholders to refine the proposal for deploying and using nutrient sensors to support nutrient trading and targeted watershed monitoring. The objectives of the workshop were to improve the project proposal; identify technical and policy issues that should be considered or integrated into the design of the project; identify and enlist support from key stakeholders; and develop a management and resource plan for implementing the project. A side benefit was to develop closer connections of experts in the field and strengthen policy networks.

The first track of the workshop focused on the development of a model to demonstrate the potential use of real-time data from distributed sensors and optimal placement of the sensors. Determining actual nutrient reductions from use of BMPs is complex. This project aims to identify and assess ways in which enhanced monitoring can support reliable, credible, and cost-effective trading. The breakout group for this track focused on more technical and design issues associated with the project.

The second track complemented the first by addressing the assumptions and alternatives that should be incorporated in the simulation for a policy perspective. The track explored the policy issues that affect the design and operation of nutrient trading programs. It also explored the potential for using nutrient sensors to improve targeted conservation efforts and support watershed monitoring programs.

Major Points and Conclusions in the Technical Modeling Discussion

General Conclusions

More reliable and precise monitoring could improve trading and water quality generally by guiding decisions about where to locate sensors, validating the effects of BMPs, and finding concentrations of landowners where application of BMPs could have measurable effects on nutrient levels.

Enhanced sensor monitoring and the resulting data would increase the legitimacy of trading programs, stemming from the added confidence in determining which practices are effective in reducing nutrients.

Getting buy-in from farmers, specifically in having access to relevant data and gaining their confidence in a trading system, is a major challenge for nutrient trading. For the trading system to work, there need to be financial incentives but also a degree of confidence and trust from the sellers of the credits.

BMPs are contextual; the ideal situation would be a network of sensors across a watershed, with data on the practices implemented at each farm and the ability to network all of the sensors together. Each sensor should have similar standards and compatible outputs to make the results comparable.

A critical part of the sensors picture is to have standardization to support the development of needed technologies. Regulators should be clear about these standards to guide the technology developers.

Design of the Simulation Project

The simulation should consider areas with a large enough nutrient removal potential to get results. It should operate at multiple scales based on a flexible spatial grid and a grid-sized ecosystem model.

The model should simulate the nutrient concentrations of individual sources (farms or urban runoff) and effects of BMPs, including green infrastructure) at the point where nutrients run off land; of tributaries that receive effluent from multiple sources, where sensors could measure changes in concentrations and validate the BMPs; and in larger watersheds to measure BMP impacts and assess watershed health.

The project should aim to adapt and refine current models, such as APEX and SWAT; NTT; USDA field-scale data (requiring partnering with USDA); SPARROW (for catchment scale); and the Chesapeake Conservancy's land use and hydrological data that are available through its precision conservation work.

A simulation with sensors deployed across part of a watershed, perhaps using the Conservancy's high-resolution data to pinpoint the best locations, with a small number of farmers is a good place to start.

The simulation should be done with landowners and stakeholders to determine how they would react to different designs, data, and scenarios. The goal should be to determine how much data are needed to identify trading opportunities and make the program credible and cost-effective.

Partnering with USDA and state agricultural interests could help to make needed data available at the farm level. This is a major challenge for the project and for nutrient trading in general.

Major Points and Conclusions in the Policy Discussion

General Conclusions

A well-designed, well-executed simulation may be useful in facilitating reliable, lower-cost water quality trading in which stakeholders may have a higher degree of confidence. However, there is a possibility that enhanced monitoring could document a need in some cases to increase uncertainty ratios.

The value of enhanced monitoring and better data is in reducing uncertainty ratios, which could increase confidence on a trading program, build the credibility of trading, lower costs, and increase the potential for using point/non-point trading for improving water quality.

The market should be designed to cover the costs of the enhanced monitoring; reducing uncertainty ratios could deliver cost savings that would pay for the enhanced monitoring.

Reduced costs could facilitate trading, but a more significant benefit could be to increase trust among stakeholders through better data and reduced uncertainty. Having more confidence in the data could allow regulators, watershed groups, communities, and others to shift the conversation to social issues that come up on a recurring basis.

The issue of avoiding *hot spots* should be redefined to avoiding any *degradation* of water quality.

A major benefit of enhanced monitoring and reliable trading would be to bring treatment plants into compliance with their existing requirements. The water quality benefits could be substantial.

Design and Benefits of the Simulation Project

The project should be designed to answer such questions as: where to place monitors; how to use monitoring cost-effectively; how in-stream sensors and remote sensing could be used effectively and in combination with one another; how to identify concentrations of sources of nutrient reductions for priority attention; what amount and quality of data meet stakeholder concerns; how to avoid or minimize temporal and geographic concentrations; and how to obtain, organize, share, and communicate data.

The simulation should be linked to progress on the Nutrients Challenge being led by EPA and the Alliance for Coastal Technology. The timing over the next two years could be coordinated.

The project could stimulate more discussion about the purpose of trading and what it may accomplish.

The simulation should be interactive by involving consultations with a range of stakeholders to be able to critically assess various assumptions and options.

The modeling project could enable more constructive discussion and experience on the suite of data sources that could be used to design and implement effective trading programs. These may include in-stream, in-field, and remote sensing capabilities.

Lessons for the Chesapeake Bay exercise could be drawn from experiences in the District of Columbia, Virginia, and Prince Georges County, Maryland as well as from other parts of the country.

The policy assumptions and trading rules for the simulation should draw upon available models from other jurisdictions; the recent publication by the World Resources Institute and Willamette Partnership on *Building Water Quality Trading Programs* could also be a valuable guide for program assumptions.

One benefit of the project would be to pilot test a methodology for conducting similar simulations for other sub-watersheds in the Bay or elsewhere.

On the geographic scope of the simulation: It should be large enough to be able to simulate a variety of trades from many sources but small enough to control the costs and manage the level of complexity.

Stakeholders

Categories of stakeholders to involve in the simulation should include: government agencies (e.g., USDA, EPA, USGS, MDE, NMFS); farming, livestock, POTW, and conservation groups; developers; nutrient credit aggregators; permitting authorities; watershed managers; stormwater management officials and communities. Specific organizations and groups could include the American Farmland Trust, Water Environment Research Foundation, and the Electric Power Research Institute. Actual or potential credit aggregators should be part of the discussion and a stakeholder group for the simulation.

Potential Sponsors

Among the possible sponsors for the simulation project (financial, sources of expertise, conveners) are federal and state agencies; USDA Conservation Innovation Grants; the Electric Power Research Institute; the National Association of Clean Water Agencies; the Chesapeake Conservancy; the Chesapeake Bay Foundation; sensor technology providers; and private foundations with interest in water quality issues.