Detailed Summary
Workshop on Nutrient Monitoring to Support Water Quality Trading
Wednesday, June 24, 2015

Partnership on Technology Innovation and the Environment

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Opening plenary

Welcome & overview: Dan Fiorino, AU

- This effort comes out of the Partnership for Technology Innovation and the Environment (PTIE) which was created by our Center for Environmental Policy at American University, the Environmental Protection Agency (EPA), Environmental Defense Fund (EDF) and the Nicholas Institute at Duke University, building on the Technology Market Summit we held in 2012.
- Water technology was one of the first issues we focused on, and specifically nutrient monitoring rose to the top as a high priority issue, which gave rise to the project we are discussing today.
- Today, we are working with George Washington University on ways to move forward with nutrient sensors for water quality monitoring.
- We want to get your advice today: how do we maximize the value of our efforts to nutrient sensor user groups?

Agenda

See Appendix A: Workshop Agenda

Introductions

See Appendix B: Participant List

Nutrient sensor challenge: Denice Shaw, EPA

- A couple of years ago the White House convened agencies to discuss the issue of nutrients and water quality.
- We set the Nutrient Challenge to help stimulate the development and deployment of water quality sensors that cost less than $5,000.
    - 29 teams have come in with sensors to test, with both nitrate and phosphorus sensors
    - The Alliance for Coastal Technology (a NOAA funded organization at the University of Maryland) is running the testing
    - Solomons Island (MD), Michigan, and Hawaii are the three testing sites that will be used by 17 of the 29 teams in August 2015
    - A year from now, formal evaluation will begin for both the beta-testing teams and for new teams
    - Following the 2016 testing results will be published and winners will be announced
    - Sub-challenges have been announced – a visualization challenge to communicate the sensor data (this was wrapped up two weeks ago with USGS data – winner will be announced on August 12), and a high school data challenge with ESRI (EPA is hoping this will help with the communication issue as well)

- EPA is trying to work with the Water Environment Foundation (WEF) and to convene listening sessions with different organizations
- In conjunction with the sensor challenge, various companies and organizations have approached EPA about accessing the sensors coming out of the challenge – there's a great deal of interest, but this is not yet planned out
- Nutrients-challenge.org takes you to the Alliance for Coastal Technologies website with all of the information

Complementary Chesapeake Conservancy project: Jeff Allenby, Director of Conservation Innovation, Chesapeake Conservancy

- The Chesapeake Conservancy is developing high resolution landscape data, which is very useful for parcel-specific projects (the National Land Cover database is more suited for watershed level and above)
- This tool has great potential for looking at specific projects, sources of pollution, site conditions, and which projects could have the most value – as well as what Best Management Practices have been used
- These datasets are going to be available online to the public free of charge, which will be helpful for sub-watersheds and small organizations
- Helps to prioritize restoration and protection
- Over the next year, we will have this high resolution for the entire Chesapeake Bay watershed

Targeted watershed projects: Michelle Perez, World Resources Institute (WRI)

- WRI is a global organization focusing primarily outside of the US, but it has a research program studying water quality in the US
- WRI conducted an economic feasibility study for a national water trading system that would range from the Gulf of Mexico to point sources in New York
- WRI recently did a review of the MRBI program, which is trying to conduct landscape-focused projects
    - The business-as-usual approach is to solve individual water quality projects on individual farms, but this approach doesn't coordinate actions or ensure that the most important parcels are part of a water quality trading project
    - USDA doesn't like the first-come, first-serve basis under which the first farmers to apply for a trading program are included with no regard for the varying potential water quality impacts of involving particular farms
    - What we need to do is prioritize and even conduct outreach to farms by impaired streams to do restoration
    - Can we have the best of both worlds? Nutrient sensing & trading *and* local watershed projects targeted at impaired waterways?

Overview of project and two tracks: Royce Francis, GWU, and Dan Fiorino, Center for Environmental Policy, AU

- Technical design of the modeling project: Royce Francis (GWU)
  - The goal is to design a simulation for these sensors
  - Jon Deason, GWU and Joe Greenblot, EPA, will be facilitating the discussion
- Policy discussion on the role of enhanced nutrient monitoring: Dan Fiorino
  - The goal is to address the policy questions of designing a simulation project for water quality monitoring sensors
  - Dan Fiorino, AU and Steve Harper, Intel, will be facilitating the discussion

Break-out session: Technical design of the modeling project

Session facilitators: Joe Greenblot (EPA), Jonathan Deason (GWU), Royce Francis (GWU)

Note: BMP = Best Management Practice

Discussion Questions:

- What effect would enhanced monitoring (water and land) have on the cost-effectiveness and credibility of water quality trading (primarily point/non-point)?
- How accurate and timely must the monitoring data be to support credible water quality trading?
- To what extent can high-resolution landscape data help identify optimal sites for monitoring and targeted conservation efforts?
- What lessons can be drawn from other water quality trading programs (such as in Maryland) to support more effective trading with enhanced monitoring?

Primary themes

Sensors and the data they provide would give much-needed legitimacy to water quality trading programs--this stems largely from the ability to quantify which practices reduce nutrients

- BMPs are not working well because we don't have quantitative information on their impacts
  - The current practice is BMP validation through visual inspection, and sensors would enable us to measure the effectiveness of BMPs
  - We need performance data
    - One practice is going to be very effective in one place and not in another; we need to know where the money is best spent–

        - think of us as conservation venture capitalists who need to find a good investment
        - Nobody's going to make the investment if they don't have the confidence that it will perform
- High-res landscape data and modeling and performance-based metrics (from sensors) can be used to look at which farms are implementing which BMPs and their impacts
- If we could figure out what impacts individuals BMPs have on particular parcels, the trading market could take off
- There are data sources that already exist that could be useful, but they are often private, like nutrient use by each farmer and USDA field-scale data
    - Some available tools that could be useful include SPARROW, APEX, NTT, the BayFast TMDL tool, and SWAT

Sensors can improve targeting of government funds and facilitate buy-in from farmers when they learn the exact pay-off of specific management practices

- If we have performance data for BMPs we can encourage farmers to put in BMPs because we'll be able to offer exact figures (e.g. $1,000/year) and the farmer could do a cost-benefit analysis
- Once we put in a sensor network, we could have empirical data to actually analyze the model, and we could tell whether this is a worthwhile use of government money – and then with the big point sources involved and buying credits produced by the non-point sources, the system could run on its own without government subsidy
    - First, however, we need to gather the data and outside funding to get things up and running
- The decisions of farmers are going to be based on economics and profit, so they need to receive incentives
    - Later, the sensor data will give us necessary data, but as a first step we need to incentivize at the grassroots level to get individual farmers involved
    - It is critical we think about decisions for information systems – it's important to know the health of the watershed, but watersheds don't make decisions, so we have to get at the operators and the decision levels

Best management practices 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 (and for each sensor to have compatible outputs - i.e. to speak the same language)

- There is a missing piece of the puzzle with the sensor technology – there needs to be some sort of standardization for sensors

- There are no standards that dictate to the sensor manufacturers how they are going to qualify and report their data
    - Right now it won't be apples-to-apples comparison
    - This issue has been raised from many of the teams in the nutrient sensor challenge
    - These sensors also all need to be inter-operable, so that other companies and states can add spokes to the network; all of the sensors need to be able to talk to each other in a universal way
- Farmers can't justify even $5,000 sensors, so those need to be distributed by third parties to get this system up and running

The trading system must be designed properly, but it alone will not guarantee trades - there needs to be buy-in from farmers on a large scale, and financial incentives

- Trying to raise capital for a sensor would be difficult because the market is not defined at all
    - A market needs to be developed, in the same way that EPA created a market with its Acid Rain Program, setting standards and a trading scheme and giving people flexibility to meet them
    - The Regional Greenhouse Gas Initiative is another model program, though it is somewhat less complex than water quality trading
    - There has to be some monetary value for nutrients themselves to scale it up
- Total Maximum Daily Load standards could play a strong role in a trading system
    - For example, TMDL for nitrogen in the Chesapeake Bay – it may be more cost effective for point sources to go out and purchase credits from a non-point source, who can do the reductions in a much more cost-effective way, making the market find the most cost-effective way
- Don't assume that regulatory systems are the only drivers – there are many systems already in place with state programs, especially since EPA has promised not to regulate non-point sources
- The challenge is to commodify ecosystem services that we can be using; Maryland's system hasn't been performing well in this regard
- A typical farmer might have the option of implementing one of 20 different conservation practices; they will do what has on-farm benefits and not the off-farm benefits unless those practices come with financial incentives

A simulation project with sensors deployed across part of a watershed (possibly using Chesapeake Conservancy's high-resolution landscape data to pinpoint the best locations) with a few individual farmers participating will be a good place to start

- Find watersheds with 3 to 16 farmers who all have an effect, and will work together to make changes, and start the simulation there

- One way to answer the ideal location question is to locate the wastewater treatment plants (that do or do not have a TMDL) and find the ones with farmers upstream – how many farms would get energized about their BMPs and could we get local wastewater utilities to contribute the funds?
- The simulation is useful because you have to install some sensors to get the simulation going, but you have to have some level of confidence to justify the market existence

Break-out session: Policy Issues Associated with Simulation Project Design

Session facilitators: Dan Fiorino (AU Center for Environmental Policy), Steve Harper (Intel)

Discussion Questions

- Can a simulation project help in designing programs that avoid unacceptable concentrations in different areas?
- What lessons can be drawn from other water quality trading programs to support more effective trading with enhanced monitoring?
- How do you motivate/ provide incentives for farmers to share data?
- Are we focused on individual trades with individual farmers vs. trying to concentrate in sub watersheds?
- What effect would enhanced monitoring (water and land) have on cost-effectiveness and credibility of water quality trading (point/ non-point)
- How accurate and timely must the monitoring data be to support credible water quality trading?
- To what extent can remote sensing identify optimal sites for trading or conservation efforts? **Prior to discussing the questions above, participants observed that incentives for water quality monitoring are absent from existing trading programs.** Specific observations included some of the geographic and socio-behavioral barriers identified those listed below.
    - The geographical barriers included adverse environmental impacts such as creation of “hot spots.” One of the participants suggested that some very good writing about “hot spots” has been done by EPA’s Region 3.
    - A lack of trust from non point sources (i.e., farmers) was considered to be a major barrier to monitoring.
    - Most underlying issues are not technical but social issues. From a social and political perspective, even if land owners meet the water quality standards, that doesn’t solve the question for all stakeholders involved. The participant asked the question whether “accurate monitoring" could address all those issues?
    - Another participant added that not only “accurate monitoring” but water quality standards could address these issues.

The Potential benefits of sensors--baseline data, moving from assumptions to quantitative data, improving credibility of water quality trading

- Nutrient sensors are valuable for identifying baselines and for on-the-ground trading. Without sensors, assumptions on hot spots are made but there is no way to verify assumptions. Nutrient sensors provide real data and allow for greater transparency.
- Nutrient sensors might be useful to combat the skepticism of trading between point and non point sources. Currently, water quality monitoring relies on assumptions and estimations. Nutrient sensors have the potential to make the trade more transparent and comparable.
- If monitoring can be accurate and timely, it could take trading to the next-level. Accurate and correctly-placed nutrient sensors could help move conversations from assumptions to facts. Sensors can provide us with those numbers.
- The group agreed that enhanced monitoring would add to the credibility and efficiency of water quality trading in the long-term.
- Prior to allowing POTWs/point sources into any trading program they must reach their current permit allocation. This means that by bringing POTWs into the program, nutrient loads would be greatly reduced before any trading program is implemented.

How can a simulation project help overcome barriers and leverage the added value of nutrient sensors. In other words, what would a simulation project contribute to that would increase stakeholder confidence? The following points were mentioned:

Reducing costs versus earning trust

Granularity / quality of data versus cost of the data collection

Accuracy and placement of the monitoring device

Duration of monitoring needed to establish a baseline

Accessibility of data versus protection of privacy

- The simulation project needs aggregators and brokers to continue to serve as intermediaries between farmers and the point-source (i.e., WWTP). There is no direct relationship between point sources and farmers. This would also help with the social acceptance of the trading scheme. An example of such a model is the Mississippi River/Gulf of Mexico Watershed Nutrient (Hypoxia) Task Force, a joint federal, state and tribal task force, chaired by the U.S. EPA and the State of Iowa. It evaluates progress toward reducing the amount of nutrients (nitrogen and phosphorus) entering local waterways and ultimately, to the Gulf of Mexico. The task force has conducted behavioral studies on how to recruit a critical mass of farmers in the right locations. Beyond the financial incentives, farmers also need to see that they are directly contributing to a positive result.

- Placement of monitors is critical. Participants agreed that simulation project could help identify the ideal locations for monitors. Participants were enthusiastic about the Chesapeake Conservancy's remote sensing to optimize sensor siting.

- One participant asked: "what is the real policy question?" Are we trying to reduce compliance costs? An EPA representative responded that compliance cost reduction is not EPA's goal. Rather, EPA's goal is to improve and meet the water quality standards without a focus on cost.
- A reasonable expectation from the simulation project is to help minimize the cost of the sensors: A participant stated that the current USGS sensor is $50k-$100k for deployment and operations for one year. The device itself costs $25k-35k. We want to bring the cost of monitors down to below $5k. More data is generally equated to being better data; however, data costs a lot of money. There needs to be a focus on using sensors more effectively and improving data quality.
- Most participants agreed that building trust with farmers is critical. The simulation project should be designed in a way that it incentivizes non-point sources to participate. For POTWs, price is somewhat flexible.
- One participant indicated that while environmental benefits will be very important, there are important political aspects of such a project. Therefore, some attention should be paid to the costs of compliance to help grow political support and sustainability.
- Participants noted that the aggregators should pay for the monitors and serve as intermediaries between buyers and sellers and should be reimbursed from the buyers' credits and added assurance. Aggregators can be seen as banker (analogous to an ESCO in an energy market). Another participant noted that an advantage of the aggregator-pays model would be that it would spread the cost across all buyers. One could take all the money and place it in a certain area. This would give the project some flexibility.
- Farmers would be uncomfortable if the aggregator handles all the data. Noting that this is a challenge, a participant added that while privacy is an issue, collecting data is critical. If aggregators have control over data, the landowners would not want the data to be easily accessible. Data cannot be anonymous due to the spatial nature of the data. In order to overcome this challenge, one participant suggested working with watershed groups. Those groups could be the access points to communities since they work with sub watershed groups that are made up of community/ private citizens that get together to self-report monitoring data from their backyards.

The group discussed the ideal conditions of the watershed to be used in the simulation project

- In terms of duration, the participants agreed that it must be determined on a case-by-case basis. For example, in some watersheds it can take 10 years to measure the impacts of BMPs.

- For a simulation to contribute to monitoring, participants noted that the size of the watershed needs to be considered. It could take years to determine the baseline conditions in a large watershed. Smaller watersheds will show quicker results. It is not only the watershed size, but also other watershed or state-specific conditions and priorities such as cleanup of the Chesapeake Bay for Maryland that determine the project's goals.
- Some watersheds lend themselves particularly well to a simulation, such as those in headwater areas.
- Participants discussed the other challenges of setting a time dimension. One added that temporal hot spots are a challenge. The other noted that if collecting continuous data was the goal (which was agreed upon by all participants) then what numbers would one report?
- Another participant agreed and added that the simulation project should concentrate more on the range of the data provided by the sensor and not so much on the granularity of data. Another added that the monitoring data must be integrated with remote sensing data.

Potential stakeholders to be included in the simulation project

Participants brainstormed potential stakeholders who should be included in the conversation and simulation project (individuals, organizations, disciplines etc). The following were suggested.

- USDA
- USGS
- Farmers
- POTW operators
- Electric Power Research Institute (EPRI)
- Watershed groups (E.g., Anacostia Riverkeepers)
- Permitting authorities
- American Farmland trust
- End-users
- Maryland Environmental Finance Center
- Sociologist
- Aggregators
- Council Fire; Maryland Department of the Environment; Workgroup on "Accounting for Growth"
- Ecosystems Investment Partners
- Water Environment Research Foundation (WERF)
- Possible Funders: Pieces Foundation, EPRI, NAQWA, Gordon and Gordon and Betty Moore Foundation

Closing session – outcomes, cross-cutting issue, next steps

Outcomes of policy session: Dan Fiorino, AU and Steve Harper, Intel

- In terms of designing the simulation, we discussed what questions this could answer – where to put the monitors, what kind of testing, this could be a pilot simulation for other trading entities that need simulations
    - Agreement that simulation should be interactive
    - Scope of the simulation: combine two objectives – reduce the cost of the simulation by making it focused and small, and flexible to simulate a variety of types of trades and sources
- Better monitoring could contribute to reducing costs but trust is a big issue
- Stakeholders: government agencies (USDA, USGS), farming representatives, POTW representatives, watershed groups, permitting authorities, users, watershed managers, credit aggregators
- Funding organizations: the USDA conservation innovation grants, as well as foundations and others
- Questions to consider
    - What is a reasonable set of expectations for a monitoring program? What questions can modeling address?
    - Where you put the monitors and where the monitoring data fits with other data is very important
    - What is the job of trading? What is trading designed to do?
- If there is confidence in the data, the conversation will shift to the social and political issues in the watershed
    - Perhaps the biggest benefit of trading is that sources have to come to a baseline in order to be eligible to trade, which has significant environmental benefits

Outcomes of technical session: Royce Francis, GWU

- Geographic scale: the scale should be about the effectiveness of the sensor monitoring ability
    - We were thinking of the Corsica watershed for its large point sources, non-point sources, and some historical data already available
- Market drivers and farmers: it may be hard to provide incentives to farmers, so how do we address that issue?
- Data availability: there are challenges with integrating available data sources
- Standardization of the measurement technique used by the sensors – it may be hard to determine reliability of the sensors because they are difficult to compare

Next steps: Jon Deason, GWU

- The most important next step is to talk about management and resources, not limited to financial resources because many of the people in this room would be good as resources

- Potential sponsors: USDA, OW + USDA, EPRI, MDE (if we do these simulations in MD), within EPA (OW, Region 3, ORD); office of fossil energy at DOE and the water-energy nexus project there, USGS, NOAA, NIS, Chesapeake Bay Foundation, Chesapeake Conservancy
- Teams in the nutrient challenge
- Is this a good fit for USDA NRCS's Conservation Innovation Grants (CIGs)?
    - CIG is not designed for research but it could be used for implementation or demonstrations
    - CIG has funded a lot of trading programs
    - There is an annual call for proposals that has already occurred this year – it's typically April or earlier
    - RCPP is open now from the NRCS, not designed for research but if it leads to management it could work
        - Two priorities: markets and adaptability
- What about phase funding?
    - This project could be presented as an implementation tool, how we might target sensors as part of the implementation trading regime – try that approach and see how it works with grant opportunities
    - There is a research aspect of the wastewater industry that could be interested in this, including WEF, WERF, and American WaterWorks Association
- EPRI has five advisory committees that could be interested
    - In-stream monitoring and being able to attribute reductions to BMPs is currently very costly and technically challenging
    - EPRI is interested in water quality trading generally, is not limited to the Ohio River
- Maryland state government is interested but has very limited financial resources
- PTIE cannot seek funding but aims to stimulate action on key innovation issues.
- Temporal considerations
    - The timeline should sync with the sensor challenge, especially if you want to go to the tech companies involved for funding
    - 18-24 months; then, transition to real sensors with a real trading regime in a defined watershed

Appendix A: Workshop Agenda

Workshop on Nutrient Monitoring to Support Water Quality Trading
June 24, 2015, 8:30am-12:30pm
Troutman Sanders LLP, 401 9th Street, NW, Suite 1000
Washington, D.C. 20004

Agenda:

Time	*Session*	
8:00am	Sign-in and continental breakfast	
8:30am	Opening plenary • Welcome and Overview of Partnership on Technology Innovation and the Environment *(10 mins)* • Nutrient Sensor Challenge *(10 mins)* • Complementary Chesapeake Conservancy Project *(10 mins)* • Targeted Watershed Projects *(10 min)* • Overview of Project and Two Tracks *(20 mins total)*	
9:30am	**Break-out sessions – Two tracks** (see below for descriptions)**:**	
	Technical Design of the Modeling Project	*Policy Discussion on the Role of Enhanced Nutrient Monitoring*
11:00am	Coffee break/transition time	
11:30am	**Closing Session – Outcomes of Tracks, Cross Cutting Issues, Next Steps** • Outcomes of two tracks, cross cutting issues, and integration into one project (30 minutes) • Making this project succeed: next steps, management, and resources (30 minutes)	
12:30pm	**Adjourn**	

Workshop Overview:

Complementing the Nutrient Challenge currently underway by EPA and other federal agencies to incentivize the production of lower cost nutrient sensors, the PTIE is developing a project to simulate the use of in-stream sensors to measure nutrient pollution reductions from the application of best management practices (BMP) in the Chesapeake Bay watershed. Better nutrient monitoring has the potential to substantially boost water quality trading programs by reducing uncertainties associated with the BMP installations, thus providing more assurance of pollution reductions and facilitating trades between point and non-point sources. Effective trading programs that involve non-point sources of nutrients are essential for accommodating continued growth in the Bay watershed while facilitating restoration of the Bay. Nutrient sensors could also support targeted watershed monitoring and watershed approaches to improving water quality. The model envisioned by the PTIE will enable stakeholders to run simulations to show how real-time distributed sensors can validate agricultural and municipal BMP effectiveness and support watershed nutrient management. This workshop will bring together experts and key stakeholders to refine the proposed plan for deployment and use of nutrient sensors to support water quality trading and targeted watershed monitoring. The objectives of the workshop are to (1) improve the project plan, (2) select a Bay sub-watershed or sensor placement, (3) identify stakeholders to be involved in the project, and (4) develop a management and resources plan to implement the project. The workshop will use two tracks to focus on: (1) design of simulation project and selection of a specific sub-watershed in the Bay area and (2) policy issues associated with water quality trading and targeted watershed monitoring, as well as their implications for the design of the simulation.

Track 1 – Technical Design of the Modeling Project

Description: The first track of the workshop will focus on the development of a model to demonstrate potential use of real-time data from distributed sensors and optimal placement of the sensors. While the use of distributed sensing for nutrient trading programs has been identified as a way to demonstrate the viability of BMPs, use of nutrient data collected by a system of watershed network sensors has heretofore not been demonstrated. This project could provide a quantitative demonstration of BMP effectiveness in reducing nutrient and sediment load reductions below no-BMP baseline conditions, which could also help with the determination of where to target water quality improvement efforts. Given the complexity of determining actual nutrient reductions from specific BMPs due to variations in site geometry, soil conditions, atmospheric sources and other factors, this proposed project aims to enable the determination of causal associations among BMP implementation and sensor readings at a level that will support greater inclusion of non-point source reductions in programs such as the Maryland Water Quality Trading Program.

Simulation discussion questions for the workshop:

- What conditions best represent baseline nutrient and sediment loading?

- Which modeling techniques should be considered for the project (headwater flow mapping, contributing area identification, concentrated flow paths, etc.)?
- Which existing data sources or public models should be considered (USDA NRCS Soil maps, USGS SPARROW maps, USGS National Hydrology Database stream maps, etc.)?
- Based on geographic cues and preliminary qualitative insights into the placement of sensors according to existing modeling techniques and data sources, what are some potential guidelines for the placement of sensors?
- What quality and/or quantity of validated with/without BMP data would help stakeholders be comfortable with using monitoring to demonstrate effectiveness of the most important BMPs?
- What are the most important BMPs to obtain a more in-depth understanding of their effectiveness in controlling nutrient and sediment loading?
- What seasonal and/or weather events should be studied in the project?
- How large of an area should the project cover? What should the spatial resolution of the model be?

Track 2 – Policy Discussion on the Role of Enhanced Nutrient Monitoring

Description: The second track of the workshop will complement the technical modeling track by addressing the assumptions and alternatives that should be incorporated into the design of the simulation from a policy perspective, as well as the questions the project should aim to answer, in order to provide guidance on how best to build enhanced monitoring into water quality trading programs. The project is based on the principle that the market is key in determining the priorities and standards for monitoring to support enhanced trading as well as funding improvements in sensor technology and integration. The project aims to show how having more available, accurate, real-time monitoring could allow for more credible tracking of BMP-based nutrient reductions from nonpoint sources. This could increase confidence in water quality trading programs that allow non-point/point source trading, thus stimulating political support of such programs. This workshop track will explore policy issues that affect the design and operation of nutrient trading programs, particularly with respect to those related to possible applications of the results of the simulation. Additionally, it will explore the potential for using nutrient sensors to support targeting conservation efforts to high priority areas and supporting targeted watershed monitoring programs.

Policy discussion questions regarding the design of the simulation project include:

- What kinds of trades should be considered as part of the simulation (e.g., agriculture, stormwater, other)?
- What should the geographic scope of the simulation encompass?
- How accurate and timely must the monitoring data be to support water quality trading?
- What stakeholders should be involved in the project?

- What lessons can be drawn from other water quality trading programs (such as in the District of Columbia) to support more effective trading with enhanced monitoring?
- How accurate does the enhanced monitoring have to be to enable cost-effective trading?
- Will enhanced monitoring have the effect of stimulating a more active trading market?
- How can a trading program be designed to avoid unacceptable concentrations at specific locations?
- What institutional models are available for facilitating the functioning of the market?
- To what extent can remote sensing identify optimal sites for trading or conservation efforts?